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COOPER BASIN

1984 PEDIRKA BLOCK HYDROCARBON MICROSEEPAGE SURVEY

Submitted by

Delhi Petroleum Pty. Ltd.
1984

SCANNED

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PRIMARY INDUSTRIES AND RESOURCES SA

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REPORT ON THE RECON EXPLORATION (AUSTRALIA) PTY LTD AERIAL SURVEY CONDUCTED IN THE PEDIRKA BLOCK, AUGUST 1984

SA3 Group
Delhi Petroleum Pty Ltd
August 1984
DFL/111/4

CONTENTS

1.0 INTRODUCTION

An aerial survey was conducted by Recon Exploration in specified areas of the Pedirka Block, South Australia. The survey technique relies on airborne microwave detection of gas microseepage above hydrocarbon accumulations and anomalies thus identified are subsequently confirmed by ground soil sampling surveys.

The aerial survey conducted in August detected four significant microseepage anomalies and has demonstrated how conventionally identified seismic prospects may be graded by a remote sensing survey. It is anticipated that the ground sampling programme planned for October will further refine the grading of Pedirka Block drilling prospects for possible inclusion in the 1985 Budget.

2.0 RECON PEDIRKA AERIAL SURVEY

a) History

A proposal for a Recon Exploration Survey in the Pedirka Block was prepared by Delhi Petroleum Pty Ltd and circulated for comment. Following a satisfactory response from partners in the Pedirka Block, a Technical Committee Meeting was called on Wednesday, August 1 to discuss the proposal. The meeting approved a 4-1/2 day helicopter survey over the following prospects:

Poolowanna
Pediban
Erabena
Oolarinna
Killumi
Glen Joyce
Mokari

A ground sampling programme was discussed but details were not finalised pending the outcome of the aerial survey.

The choice of prospects was based on structural closures that had been identified by seismic interpretation and the Recon programme was not designed for 'broadacre' prospecting; as such, the survey was somewhat subjective, but the poor results of drilling conventional closures in the Pedirka Block introduced uncertainties that were regarded as sufficiently challenging to successfully evaluate the survey technique.

The survey was programmed to commence on Wednesday August 8, but equipment was inadvertantly offloaded in Singapore and the start was delayed for two days.

b) Record of Events

W. Fawcett (Delhi), K. Thompson (Recon President) and D. Strachan (Recon Australian Manager) flew to the Norpac International Inc seismic camp based at Mokari on Thursday August 8. A flight plan to cover the specified prospects was prepared in consultation with K. Thompson and Norpac staff who were able to offer advice about the status of new and old seismic lines. Navigation for the survey was based totally on seismic grids and the proposed flight plan reflected this constraint. The approximate areas for the survey were as follows:

Mokari/Glen Joyce	180 km^2
Killumi	112 km^2
Oolarinna	77 km^2
Poolowanna	126 km^2
Pediban	40 km^2

A series of three traverses over Erabena 1 for dry well control was envisaged as adequate to assess the location. Seismic basemaps generated by W. Fawcett were used for the survey; no structural interpretation or other information was included. Anomalies were recorded directly onto the basemaps by the equipment operator, K. Thompson.

2.0 RECON PEDIRKA AERIAL SURVEY (Cont.)

b) Record of Events (Cont.)

The helicopter arrived at approximately 0820 hours on Friday, August 9, and the proposed flight plan was discussed with the pilot.

The initial flights over Glen Joyce prospect were conducted with the pilot (G. Rutter) and K. Thompson. The close spacing of parallel dunes and uncertainties about wind turbulence necessitated light passenger loading and this procedure was adopted in all new locations. W. Fawcett accompanied the survey over Mokari to evaluate the survey technique and to establish the accuracy of navigating over a seismic grid.

The seismic camps moved to Macumba on Friday and the helicopter flew to that location at the end of the Mokari survey. Flying time totalled 4.8 hours over the prospects, with an additional 0.5 hours incurred flying to the new campsite.

Poolowanna and Pediban were surveyed on the second day, with a total flying time of 6.4 hours being recorded due to the distance between the camp and the eastern prospects.

Oolarinna was surveyed on Sunday and the Erabena wellsite was also traversed to assess the hydrocarbon indications in a dry well: flying time totalled 5.1 hours.

On Monday, August 13, W. Fawcett, D. Strachan and G. Rutter returned to Adelaide and a relieving pilot J. Klopper continued the survey. Killumi and an anomaly west of Killumi were flown, as well as the Macumba well site, and the helicopter returned to Adelaide via Oodnadatta and Marla Bore where similar work was performed on behalf of other companies. Flying time on Monday and Tuesday (part) totalled 7.5 hours.

c) Survey Parameters

i) Navigation

Navigation by seismic lines proved to be extremely successful. The extensive regrowth on lines as recent as 1982 vintage at times caused disorientation but marker pegs along lines and at line intersections could be read by landing the helicopter. The speed of the helicopter (60 knots) made distance estimates difficult for a novice to such work, but the pilot and K. Thompson displayed considerable experience and were able to determine positions accurately. An alternative to landing to verify position was to gain altitude above a fixed ground location, thereby determining the spatial orientation of lines; this knowledge could then be applied to the seismic basemap. The ability of the helicopter to change direction abruptly enabled close-spaced grids to be followed and an anomaly, once detected, could be rapidly criss-crossed with infill traverses.

2.0 RECON PEDIRKA AERIAL SURVEY (Cont.)

c) Survey Parameters (Cont.)

i) Navigation (Cont.)

The use of the aerial survey technique in regions lacking seismic coverage would be impossible without sophisticated navigation (eg Omega?) and this would restrict small surveys due to cost. As such, the Recon technique will be hard to evaluate if further small scale trials are required in areas not traversed by seismic lines (ie for a totally objective evaluation).

The extent of regrowth on lines as recent as 1982 caused occasional confusion; these lines were bulldozed with reduced width (for environmental reasons) and in many cases had blended well with surrounding vegetation cover. It is not unlikely that lines could, with time, blend in completely when viewed from low altitude, especially if good rains continue, and alternative reference points would be required.

ii) Flying Parameters

The standard procedure for surveying prospects was to fly at approximately 60 knots at an altitude of 15 feet. Dunes in the Pedirka Block range from 20 ft to 60 ft and the helicopter was able to climb as necessary and then descend into the swales to maintain a uniform height above ground.

Turbulence was common and the pilot chose to fly with a minimum passenger load in the mornings until the pattern of air movement was established over a prospect. The separation between dunes was much greater towards the east (Poolowanna, Pediban) and the dunes were higher than in the Mokari area; flying was therefore more demanding in the western part of the block, with ground relief harder to predict. The windward/leeward assymetry of the dunes altered wind characteristics across the crests and the approach direction (ie east/west) influenced helicopter stability. Overall, however, no conditions that made flying unsafe were encountered during the survey. With respect to seasonal variations, casual discussions with persons familiar with the Pedirka region suggest that high winds are common in spring/summer (personal experience at Kuncherinna 1 in February, 1982 supports this observation) and surveys during that period could be extremely hazardous.

No mechanism was available to predict drift (eg flight computer) because no single bearing was maintained for a long enough period. The flying speed of 60 knots ± is equivalent to 110 km/hr and at this speed, a 10 km traverse could be flown in 5 minutes. Seismic lines spaced 2 km apart were intersected in 1 minute and drift corrections in such a short space of time were dependent on the

2.0 RECON PEDIRKA AERIAL SURVEY (Cont.)

c) Survey Parameters (Cont.)

ii) Flying Parameters (Cont.)

pilot's judgement of the helicopter's attitude to its flight path. The survey method involved repetitive flight lines, however, and anomalous zones were traversed several times for verification, thus minimising errors in position.

iii) Recon Survey Data

The Recon survey technique relies upon the assumptions that (a) gas microseepage may be detected by an airborne microwave-based system, and (b) Recon personnel are able to recognise anomalies against background gas values.

The equipment employed for aerial detection consists of a rotating transmit/receive antenna coupled to a rotating display cathode ray tube. Due to high ambient light levels, a hood is placed over the screen and the only person with access to the display is the operator. No 'hard copy' of the display is available and a casual observer cannot directly ascertain any details during an actual survey.

The second point about the survey technique is that the anomaly is a highly subjective thing; even if an independent observer gains access to the display, it is unlikely that the image will convey any true meaning. Recon personnel familiar with both the equipment and anomalies elsewhere (eg USA) claim the ability to be able to grade a screen image into background or true anomaly categories based on their experience (the Recon 'data base') - this appraisal cannot, therefore, be scrutinised by an independent observer, as distinct from, say, seismic acquisition.

The President of Recon Exploration (Australia) Pty Ltd, K. Thompson, personally conducted the Pedirka survey, thus eliminating any grounds for doubt about operator proficiency.

Without doubt, the lack of machine generated 'hard copy' and inability of independents to verify anomalies generates the main scepticism about the technique; consequently it must be borne in mind that ground validation, generating quantitative data, is an integral part of the Recon survey and the aerial survey must be seen in context.

There is no doubt that anomalies can be detected by Recon equipment and experience with the Pedirka Block survey has clearly shown that zones corresponding to seismic highs may be mapped. As such the aerial component of a Recon survey must be accepted on face value as an excellent technique for both locating and delineating hydrocarbon anomalies for later validation by ground geochemistry.

2.0 RECON PEDIRKA AERIAL SURVEY (Cont.)

d) Results

The results of the survey have been adequately discussed by Mr K. Thompson in his report and will not be repeated here. The major points to be considered, however, are as follows:

a) Recon Exploration does not make any claims about the prospectivity of an aerially-detected anomaly until the anomaly has been verified by ground sampling. Glen Joyce, Poolowanna and Killumi have been clearly identified as significant anomalies and deserve priority in ground sampling, but they may yet prove to be unprospective following ground geochemistry.

b) Recon personnel were aware that the areas selected for the survey were seismically-identified prospects and the objectivity of the survey was therefore compromised. It must be remembered, however, that Kuncherinna, Erabena and Walkandi were devoid of significant hydrocarbons and conventional closure is no guarantee of hydrocarbon accumulation. In view of this fact, structural information was of limited value to Recon personnel and prospects still required grading objectively via survey equipment.

c) The sheer size of the Pedirka Block necessitates that survey work of this nature must be conducted by air. The distances flown amounted to several days travelling time by car and there seems little alternative to helicopter support for the ground sampling survey.

d) The position of the anomalies shows considerable agreement with subsurface structure and clear-overlays of the relevant structures have been provided for easy comparison.

APPENDIX 1

Photographic Record of the Recon Pedirka Survey

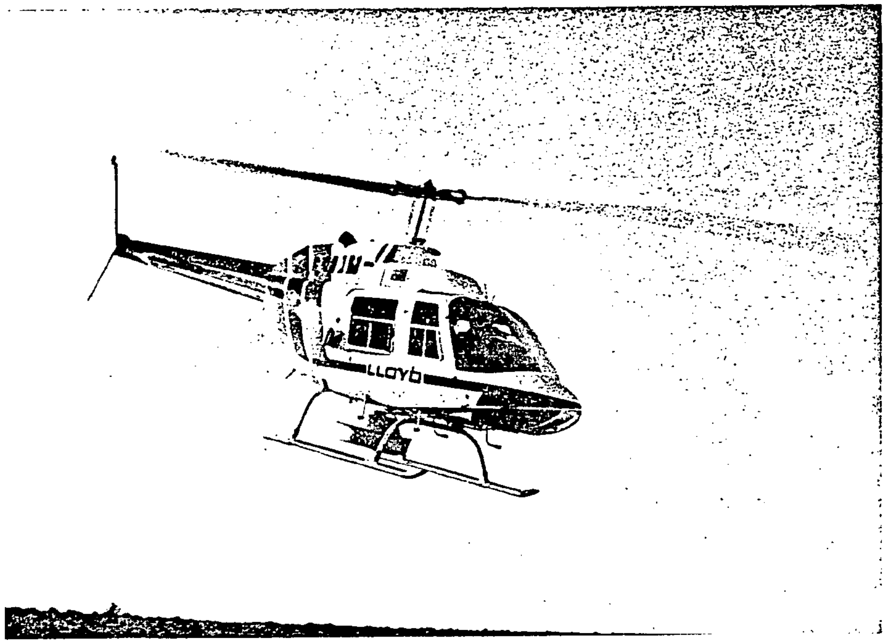

FIGURE 1 Lloyd Aviation Bell Jetranger with Recon microwave transmit/ receive antenna.

FIGURE 2 Flight briefing prior to Recon survey over Poolowanna. L. to R. K. Thompson (President, Recon Exploration Pty Ltd), D. Strachan (Manager, Recon Exploration (Australia) Pty Ltd), G. Rutter (Pilot, Lloyd Aviation).

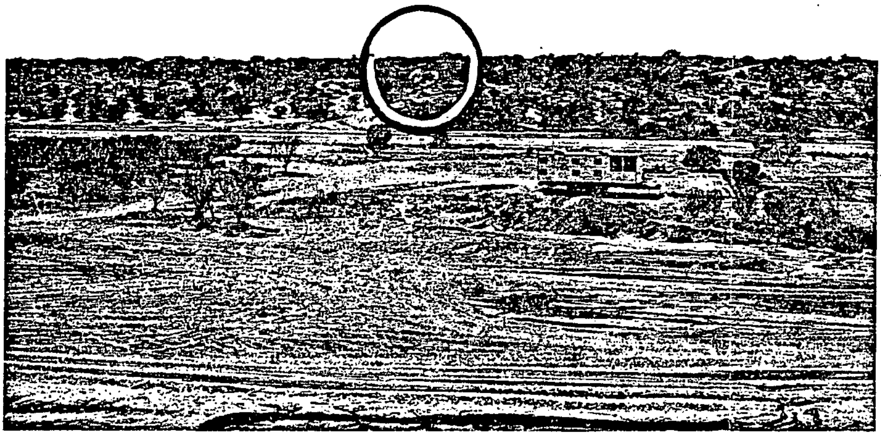

FIGURE 3 Helicopter flying west along 76-WAA over the Mokari 1 wellsite at standard survey altitude.

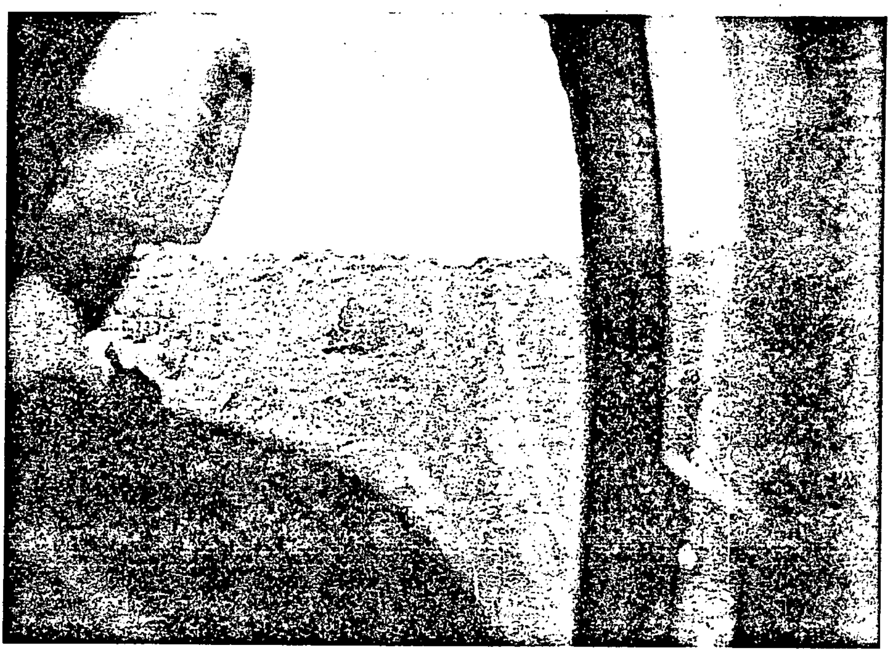

FIGURE 4 Approaching a typical 30 ft high sand dune on 84-WMG near Mokari. The narrow width of the lines is readily apparent.

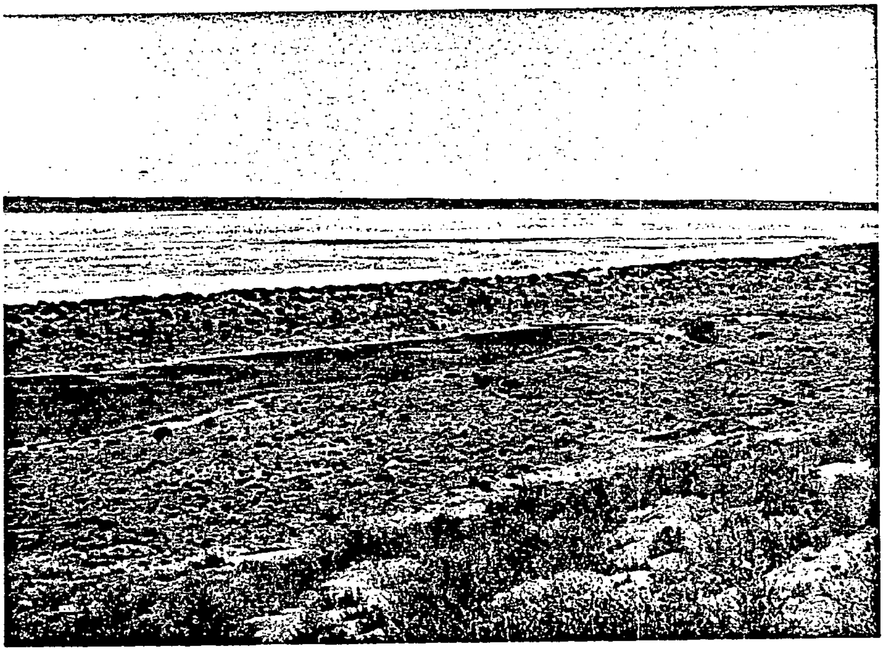

FIGURE 5 Pediban survey, Saturday, August 12. Note the height of the (typical) dune in this region of the Pedirka Block.

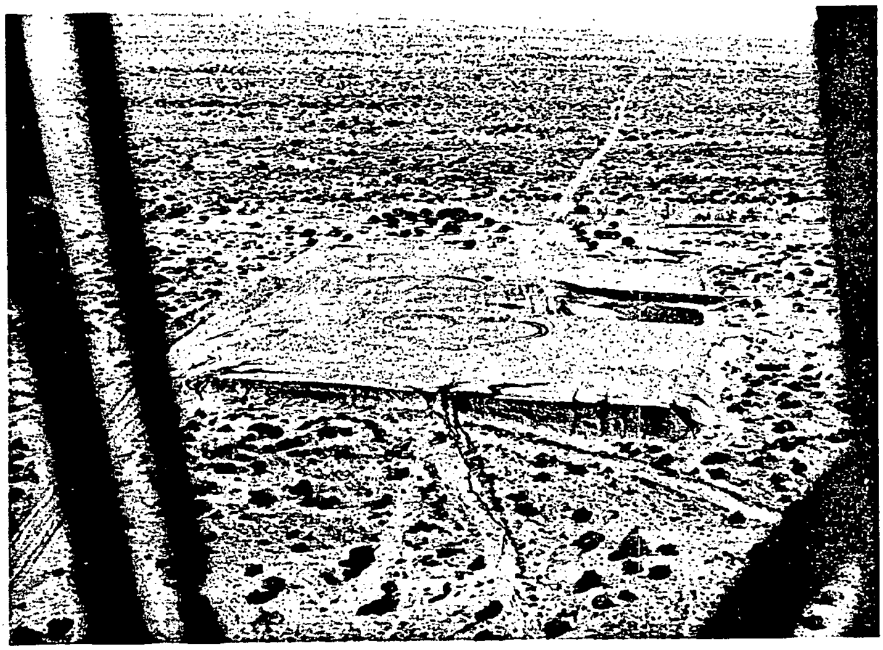

FIGURE 6 Erabena 1 lease. The well was plugged and abandoned on 18/12/81.

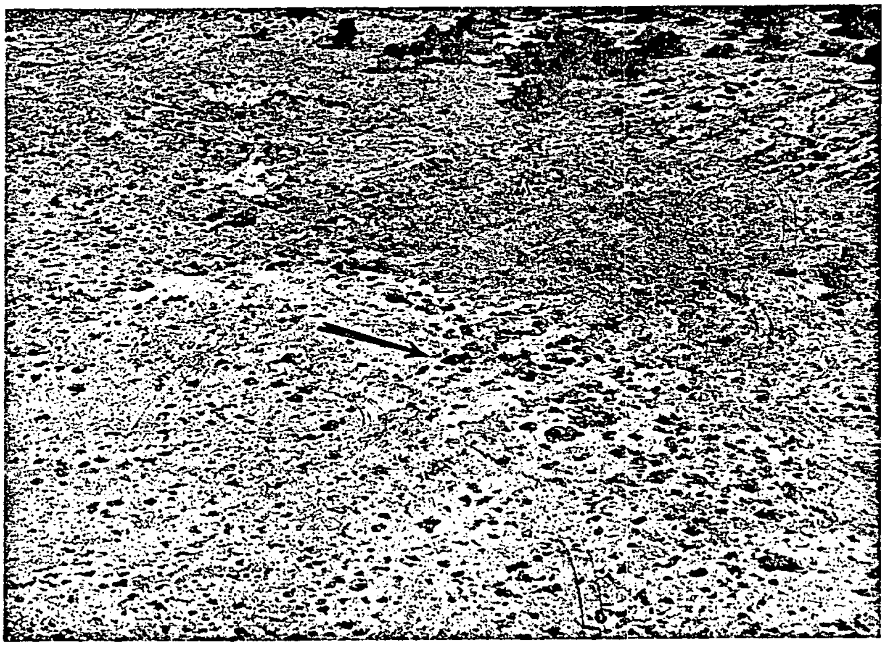

FIGURE 7 Poolowanna 1 wellsite. Note the regeneration in the sump. Poolowanna was drilled in 1977.

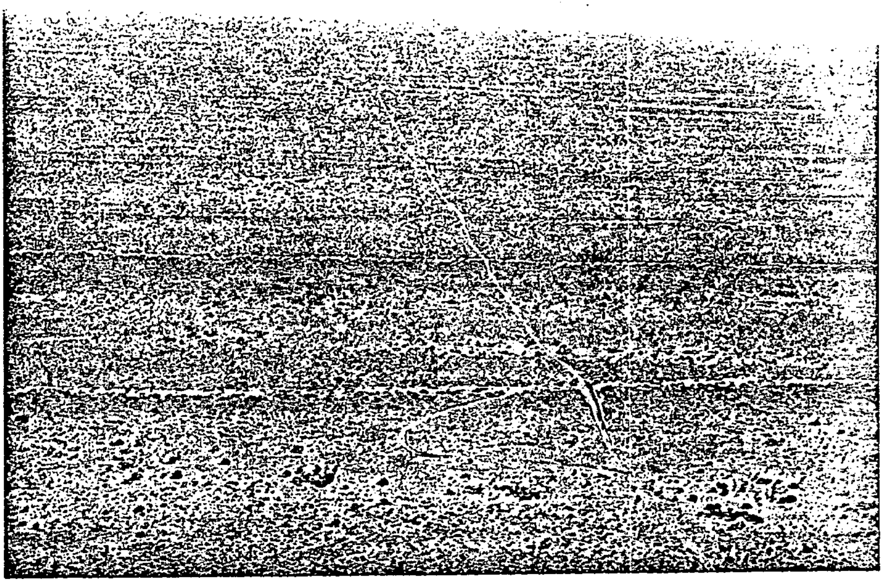

FIGURE 8 Looking west along 84-WML. Recent seismic lines are restricted to one blade width to minimise environmental impact; caving on dune crests causes problems with soft sand as a result.

The following series of photographs indicates the extent of regrowth on seismic lines in the Pedirka Block. The photographs were taken at random to give a general picture of the state of environmental impact. Many lines are visible only at altitude and were missed during the Recon Survey.

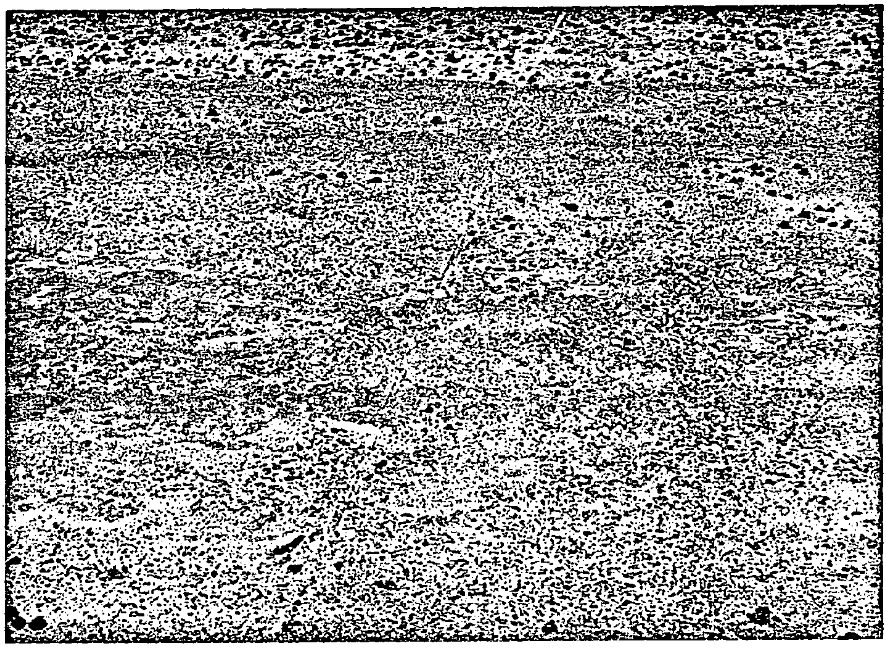

FIGURE 9 East along 76-WBL (elevation ca. 1000 ft).

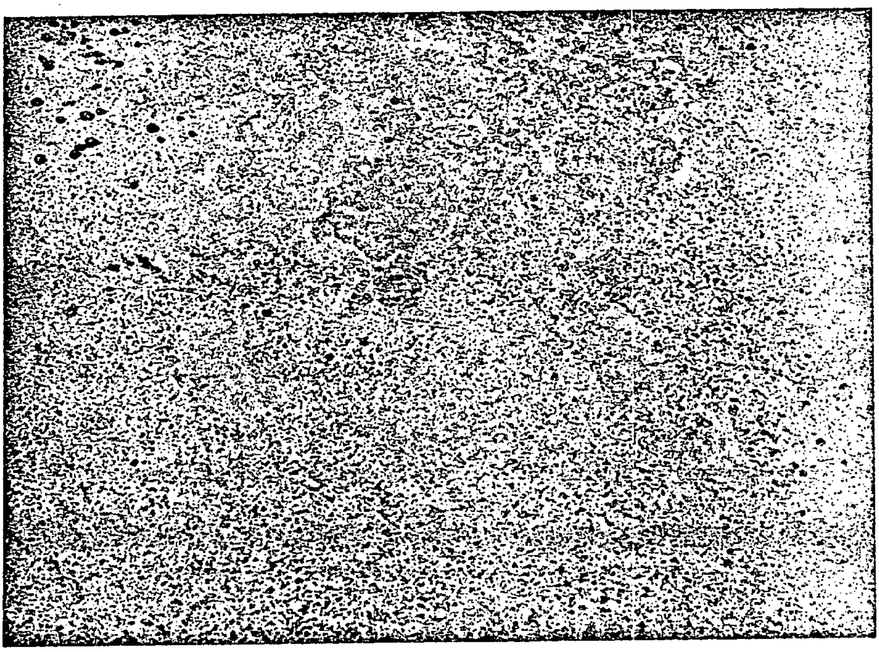

FIGURE 10 76-WBL, as above, from a different aspect.

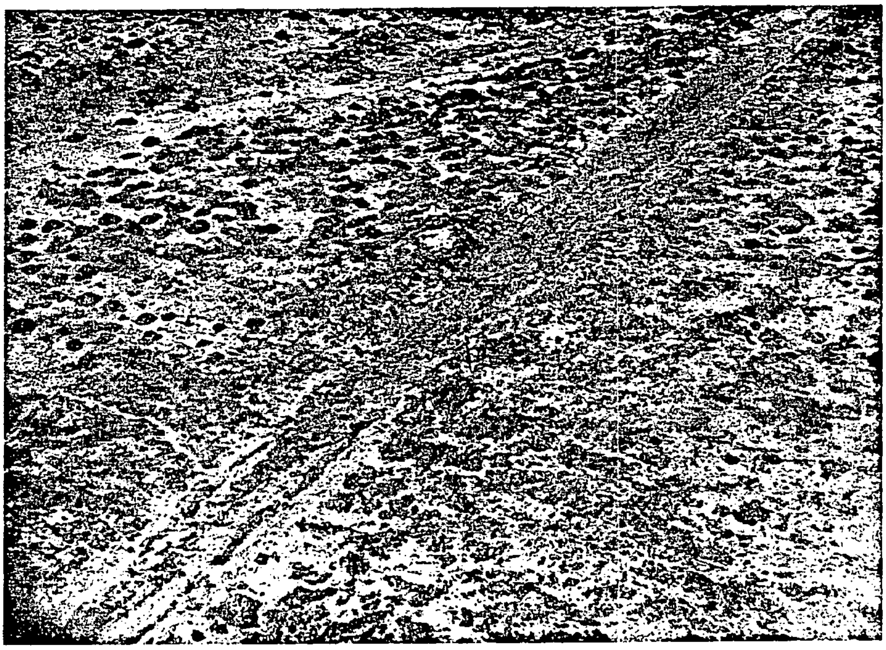

FIGURE 11 Heading east along 76-WAB at the intersection with 80-WJE, SP 106. Regeneration in seismic lines that run parallel to the longitudinal dunes is occasionally impaired by migration of fines into the resultant low point in the swale. A similar effect occurs naturally (see Figure 5).

