SYDNEY OIL COMPANY (PEDIRKA) PTY LIMITED

ONSHORE

SIMPSON SEISMIC SURVEY
SEISMIC PROCESSING REPORT
PEDIRKA BASIN OP 238, NORTHERN TERRITORY
FEBRUARY 1988

PR88/-70 **A**

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Approved by: .... Management   Date: ....

               .... Geology   Date: ....

               .... Geophysics   Date: ....

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1. INTRODUCTION

Sydney Oil Company (Pedirka) Pty Limited, Simpson Seismic Survey was recorded in the Pedirka Basin of S.E. Northern Territory, during September 1987. The data was recorded using a vibroseis source with uphole control, by Norpac crew 287. Data processing was performed by Hoskings Geophysical initially in their Sydney based processing centre and subsequently in their Perth offices. Project monitoring was performed by the author of this report, Mr Nicholas Blake of Sedapro Consulting of Sydney.

The survey was conducted in the northern central locations (Simpson Prospect) and the north western corner (Madigan Trough) of the permit OP 238. These locations lie in the Simpson Desert in an area covered with sand dunes.

Around the Simpson Prospect the sand dunes have elevations of up to 135m ASL with the inter-dune valley floors being at an elevation of 100m ASL. Typically the change in elevation from base to peak of the dunes is 10 to 20 metres. The wavelength of the dunes varies between 300 to 600 metres.

Over the Madigan Trough the dunes have a maximum and minimum range of 155 to 135m ASL. The relief of these dunes is less than seen over the Simpson Prospect and there is approximately 10m of elevation change. The wavelength of these dunes is typically less than 300m.

The effect of the dunes could clearly be seen on the first breaks of the field records.

This type of terrain made acquisition difficult, especially for the uphole drill crew as their water supply lines became extremely long. As a result of this some of the upholes were cancelled.

Simpson Desert Prospect

This survey was aimed at the further detailing of potential leads developed from the 1986 Bejah Seismic Survey (Border Trend). The lines from this 1987 survey being designed as infill lines over areas of poor coverage (See Map of Appendix 1).

The survey consisted of the following lines:

Line	Range	Dir	Km	Field Reels
S87-SI-01	100-635	NE	16.05	5006
S87-SI-02	100-320	SE	6.6	5006A
S87-SI-03	100-635	NE	16.05	5009
S87-SI-04	100-320	NW	6.6	5007
S87-SI-05	110-850	NE	22.2	5001/5002
S87-SI-06	100-320	SE	6.6	5008
S87-SI-07	100-668	NE	17.1	5010
S87-SI-08	100-384	NW	8.55	5003
S87-SI-10	100-450	SE	10.5	5004
S87-SI-12	100-568	NW	14.1	5005
			124.35	