FIGURE 12 West along 76-WBX. The finer white sand appears to be more difficult to stabilise and regeneration has suffered.

FIGURE 13 North north west along 80-WGC.

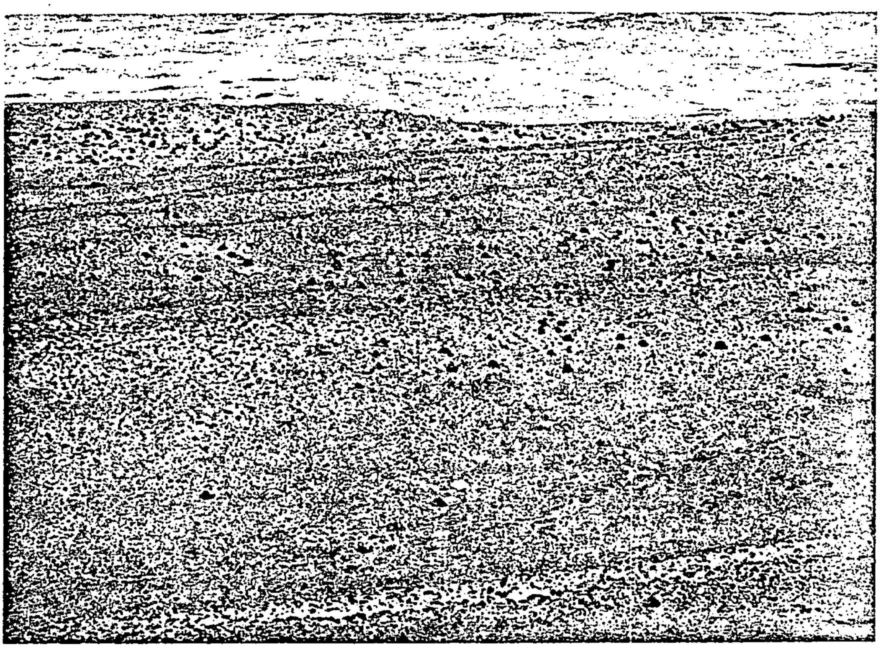

FIGURE 14 East along 82-WLZ. Lines with this amount of regeneration made navigation extremely difficult at low altitudes.

APPENDIX 2

Transparent Overlays of Structure
Maps over the Prospects Surveyed by
Recon Exploration (Australia) Pty Ltd.

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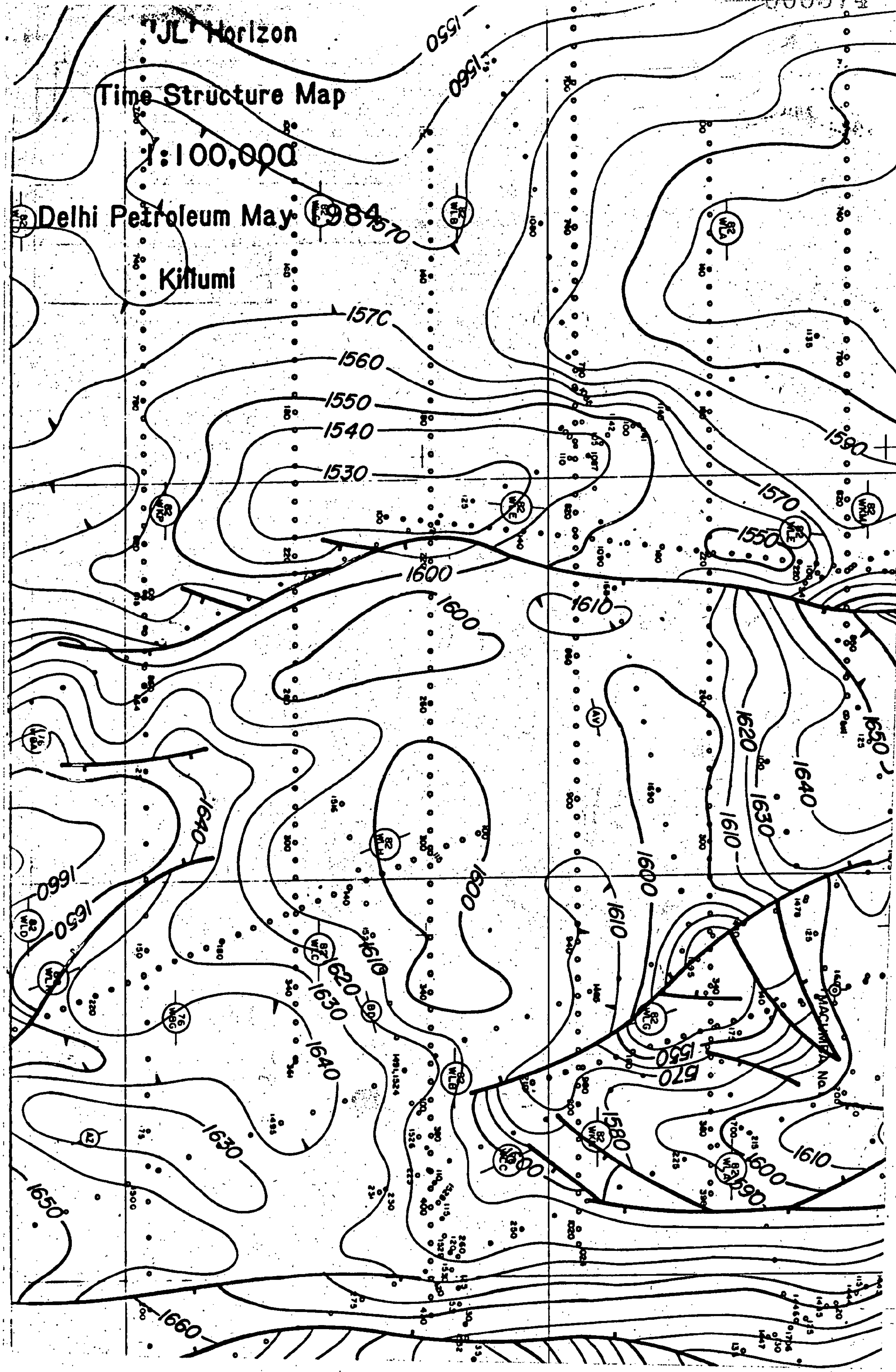
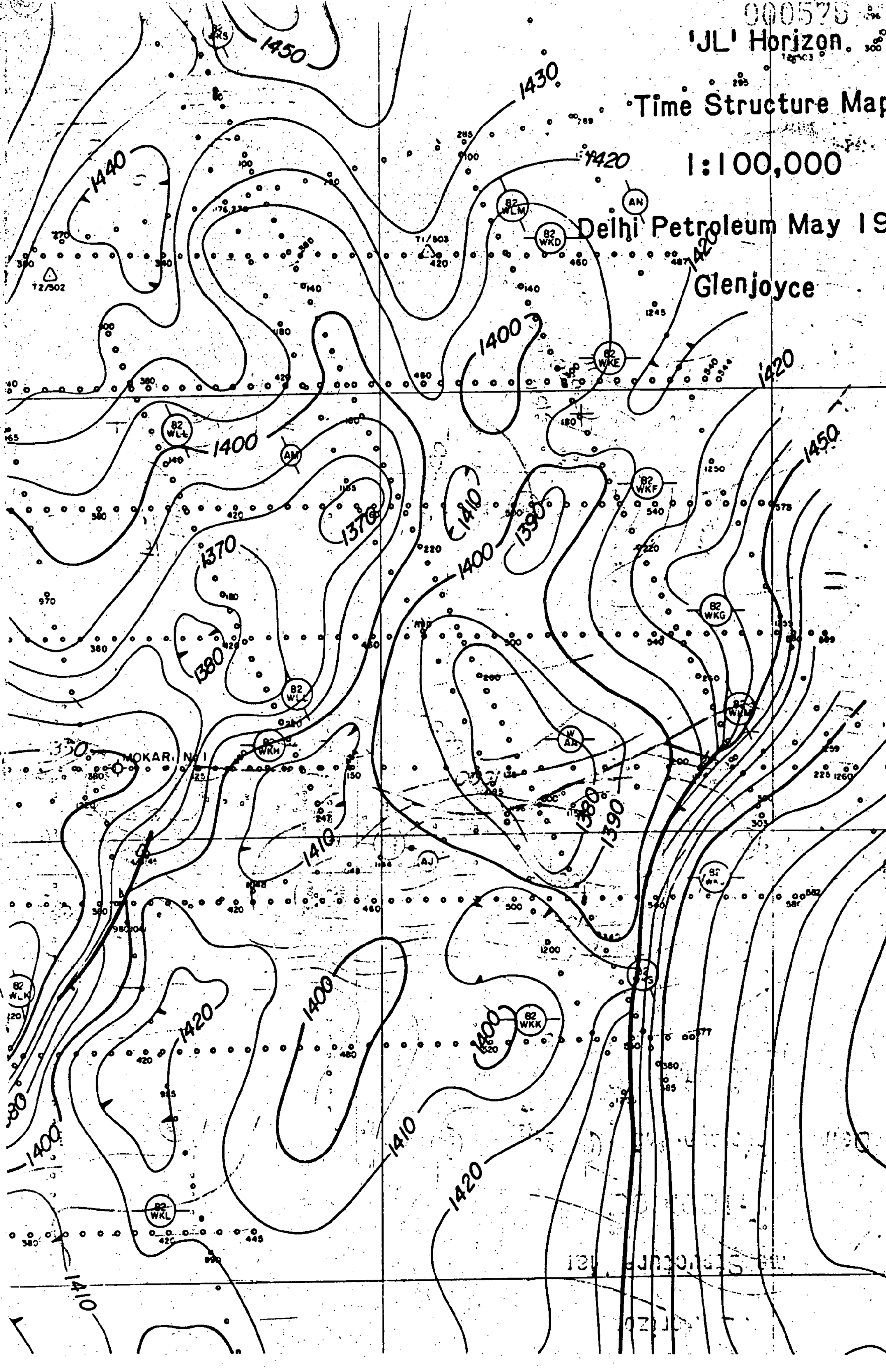

"JL" Horizon
Time Structure Map
1:100,000
Delhi Petroleum May 1984
Killumi
1530
1540
1550
1560
1570
1590
1600
1610
1620
1630
1640
1650
1660
MACUMBA No.

000579


'JL' Horizon.
Time Structure Map
1:100,000
Delhi Petroleum May 19
Glenjoyce
MOKAR No 1
1450
1440
1430
1420
1410
1400
1390
1380
1370
82 WLM
82 WKD
82 WKE
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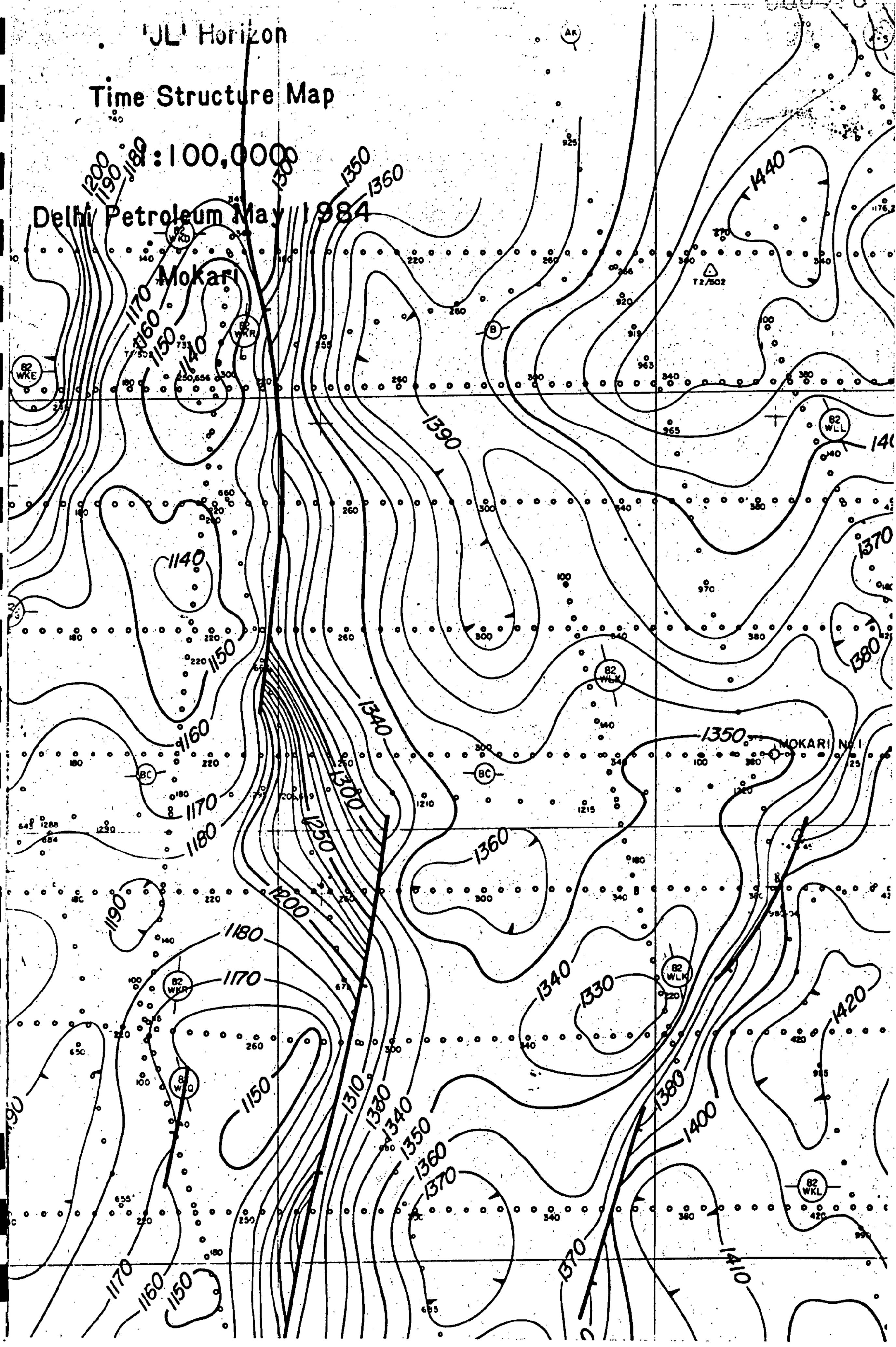
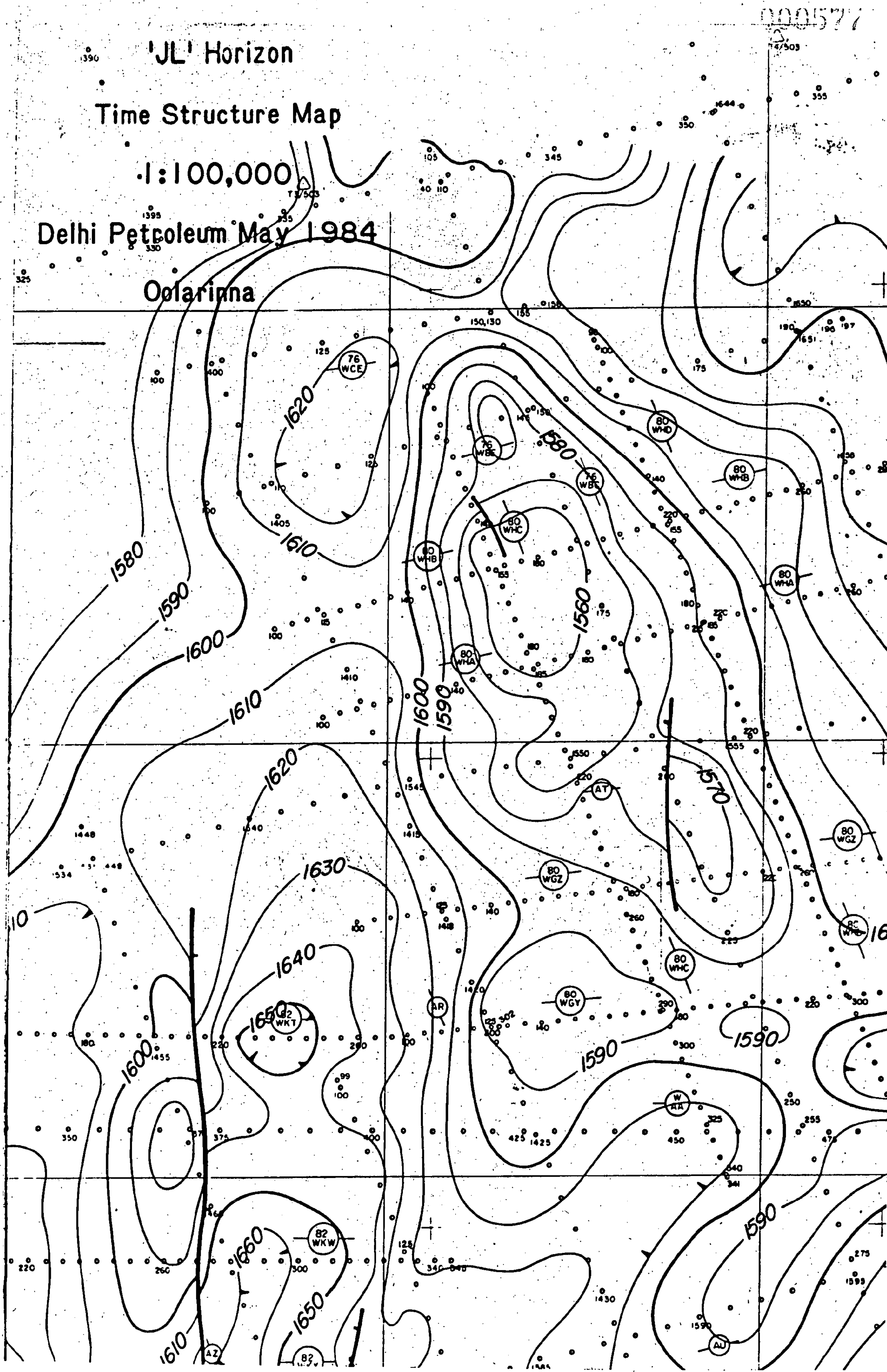
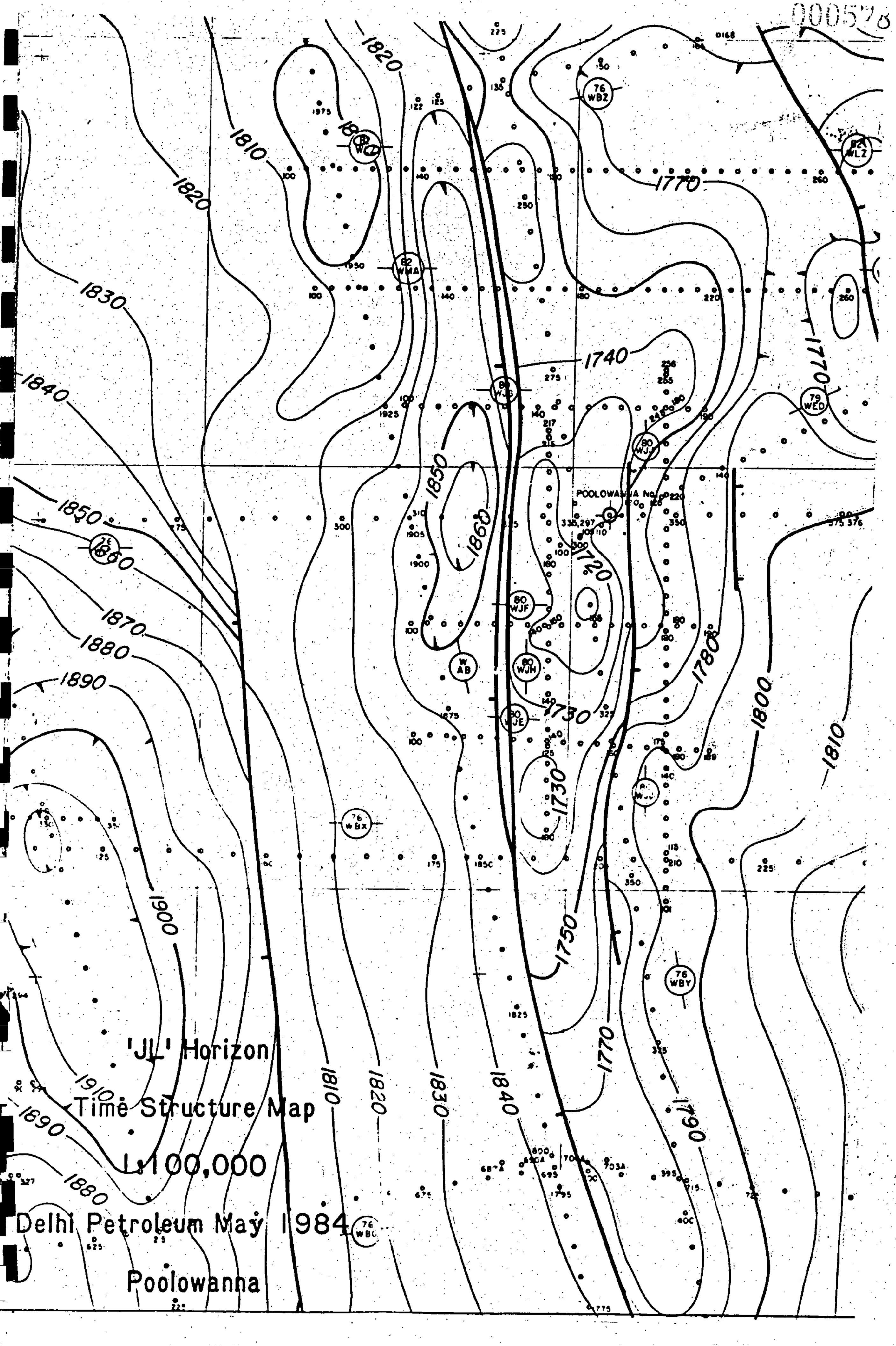
82 WKF
82 WKG
82 WLC
82 WKH
82 WKK
82 WLK
82 WKL
AN
AM
AJ

000576


'JL' Horizon
Time Structure Map
1:100,000
Delhi Petroleum May 1984
Mokari
MOKARI No 1



'JL' Horizon
Time Structure Map
1:100,000
Delhi Petroleum May 1984
Oolarinna
1580
1590
1600
1610
1620
1630
1640
1650
1660
1560
1570


'JL' Horizon
Time Structure Map
1:100,000
Delhi Petroleum May 1984
Poolowanna

000579

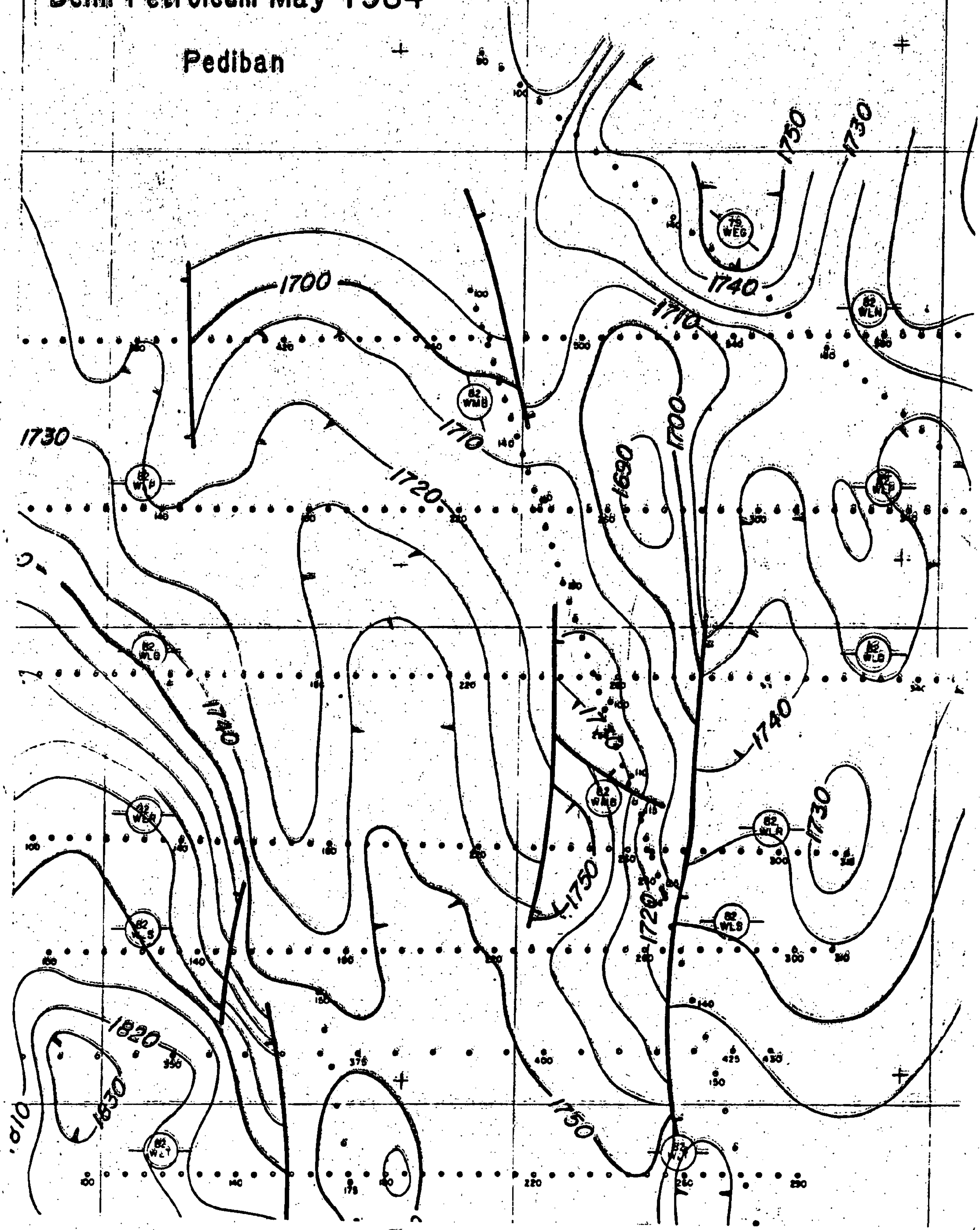
'JL' Horizon

Time Structure Map

1:100,000

Delhi Petroleum May 1984

Pediban



000580

PROPOSED RECON EXPLORATION (AUSTRALIA) PTY. LTD. SURVEY IN THE PEDIRKA BLOCK

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SA3 Group,
Delhi Petroleum Pty. Ltd.,
June, 1984
BJS/111/4

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CONTENTS

INTRODUCTION

The extremely large area of the Pedirka Block and the paucity of seismic coverage in the southern and eastern parts would make the Block an ideal candidate for an airborne reconnaissance geochemical survey. Recon Exploration has developed a technique that enables large areas to be aerially assessed for hydrocarbons by detecting ground leakage through caprock seals and any anomalies so discovered can be verified by ground sampling. The company claims excellent results overseas and now offers their services to J.V. partners in the Pedirka Sector.

The following proposal outlines a Recon Exploration (Australia) Pty. Ltd. survey across regions in the Pedirka Block. The total cost is estimated to be $80,000.

DISCUSSION

Recon Exploration aerial hydrocarbon surveying employs a radar transceiver mounted under a helicopter and relies on the interaction between the emitted microwaves and hydrocarbons leaking to surface to create a reflected and/or re-emitted signal. The signal is then displayed on a cathode ray tube and a trained operator can detect anomalous zones above the background levels and identify areas for ground sampling and confirmation.

The Recon technique is based on a number of assertions that must be accepted before any credence is placed on the method. These assertions are as follows:-

a) hydrocarbons leak to surface from reservoirs by migration through caprocks;

b) these hydrocarbons can be detected at the surface by technologically valid methods;

c) Recon Exploration has developed these theoretically sound methods to the point where they become a legitimate prospecting tool.

These points are elaborated below, bearing in mind that they are the author's interpretations and cannot be readily verified on the grounds of confidentiality (due to patents that may exist or have been lodged by Recon to protect their investment in the survey technique).

a) Leakage from Reservoirs

The very foundation of the oil and gas industry is the entrapment of mobile hydrocarbons by caprock seals impervious to fluids in either structural or stratigraphic traps. The Recon survey technique, however, relies on microseepage from reservoirs and assumes that no caprock seal is truly impervious. Values of vertical permeability for shales generally lie within the range of 10^{-6} - 10^{-12} m/day (Bowering, 1982), and Bouwer (1978) quotes a value of 10^{-7} m/day as being typical for a consolidated shale. The figures quoted by these authors suggest that the Recon microseepage concept is correct and that reservoirs do leak hydrocarbons at a presumably small but detectable rate. The aerial survey only detects methane, the lightest and most mobile hydrocarbon and its ascent to the surface would be the most rapid of all the hydrocarbons.

The influence of background methane levels has been discussed and the company claims the survey method detects only anomalies above background. Consequently the ubiquitous blanket of Winton Formation coals and deeper source rock beds should not mask the microseepage above actual accumulations. Ground sampling via the 'spears' can detect C_1 to C_7 and will therefore discriminate above high background methane values.

b) Recon Exploration uses a device labelled a "Reservoir Gas Mapper" to detect microseepage. The apparatus has a certain 'black box' mystique and therefore arouses suspicion about its validity.

The scientific rationale behind the Recon method appears similar to that used in spectroscopy and therefore has a solid experimental

DISCUSSION (Cont.)

b) basis. Molecules may interact with microwaves by absorbing energy which may then excite molecular vibration: the result is both a loss of energy from the microwave beam as it passes by the molecules and a subsequent emission of energy by the vibrating molecules as they return to their resting state. The frequency of the microwave transmission must be carefully chosen to resonate the C-H bond and produce an interaction. This situation gives rise to two methods by which a hydrocarbon cloud may be detected:-

(i) a radar image of the ground peripheral to, and at some distance from, the helicopter would become blurred as the beam penetrated an anomalously high concentration of methane due to loss of wave energy by absorption (absorption would only occur at the correct frequency, selected by Recon, for methane);

(ii) hydrocarbons penetrated by the microwave beam would become excited and then re-emit energy that could be detected by the equipment receiver. Recon literature states that this is the method employed by the company and the following explanation is given:

EQUIPMENT - The RG Mapper is an electronic installation mounted in Recon's helicopter, with a rotating beam antenna emitting pulsed specific frequency energy in a fan shaped beam. The pulses excite the gas molecules to a higher state of energy. Between pulses the gas molecules re-radiate the energy which is detected and displayed on a video screen in the helicopter. The picture generated looks much like rainstorms seen on nightly TV weather news. Sensitivity is so great that minute amounts (even a few parts per million) can readily be detected and recorded.

(from "Mapping the Invisible Footprint" - Recon Exploration)

Interactions between molecules and microwaves in this manner are beyond doubt. Astronomers studying galaxies rely on the microwave flux present naturally to excite molecules which can then be identified on Earth by the spectra they emit e.g. Hydrogen was identified in 1951, formaldehyde (CH_2O) in 1969. Radar in its early stages was plagued by rapid signal attenuation due to resonance and absorption of energy by atmospheric oxygen and present day radar systems are still a compromise between resolution (hence short wavelengths) and range, the shorter wavelengths being most rapidly attenuated.

In summary, microwave excitation of hydrocarbon molecules and detection of re-emitted energy is technically feasible, and selection of frequency bandwidths to characterise specific molecules is a logical approach to hydrocarbon identification.

DISCUSSION (Cont.)

c) Recon Exploration make the following statements in their literature:

APPLICATION - When used over clear to partially clear terrain, with flat or gently rolling surface conditions, the RG Mapper will detect and display microseeps within a half mile radius and indicate relative intensities. The microseeps are plotted by the operator on topographic or aerial photo base maps, which serve as a guide to confirm the anomalies by gas sampling on the ground.

CONFIRMATION - Areas of significant microseepage that cover sufficient acreage to qualify as economic targets, are then surveyed on the ground by taking a profile line of interstitial gas samples with Recon's own proprietary design probe. The gas samples are then analysed by hydrogen flame gas chromatography, accurate to ten parts per billion. The analysis will confirm that the microseep is petroliferous (gases that are unique to oil and gas reservoirs, i.e. ethane, propane, butane and pentane) and will measure relative strengths across the anomalies.

CONCLUSION - Having flown several million acres and surveyed many hundreds of oil and gas fields, Recon can state, unequivocally, that microseepage has been detected over all the producing fields surveyed to date. Because of this experience, Recon postulates:

"The microseep 'footprint' can be detected and measured on the surface above the source reservoir, no matter what the reservoir depth may be."

To accept the latter 'Conclusion', the ability of Recon equipment to excite hydrocarbon molecules and then to detect the energy re-emitted, at wavelengths specific to methane, must be assumed. The competence of the operator must also be assumed because the cathode ray tube display apparently conveys little information to the untrained observer (J. Allender, pers. comm.).

These latter assumptions are most likely of greatest concern to J.V. partners and the company has yet to prove beyond doubt its capabilities in Australia. Names of American referees are attached (Appendix I) from whom information about the survey technique may be obtained and a free trial was conducted and documented in 1983 (see report by Mr D. Vinall). The latter trial suggests that the technique has merit and may prove itself in the Pedirka Sector.

A suggested survey in the Pedirka Block is attached (Appendix II) and it is anticipated that valuable information regarding the presence of hydrocarbons will be obtained.

W. Fawcett,
May, 1984

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Bouwer, H. (1978). Groundwater Hydrology, McGraw-Hill, New York.

Bowering, O.J.W. (1982). Hydrodynamics and Hydrocarbon Migration - a Model for the Eromanga Basin. A.P.E.A. Journal, Vol 22, Part 1.

APPENDIX I

U.S.A. Referees

RECON

EXPLORATION (AUSTRALIA) P/L

USA REFEREES

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APPENDIX II

Proposed Recon Survey Programme in the Pedirka Block

PEDIRKA

The extremely large area of the Pedirka Block and the paucity of seismic in the southern and eastern parts would make the Block an ideal candidate for an airborne reconnaissance geochemical survey.

If the whole block was gridded, the cost although large should be seen in perspective - about the same as two dry holes.

What is proposed is a trial of about 8 days ($80,000) looking at prospects, some of which will be drilled in 1985. Hence next year an evaluation of Recon usefulness can be validly made.

The proposal:

1. Airborne Survey

Ideally 500m flight line spacing is used on prospects, and a 1 km spacing for regional lines. Average prospect coverage per day is about 160 km^2 with 1 km flight line spacing ($10,000/day). It is proposed to detail the following prospects, with Erabena (dry hole in 1981) as the control.

Poolowanna and Pediban	1 day
Killumi	1 day
Oolarinna	1 day
Glen Joyce and Mokari	2 days
Erabena	1/2 day

Total Cost $55,000

2. Ground Followup

This is a separate crew, capable of 60 samples/day with a sample every 200m, or about 12 km per day. The following time will depend partly on the number and size of anomalies detected by the airborne survey and on access/logistics. However, the following is proposed:

Poolowanna	(2 east-west lines at 4 km each)
Killumi	(2 east-west lines at 5 km each)

+ other anomaly testing

Total 2-3 days $10-15,000

Further Options

1. To free more time, increase prospect line spacing to 2 km.
2. Fly two long regional east-west lines, with 1 km spacing, over several prospects and leads.
3. Trial the airborne and ground followup over salt lakes (eg Peera Peera Poolanna Lake) where seismic is restricted.

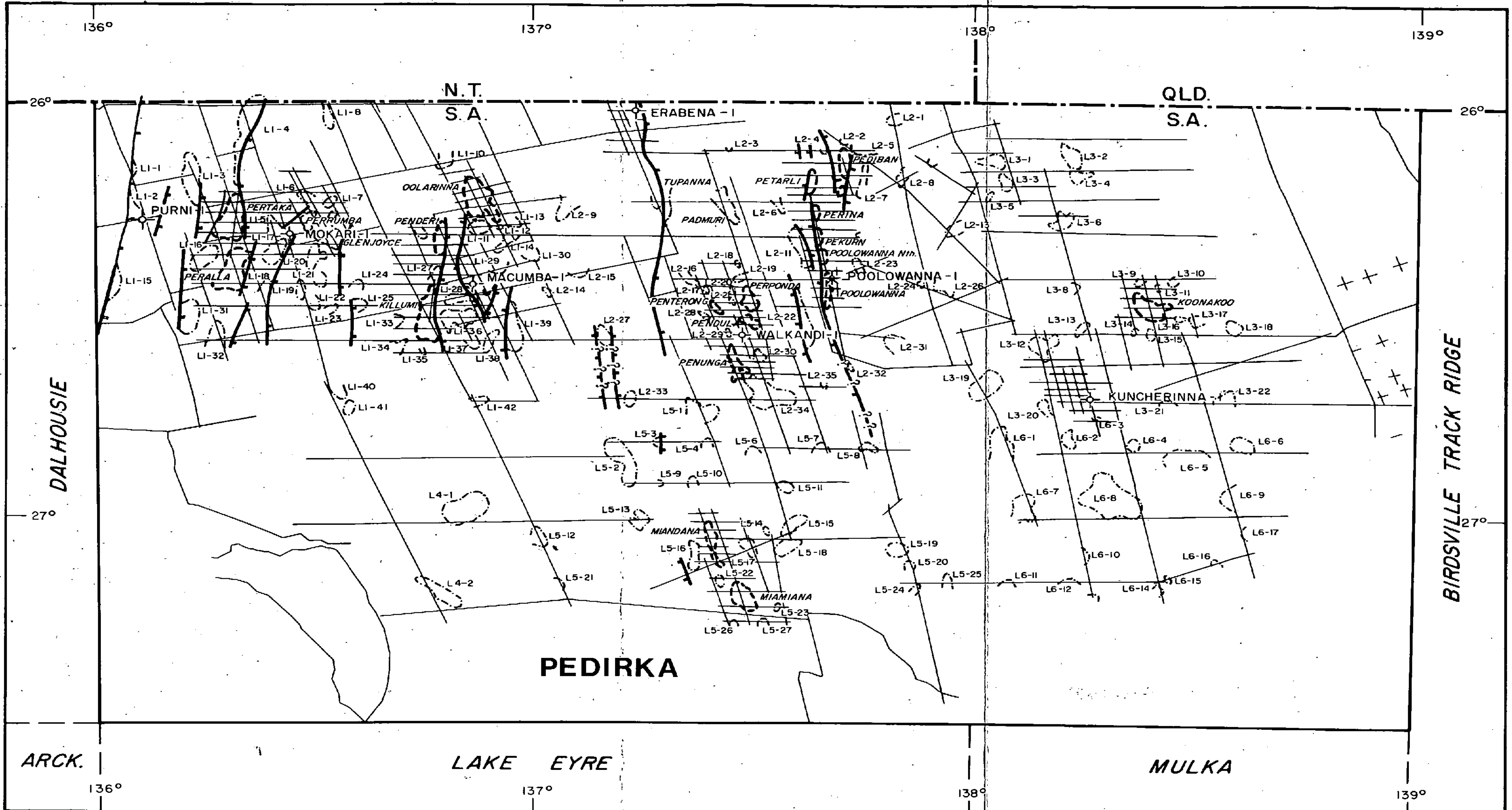
PEDIRKA (Cont.)

Summary of Costs

Airborne Survey	$55,000
Ground followup	$10-15,000
Contingency Mobilisation	$10,000
Total	$80,000 (Max.)

The amount needed for mobilisation will probably be considerably less, especially if the seismic survey camp (in Pedirka from June-August) can be used as a base.

N. Moriarty
May 1984



LEGEND

- PROSPECT
- LEAD
- FAULT

SEISMIC COVERAGE

—— UP TO 1983

- WELL, SITE OR DRILLING
- DRY WELL
- OIL SHOW
- GAS SHOW
- OIL WELL
- GAS WELL

DELHI PETROLEUM PTY LTD

PEDIRKA BLOCK

INDEX MAP

LEADS & PROSPECTS

1:1 000 000

km 10 0 10 20 30 40 km

DRAFTED. S.J.

INTERP. N.J.M

DATE. MARCH 1984

Dwg.N° 84XP-2690

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RECON EXPLORATION (AUSTRALIA) PTY. LTD. PEDIRKA SURVEY

DISCUSSION OF RESULTS OF GROUND SAMPLING PROGRAMME

SA3 TEAM
Delhi Petroleum Pty. Ltd.
November 1984
njs/111/3-3

CONTENTS

INTRODUCTION

An aerial survey was conducted by Recon Exploration over 6 seismically defined prospects in the Pedirka Block. The survey indicated that three prospects had "significant" hydrocarbon microseepage anomalies (Glen Joyce, Killumi and Poolowanna). A ground geochemistry survey was initiated in October and the three prospects listed above, as well as Oolarinna, were sampled using Recon proprietary techniques. Samples of interstitial soil gas were collected at 200m spacing and analysed in a field laboratory for C_1-C_4 gases; the results of the analyses were presented to Pedirka Block partners by Recon staff on Thursday, 25 October 1984.

The data presented by Recon is essentially unprocessed and the following report attempts to analyse the results so that the value of the Recon prospecting technique may be evaluated.

RECON SAMPLING TECHNIQUES

Recon soil sampling procedures involve hammering specially designed spears into the ground to a depth of approximately 0.7 metre. The spears are designed to have the minimum possible internal volume so that, when opened, an essentially undiluted/uncontaminated sample of soil gas may be drawn into a sampling syringe (the syringe plunger generates a partial vacuum when drawn upwards enabling soil gas to enter the probe). A 3cc gas sample may be collected within 30-90 seconds depending upon the cohesiveness and permeability of the soil, and this sample is then fed into a gas chromatograph for analysis. Comparison of the results allows determination of background levels and anomalously high values are regarded as indicative of accumulations that are sourcing the microseepage.

A major component in the assessment of Recon data is the determination of background hydrocarbon values. Deep seated source rocks, shallower carbonaceous horizons (e.g. Winton Formation coals) and surficial organic content may all contribute to background levels, possibly masking actual accumulations or exaggerating them. The sampling programme followed in the Pedirka Block included tailspread flanking the anomalies detected by the aerial survey - the aim of the tailspread was to determine scatter caused by background gas concentrations so that the significance of any anomalies would be clear. The influence of geomorphology was also a consideration and a record of the immediate terrain was maintained (i.e. dune crest, swale, claypan). Tectonics may also affect gas readings, with faults potentially forming conduits along which gases may migrate; the relative velocities differ from normal microseepage and Recon Exploration claims to be able to identify a fault signature.

RESULTS

(a) RELATIONSHIP BETWEEN GAS READINGS AND GEOMORPHOLOGY

Recon staff will not collect a gas sample from very soft soils i.e. those that offer no resistance to probe penetration. Friable soils are unlikely to have good gas retention and indurated ground in the immediate vicinity of the sample location is sought in preference. Sampling on the crests of dunes was unavoidable in the Simpson Desert and the influence of crestal sands relative to the more compacted swales was considered.

Without doubt, the best way to assess the influence of dunes would be to sample at closely spaced intervals across a dune profile, but in view of limited costs ($100/sample), this was not possible. The 200 metre sample spacing used in the Pedirka survey guaranteed that no single dune was sampled more than once, hence no basis for immediate comparison is available: the sample locations on dune crests have been labelled in Appendix 1.

Variations in readings appear to have little significance and no statistical analysis was warranted, especially in light of:-

- the scatter test variability ($\pm$10%)
- the variability that may be apparent when any two consecutive readings are compared at random, irrespective of geomorphology.

(b) DETERMINATION OF BACKGROUND

The findings discussed in part (a) preceding are that the effects of geomorphology are not clear due to inherent scatter in data, and that comparison of any two consecutive samples is likely to show a variation equal to or greater than the variation over crests. This observation introduces complexities when determining background levels and, subsequently, the significance of any anomalies.

The difficulty associated with determining regional background is readily apparent when analysing the Poolowanna tie line 76-WBY. C_1 values range from 11.38 to 39.14 over the 2.4 km sample interval which is at the crest of the Poolowanna structure and within the "significant" aerial anomaly. No part of the line, therefore, could be considered as true background yet the average value for the first four readings is 14.72, only marginally greater than the first four readings at Killumi ($\bar{x}$ 12.5) and Glen Joyce($\bar{x}$ 11.63), both of which should be true background.

Statistical interpretation was applied to the data from the Poolowanna 76-WBY tie line and the following results were obtained:-

	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
$\bar{X}$	20.02	0.85	0.95	0.35	0.54	1.27
s	7.16	0.29	0.34	0.12	0.21	0.25

DETERMINATION OF BACKGROUND (Cont)

Linear regression analysis yielded the following correlation coefficients:-

DATA PAIR	r
Methane - Ethane	+0.86
Methane - Ethylene	+0.86
Methane - Propane	+0.61
Methane - Butanes	+0.65
Propane - Butanes	+0.63
Ethane - Propane	+0.56

The mean of the Methane readings on the tie line is considerably higher than the values at the ends of the Poolowanna A and B lines (the presumed background specific to those lines) and the values for Butanes ($\bar{x}$ 1.27) and Propylene ($\bar{x}$ 0.54) are similarly higher: this observation lends weight to the method as a prospecting tool for identifying anomalous zones, especially in the case of the heavier, 'wet' hydrocarbons. One concern, however, is the apparent variation due to the conditions on the day of sampling - this is apparent when Poolowanna A data are compared with Poolowanna B data. A brief scan of the respective data suggests considerable differences and to verify this, the values west of the tie line (76 WBY) were compared. The tie line is near the eastern margin of the aerial anomaly and mapped structure, so 6 samples on both 76 WBL and 80 WJF west of the tie line intersection were considered i.e. samples 17 to 22 on 76 WBL, and 76 WBL and 80 WJF. These samples should show consistently high values but Poolowanna B (sampled on Monday, 15 October, 1984) is markedly lower. (Table 2)

TABLE 2

	METHANE	PROPANE	BUTANES
Poolowanna A ($\bar{x}$)	16.13	0.47	1.05
Poolowanna B ($\bar{x}$)	9.30	0.26	0.57

Poolowanna A was sampled on Sunday 14 October in very hot conditions and climatic factors may have affected results, bearing in mind that samples are collected approximately 0.7m below the ground surface.

The main observation is that a single line through an aerially detected anomaly in one case (Poolowanna A) indicates a significant zone whereas a second line (Poolowanna B) downgrades the anomaly: this is a critically important consideration if a Recon survey is conducted away from the known seismic coverage and aerially detected anomalies are to be tested by a single line only!

DETERMINATION OF BACKGROUND (Cont)

The application of statistics to Recon data may be excessive and results should be treated with caution (i.e. there are lies, damned lies, geophysics and statistics). The correlation coefficients are interesting, however, because they suggest that the higher hydrocarbons are not so dependent upon methane (i.e. methane/propane +0.61, methane/butanes +0.65), yet methane is the gas detected by the aerial survey. This observation may account for the reluctance by Recon to claim the presence of hydrocarbon accumulations based on the results of the aerial survey alone - only ground sampling can show the 'wet' gases and the aerial anomaly is just a guide.

The results of the tie line over what must be regarded as a highly prospective region (based on the Poolowanna 1 recovery) with respect to higher hydrocarbons is also interesting; propane/butane and ethane/propane have positive but low correlation coefficients (0.63 and 0.56 respectively) so interpretation of wet gas data cannot be expected to follow a clearly defined straight line relationship. This fact naturally introduces complications when attempting to interpret data over untested prospects e.g. Killumi, Glen Joyce, Oolarinna.

Methane and ethane show a high positive correlation (+0.86) and it may be assumed that these two gases have a recognisable relationship over accumulations - a quick analysis over the first 11 samples on line 76 WBL, off the seismic crest and west of the aerial anomaly, however, shows a correlation coefficient of 0.91 suggesting a normal soil relationship between these two gases. This interpretation, however, would require analysis of all lines before conclusions could be drawn.

In summary, it is difficult to make definitive statements about data collected over what is regarded as a highly prospective region in the Pedirka Block. The considerable variation between Poolowanna A and B is disturbing, especially in light of the fact that the dramatically increasing hydrocarbon values on the tie line 76 WBY intersect the line 80 WJF which has, overall, considerably lower gas readings! The generally low correlation coefficients between methane/propane and methane/butanes suggests that methane values may vary independently of higher hydrocarbons (e.g. due to biogenic sources near the surface) and detection of an aerial gas anomaly must be followed by ground validation (standard Recon Exploration policy). Ethane is apparently correlatable with methane both within and exterior to aerial gas anomalies, so it is not a diagnostic gas: similarly, the 'wet' gases have positive, but low, correlation coefficients so their relative abundances are not regarded as conclusive evidence for subsurface accumulations.

INTERPRETATION OF GAS CURVES

Recon Exploration presents analysed gas data in a standard format with methane (x1), ethane (x10) and propane (x10) plots. The curves illustrating the Pedirka survey have not undergone smoothing because determination of background scatter was an important consideration when preparing the programme. Several packages are available whereby data may be averaged and more uniform curves would result, but the validity of extensive smoothing is questionable, especially if it serves mainly to mask data with excessive scatter.

The benchmark for the geochemical survey is Poolowanna, yet as mentioned previously, considerable variation exists between the two east-west lines A and B. Line B has several peaks that are in approximate agreement with the overall higher line A but the prominent peaks show quite different methane to ethane ratios. Recon Exploration claims that faults produce a distinctive signature due to more uniform migration from the reservoir to the surface and the peaks at samples 12 and 24 probably reflect tectonic processes (Recon report) along line B. (Due to the north-south trend of faults as mapped in the vicinity of Poolowanna, the absence of such fault signatures along strike in the northern sample line A is surprising.)

A major aim of the Recon survey was to determine what level of background gas values were present in order to determine the significance of anomalies over hydrocarbon accumulations. Casual evaluation of the plotted data suggests that this task is complex. The presence of peaks on gas profiles may reflect faults or may, on the other hand, be no more than erroneous data points i.e. background scatter. Seismic resolution may be insufficient to allow mapping of many faults, or listric or other shallow faults may channel gases away from their point of origin to generate peaks in unexpected locations; it is therefore easy to attribute any anomalous peak to faulting.

These observations taken in conjunction suggest that fluctuations in analysed data may be attributed to either faulting, background scatter or subsurface accumulations. Killumi and Glen Joyce profiles show considerable variation and use of such data in the absence of seismic maps (as may be the case if a survey over the total Pedirka Block is undertaken) would be complicated. The results of the Pedirka survey seem to suggest that the longer the sampling lines, the more complex interpretation becomes because of the influence of factors such as faulting, background scatter and actual accumulations! Smoothing of the data would aid interpretation but it seems highly desirable to ascertain the nature and origin of the data being processed. The possible effects of faulting are illustrated in Appendix II.

The Recon Exploration report on the Pedirka survey states that:

> "The ratios of all the hydrocarbons that were measured indicate that they are being emitted from a source containing both natural gas and liquid petroleum" (page 3).

INTERPRETATION OF GAS CURVES (Cont)

This belief is encouraging in view of the poor drilling results in the Simpson Desert (i.e. 15 petroleum exploration wells with only 1 recovering oil). The Recon technique may, however, be highly susceptible to regional factors that invalidate its results and the optimistic predictions from this survey may be overturned by poor drilling results: consequently there seems little chance of fully evaluating the method prior to the 1985 drilling programme and its future use as a remote sensing technique for large scale prospecting in the Pedirka Block will depend on the results of that drilling.

The potential of the Simpson Desert region has recently been appraised by the Regional Studies Group, Delhi Petroleum, and the results of their study may be found in "Jurassic and Triassic Stratigraphy and Hydrocarbon Potential of the Poolowanna Trough (Simpson Desert Region) Northern South Australia".

CONCLUSIONS

Recon Exploration (Australia) Pty. Ltd. conducted a ground geochemistry survey over four mapped prospects in the Pedirka Block. Visual and statistical evaluation of the results of the survey show that significant anomalies may be recognised although determination of clear trends in gas ratios and background levels is difficult.

Recon Exploration suggests in its report that a liquid petroleum source is present in all prospects, with Glen Joyce, Killumi and Poolowanna being most significant; final validation of this prediction will come when the prospects are drilled, probably in 1985.

APPENDIX I

Data summary tables showing
dune crest locations

SEISMIC LINE 82 - WKN

KILLUMI

DATA SUMMARY TABLE

	SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
	1	12.63	.73	.38	.31	.21	.27
	2	14.68	.80	.46	.34	.29	.52
	3	12.38	.58	.33	.21	.17	.39
	4	10.31	.52	.27	.18	.14	.19
crest	5	8.48	.45	.28	.17	.15	.13
	6	11.06	.56	.37	.25	.22	.53
	7	11.08	.71	.44	.33	.25	.42
	8	15.33	1.17	.85	.58	.53	.56
	9	17.49	1.41	.76	.50	.38	.71
	10	11.88	.85	.46	.30	.22	.60
	11	18.84	1.53	.84	.52	.45	.65
	12	20.20	1.66	.98	.56	.50	.73
	13	16.81	1.27	.78	.48	.30	.60
	14	27.01	2.06	1.33	.79	.60	1.31
	15	17.86	1.55	.92	.58	.48	.93
	16	22.40	1.87	1.19	.68	.62	1.12
	17	18.95	1.47	.86	.57	.47	.92
	18	19.91	1.72	.98	.67	.55	1.03
	19	20.88	1.96	1.10	.77	.63	1.14
	20	11.31	.76	.42	.28	.23	.59
	21	12.26	.75	.42	.28	.23	.64
	22	13.60	.92	.52	.36	.26	.75
	23	11.50	.70	.44	.29	.24	.54
	24	10.63	.61	.35	.23	.18	.50
	25	12.68	.75	.45	.28	.25	.62
	26	11.30	.65	.41	.27	.21	.53
	27	13.73	.75	.55	.30	.27	.73
	28	23.11	1.67	1.08	.63	.70	1.30
	29	19.83	1.38	.86	.48	.40	1.00
	30	13.25	.79	.42	.31	.24	.58
	31	15.78	1.05	.51	.39	.24	.68
crest	32	15.90	1.16	.61	.46	.29	.95
	33	14.94	1.08	.55	.42	.30	.84
	34	13.98	1.00	.48	.38	.24	.74
	35	13.99	.95	.54	.39	.27	.82
	36	15.76	1.20	1.14	.43	.31	.71
	37	11.48	.74	.36	.26	.17	.46
	38	12.39	.83	.42	.29	.20	.51
	39	10.38	.52	.25	.20	.14	.46
	40	10.19	.48	.21	.20	.14	.32
	41	8.70	.32	.16	.13	.10	.15
	42	15.68	1.25	.52	.63	.33	.60
	43	12.91	.73	.43	.32	.27	.43
	44	12.58	.79	.35	.34	.23	.46
	45	10.15	.43	.19	.18	.12	.20
	46	9.85	.43	.20	.18	.12	.33
	47	10.48	.50	.25	.22	.16	.38
	48	11.13	.57	.28	.24	.19	.39
	49	18.23	1.16	.67	.47	.39	.69
	50	23.85	1.64	.74	.68	.47	.75

SEISMIC LINE 82 - WKN

	SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
crest	51	17.66	1.24	.54	.57	.38	.51
	52	17.44	1.22	.46	.54	.32	.49
	53	14.03	.85	.45	.39	.27	.65
	54	12.49	.78	.40	.37	.28	.58
crest	55	17.34	1.21	.55	.53	.36	.65
	56	12.24	.75	.38	.33	.28	.38
crest	57	10.79	.63	.32	.32	.22	.53
crest	58	11.95	.55	.32	.27	.22	.59
crest	59	12.84	.79	.38	.38	.28	.49
	60	8.19	.40	.13	.19	.11	.12
	61	16.34	1.28	.64	.84	.40	.66
	62	17.75	1.57	.75	.94	.48	.78
	63	10.11	.49	.26	.21	.17	.48
	64	12.44	.77	.39	.31	.23	.55
crest	65	14.30	.97	.47	.42	.33	.62
	66	12.35	.71	.49	.31	.31	.68

SEISMIC LINE 82 - WKH

GLEN JOYCE

DATA SUMMARY TABLE

Dune pattern lacks sufficient resolution for analysis of data.

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	12.32	.77	.39	.37	.29	.86
2	17.38	1.35	.64	.61	.48	1.44
3	6.97	.20	.16	.15	.11	.51
4	9.84	.47	.35	.26	.23	1.06
5	10.75	.44	.37	.32	.25	1.32
6	13.92	.74	.53	.49	.35	1.41
7	15.30	.77	.58	.56	.39	1.81
8	15.78	.86	.51	.55	.35	1.54
9	7.12	.22	.15	.21	.10	.38
10	8.64	.37	.29	.24	.19	.71
11	11.96	.57	.44	.34	.30	1.21
12	16.07	1.03	.68	.56	.45	1.60
13	17.13	1.21	.72	.63	.44	.96
14	18.89	1.41	.81	.77	.53	1.93
15	16.07	1.14	.70	.71	.42	.76
16	22.79	1.81	.68	.84	.59	1.30
17	26.57	2.05	.75	.81	.55	1.61
18	19.81	1.50	.74	.58	.53	.88
19	23.01	1.95	.85	.86	.59	1.74
20	13.68	1.13	.35	.44	.26	.92
21	9.95	.64	.25	.28	.16	.66
22	12.51	1.06	.29	.44	.24	.85
23	11.02	.98	.26	.40	.21	.55
24	12.51	1.10	.30	.42	.23	.56
25	12.97	1.19	.44	.43	.27	.71
26	19.97	1.68	.63	.81	.51	1.76
27	8.33	.44	.28	.19	.17	.93
28	12.13	.81	.40	.42	.26	.73
29	11.54	.91	.59	.39	.52	.62
30	9.58	.76	.46	.30	.25	.35
31	8.56	.47	.27	.28	.14	.55
32	8.10	.43	.25	.20	.13	.35
33	10.02	.67	.36	.34	.23	.54
34	7.86	.44	.25	.21	.15	.38
35	10.31	.81	.52	.30	.25	.65
36	11.85	1.01	.52	.38	.28	.61
37	9.50	.58	.29	.25	.18	.49
38	10.93	.70	.38	.32	.23	.73
39	13.70	.99	.51	.47	.28	.93
40	10.95	.62	.33	.37	.21	.86
41	9.76	.52	.27	.29	.18	.49
42	13.56	.93	.55	.38	.30	.82
43	21.05	1.73	1.02	.76	.58	1.40
44	15.53	1.25	.61	.57	.40	1.13
45	12.57	.78	.33	.44	.26	.89
46	10.20	.66	.25	.37	.18	.63

OOLARINNA

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	10.72	.87	.68	.37	.38	.97
2	9.84	.74	.52	.33	.30	1.02
crest 3	9.86	.81	.60	.33	.32	.88
4	11.87	1.06	.82	.45	.45	1.26
crest 5	10.92	.85	.66	.37	.38	.93
6	8.16	.56	.41	.27	.26	.90
7	9.18	.74	.54	.34	.30	.99
8	10.11	.83	.60	.37	.37	1.07
9	13.48	1.34	.97	.62	.65	1.23
10	16.31	1.56	1.17	.68	.65	1.14
crest 11	15.95	1.26	1.03	.47	.56	.83
12	13.07	1.15	.90	.40	.47	.77
13	7.67	.40	.30	.15	.19	.43
14	9.43	.56	.46	.22	.27	.67
crest 15	9.46	.59	.49	.20	.26	.50
16	13.70	1.04	.84	.34	.44	.68
17	9.21	.52	.47	.18	.25	.66
18	14.33	.81	.69	.27	.35	.70
19	11.28	.55	.46	.18	.24	.64
20	10.23	.55	.47	.18	.24	.66
21	7.25	.34	.28	.14	.17	.46
22	8.51	.38	.32	.16	.18	.76
23	10.44	.45	.39	.19	.21	.57
crest 24	11.34	.47	.37	.20	.21	.54
25	8.88	.38	.31	.15	.17	.28
26	10.51	.44	.36	.17	.21	.55
27	8.30	.31	.29	.15	.17	.44
28	7.42	.28	.25	.12	.16	.34
29	7.46	.26	.24	.12	.14	.38
30	16.17	.70	.60	.23	.31	.79
crest 31	10.58	.42	.40	.17	.23	.51
32	7.87	.20	.18	.09	.11	.20
33	8.03	.24	.22	.10	.14	.24
34	9.57	.63	.72	.21	.23	.33
35	6.62	.22	.20	.08	.12	.24
crest 36	11.15	.33	.33	.14	.20	.56
crest 37	7.97	.18	.19	.10	.12	.21
38	7.82	.18	.21	.07	.13	.23
39	6.96	.15	.18	.06	.10	.20
40	8.61	.24	.26	.09	.14	.27
41	6.58	.13	.14	.05	.08	.15

SEISMIC LINE 76 -WBL

POOLOWANNA-A

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	12.30	1.01	.59	.38	.32	.57
2	13.69	1.15	.75	.44	.42	.75
3	12.07	1.15	.79	.44	.41	.89
4	10.13	.67	.50	.27	.28	.55
5	10.04	.59	.50	.24	.26	.69
6	7.78	.54	.40	.21	.23	.56
7	13.09	1.35	.99	.49	.51	.83
8	10.12	.68	.47	.27	.24	.59
crest 9	11.41	1.00	.75	.42	.40	.76
10	13.25	1.17	.87	.50	.45	1.02
11	14.25	1.18	.90	.47	.46	1.05
12	15.25	1.17	1.02	.46	.55	1.09
13	13.08	1.04	.87	.39	.48	.91
crest 14	8.64	.75	.59	.35	.42	.62
15	11.36	.68	.67	.33	.39	.95
16	14.83	.92	.82	.41	.44	1.04
crest 17	22.16	1.40	1.14	.85	.58	1.08
18	15.43	.87	.84	.37	.45	1.02
19	15.38	.94	.92	.39	.50	1.07
20	23.65	1.47	1.56	.58	.76	1.52
crest 21	9.67	.48	.56	.21	.31	.71
22	10.48	.52	.54	.39	.35	.87
crest 23	10.95	.60	.75	.27	.41	1.12
24	13.72	.80	.92	.34	.48	1.37
25	21.29	1.11	1.16	.44	.61	1.53
26	17.58	.89	1.03	.37	.53	1.49
27	21.63	1.11	1.41	.49	.75	1.50
28	13.03	.68	.78	.31	.46	1.76
crest 29	14.84	.63	.70	.27	.42	1.07
crest 30	13.15	.74	.76	.28	.41	1.13
31	11.77	.69	.69	.26	.37	1.22
32	13.14	.49	.55	.22	.31	1.14
33	14.09	.50	.56	.22	.24	1.12
34	16.54	.72	.71	.25	.26	1.35
35	17.98	.85	1.25	.35	.34	1.07
crest 36	14.17	.60	.63	.28	.37	1.13

SEISMIC LINE 80 - WJF

POOLOWANNA-B

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	7.47	.47	.30	.24	.23	.15
2	7.87	.50	.27	.23	.17	.49
crest 3	7.29	.42	.23	.17	.13	.25
4	7.36	.51	.32	.19	.16	.18
5	7.48	.43	.32	.16	.15	.21
6	8.67	.66	.44	.25	.22	.23
crest 7	7.92	.43	.30	.16	.16	.18
8	8.98	.56	.41	.22	.20	.39
9	8.38	.59	.43	.24	.26	.61
crest 10	9.32	.81	.53	.31	.27	.25
11	8.45	.56	.38	.23	.21	.57
12	11.96	1.32	.78	.49	.41	.62
13	5.56	.19	.11	.09	.08	.08
14	8.14	.60	.41	.25	.22	.41
15	9.56	.69	.45	.28	.23	.95
16	12.16	.93	.64	.37	.36	.84
17	10.47	.76	.47	.32	.24	.83
18	10.06	.65	.41	.27	.22	.66
19	9.13	.56	.37	.24	.22	.71
20	5.67	.24	.12	.13	.10	.08
21	9.80	.64	.42	.26	.22	.48
22	10.55	.71	.45	.31	.26	.63
23	11.48	.88	.51	.38	.30	.75
24	20.15	1.80	.96	.70	.53	1.26
25	11.56	.75	.45	.32	.27	.84
crest 26	10.66	.62	.38	.25	.21	.70
27	12.13	.99	.52	.43	.27	.66
28	10.23	.84	.57	.34	.22	.52
29	9.37	.78	.43	.34	.23	.49
30	8.81	.59	.34	.25	.20	.56
crest 31	10.12	.90	.48	.40	.28	.72
32	12.45	1.13	.63	.48	.32	.76
33	13.16	1.28	.75	.57	.41	.73
34	11.18	.87	.51	.40	.31	.87
35	10.61	.92	.58	.41	.34	.64
36	10.30	.83	.76	.39	.30	.83

SEISMIC LINE 76 - WBY

POOLOWANNA TIE LINE

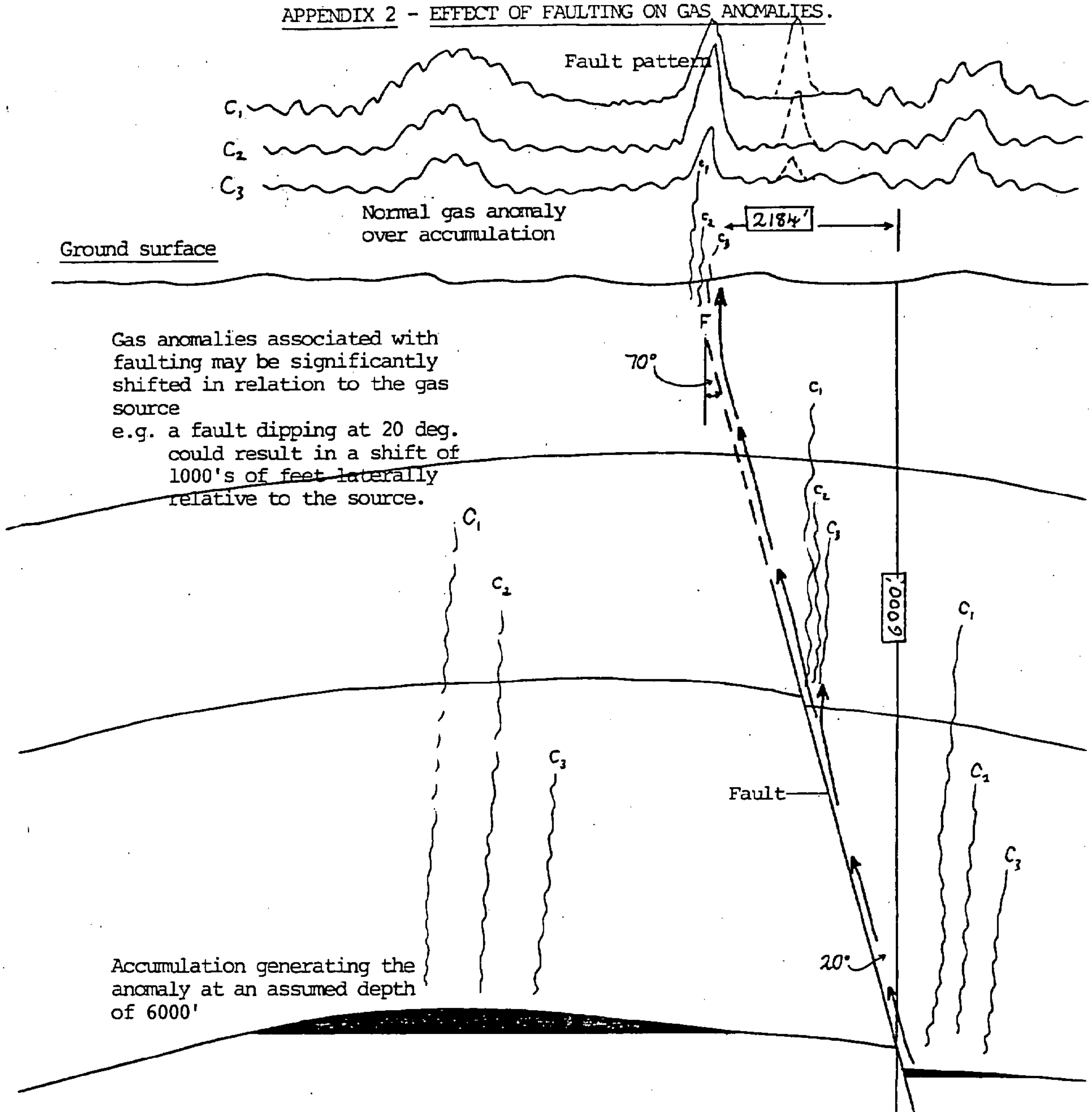
DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	14.63	.63	.86	.29	.38	1.12
2	11.83	.61	.61	.25	.37	1.03
3	19.35	.79	.86	.29	.42	1.19
4	13.08	.56	.58	.22	.34	1.07
5	18.41	.83	.93	.30	.48	1.28
6	19.63	.71	.81	.29	.44	1.25
7	21.71	.71	.78	.65	.56	1.37
crest 8	17.16	.82	.77	.31	.42	1.36
9	20.94	1.18	1.36	.43	.96	1.25
10	20.44	.91	1.05	.34	.55	1.62
11	28.42	1.36	1.54	.49	.94	1.70
12	39.14	1.39	1.57	.45	.78	1.48
13	15.54	.52	.65	.21	.39	.74

APPENDIX II

Effect of faulting on gas anomalies

APPENDIX 2 - EFFECT OF FAULTING ON GAS ANOMALIES.



The presence of faults is claimed by Recon Exploration to generate peaks with a different signature than apparent over crestal oil accumulations. The basis for this difference is described as a 'chromatograph column' effect whereby gases diffuse towards the surface at a faster rate along fault zones than occurs naturally through unfaulted strata. This analogy overlooks the fact that separation through a fractionating column as occurs in a chromatograph necessitates spot samples so that diffusion rates cause the separation; continual injection of gases would rapidly result in an equilibrium situation whereby gases would continue to move through the column at their specific rates but overlap would take place and the gases would again mix according to their initial concentrations. Due to the length of time accumulations have existed subsurface (millions of years), mixing would have occured and a pattern similar to the normal anomaly signature could be expected.

APPENDIX III

Smoothing programme description
and smoothed data

APPENDIX III

RECON SMOOTHING PROGRAMME

Raw data have been smoothed using a running 3 point mean (0.25, 0.5, 0.25) and output at the central value of the mean. Hence for N raw data values there are N-2 smoothed values.

Plots are separated into two groups:

(1) Methane, Ethane (x10), Propane (x10)

(2) Ethylene (x10), Propylene (x10), Butane (x10)

The mean of each gas samples is shown on the gas concentration axis at the appropriate value.

Listings of the smoothed data are also included.

KILLUMI 82 - WKN

SMOOTHED DATA

SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	13.59	0.73	0.41	0.30	0.24	0.42
3	12.44	0.62	0.35	0.23	0.19	0.37
4	10.37	0.52	0.29	0.19	0.15	0.22
5	9.58	0.50	0.30	0.19	0.17	0.24
6	10.42	0.57	0.37	0.25	0.21	0.40
7	12.14	0.79	0.53	0.37	0.31	0.48
8	14.81	1.12	0.73	0.50	0.42	0.56
9	15.55	1.21	0.71	0.47	0.38	0.65
10	15.02	1.16	0.63	0.41	0.32	0.64
11	17.44	1.39	0.78	0.48	0.41	0.66
12	19.01	1.53	0.89	0.53	0.44	0.68
13	20.21	1.56	0.97	0.58	0.43	0.81
14	22.17	1.74	1.09	0.66	0.50	1.04
15	21.28	1.76	1.09	0.66	0.55	1.07
16	20.40	1.69	1.04	0.63	0.55	1.02
17	20.05	1.63	0.97	0.62	0.53	1.00
18	19.91	1.72	0.98	0.67	0.55	1.03
19	18.24	1.60	0.90	0.62	0.51	0.97
20	13.94	1.06	0.59	0.40	0.33	0.74
21	12.36	0.80	0.44	0.30	0.24	0.66
22	12.74	0.82	0.47	0.32	0.25	0.67
23	11.81	0.73	0.44	0.29	0.23	0.58
24	11.36	0.67	0.40	0.26	0.21	0.54
25	11.82	0.69	0.41	0.27	0.22	0.57
26	12.25	0.70	0.46	0.28	0.24	0.60
27	15.47	0.96	0.65	0.38	0.36	0.82
28	19.94	1.37	0.89	0.51	0.52	1.08
29	19.01	1.30	0.81	0.48	0.44	0.97
30	15.53	1.00	0.55	0.37	0.28	0.71
31	15.18	1.01	0.51	0.39	0.25	0.72
32	15.63	1.11	0.57	0.43	0.28	0.85
33	14.94	1.08	0.55	0.42	0.28	0.84
34	14.22	1.01	0.51	0.39	0.26	0.78
35	14.43	1.03	0.68	0.40	0.27	0.77
36	14.25	1.02	0.80	0.38	0.27	0.68
37	12.78	0.88	0.57	0.31	0.21	0.54
38	11.66	0.73	0.36	0.26	0.18	0.49
39	10.84	0.59	0.28	0.22	0.16	0.44
40	9.86	0.45	0.21	0.18	0.13	0.31
41	10.82	0.59	0.26	0.27	0.17	0.31
42	13.24	0.89	0.41	0.43	0.26	0.45
43	13.52	0.88	0.43	0.40	0.28	0.48
44	12.06	0.69	0.33	0.30	0.21	0.39
45	10.68	0.52	0.23	0.22	0.15	0.30
46	10.08	0.45	0.21	0.19	0.13	0.31
47	10.48	0.50	0.25	0.22	0.16	0.37
48	12.74	0.70	0.37	0.29	0.23	0.46
49	17.86	1.13	0.59	0.47	0.36	0.63
50	20.90	1.42	0.67	0.60	0.43	0.68
51	19.15	1.34	0.57	0.59	0.39	0.56
52	16.64	1.13	0.48	0.51	0.32	0.54
53	14.50	0.93	0.44	0.42	0.28	0.59
54	14.09	0.91	0.45	0.41	0.30	0.62
55	14.85	0.99	0.47	0.44	0.32	0.56

56	13.15	0.84	0.41	0.38	0.28	0.48
57	11.44	0.64	0.34	0.31	0.24	0.51
58	11.88	0.63	0.34	0.31	0.24	0.55
59	11.45	0.63	0.30	0.31	0.22	0.42
60	11.39	0.72	0.32	0.40	0.23	0.35
61	14.65	1.13	0.54	0.70	0.35	0.56
62	15.49	1.23	0.60	0.73	0.38	0.68
63	12.60	0.83	0.41	0.42	0.26	0.57
64	12.32	0.75	0.38	0.31	0.24	0.55
65	13.35	0.86	0.46	0.37	0.30	0.62
MEANS	14.36	0.96	0.53	0.40	0.30	0.61

SMOOTHED DATA

SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	13.51	0.92	0.46	0.44	0.34	1.06
3	10.29	0.56	0.33	0.29	0.23	0.88
4	9.35	0.40	0.31	0.25	0.20	0.99
5	11.32	0.52	0.41	0.35	0.27	1.28
6	13.47	0.67	0.50	0.47	0.34	1.49
7	15.07	0.79	0.55	0.54	0.37	1.64
8	13.49	0.68	0.44	0.47	0.30	1.32
9	9.66	0.42	0.28	0.30	0.19	0.75
10	9.09	0.38	0.29	0.26	0.20	0.75
11	12.16	0.63	0.46	0.37	0.31	1.18
12	15.31	0.96	0.63	0.52	0.41	1.34
13	17.31	1.22	0.73	0.65	0.47	1.36
14	17.75	1.29	0.76	0.72	0.48	1.39
15	18.45	1.38	0.72	0.76	0.49	1.19
16	22.06	1.70	0.70	0.80	0.54	1.24
17	23.93	1.85	0.73	0.76	0.56	1.35
18	22.30	1.75	0.77	0.71	0.55	1.28
19	19.88	1.63	0.70	0.69	0.49	1.32
20	15.08	1.21	0.45	0.50	0.32	1.06
21	11.52	0.87	0.28	0.36	0.20	0.77
22	11.50	0.94	0.27	0.39	0.21	0.73
23	11.77	1.03	0.28	0.41	0.22	0.63
24	12.25	1.09	0.33	0.42	0.24	0.60
25	14.61	1.29	0.45	0.52	0.32	0.94
26	15.31	1.25	0.50	0.56	0.36	1.29
27	12.19	0.84	0.40	0.40	0.28	1.09
28	11.03	0.74	0.42	0.35	0.30	0.75
29	11.20	0.85	0.51	0.38	0.39	0.58
30	9.82	0.73	0.44	0.32	0.29	0.47
31	8.70	0.53	0.31	0.27	0.17	0.45
32	8.70	0.50	0.28	0.25	0.16	0.45
33	9.00	0.55	0.31	0.27	0.19	0.45
34	9.01	0.59	0.34	0.27	0.20	0.49
35	10.08	0.77	0.45	0.30	0.23	0.57
36	10.88	0.85	0.46	0.33	0.25	0.59
37	10.45	0.72	0.37	0.30	0.22	0.58
38	11.27	0.74	0.39	0.34	0.23	0.72
39	12.32	0.83	0.43	0.41	0.25	0.86
40	11.34	0.69	0.36	0.38	0.22	0.79
41	11.01	0.65	0.36	0.33	0.22	0.67
42	14.48	1.03	0.60	0.45	0.34	0.88
43	17.80	1.41	0.80	0.62	0.47	1.19
44	16.17	1.25	0.64	0.58	0.41	1.14
45	12.72	0.87	0.38	0.46	0.28	0.89
MEANS	13.24	0.92	0.46	0.44	0.31	0.94

OOLARINNA 84-WML

SMOOTHED DATA

SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	10.07	0.79	0.58	0.34	0.33	0.97
3	10.36	0.86	0.63	0.36	0.35	1.01
4	11.13	0.94	0.73	0.40	0.40	1.08
5	10.47	0.83	0.64	0.37	0.37	1.00
6	9.11	0.68	0.50	0.31	0.30	0.93
7	9.16	0.72	0.52	0.33	0.31	0.99
8	10.72	0.94	0.68	0.43	0.42	1.09
9	13.35	1.27	0.93	0.57	0.58	1.17
10	15.51	1.43	1.09	0.61	0.63	1.09
11	15.32	1.31	1.03	0.50	0.56	0.89
12	12.44	0.99	0.78	0.35	0.42	0.70
13	9.46	0.63	0.49	0.23	0.28	0.57
14	9.00	0.53	0.43	0.20	0.25	0.57
15	10.51	0.69	0.57	0.24	0.31	0.59
16	11.52	0.78	0.66	0.27	0.35	0.63
17	11.61	0.71	0.62	0.24	0.32	0.68
18	12.29	0.67	0.58	0.23	0.30	0.68
19	11.78	0.62	0.52	0.20	0.27	0.66
20	9.75	0.50	0.42	0.17	0.22	0.61
21	8.31	0.40	0.34	0.16	0.19	0.59
22	8.68	0.39	0.33	0.16	0.19	0.64
23	10.18	0.44	0.37	0.19	0.20	0.61
24	10.50	0.44	0.36	0.19	0.20	0.48
25	9.90	0.42	0.34	0.17	0.19	0.41
26	9.55	0.39	0.33	0.16	0.19	0.46
27	8.63	0.34	0.30	0.15	0.18	0.44
28	7.65	0.28	0.26	0.13	0.16	0.38
29	9.63	0.38	0.33	0.15	0.19	0.47
30	12.60	0.52	0.46	0.19	0.25	0.62
31	11.30	0.44	0.40	0.17	0.22	0.50
32	8.59	0.26	0.25	0.11	0.15	0.29
33	8.38	0.33	0.34	0.13	0.16	0.25
34	8.45	0.43	0.47	0.15	0.18	0.28
35	8.49	0.35	0.36	0.13	0.17	0.34
36	9.22	0.27	0.26	0.12	0.16	0.39
37	8.73	0.22	0.23	0.10	0.14	0.30
38	7.64	0.17	0.20	0.08	0.12	0.22
39	7.59	0.18	0.21	0.07	0.12	0.23
40	7.69	0.19	0.21	0.07	0.12	0.22
MEANS	10.07	0.58	0.48	0.23	0.26	0.61

POOLOWANNA LINE A 76-WBL

SMOOTHED DATA

SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	12.94	1.12	0.72	0.43	0.39	0.74
3	11.99	1.03	0.71	0.40	0.38	0.77
4	10.59	0.77	0.57	0.31	0.31	0.67
5	9.50	0.60	0.47	0.24	0.26	0.62
6	9.67	0.76	0.57	0.29	0.31	0.66
7	11.02	0.98	0.71	0.37	0.37	0.70
8	11.19	0.93	0.67	0.36	0.35	0.69
9	11.55	0.96	0.71	0.40	0.37	0.78
10	13.04	1.13	0.85	0.47	0.44	0.96
11	14.25	1.17	0.92	0.48	0.48	1.05
12	14.46	1.14	0.95	0.44	0.51	1.03
13	12.51	1.00	0.84	0.40	0.48	0.88
14	10.43	0.81	0.68	0.36	0.43	0.78
15	11.55	0.76	0.69	0.35	0.41	0.89
16	15.80	0.98	0.86	0.50	0.46	1.03
17	18.65	1.15	0.98	0.62	0.51	1.06
18	17.10	1.02	0.94	0.50	0.50	1.05
19	17.46	1.06	1.06	0.43	0.55	1.17
20	18.09	1.09	1.15	0.44	0.58	1.21
21	13.37	0.74	0.81	0.35	0.43	0.95
22	10.39	0.53	0.60	0.31	0.35	0.89
23	11.53	0.63	0.74	0.32	0.41	1.12
24	14.92	0.83	0.94	0.35	0.50	1.35
25	18.47	0.98	1.07	0.40	0.56	1.48
26	19.52	1.00	1.16	0.42	0.61	1.50
27	18.47	0.95	1.16	0.42	0.62	1.56
28	15.63	0.78	0.92	0.34	0.52	1.52
29	13.97	0.67	0.74	0.28	0.43	1.26
30	13.23	0.70	0.73	0.27	0.40	1.14
31	12.46	0.65	0.67	0.25	0.37	1.18
32	13.04	0.54	0.59	0.23	0.31	1.15
33	14.47	0.55	0.60	0.23	0.26	1.18
34	16.29	0.70	0.81	0.27	0.28	1.22
35	16.67	0.76	0.96	0.31	0.33	1.16
MEANS	13.94	0.87	0.80	0.37	0.42	1.03

POOLOWANNA LINE B 80-WJF

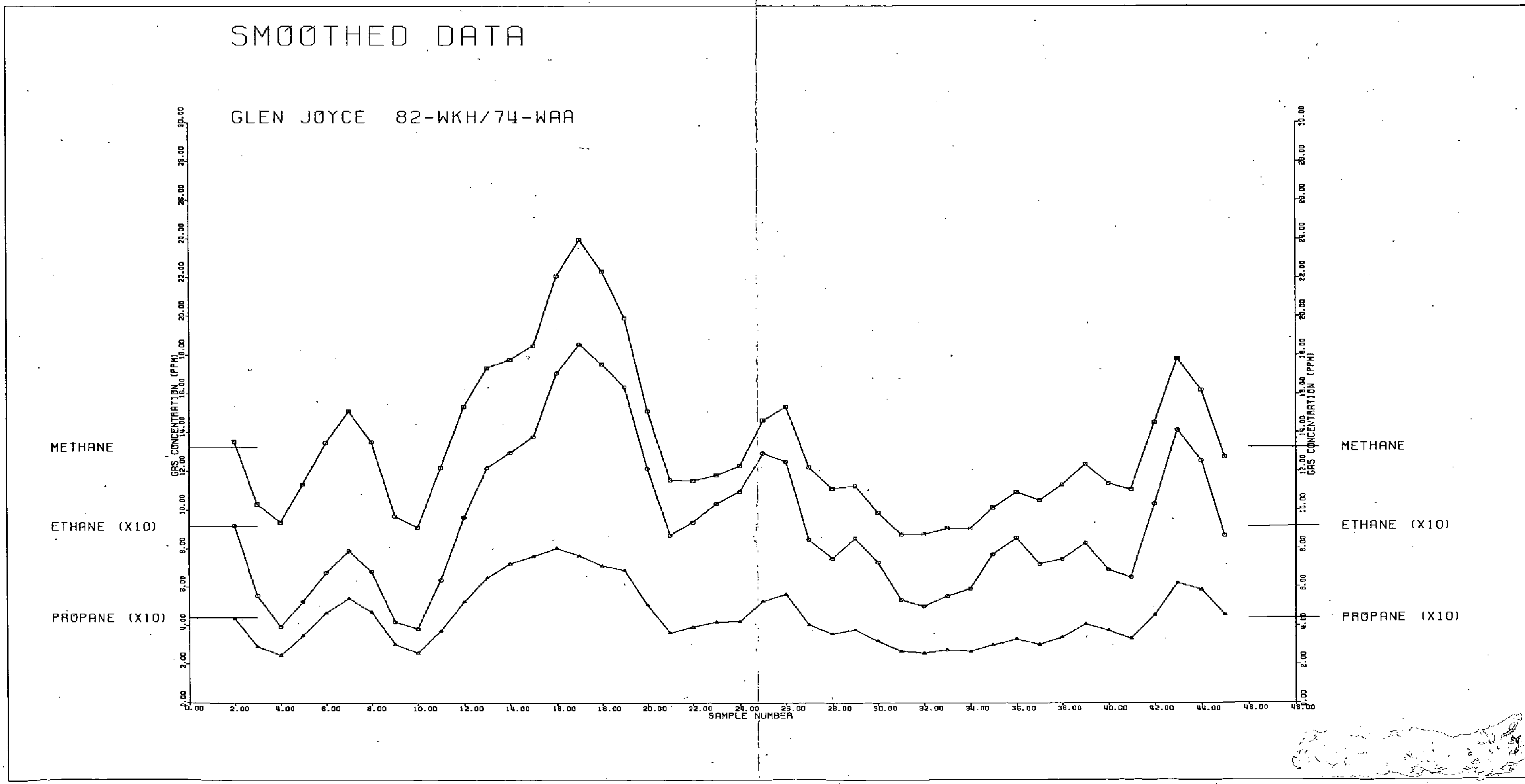
SMOOTHED DATA

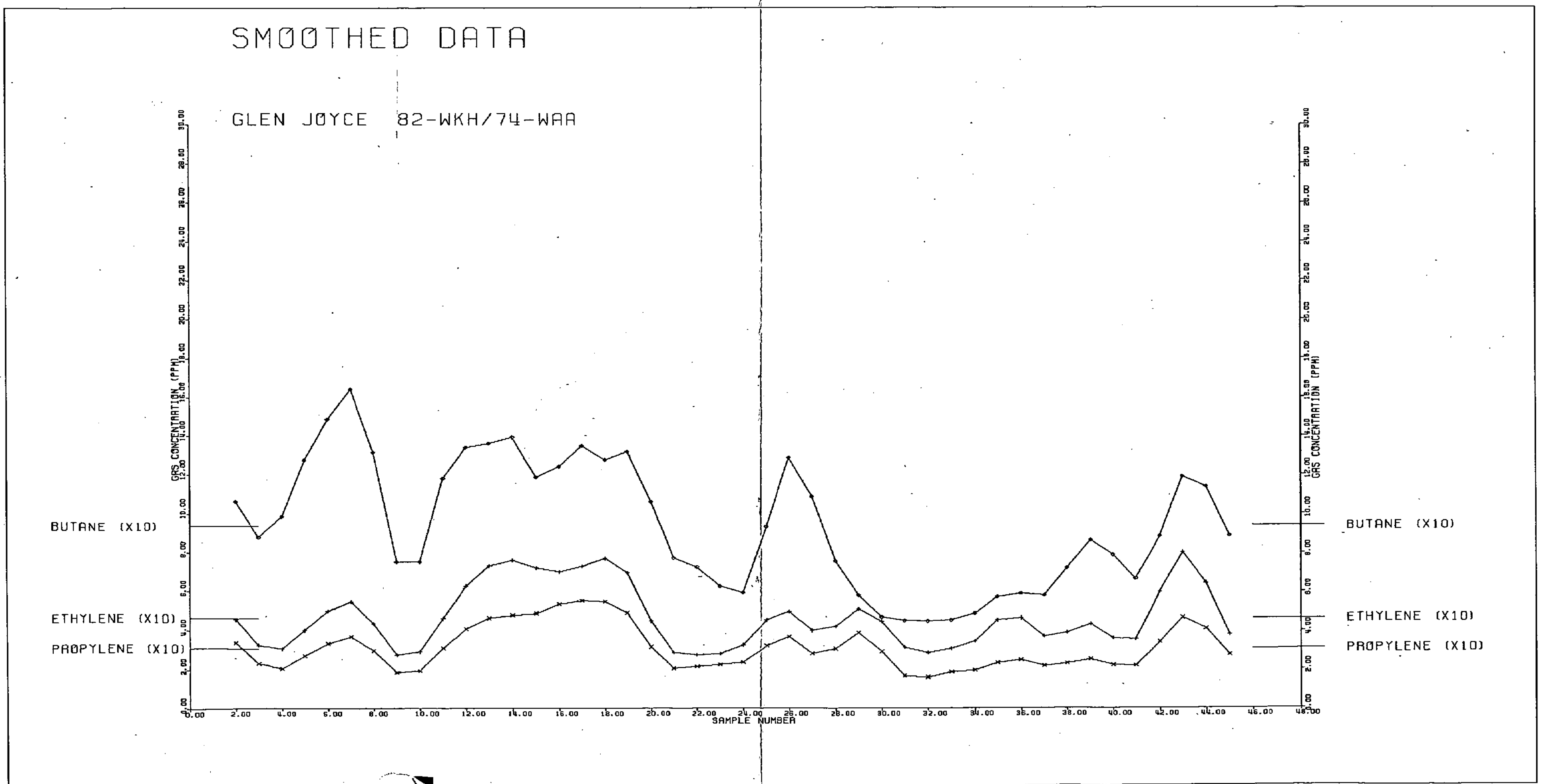
SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	7.63	0.47	0.27	0.22	0.17	0.34
3	7.45	0.46	0.26	0.19	0.15	0.29
4	7.37	0.47	0.30	0.18	0.15	0.20
5	7.75	0.51	0.35	0.19	0.17	0.21
6	8.19	0.55	0.38	0.21	0.19	0.21
7	8.37	0.52	0.36	0.20	0.19	0.25
8	8.56	0.54	0.39	0.21	0.20	0.39
9	8.77	0.64	0.45	0.25	0.25	0.47
10	8.87	0.69	0.47	0.27	0.25	0.42
11	9.55	0.81	0.52	0.32	0.28	0.50
12	9.48	0.85	0.51	0.33	0.28	0.47
13	7.81	0.58	0.35	0.23	0.20	0.30
14	7.85	0.52	0.34	0.22	0.19	0.46
15	9.86	0.73	0.49	0.30	0.26	0.79
16	11.09	0.83	0.55	0.34	0.30	0.86
17	10.79	0.78	0.50	0.32	0.27	0.79
18	9.93	0.65	0.41	0.28	0.23	0.72
19	8.50	0.50	0.32	0.22	0.19	0.54
20	7.57	0.42	0.26	0.19	0.16	0.34
21	8.95	0.56	0.35	0.24	0.20	0.42
22	10.60	0.74	0.46	0.31	0.26	0.62
23	13.41	1.07	0.61	0.44	0.35	0.85
24	15.84	1.31	0.72	0.52	0.41	1.03
25	13.48	0.98	0.56	0.40	0.32	0.91
26	11.25	0.75	0.43	0.31	0.24	0.73
27	11.29	0.86	0.50	0.36	0.24	0.63
28	10.49	0.86	0.52	0.36	0.24	0.55
29	9.44	0.75	0.44	0.32	0.22	0.51
30	9.28	0.71	0.40	0.31	0.23	0.58
31	10.38	0.88	0.48	0.38	0.27	0.69
32	12.05	1.11	0.62	0.48	0.33	0.74
33	12.49	1.14	0.66	0.50	0.36	0.77
34	11.53	0.99	0.59	0.44	0.34	0.78
35	10.68	0.88	0.61	0.40	0.32	0.75
MEANS	9.85	0.73	0.46	0.31	0.25	0.56

POOLOWANNA TIE LINE 76-WBY

SMOOTHED DATA

SAMPLE	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANE
2	14.41	0.66	0.74	0.27	0.38	1.09
3	15.90	0.69	0.73	0.26	0.39	1.12
4	15.98	0.69	0.74	0.26	0.40	1.15
5	17.38	0.73	0.81	0.28	0.44	1.22
6	19.84	0.74	0.83	0.38	0.48	1.29
7	20.05	0.74	0.78	0.47	0.50	1.34
8	19.24	0.88	0.92	0.43	0.59	1.34
9	19.87	1.02	1.13	0.38	0.72	1.37
10	22.56	1.09	1.25	0.40	0.75	1.55
11	29.10	1.25	1.43	0.44	0.80	1.63
12	30.56	1.16	1.33	0.40	0.72	1.35
MEANS	20.02	0.85	0.95	0.35	0.54	1.27

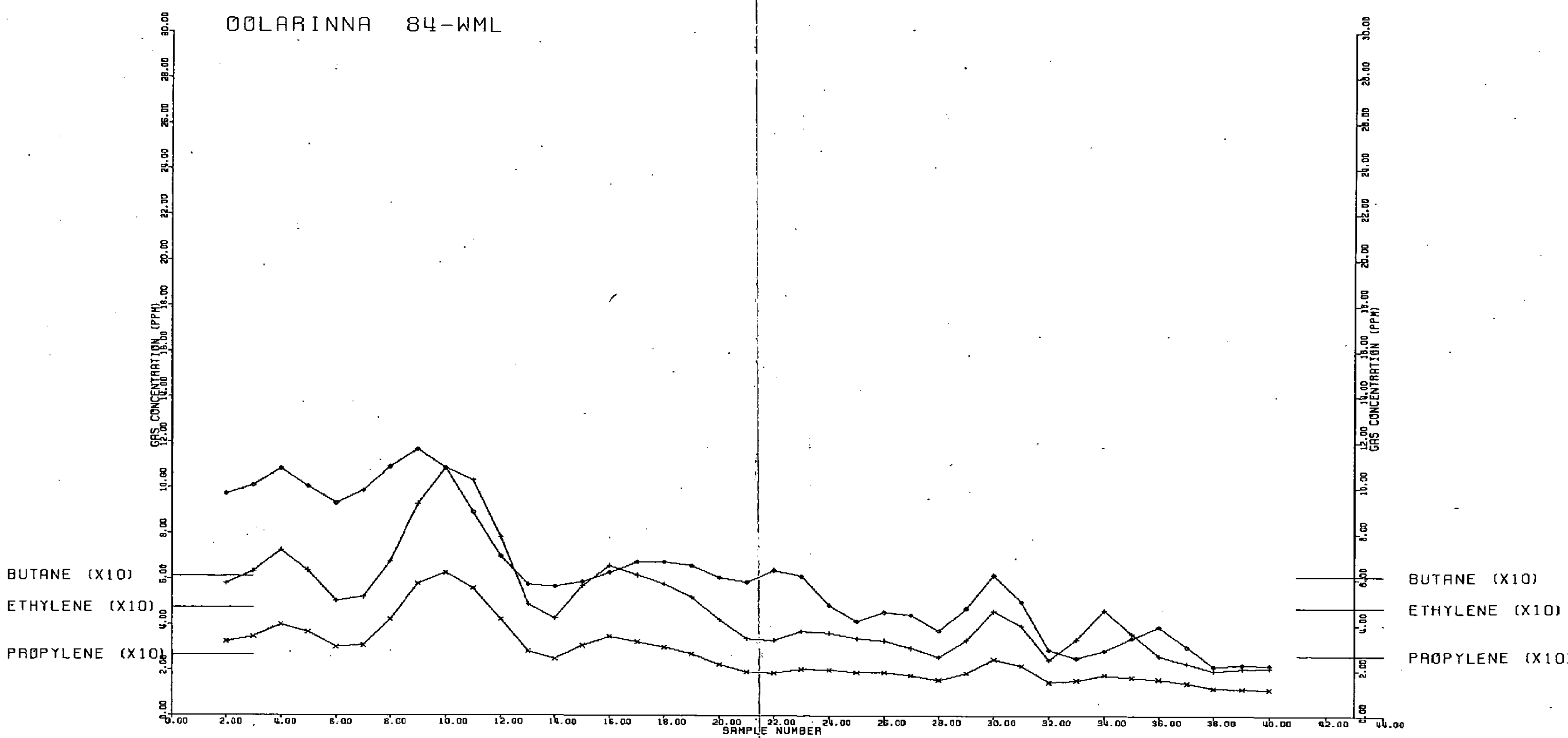

SMOOTHED DATA
GLEN JOYCE 82-WKH/74-WAA
METHANE
ETHANE (X10)
PROPANE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER

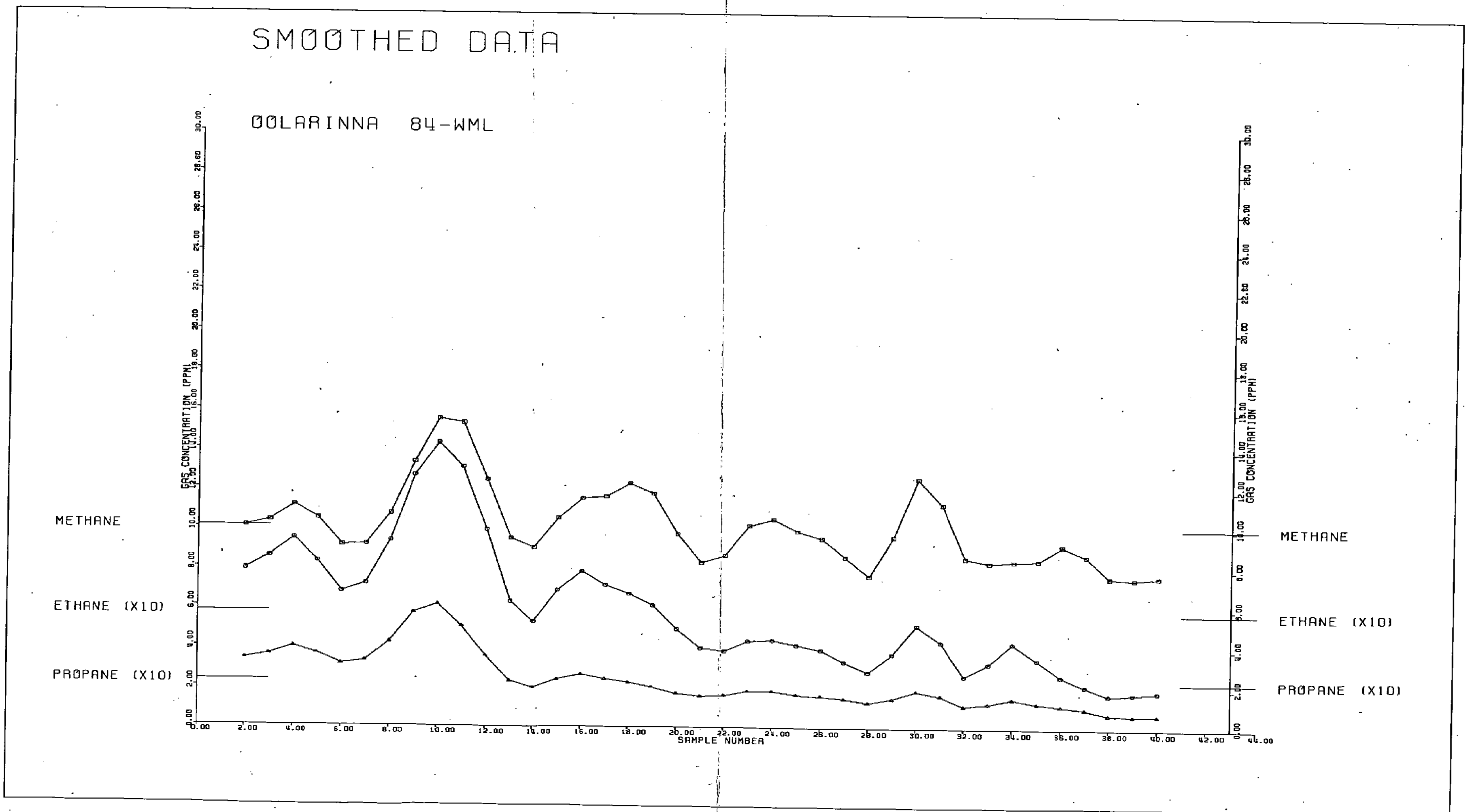


SMOOTHED DATA
GLEN JOYCE 82-WKH/74-WAA
BUTANE (X10)
ETHYLENE (X10)
PROPYLENE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER

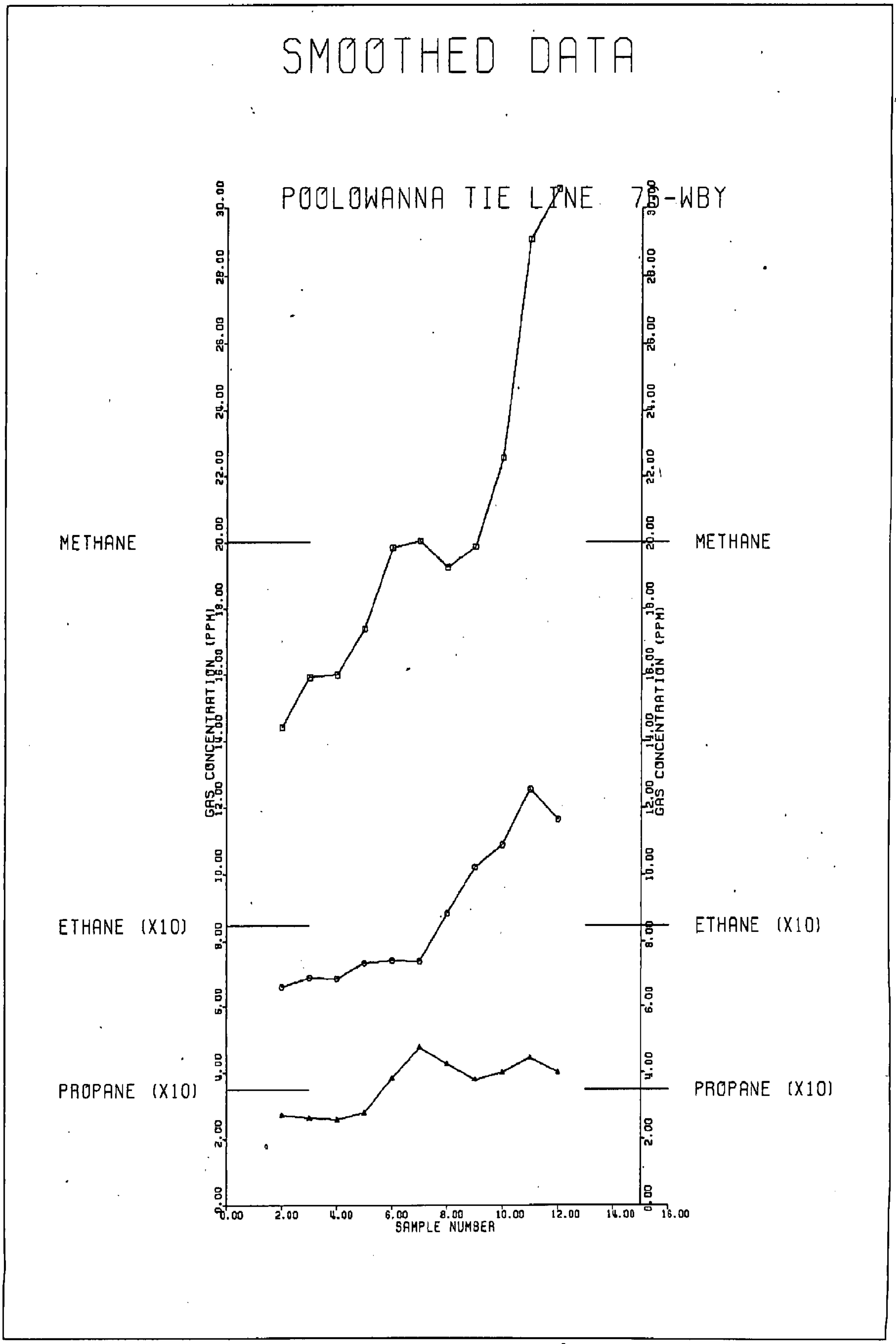
000625

SMØØTHED DATA



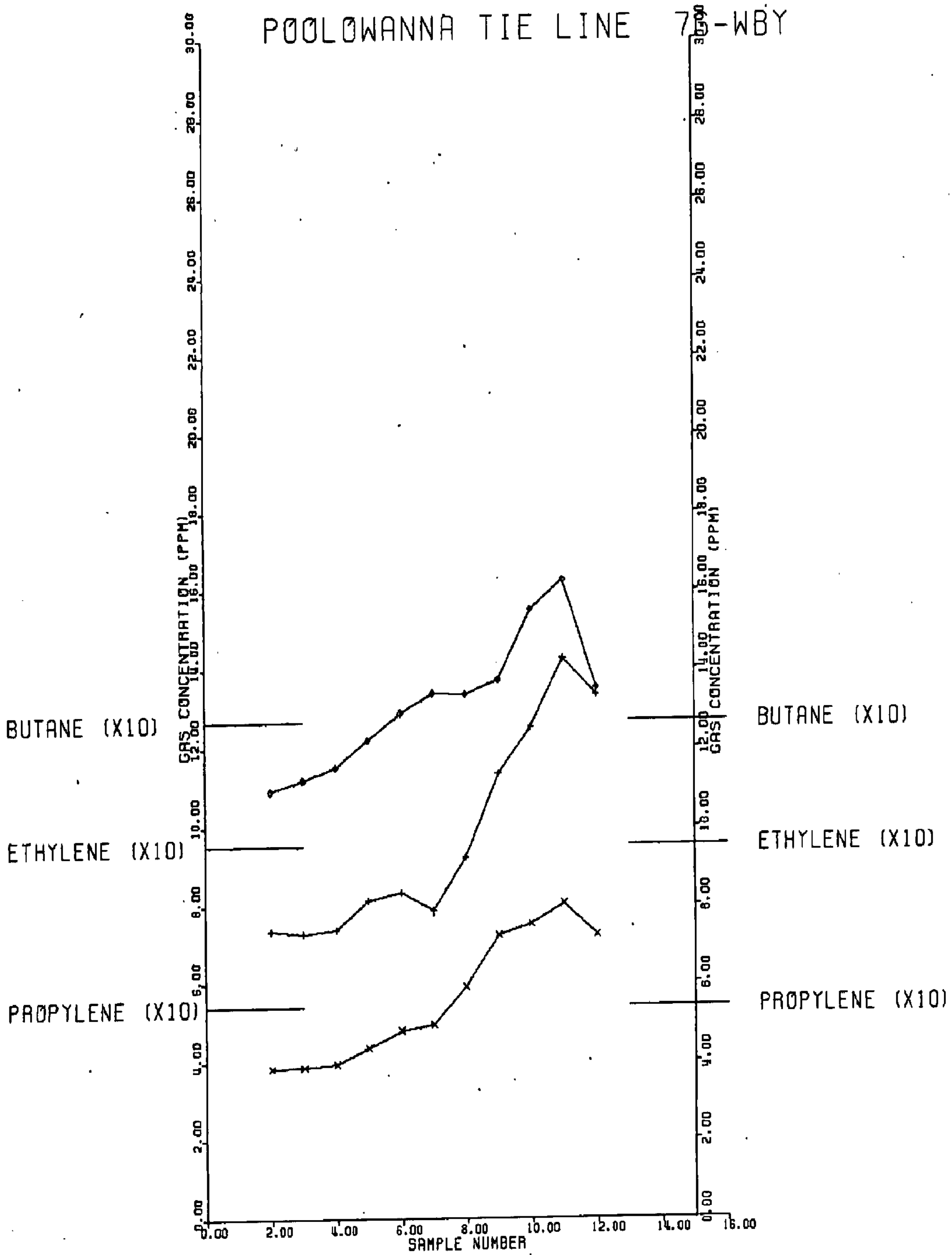

SMOOTHED DATA
OOLARINNA 84-WML
GAS CONCENTRATION (PPM)
METHANE
ETHANE (X10)
PROPANE (X10)
SAMPLE NUMBER

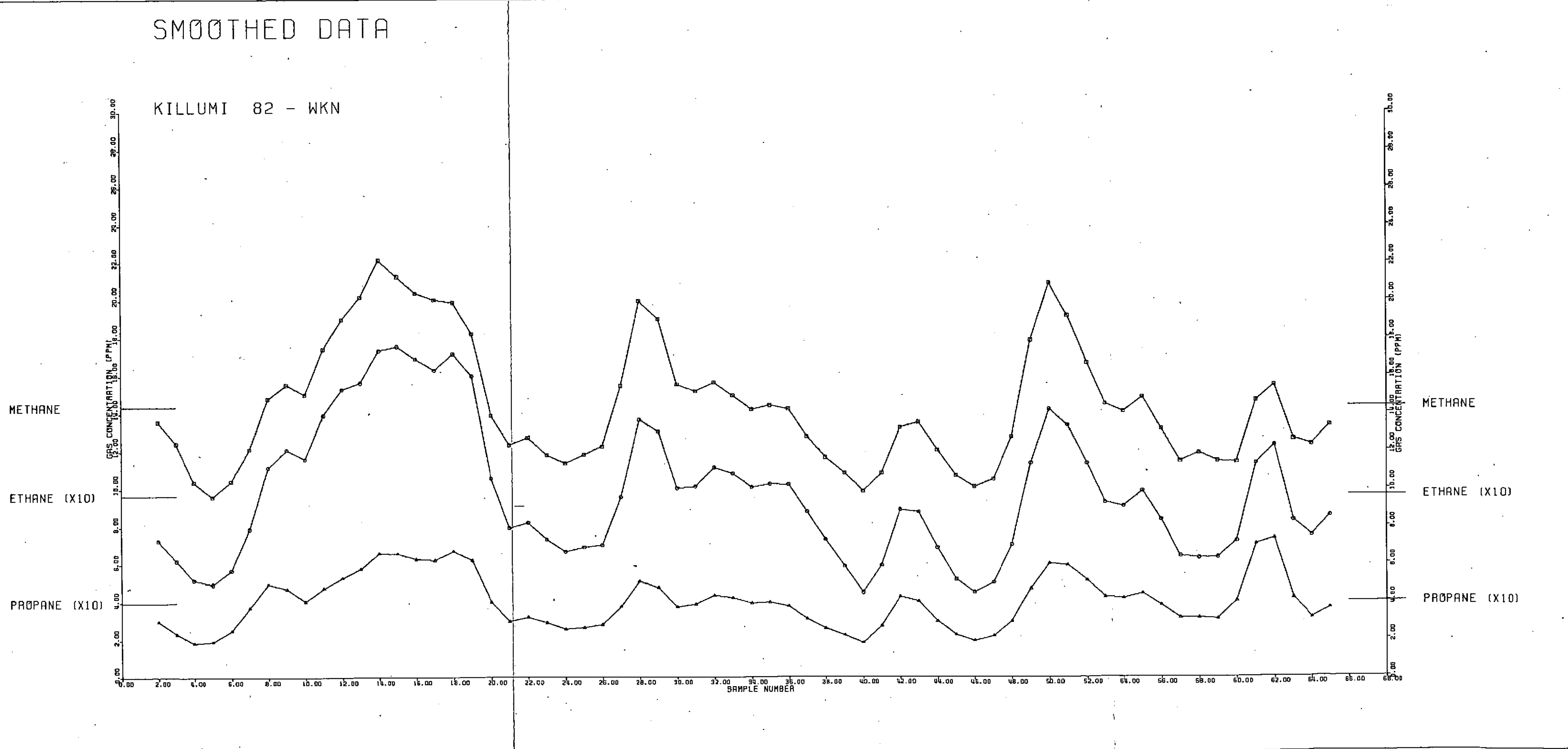
000627

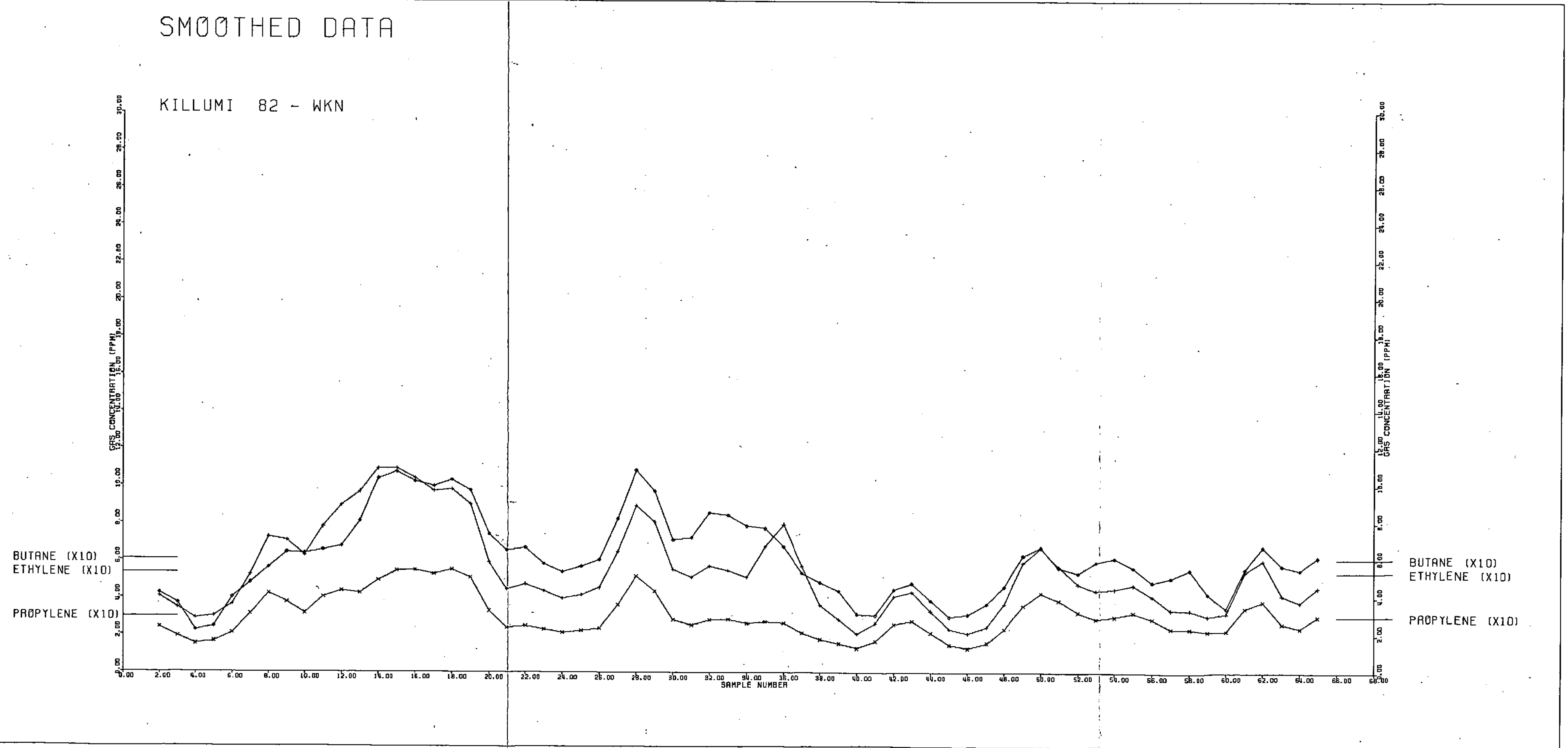


SMOOTHED DATA
POOLOWANNA TIE LINE 76-WBY
METHANE
ETHANE (X10)
PROPANE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00

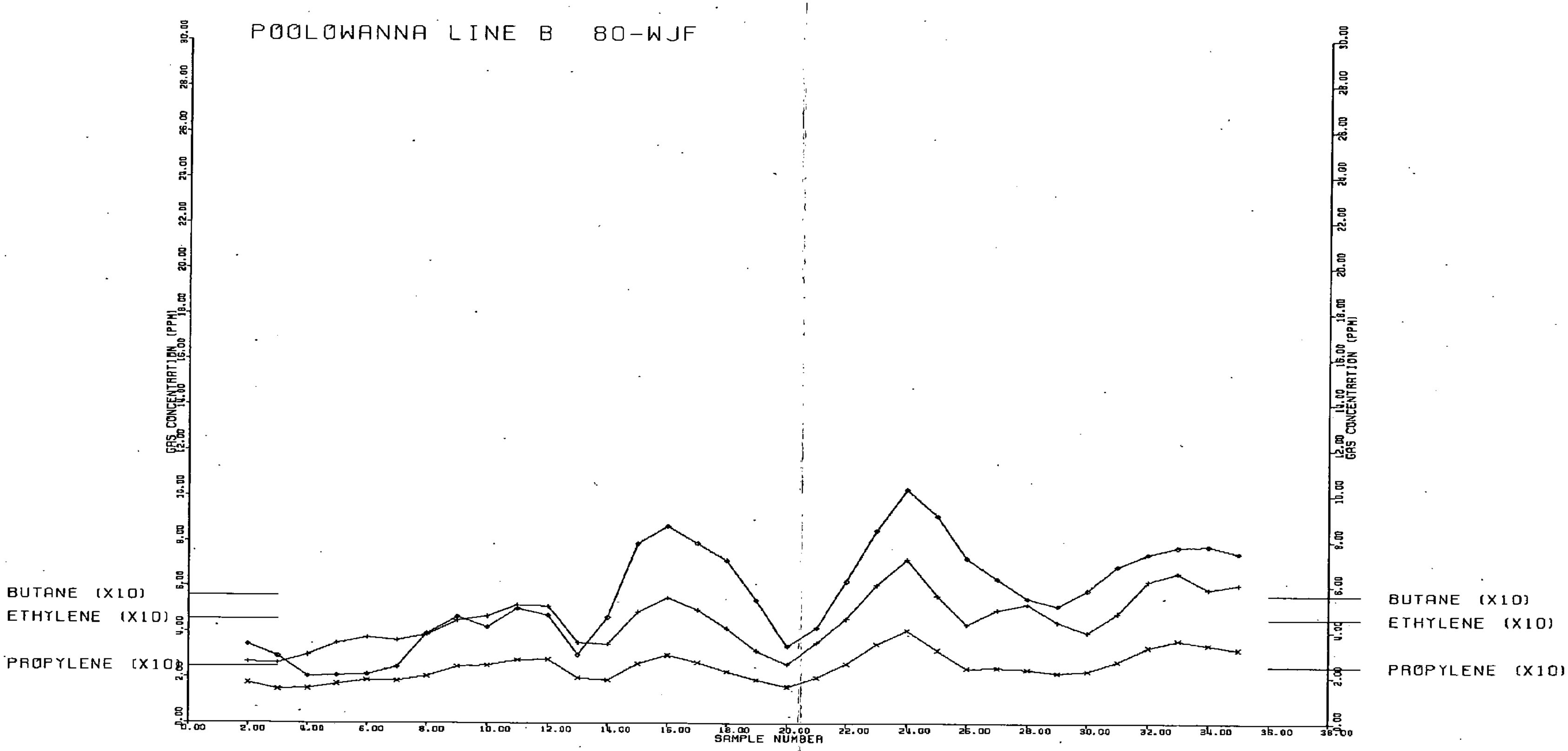
SMOOTHED DATA



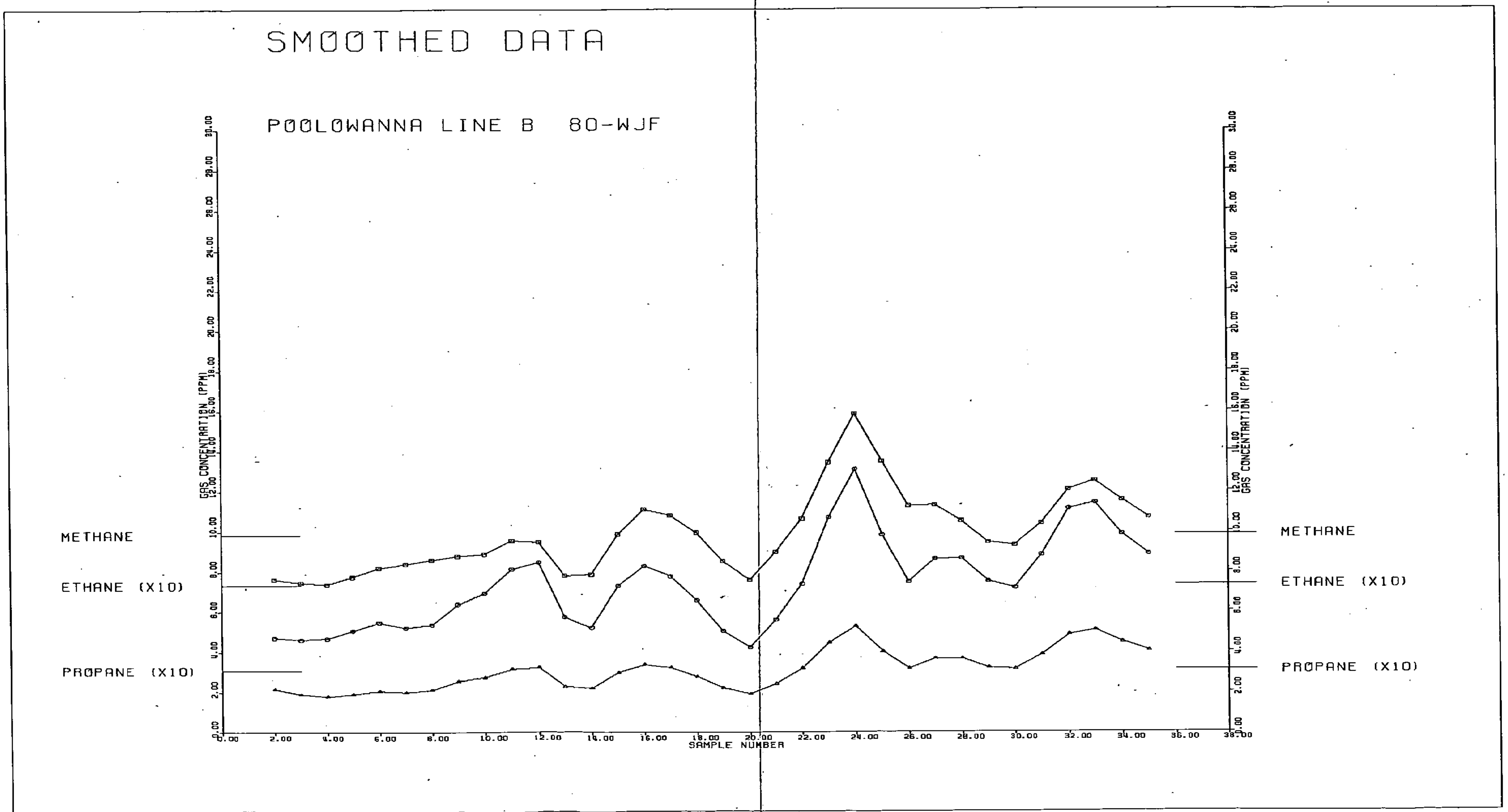

SMOOTHED DATA
KILLUMI 82 - WKN
METHANE
ETHANE (X10)
PROPANE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER

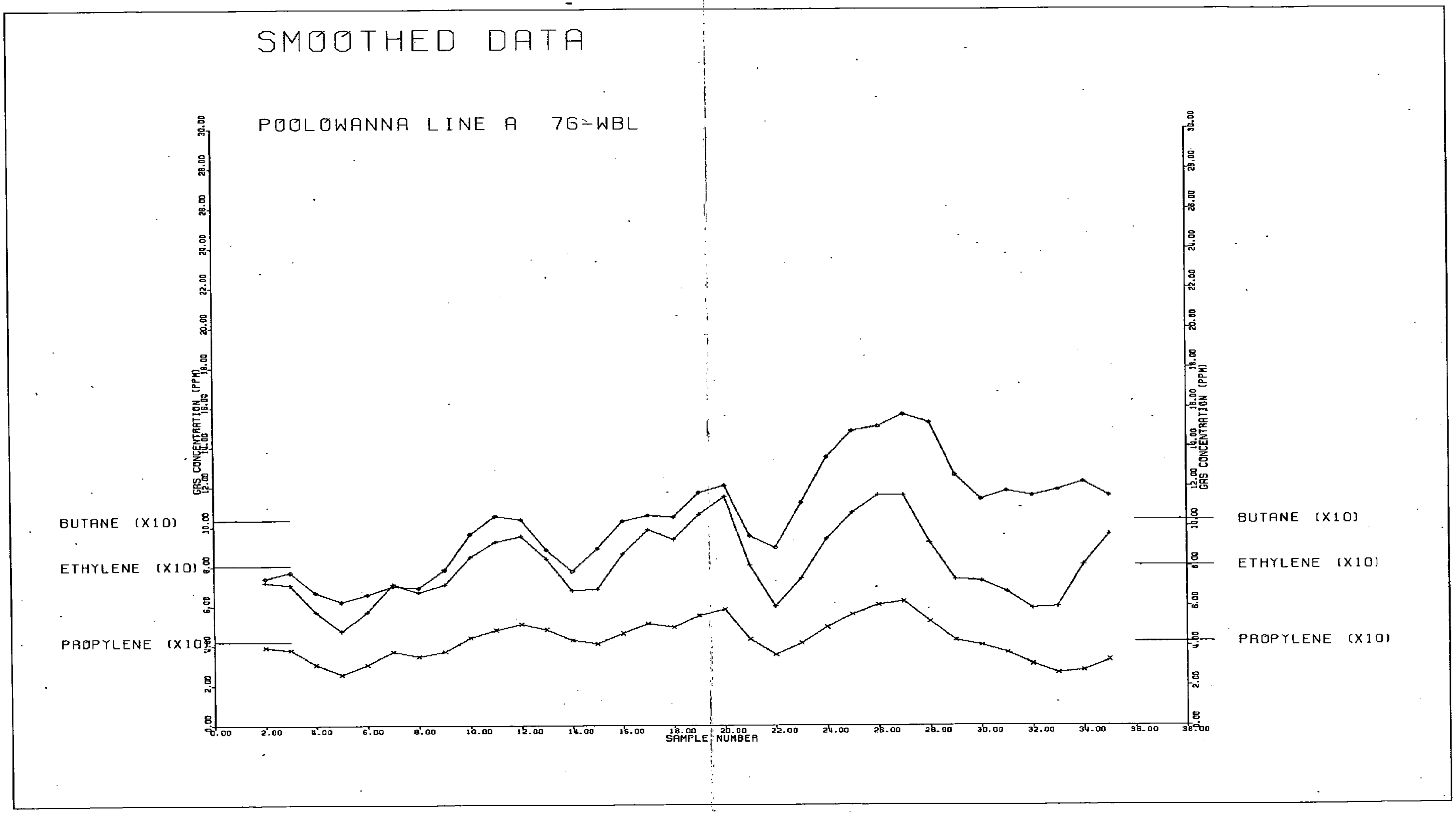

SMOOTHED DATA
KILLUMI 82 - WKN
GAS CONCENTRATION (PPM)
SAMPLE NUMBER
BUTANE (X10)
ETHYLENE (X10)
PROPYLENE (X10)

SMOOTHED DATA



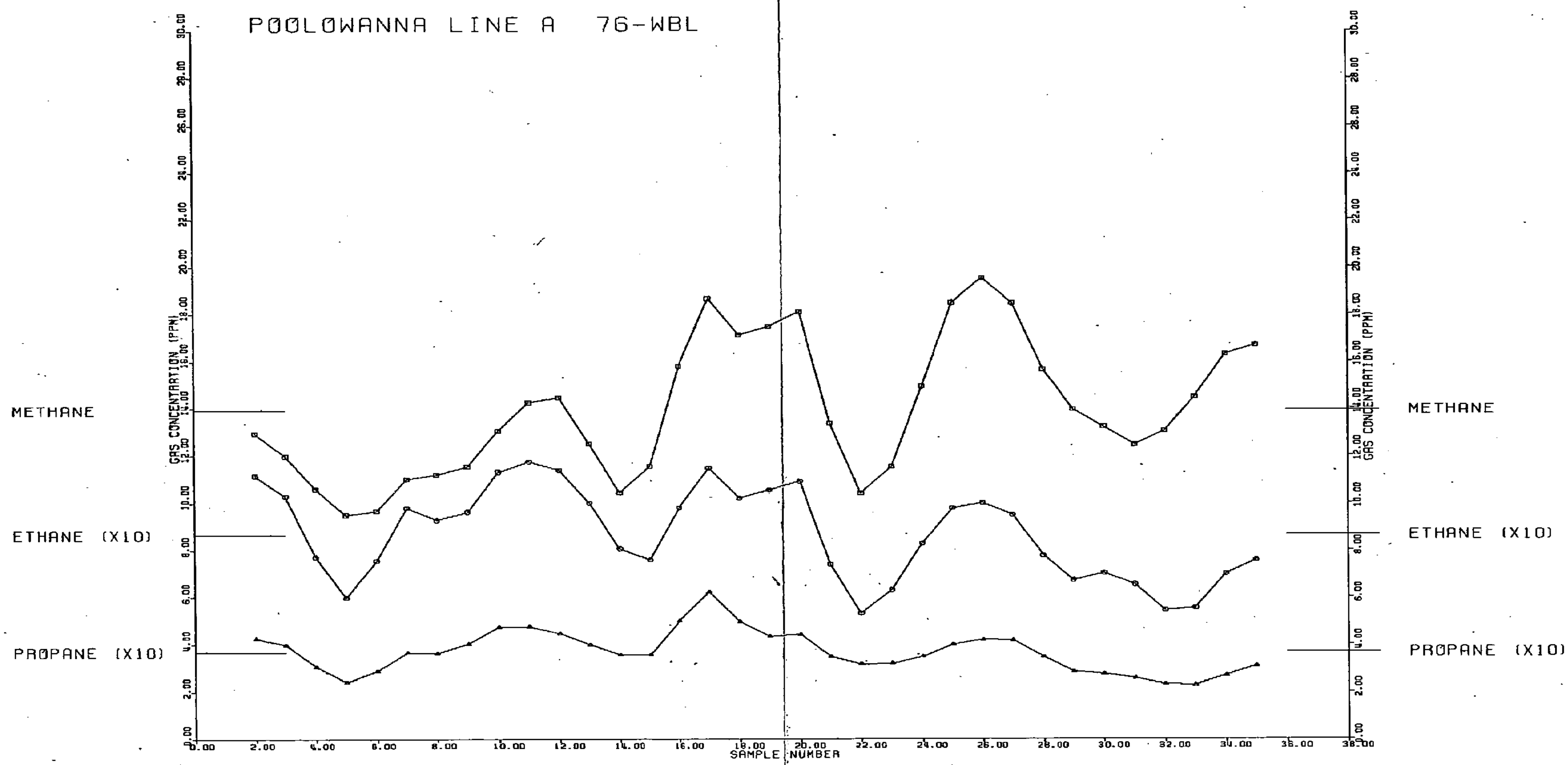
000632


SMOOTHED DATA
POOLOWANNA LINE B 80-WJF
METHANE
ETHANE (X10)
PROPANE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER


SMOOTHED DATA
POOLOWANNA LINE A 76-WBL
BUTANE (X10)
ETHYLENE (X10)
PROPYLENE (X10)
GAS CONCENTRATION (PPM)
SAMPLE NUMBER

000634

SMOOTHED DATA



ENCLOSURE 1

Plots of gas anomaly curves
using smoothed data


Sheet P/I 1:100,000
NORTHERN TERRITORY
SOUTH AUSTRALIA
MOKARI NORTH
GLEN JOYCE
MOKARI
MOKARI WEST
OOLARINNA
MACUMBA EAST
KILLUMI WEST
KILLUMI
N.T.
QLD.
W.A.
N.S.W.
VIC.
SOUTH AUSTRALIA
ADELAIDE
LOCATION
Significant Hydrocarbon Gas Microseepage
Moderate Hydrocarbon Gas Microseepage
Minor Hydrocarbon Gas Microseepage
Indefinite Boundry
30 Sample Location (Recon recommendation)
25 Sample Location (Delhi recommendation)
DELHI PETROLEUM PTY. LTD.
RECON EXPLORATION SURVEY
PEDIRKA BLOCK
P.E.L. 5/6, SOUTH AUSTRALIA
4891-1
TRANSVERSE MERCATOR PROJECTION based on CLARKE'S 1858 SPHEROID. CROSSES indicate 10,000 metre GRID intercepts from the FALSE ORIGIN, ZONE 5, AUSTRALIAN MAP SERIES.
SCALE 1:100,000
10 KILOMETRES
MILES
Dwg. 84XP-3249
Drafted. A.H.
Date: Sept.1984
File: X-28
Sheet P/I 1:100,000

Sheet P/2 1:100,000

Sheet P/2 1:100,000

RECON

EXPLORATION [AUSTRALIA] P/L

October 24th, 1984

Delhi Petroleum Pty. Ltd.,
33 King William Street,
ADELAIDE. S.A. 5000

ATT: MR. ROD HOLLINGSWORTH

Dear Mr. Hollingsworth,

REF: GROUND VALIDATION INTERSTITIAL HYDROCARBON GAS SAMPLING SURVEY, PEDIRKA BLOCK.

Please find attached the results of our recent ground geochemical survey.

Delhi and Partners chose five areas to sample from the results of our August airborne survey. Glen Joyce, Killumi and Northern Poolowanna were found to contain significant hydrocarbon microseepage; while Southern Poolowanna and Oolarinna have been graded as moderate hydrocarbon microseepage anomalies. In all cases our hydrocarbon analyses indicate a high degree of "wetness" rather than dry gas microseepages.

It has been a pleasure working with Delhi and Partners, and particularly Mr. Bill Fawcett who has helped with the difficult logistics. I hope we can be of assistance to the Group in the future.

Yours faithfully,

David J. Strachan

DAVID J. STRACHAN
MANAGER

DS/km
enc.

Adelaide Airport, South Australia 5000
Telephone: (08) 352 6944 Telex: AA 89619

RECON
EXPLORATION (AUSTRALIA) P/L

October 24, 1984

Delhi Petroleum Pty. Ltd.,
33 King William Street,
ADELAIDE. S.A. 5000

ATT: MR. ROD HOLLINGSWORTH

Dear Mr. Hollingsworth,

GROUND VALIDATION INTERSTITIAL HYDROCARBON GAS SAMPLING SURVEY: PEDIRKA BLOCK

This letter is a report of the result of our recently completed ground validation geochemical sampling survey in the PEDIRKA BLOCK, in South Australia. The purpose of this survey was to validate and quantify hydrocarbon gas microseepage occurring over the remotely detected geochemical anomalies, designated by your group. These are: (1) Glen Joyce, (2) Killumi and Killumi West, (3) Poolowanna, and (4) Oolarinna. The Poolowanna anomaly was used for benchmark comparisons. When compared to this anomaly, all four (4) anomalies compare favourably.

GROUND INTERSTITIAL HYDROCARBON SAMPLING SURVEY

A total of 242 interstitial gas samples were collected by our field crew along profiles in these four (4) anomalous areas and analyzed in our Field Geochemical Exploration Laboratory located at the NORPAC Field Camp in the Simpson Desert. The samples were collected at each location, spaced at 200 metre intervals in each of the four (4) areas evaluated. These samples were then transported to our field laboratory for same-day analysis. In the laboratory we utilize a hydrogen-flame ionization gas chromatograph for analysis and associated computer instrumentation for collecting and interpreting the analytical data. By having this instrumentation near the sample sites, it is possible to perform preliminary evaluations of the data and provide more efficient quality control of sampling and analytical operations.

Interstitial gas samples were collected along each sampling line at a depth of approximately 0.7 metre utilizing RECON's patented interstitial gas sampling probe. The soil conditions varied throughout the sampling areas from loose sands to very compact sandy clays. The soil moisture varied from dry to slightly damp, depending upon the sample location site (i.e., dune crest, dune flank, or swale). Sampling profiles were prepared to completely evaluate the hydrocarbon gas microseepage patterns associated with the following anomalies mapped by RECON's remote gas sensor:

Glen Joyce: Forty-six (46) interstitial gas samples were collected utilizing a 200-metre spacing along seismic line 82-WKH for 9.2 km. east of shot point #430. These samples were

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collected over a period of two days. Relief was about 9-metre through dune and swale country. Open woodland with grasses and small shrubs were in bloom due to the recent rains. The microseepage in this area is classified as significant, with the highest concentration levels exhibited between sample points 11-20. The increase in concentration near sample point 43 could be related to faulting, since the pattern is rather narrow.

Killumi: Sixty-six (66) interstitial gas samples were collected at 200-metre spacing along seismic line 82-WKN for 13 km. east of S.P. 700. These samples were collected over a period of 1.5 days. The relief varied with a maximum of 20 metres between dunes and swale. Open woodland with grasses and scrub bush dominated, particularly along the eastern flanks of the dunes and within the swales. The microseepage in this area is classified as significant, with the highest concentration levels exhibited between sample points 7-20. The increase in concentration near sample point 28 could be related to faulting, since the microseepage pattern is rather narrow.

Poolowanna-A: The remotely sensed Poolowanna anomaly was covered by three profiles to evaluate its total microseepage pattern. The -A profile is from west to east and furthest to the north. Thirty-six (36) interstitial gas samples were collected at 200-metre spacing along seismic line 76-WBL for 7 km. east of S.P. 310. The relief in the Poolowanna area was typical desert terrain, with dunes to a maximum height of 40-metres having crests spaced at about 200 to 500 metres. Along the dune flanks were grasses, shrubs, and small trees in blossom due to the season and recent rains. Sampling conditions varied, depending upon location of the sampling stations. The microseepage along this profile is classified as significant, with the highest concentration levels exhibited between sample points 6-20. The increase in concentration near sample point 43 can be related to faulting, since the microseepage pattern is very narrow.

Poolowanna-B: This profile was from west to east across the southern part of the airborne anomaly. Thirty-six (36) interstitial gas samples were collected at 200-metre spacing along seismic line 80-WJF. The sampling conditions were very similar to those in Poolowanna-A. The microseepage across this profile is classified as moderate with the highest values lying between sample points 11-34. There are two narrow microseepage patterns in this profile, one at sample point 12 and the other at sample point 24 which are possibly related to faulting in the area.

Poolowanna Tie-Line: This 2.4 km. profile lies along seismic line 76-WBY joining the Poolowanna Lines A and B at sample points 20 and 22 respectively. This tie-line was predominantly along a swale corridor having a hard clay pan, with sparse vegetation. The entire profile lies within the central portion of the airborne anomaly, with microseepage classified as significant. The highest concentration levels are exhibited between sample points 5-12 with good correlation with the high values on the eastern end of Poolowanna-B.

Oolarinna: Forty-one (41) interstitial gas samples were collected at 200-metre spacing along seismic line 84-WML for 8 km. west of S.P. 1054. The relief varied with dunes up to 20 metres in height. There was denser vegetation along the eastern facing flanks and along the swale corridors. The slope was steep on the eastern flanks with gradual rises on the western flanks. The weather was very hot (45-50 deg.C) and windy. The sampling conditions varied depending upon the position on the dune crests, flanks or in the swales. The microseepage along this profile is classified as moderate, with the highest concentrations being measured between sample points 7-12. There does not appear to be any microseepage in this area that is related to faulting.

Scatter Test: Four (4) samples were collected within a 2-metre radius on all four sides of sample station 22 on the Poolowanna-B profile. These tests show very good agreement and are within our +/- 5-10% allowable variation due to local changes in the sampling environment.

Four (4) of the profiles from these remotely detected anomalies sampled compare favorably with the microseepage over the benchmark area, and would be classified as significant. Two (2) of the profiles are classified as moderate.

Profiles from the anomalous areas that were sampled during October, 1984 and interpreted to be significant or moderate are as follows:

SIGNIFICANT ANOMALIES	MODERATE ANOMALIES
GLEN JOYCE	POOLOWANNA-B
KILLUMI	OOLARINNA
POOLOWANNA-A	
POOLOWANNA TIE-LINE	

Narrow spikes and unusually high concentration ratios for the wet gases (ethane through butanes) and the corresponding high values for the percent wetness are usually indicative of microseepage along a fault. The relative sums and ratios of the components in the anomalous samples are very similar to those measured in the benchmark field. The ratios of all the hydrocarbons that were measured indicate that they are being emitted from a source containing both natural gas and liquid petroleum.

CONCLUSIONS AND RECOMMENDATIONS

It has been our experience that geochemical anomalies exhibiting hydrocarbon gas microseepage in excess of background levels, and comparable to profiles collected over production in the same area, are of the utmost importance. A comparison of the samples collected over these prospects and the Poolowanna benchmark are very favourable We recommend that other information be considered along with this geochemical quantitative data, such as seismic records, geological information, Landsat imagery, etc.

The results of these analyses are presented on the attached profile graphs of methane, ethane, and propane. Chromatographic analysis data for each sample are also included along with several summations and ratios that are helpful in interpreting the results. We are also enclosing 1:100,000 seismic base maps showing the airborne anomalies with the location of each sample point noted.

In general, the interpretation of the attached profiles is relatively straightforward. That is, the most concentrated amounts of hydrocarbon gases were collected over the areas previously identified and mapped by the remote gas sensor and were higher than the adjacent background levels. Statistical evaluation of the hydrocarbon gas sample data supports our interpretations. Each remotely detected anomaly that was ranked as significant or moderate has microseepage exceeding background levels in the areas by more than two to three times. We believe these hydrocabon patterns define the areas of primary interest and should be considered as wildcat prospects. With the aid of these quantitative hydrocarbon gas samples, a thorough evaluation of each prospect identified is suggested. The attached profile graphs of the samples collected and analyzed will be helpful when considered with other information including geological data, Landsat imagery and geophysical data, etc.

SUMMARY

Interstitial hydrocarbon gas samples were collected and analyzed along profiles from four (4) of the remotely sensed anomalies you selected in the PEDIRKA Block. Of these anomalies, parts of all of them are interpreted as exhibiting significant hydrocarbon microseepage. Our interpretation is derived by evaluating the amounts of hydrocarbon gas microseepage over the Poolowanna Prospect, and comparing its benchmark characteristics, along with the background microseepage for the region, to the data collected over these anomalies. In our opinion, these significant hydrocarbon gas microseepage prospects warrant further detailed evaluation, i.e., detailed stratigraphy, photo interpretation (e.g. Landsat imagery), geological or geophysical evaluation.

It has been a pleasure conducting this survey in your behalf, especially with such positive results. We hope these findings will aid in your evaluation and ultimate selection of drill sites. If you should have any questions with regard to the enclosed information, please do not hesitate to call.

We appreciate the opportunity to perform this work for DELHI PETROLEUM and Partners and look forward to our next opportunity to serve your group.

Very truly yours,

RECON EXPLORATION, INC.

Ray Burson
Manager, Geochemical Programs

Enclosures
KRB/km

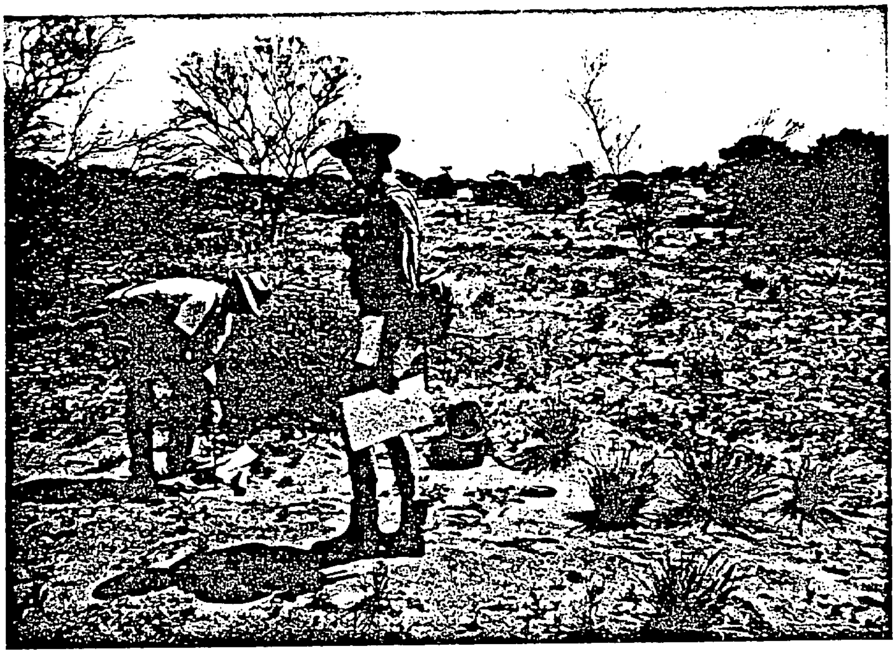


PLATE 1: MESSRS ABEL AND FAWCETT SAMPLING

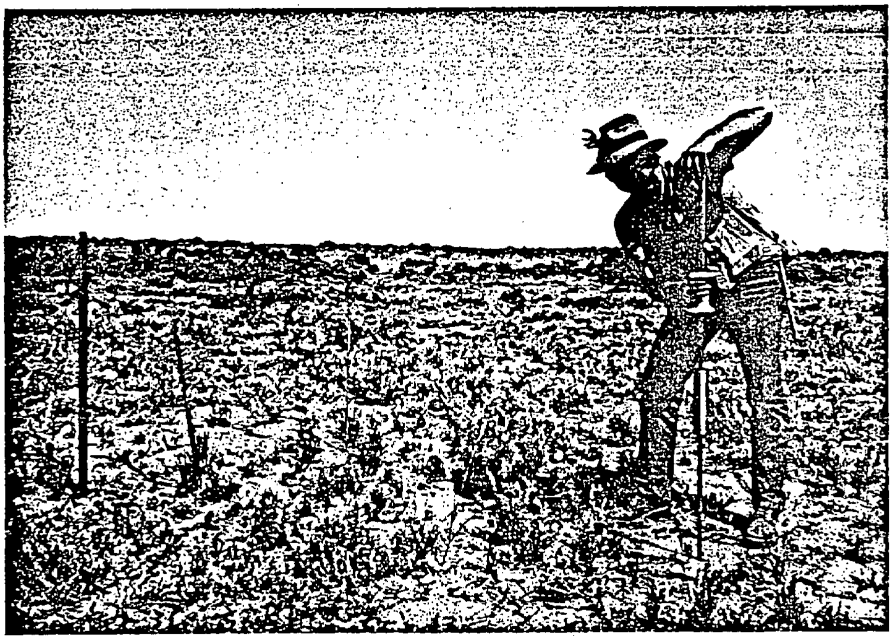


PLATE 2: MR. JOHN ABEL HAMMERING THE PROBE TO 0.7m

PLATE 3: THE SIMPSON DESERT AROUND GLEN JOYCE.

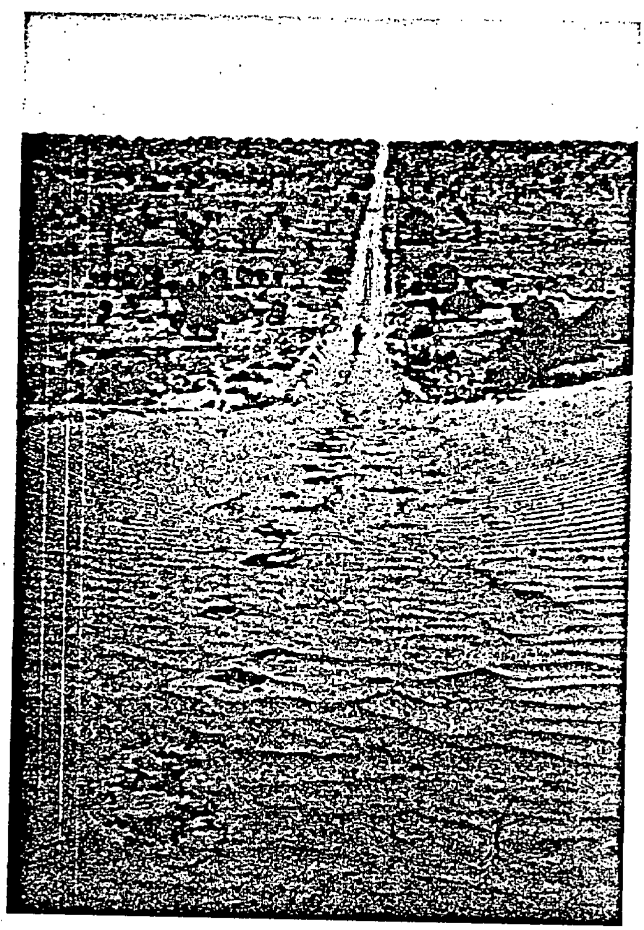


PLATE 4: HIGH DUNES AND A HOT DAY AT POOLOWANNA.

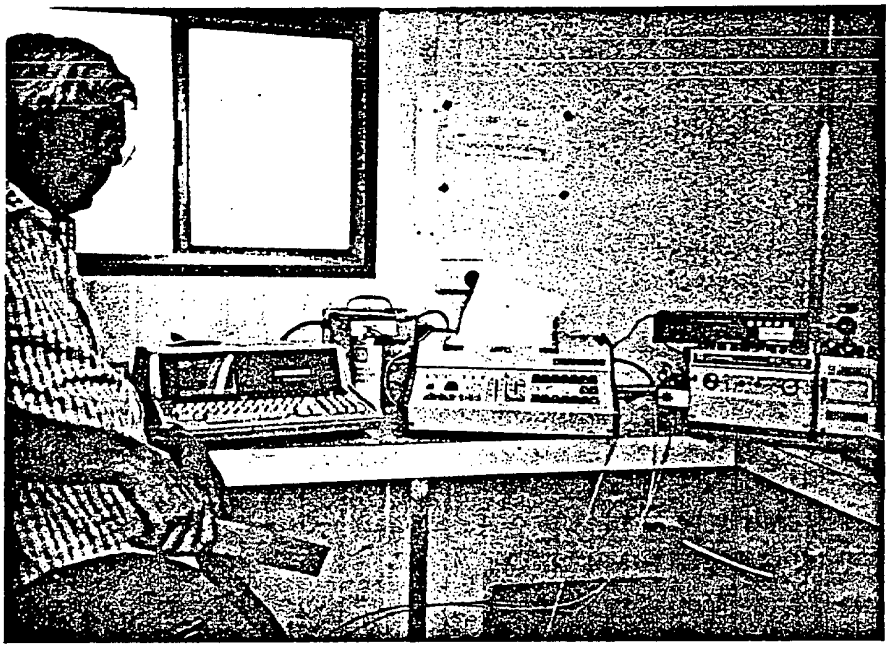


PLATE 5: MR. RAY BURSON WITH THE PORTABLE FIELD LABORATORY AT THE NORPAC CAMP.

PLATE 6: OUR TRANSPORT AND SHADE.

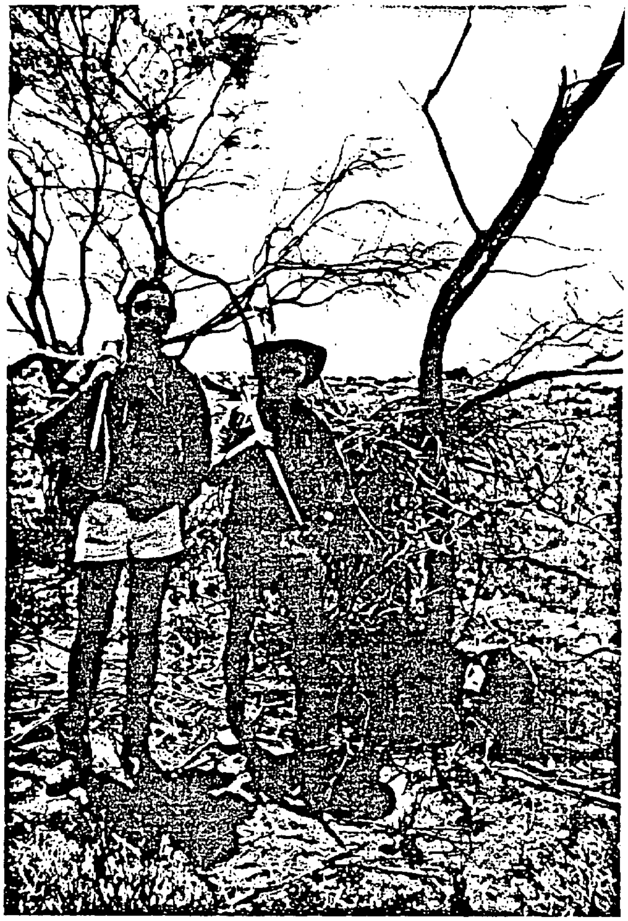
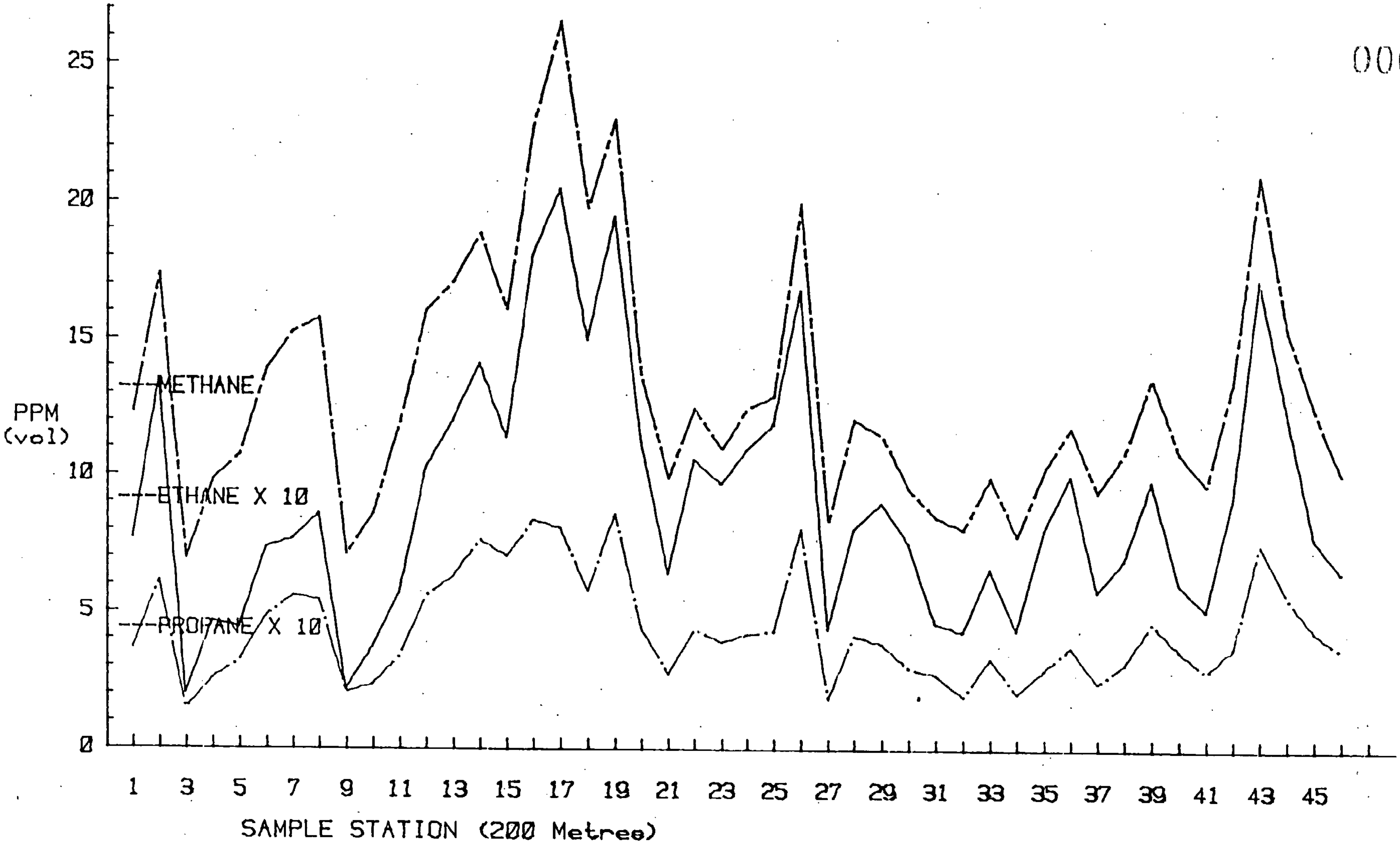


PLATE 7: MESSRS FAWCETT AND STRACHAN (WITH PROBES) NEAR AN EAGLE'S NEST.

000645



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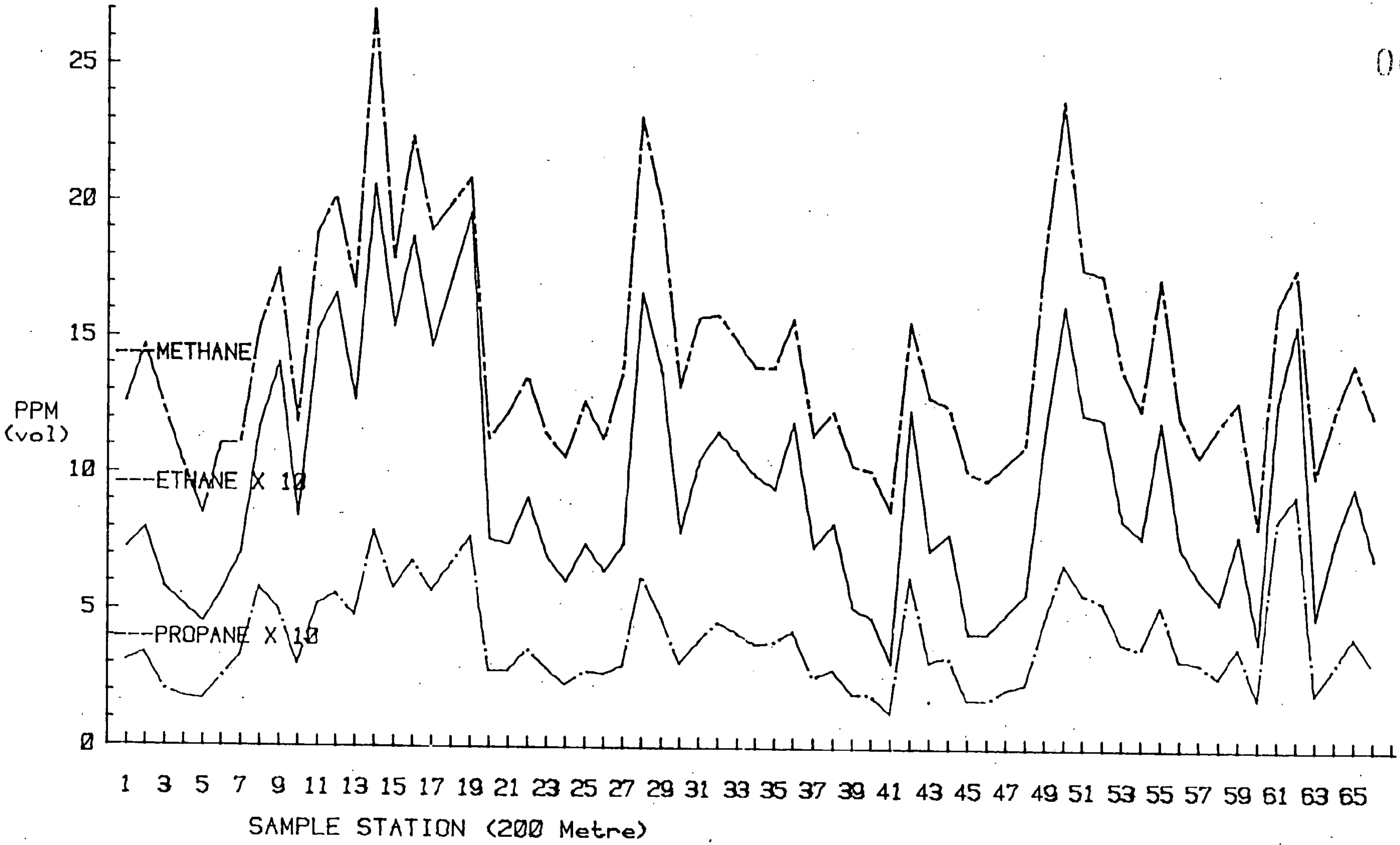
ADELAIDE, SO. AUSTRALIA 5000

PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
GLEN JOYCE
October 1984

000646



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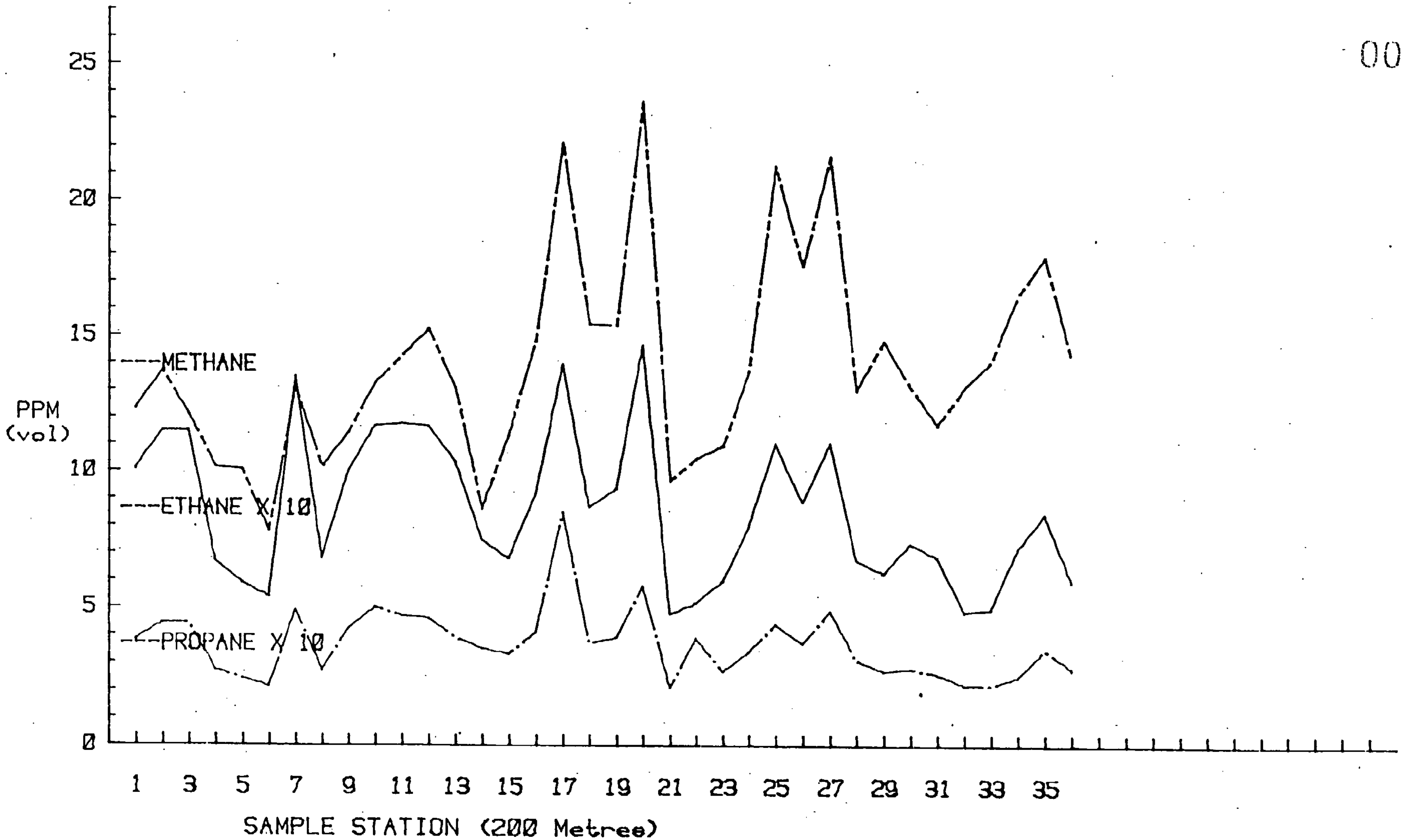
ADELAIDE, SO. AUSTRALIA 5000

PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
KILLUMI
October 1984

000647



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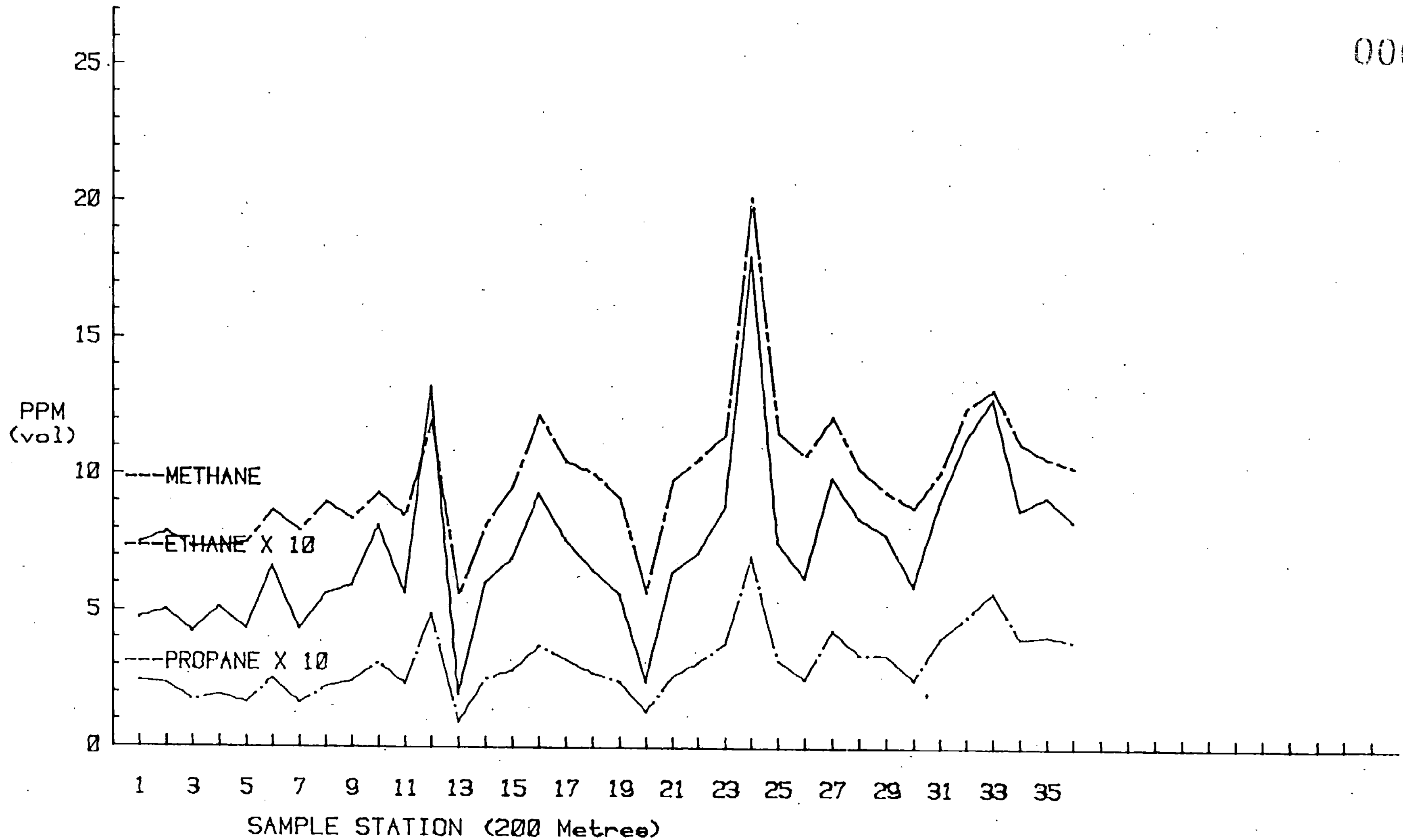
ADELAIDE, SO. AUSTRALIA 5000

PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
POOLOWANNA LINE-A
October 1984

000648



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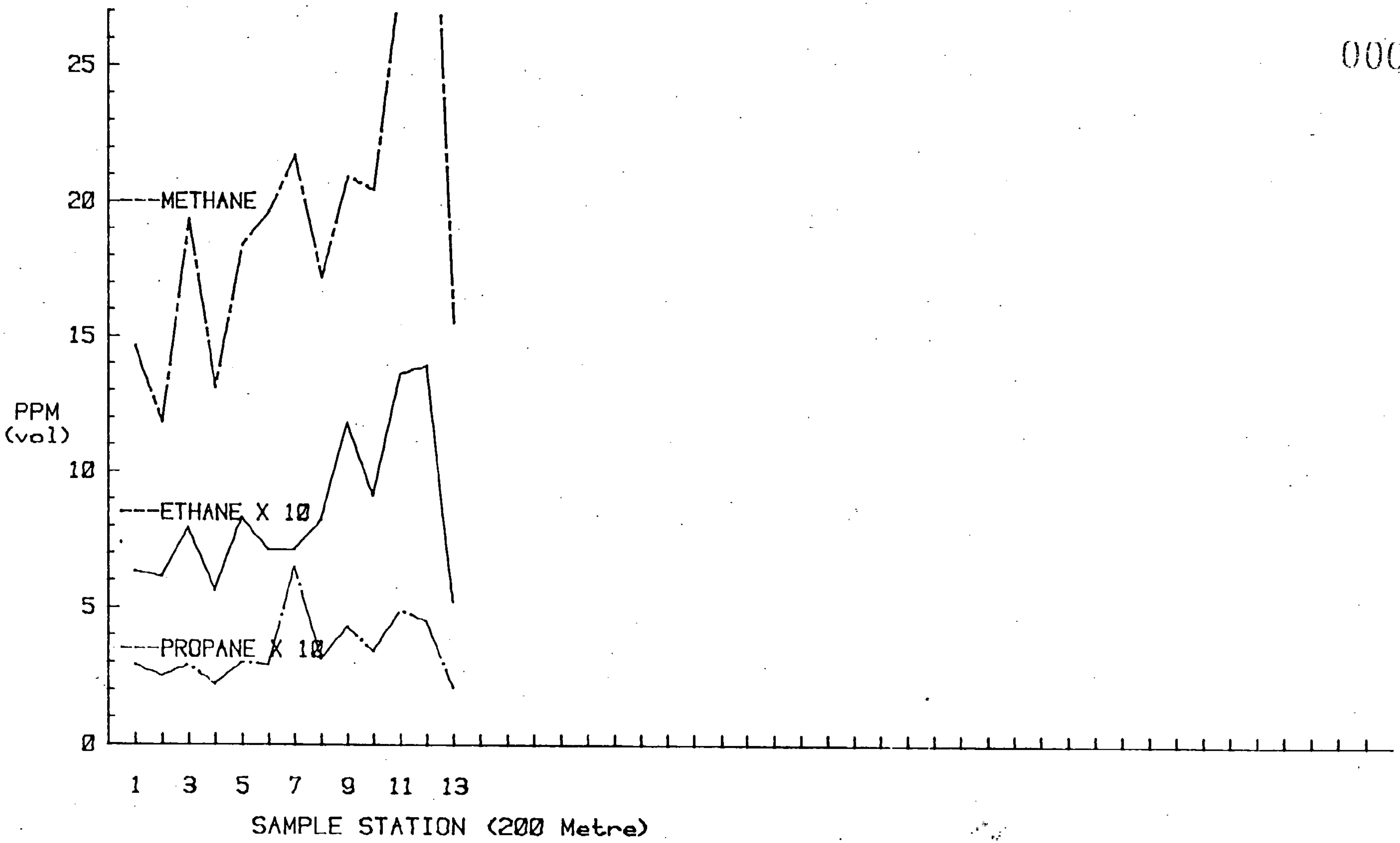
PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
POOLOWANNA LINE-B
October 1984



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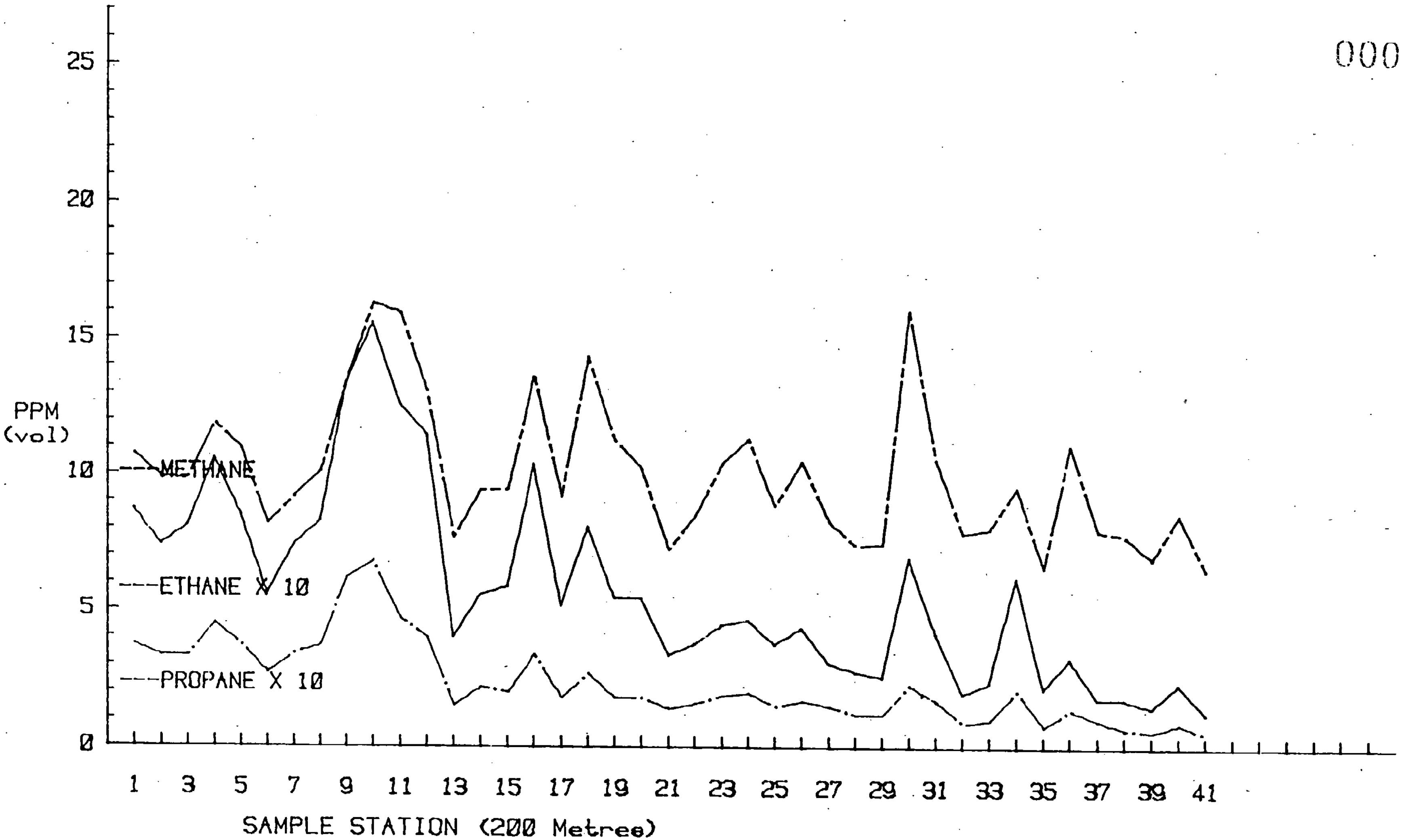
PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
POOLOWANNA TIE LINE
October 1984

000650



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ADELAIDE, SO. AUSTRALIA 5000

PEDIRKA BLOCK, PEL 5&6
DELHI PETROLEUM PTY., LTD.
OOLARINNA
October 1984

GLEN JOYCE

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	12.32	.77	.39	.37	.29	.86
2	17.38	1.35	.64	.61	.48	1.44
3	6.97	.20	.16	.15	.11	.51
4	9.84	.47	.35	.26	.23	1.06
5	10.75	.44	.37	.32	.25	1.32
6	13.92	.74	.53	.49	.35	1.41
7	15.30	.77	.58	.56	.39	1.81
8	15.78	.86	.51	.55	.35	1.54
9	7.12	.22	.15	.21	.10	.38
10	8.64	.37	.29	.24	.19	.71
11	11.96	.57	.44	.34	.30	1.21
12	16.07	1.03	.68	.56	.45	1.60
13	17.13	1.21	.72	.63	.44	.96
14	18.89	1.41	.81	.77	.53	1.93
15	16.07	1.14	.70	.71	.42	.76
16	22.79	1.81	.68	.84	.59	1.30
17	26.57	2.05	.75	.81	.55	1.61
18	19.81	1.50	.74	.58	.53	.88
19	23.01	1.95	.85	.86	.59	1.74
20	13.68	1.13	.35	.44	.26	.92
21	9.95	.64	.25	.28	.16	.66
22	12.51	1.06	.29	.44	.24	.85
23	11.02	.98	.26	.40	.21	.55
24	12.51	1.10	.30	.42	.23	.56
25	12.97	1.19	.44	.43	.27	.71
26	19.97	1.68	.63	.81	.51	1.76
27	8.33	.44	.28	.19	.17	.93
28	12.13	.81	.40	.42	.26	.73
29	11.54	.91	.59	.39	.52	.62
30	9.58	.76	.46	.30	.25	.35
31	8.56	.47	.27	.28	.14	.55
32	8.10	.43	.25	.20	.13	.35
33	10.02	.67	.36	.34	.23	.54
34	7.86	.44	.25	.21	.15	.38
35	10.31	.81	.52	.30	.25	.65
36	11.85	1.01	.52	.38	.28	.61
37	9.50	.58	.29	.25	.18	.49
38	10.93	.70	.38	.32	.23	.73
39	13.70	.99	.51	.47	.28	.93
40	10.95	.62	.33	.37	.21	.86
41	9.76	.52	.27	.29	.18	.49
42	13.56	.93	.55	.38	.30	.82
43	21.05	1.73	1.02	.76	.58	1.40
44	15.53	1.25	.61	.57	.40	1.13
45	12.57	.78	.33	.44	.26	.89
46	10.20	.66	.25	.37	.18	.63

GLEN JOYCE

SUMS AND RATIOS

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	14.99	2.67	1.16	.65	82.20	16.04	29.69	17.80
2	21.91	4.53	1.99	1.10	79.32	12.84	35.37	20.68
3	8.09	1.13	.36	.26	86.09	34.67	21.01	13.91
4	12.21	2.36	.81	.49	80.66	21.08	26.26	19.34
5	13.45	2.70	.81	.57	79.91	24.25	29.95	20.09
6	17.44	3.52	1.27	.84	79.81	18.84	35.05	20.19
7	19.41	4.11	1.35	.95	78.83	19.91	36.67	21.17
8	19.60	3.82	1.38	.90	80.51	18.29	34.61	19.49
9	8.18	1.06	.37	.31	87.07	32.57	29.45	12.93
10	10.45	1.81	.66	.43	82.72	23.21	27.66	17.28
11	14.84	2.88	1.02	.64	80.61	20.86	28.55	19.39
12	20.38	4.32	1.71	1.01	78.82	15.62	34.91	21.18
13	21.10	3.97	1.93	1.08	81.19	14.21	37.02	18.81
14	24.34	5.45	2.22	1.29	77.60	13.37	40.55	22.40
15	19.80	3.73	1.84	1.12	81.17	14.09	44.00	18.83
16	28.01	5.22	2.49	1.43	81.36	12.60	36.86	18.64
17	32.34	5.77	2.80	1.36	82.16	12.96	30.49	17.84
18	24.04	4.23	2.24	1.11	82.40	13.21	29.28	17.60
19	29.01	5.99	2.80	1.45	79.34	11.80	37.52	20.66
20	16.77	3.09	1.48	.70	81.55	12.11	32.46	18.45
21	11.93	1.98	.89	.43	83.36	15.44	27.96	16.64
22	15.39	2.88	1.36	.68	81.29	11.76	35.08	18.71
23	13.42	2.40	1.24	.61	82.13	11.30	35.85	17.87
24	15.13	2.61	1.40	.65	82.72	11.38	33.91	17.28
25	16.02	3.05	1.64	.71	80.98	10.87	33.47	19.02
26	25.36	5.39	2.31	1.32	78.74	11.85	40.56	21.26
27	10.34	2.00	.72	.36	80.61	18.79	22.84	19.39
28	14.74	2.62	1.21	.68	82.25	14.98	34.59	17.75
29	14.57	3.03	1.50	.91	79.20	12.70	33.80	20.80
30	11.70	2.12	1.22	.55	81.90	12.63	31.32	18.10
31	10.26	1.70	.73	.42	83.40	18.34	32.71	16.60
32	9.46	1.36	.68	.33	85.59	18.69	24.69	14.41
33	12.16	2.14	1.03	.57	82.44	15.03	33.93	17.56
34	9.29	1.43	.69	.36	84.59	17.80	26.72	15.41
35	12.84	2.53	1.33	.55	80.33	12.75	29.10	19.67
36	14.65	2.80	1.53	.66	80.91	11.75	32.07	19.09
37	11.30	1.80	.88	.43	84.11	16.29	26.32	15.89
38	13.29	2.36	1.08	.55	82.27	15.61	29.28	17.73
39	16.88	3.18	1.50	.75	81.16	13.82	34.31	18.84
40	13.33	2.38	.94	.58	82.14	17.76	33.79	17.86
41	11.50	1.74	.78	.47	84.84	18.89	29.71	15.16
42	16.54	2.98	1.48	.68	82.01	14.66	28.02	17.99
43	26.53	5.48	2.74	1.34	79.34	12.20	36.10	20.66
44	19.49	3.96	1.86	.97	79.69	12.42	36.70	20.31
45	15.28	2.71	1.12	.70	82.28	16.05	35.00	17.72
46	12.29	2.09	.91	.55	83.01	15.49	36.27	16.99

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DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	12.63	.73	.38	.31	.21	.27
2	14.68	.80	.46	.34	.29	.52
3	12.38	.58	.33	.21	.17	.39
4	10.31	.52	.27	.18	.14	.19
5	8.48	.45	.28	.17	.15	.13
6	11.06	.56	.37	.25	.22	.53
7	11.08	.71	.44	.33	.25	.42
8	15.33	1.17	.85	.58	.53	.56
9	17.49	1.41	.76	.50	.38	.71
10	11.88	.85	.46	.30	.22	.60
11	18.84	1.53	.84	.52	.45	.65
12	20.20	1.66	.98	.56	.50	.73
13	16.81	1.27	.78	.48	.30	.60
14	27.01	2.06	1.33	.79	.60	1.31
15	17.86	1.55	.92	.58	.48	.93
16	22.40	1.87	1.19	.68	.62	1.12
17	18.95	1.47	.86	.57	.47	.92
18	19.91	1.72	.98	.67	.55	1.03
19	20.88	1.96	1.10	.77	.63	1.14
20	11.31	.76	.42	.28	.23	.59
21	12.26	.75	.42	.28	.23	.64
22	13.60	.92	.52	.36	.26	.75
23	11.50	.70	.44	.29	.24	.54
24	10.63	.61	.35	.23	.18	.50
25	12.68	.75	.45	.28	.25	.62
26	11.30	.65	.41	.27	.21	.53
27	13.73	.75	.55	.30	.27	.73
28	23.11	1.67	1.08	.63	.70	1.30
29	19.83	1.38	.86	.48	.40	1.00
30	13.25	.79	.42	.31	.24	.58
31	15.78	1.05	.51	.39	.24	.68
32	15.90	1.16	.61	.46	.29	.95
33	14.94	1.08	.55	.42	.30	.84
34	13.98	1.00	.48	.38	.24	.74
35	13.99	.95	.54	.39	.27	.82
36	15.76	1.20	1.14	.43	.31	.71
37	11.48	.74	.36	.26	.17	.46
38	12.39	.83	.42	.29	.20	.51
39	10.38	.52	.25	.20	.14	.46
40	10.19	.48	.21	.20	.14	.32
41	8.70	.32	.16	.13	.10	.15
42	15.68	1.25	.52	.63	.33	.60
43	12.91	.73	.43	.32	.27	.43
44	12.58	.79	.35	.34	.23	.46
45	10.15	.43	.19	.18	.12	.20
46	9.85	.43	.20	.18	.12	.33
47	10.48	.50	.25	.22	.16	.38
48	11.13	.57	.28	.24	.19	.39
49	18.23	1.16	.67	.47	.39	.69
50	23.85	1.64	.74	.68	.47	.75

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
51	17.66	1.24	.54	.57	.38	.51
52	17.44	1.22	.46	.54	.32	.49
53	14.03	.85	.45	.39	.27	.65
54	12.49	.78	.40	.37	.28	.58
55	17.34	1.21	.55	.53	.36	.65
56	12.24	.75	.38	.33	.28	.38
57	10.79	.63	.32	.32	.22	.53
58	11.95	.55	.32	.27	.22	.59
59	12.84	.79	.38	.38	.28	.49
60	8.19	.40	.13	.19	.11	.12
61	16.34	1.28	.64	.84	.40	.66
62	17.75	1.57	.75	.94	.48	.78
63	10.11	.49	.26	.21	.17	.48
64	12.44	.77	.39	.31	.23	.55
65	14.30	.97	.47	.42	.33	.62
66	12.35	.71	.49	.31	.31	.68

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SUMS AND RATIOS

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	14.52	1.90	1.11	.52	86.92	17.36	24.55	13.08
2	17.09	2.41	1.26	.63	85.88	18.34	23.17	14.12
3	14.05	1.68	.91	.38	88.05	21.27	16.97	11.95
4	11.61	1.30	.79	.32	88.80	19.90	17.45	11.20
5	9.66	1.19	.74	.32	87.72	18.65	20.06	12.28
6	13.00	1.94	.94	.47	85.10	19.63	22.60	14.90
7	13.22	2.15	1.15	.58	83.77	15.62	29.80	16.23
8	19.02	3.70	2.03	1.11	80.56	13.07	37.85	19.44
9	21.25	3.76	2.17	.88	82.29	12.41	28.59	17.71
10	14.30	2.43	1.31	.52	83.02	14.05	25.26	16.98
11	22.82	3.98	2.36	.97	82.54	12.33	27.60	17.46
12	24.64	4.44	2.65	1.06	82.00	12.14	27.72	18.00
13	20.25	3.43	2.05	.78	83.04	13.21	28.55	16.96
14	33.10	6.09	3.39	1.39	81.60	13.09	29.25	18.40
15	22.32	4.45	2.46	1.06	80.04	11.56	32.47	19.96
16	27.88	5.48	3.06	1.30	80.33	11.96	30.36	19.67
17	23.25	4.30	2.34	1.04	81.52	12.87	30.08	18.48
18	24.86	4.95	2.70	1.22	80.09	11.59	33.65	19.91
19	26.48	5.60	3.06	1.40	78.84	10.63	36.89	21.16
20	13.59	2.28	1.18	.51	83.21	14.81	24.75	16.79
21	14.58	2.31	1.16	.51	84.13	16.45	22.83	15.87
22	16.41	2.81	1.44	.62	82.89	14.81	26.47	17.11
23	13.71	2.21	1.14	.53	83.90	16.43	25.22	16.10
24	12.50	1.87	.96	.41	85.01	17.44	21.65	14.99
25	15.02	2.34	1.19	.53	84.41	17.00	22.09	15.59
26	13.36	2.06	1.05	.48	84.55	17.51	23.89	15.45
27	16.32	2.59	1.29	.57	84.12	18.41	21.86	15.88
28	28.50	5.38	2.75	1.33	81.10	13.82	27.26	18.90
29	23.95	4.13	2.25	.88	82.78	14.35	24.21	17.22
30	15.59	2.34	1.21	.55	85.00	16.75	23.40	15.00
31	18.65	2.87	1.56	.63	84.59	14.96	24.72	15.41
32	19.37	3.47	1.77	.75	82.07	13.66	28.93	17.93
33	18.12	3.19	1.63	.72	82.41	13.81	28.12	17.59
34	16.82	2.84	1.48	.62	83.10	13.98	27.19	16.90
35	16.96	2.97	1.49	.66	82.48	14.65	27.88	17.52
36	19.55	3.79	2.34	.74	80.63	13.14	27.28	19.37
37	13.47	1.99	1.10	.43	85.22	15.58	22.66	14.78
38	14.63	2.25	1.25	.49	84.65	14.97	23.41	15.35
39	11.94	1.56	.76	.34	86.90	20.02	19.28	13.10
40	11.54	1.35	.69	.34	88.29	21.14	19.63	11.71
41	9.56	.86	.48	.23	90.99	27.34	14.94	9.01
42	19.00	3.32	1.76	.96	82.51	12.59	40.19	17.49
43	15.09	2.17	1.15	.59	85.59	17.75	24.78	14.41
44	14.75	2.18	1.15	.57	85.25	15.90	27.04	14.75
45	11.27	1.12	.62	.30	90.08	23.76	17.73	9.92
46	11.11	1.26	.63	.30	88.68	23.05	18.27	11.32
47	11.99	1.51	.75	.38	87.37	20.95	21.00	12.63
48	12.80	1.67	.85	.43	86.92	19.42	21.57	13.08
49	21.61	3.39	1.84	.86	84.33	15.66	25.79	15.67
50	28.12	4.27	2.37	1.15	84.81	14.58	28.51	15.19

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
51	20.90	3.23	1.77	.95	84.53	14.29	32.27	15.47
52	20.47	3.03	1.68	.86	85.19	14.31	30.97	14.81
53	16.63	2.60	1.29	.66	84.36	16.59	27.81	15.64
54	14.90	2.41	1.18	.65	83.81	15.97	29.63	16.19
55	20.63	3.29	1.75	.89	84.03	14.34	30.57	15.97
56	14.35	2.12	1.13	.61	85.25	16.42	26.97	14.75
57	12.80	2.02	.95	.54	84.26	17.20	29.66	15.74
58	13.89	1.94	.86	.49	86.01	21.91	22.59	13.99
59	15.16	2.32	1.17	.66	84.68	16.23	29.60	15.32
60	9.13	.95	.53	.30	89.63	20.47	23.21	10.37
61	20.16	3.82	1.92	1.24	81.06	12.75	51.42	18.94
62	22.27	4.52	2.32	1.42	79.71	11.29	52.96	20.29
63	11.73	1.61	.75	.38	86.23	20.60	20.77	13.77
64	14.69	2.25	1.16	.54	84.66	16.10	24.92	15.34
65	17.12	2.82	1.45	.75	83.55	14.70	29.37	16.45
66	14.85	2.50	1.20	.62	83.16	17.42	25.10	16.84

POOLOWANNA-A

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	12.30	1.01	.59	.38	.32	.57
2	13.69	1.15	.75	.44	.42	.75
3	12.07	1.15	.79	.44	.41	.89
4	10.13	.67	.50	.27	.28	.55
5	10.04	.59	.50	.24	.26	.69
6	7.78	.54	.40	.21	.23	.56
7	13.09	1.35	.99	.49	.51	.83
8	10.12	.68	.47	.27	.24	.59
9	11.41	1.00	.75	.42	.40	.76
10	13.25	1.17	.87	.50	.45	1.02
11	14.25	1.18	.90	.47	.46	1.05
12	15.25	1.17	1.02	.46	.55	1.09
13	13.08	1.04	.87	.39	.48	.91
14	8.64	.75	.59	.35	.42	.62
15	11.36	.68	.67	.33	.39	.95
16	14.83	.92	.82	.41	.44	1.04
17	22.16	1.40	1.14	.85	.58	1.08
18	15.43	.87	.84	.37	.45	1.02
19	15.38	.94	.92	.39	.50	1.07
20	23.65	1.47	1.56	.58	.76	1.52
21	9.67	.48	.56	.21	.31	.71
22	10.48	.52	.54	.39	.35	.87
23	10.95	.60	.75	.27	.41	1.12
24	13.72	.80	.92	.34	.48	1.37
25	21.29	1.11	1.16	.44	.61	1.53
26	17.58	.89	1.03	.37	.53	1.49
27	21.63	1.11	1.41	.49	.75	1.50
28	13.03	.68	.78	.31	.46	1.76
29	14.84	.63	.70	.27	.42	1.07
30	13.15	.74	.76	.28	.41	1.13
31	11.77	.69	.69	.26	.37	1.22
32	13.14	.49	.55	.22	.31	1.14
33	14.09	.50	.56	.22	.24	1.12
34	16.54	.72	.71	.25	.26	1.35
35	17.98	.85	1.25	.35	.34	1.07
36	14.17	.60	.63	.28	.37	1.13

POOLOWANNA-A

SUMS AND RATIOS

AMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	15.17	2.87	1.60	.70	81.08	12.18	30.89	18.92
2	17.20	3.51	1.90	.86	79.59	11.90	32.14	20.41
3	15.75	3.68	1.94	.85	76.63	10.50	36.45	23.37
4	12.40	2.27	1.17	.55	81.69	15.12	26.65	18.31
5	12.32	2.28	1.09	.50	81.49	17.02	23.90	18.51
6	9.72	1.94	.94	.44	80.04	14.41	26.99	19.96
7	17.26	4.17	2.34	1.00	75.84	9.70	37.43	24.16
8	12.37	2.25	1.15	.51	81.81	14.88	26.68	18.19
9	14.74	3.33	1.75	.82	77.41	11.41	36.81	22.59
10	17.26	4.01	2.04	.95	76.77	11.32	37.74	23.23
11	18.31	4.06	2.08	.93	77.83	12.08	32.98	22.17
12	19.54	4.29	2.19	1.01	78.05	13.03	30.16	21.95
13	16.77	3.69	1.91	.87	78.00	12.58	29.82	22.00
14	11.37	2.73	1.34	.77	75.99	11.52	40.51	24.01
15	14.38	3.02	1.35	.72	79.00	16.71	29.05	21.00
16	18.46	3.63	1.74	.85	80.34	16.12	27.65	19.66
17	27.21	5.05	2.54	1.43	81.44	15.83	38.36	18.56
18	18.98	3.55	1.71	.82	81.30	17.74	23.98	18.70
19	19.20	3.82	1.86	.89	80.10	16.36	25.36	19.90
20	29.54	5.89	3.03	1.34	80.06	16.09	24.52	19.94
21	11.94	2.27	1.04	.52	80.99	20.15	21.72	19.01
22	13.15	2.67	1.06	.74	79.70	20.15	37.21	20.30
23	14.10	3.15	1.35	.68	77.66	18.25	24.66	22.34
24	17.63	3.91	1.72	.82	77.82	17.15	24.78	22.18
25	26.14	4.85	2.27	1.05	81.45	19.18	20.67	18.55
26	21.89	4.31	1.92	.90	80.31	19.75	21.05	19.69
27	26.89	5.26	2.52	1.24	80.44	19.49	22.65	19.56
28	17.02	3.99	1.46	.77	76.56	19.16	23.79	23.44
29	17.93	3.09	1.33	.69	82.77	23.56	18.19	17.23
30	16.47	3.32	1.50	.69	79.84	17.77	21.29	20.16
31	15.00	3.23	1.38	.63	78.47	17.06	22.09	21.53
32	15.85	2.71	1.04	.53	82.90	26.82	16.74	17.10
33	16.73	2.64	1.06	.46	84.22	28.18	15.61	15.78
34	19.83	3.29	1.43	.51	83.41	22.97	15.11	16.59
35	21.84	3.86	2.10	.69	82.33	21.15	19.47	17.67
36	17.18	3.01	1.23	.65	82.48	23.62	19.76	17.52

POOLOWANNA-B

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	7.47	.47	.30	.24	.23	.15
2	7.87	.50	.27	.23	.17	.49
3	7.29	.42	.23	.17	.13	.25
4	7.36	.51	.32	.19	.16	.18
5	7.48	.43	.32	.16	.15	.21
6	8.67	.66	.44	.25	.22	.23
7	7.92	.43	.30	.16	.16	.18
8	8.98	.56	.41	.22	.20	.39
9	8.38	.59	.43	.24	.26	.61
10	9.32	.81	.53	.31	.27	.25
11	8.45	.56	.38	.23	.21	.57
12	11.96	1.32	.78	.49	.41	.62
13	5.56	.19	.11	.09	.08	.08
14	8.14	.60	.41	.25	.22	.41
15	9.56	.69	.45	.28	.23	.95
16	12.16	.93	.64	.37	.36	.84
17	10.47	.76	.47	.32	.24	.83
18	10.06	.65	.41	.27	.22	.66
19	9.13	.56	.37	.24	.22	.71
20	5.67	.24	.12	.13	.10	.08
21	9.80	.64	.42	.26	.22	.48
22	10.55	.71	.45	.31	.26	.63
23	11.48	.88	.51	.38	.30	.75
24	20.15	1.80	.96	.70	.53	1.26
25	11.56	.75	.45	.32	.27	.84
26	10.66	.62	.38	.25	.21	.70
27	12.13	.99	.52	.43	.27	.66
28	10.23	.84	.57	.34	.22	.52
29	9.37	.78	.43	.34	.23	.49
30	8.81	.59	.34	.25	.20	.56
31	10.12	.90	.48	.40	.28	.72
32	12.45	1.13	.63	.48	.32	.76
33	13.16	1.28	.75	.57	.41	.73
34	11.18	.87	.51	.40	.31	.87
35	10.61	.92	.58	.41	.34	.64
36	10.30	.83	.76	.39	.30	.83

POOLOWANNA-B

SUMS AND RATIOS

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	8.86	1.39	.77	.47	84.31	15.89	32.13	15.69
2	9.53	1.66	.77	.40	82.58	15.74	29.22	17.42
3	8.49	1.20	.65	.30	85.87	17.36	23.32	14.13
4	8.72	1.36	.83	.35	84.40	14.43	25.82	15.60
5	8.75	1.27	.75	.31	85.49	17.40	21.39	14.51
6	10.47	1.80	1.10	.47	82.81	13.14	28.84	17.19
7	9.15	1.23	.73	.32	86.56	18.42	20.20	13.44
8	10.76	1.78	.97	.42	83.46	16.04	24.50	16.54
9	10.51	2.13	1.02	.50	79.73	14.20	28.64	20.27
10	11.49	2.17	1.34	.58	81.11	11.51	33.26	18.89
11	10.40	1.95	.94	.44	81.25	15.09	27.22	18.75
12	15.58	3.62	2.10	.90	76.77	9.06	40.97	23.23
13	6.11	.55	.30	.17	91.00	29.26	16.19	9.00
14	10.03	1.89	1.01	.47	81.16	13.57	30.71	18.84
15	12.16	2.60	1.14	.51	78.62	13.86	29.29	21.38
16	15.30	3.14	1.57	.73	79.48	13.08	30.43	20.52
17	13.09	2.62	1.23	.56	79.98	13.78	30.56	20.02
18	12.27	2.21	1.06	.49	81.99	15.48	26.84	18.01
19	11.23	2.10	.93	.46	81.30	16.30	26.29	18.70
20	6.34	.67	.36	.23	89.43	23.63	22.93	10.57
21	11.82	2.02	1.06	.48	82.91	15.31	26.53	17.09
22	12.91	2.36	1.16	.57	81.72	14.86	29.38	18.28
23	14.30	2.82	1.39	.68	80.28	13.05	33.10	19.72
24	25.40	5.25	2.76	1.23	79.33	11.19	34.74	20.67
25	14.19	2.63	1.20	.59	81.47	15.41	27.68	18.53
26	12.82	2.16	1.00	.46	83.15	17.19	23.45	16.85
27	15.00	2.87	1.51	.70	80.87	12.25	35.45	19.13
28	12.72	2.49	1.41	.56	80.42	12.18	33.24	19.58
29	11.64	2.27	1.21	.57	80.50	12.01	36.29	19.50
30	10.75	1.94	.93	.45	81.95	14.93	28.38	18.05
31	12.90	2.78	1.38	.68	78.45	11.24	39.53	21.55
32	15.77	3.32	1.76	.80	78.95	11.02	38.55	21.05
33	16.90	3.74	2.03	.98	77.87	10.28	43.31	22.13
34	14.14	2.96	1.38	.71	79.07	12.85	35.78	20.93
35	13.50	2.89	1.50	.75	78.59	11.53	38.64	21.41
36	13.41	3.11	1.59	.69	76.81	12.41	37.86	23.19

POOLOWANNA TIE LINE

DATA SUMMARY TABLE

AMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	14.63	.63	.86	.29	.38	1.12
2	11.83	.61	.61	.25	.37	1.03
3	19.35	.79	.86	.29	.42	1.19
4	13.08	.56	.58	.22	.34	1.07
5	18.41	.83	.93	.30	.48	1.28
6	19.63	.71	.81	.29	.44	1.25
7	21.71	.71	.78	.65	.56	1.37
8	17.16	.82	.77	.31	.42	1.36
9	20.94	1.18	1.36	.43	.96	1.25
10	20.44	.91	1.05	.34	.55	1.62
11	28.42	1.36	1.54	.49	.94	1.70
12	39.14	1.39	1.57	.45	.78	1.48
13	15.54	.52	.65	.21	.39	.74

SCATTER TESTS

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	19.22	.66	.76	.24	.41	1.18
2	17.78	1.06	.97	.38	.53	1.33
3	19.25	1.00	1.00	.38	.55	1.38
4	25.10	1.07	.95	.44	.53	1.36

SCATTER TESTS

SUMS AND RATIOS

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	22.47	3.25	1.42	.65	85.54	29.12	12.49	14.46
2	22.05	4.27	2.03	.91	80.63	16.77	21.37	19.37
3	23.56	4.31	2.00	.93	81.71	19.25	19.74	18.29
4	29.45	4.35	2.02	.97	85.23	23.46	17.53	14.77

OOLARINNA

DATA SUMMARY TABLE

SAMPLE #	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	BUTANES
1	10.72	.87	.68	.37	.38	.97
2	9.84	.74	.52	.33	.30	1.02
3	9.86	.81	.60	.33	.32	.88
4	11.87	1.06	.82	.45	.45	1.26
5	10.92	.85	.66	.37	.38	.93
6	8.16	.56	.41	.27	.26	.90
7	9.18	.74	.54	.34	.30	.99
8	10.11	.83	.60	.37	.37	1.07
9	13.48	1.34	.97	.62	.65	1.23
10	16.31	1.56	1.17	.68	.65	1.14
11	15.95	1.26	1.03	.47	.56	.83
12	13.07	1.15	.90	.40	.47	.77
13	7.67	.40	.30	.15	.19	.43
14	9.43	.56	.46	.22	.27	.67
15	9.46	.59	.49	.20	.26	.50
16	13.70	1.04	.84	.34	.44	.68
17	9.21	.52	.47	.18	.25	.66
18	14.33	.81	.69	.27	.35	.70
19	11.28	.55	.46	.18	.24	.64
20	10.23	.55	.47	.18	.24	.66
21	7.25	.34	.28	.14	.17	.46
22	8.51	.38	.32	.16	.18	.76
23	10.44	.45	.39	.19	.21	.57
24	11.34	.47	.37	.20	.21	.54
25	8.88	.38	.31	.15	.17	.28
26	10.51	.44	.36	.17	.21	.55
27	8.30	.31	.29	.15	.17	.44
28	7.42	.28	.25	.12	.16	.34
29	7.46	.26	.24	.12	.14	.38
30	16.17	.70	.60	.23	.31	.79
31	10.58	.42	.40	.17	.23	.51
32	7.87	.20	.18	.09	.11	.20
33	8.03	.24	.22	.10	.14	.24
34	9.57	.63	.72	.21	.23	.33
35	6.62	.22	.20	.08	.12	.24
36	11.15	.33	.33	.14	.20	.56
37	7.97	.18	.19	.10	.12	.21
38	7.82	.18	.21	.07	.13	.23
39	6.96	.15	.18	.06	.10	.20
40	8.61	.24	.26	.09	.14	.27
41	6.58	.13	.14	.05	.08	.15

OOLARINNA

SUMS AND RATIOS

SAMPLE #	SUM C1-C4	SUM C2-C4	SUM C2's	SUM C3's	PERCENT METHANE	ETHANE RATIO	PROPANE RATIO	PERCENT WETNESS
1	13.99	3.27	1.55	.75	76.63	12.32	34.51	23.37
2	12.75	2.91	1.26	.63	77.18	13.30	33.54	22.82
3	12.80	2.94	1.41	.65	77.03	12.17	33.47	22.97
4	15.91	4.04	1.88	.90	74.61	11.20	37.91	25.39
5	14.11	3.19	1.51	.75	77.39	12.85	33.88	22.61
6	10.56	2.40	.97	.53	77.27	14.57	33.09	22.73
7	12.09	2.91	1.28	.64	75.93	12.41	37.04	24.07
8	13.35	3.24	1.43	.74	75.73	12.18	36.60	24.27
9	18.29	4.81	2.31	1.27	73.70	10.06	45.99	26.30
10	21.51	5.20	2.73	1.33	75.83	10.46	41.69	24.17
11	20.10	4.15	2.29	1.03	79.35	12.66	29.47	20.65
12	16.76	3.69	2.05	.87	77.98	11.37	30.60	22.02
13	9.14	1.47	.70	.34	83.92	19.18	19.56	16.08
14	11.61	2.18	1.02	.49	81.22	16.84	23.33	18.78
15	11.50	2.04	1.08	.46	82.26	16.03	21.14	17.74
16	17.04	3.34	1.88	.78	80.40	13.17	24.82	19.60
17	11.29	2.08	.99	.43	81.58	17.71	19.54	18.42
18	17.15	2.82	1.50	.62	83.56	17.69	18.84	16.44
19	13.35	2.07	1.01	.42	84.49	20.51	15.96	15.51
20	12.33	2.10	1.02	.42	82.97	18.60	17.60	17.03
21	8.64	1.39	.62	.31	83.91	21.32	19.31	16.09
22	10.31	1.80	.70	.34	82.54	22.39	18.80	17.46
23	12.25	1.81	.84	.40	85.22	23.20	18.20	14.78
24	13.13	1.79	.84	.41	86.37	24.13	17.64	13.63
25	10.17	1.29	.69	.32	87.32	23.37	16.89	12.68
26	12.24	1.73	.80	.38	85.87	23.89	16.18	14.13
27	9.66	1.36	.60	.32	85.92	26.77	18.07	14.08
28	8.57	1.15	.53	.28	86.58	26.50	16.17	13.42
29	8.60	1.14	.50	.26	86.74	28.69	16.09	13.26
30	18.80	2.63	1.30	.54	86.01	23.10	14.22	13.99
31	12.31	1.73	.82	.40	85.95	25.19	16.07	14.05
32	8.65	.78	.38	.20	90.98	39.35	11.44	9.02
33	8.97	.94	.46	.24	89.52	33.46	12.45	10.48
34	11.69	2.12	1.35	.44	81.86	15.19	21.94	18.14
35	7.48	.86	.42	.20	88.50	30.09	12.08	11.50
36	12.71	1.56	.66	.34	87.73	33.79	12.56	12.27
37	8.77	.80	.37	.22	90.88	44.28	12.55	9.12
38	8.64	.82	.39	.20	90.51	43.44	8.95	9.49
39	7.65	.69	.33	.16	90.98	46.40	8.62	9.02
40	9.61	1.00	.50	.23	89.59	35.88	10.45	10.41
41	7.13	.55	.27	.13	92.29	50.62	7.60	7.71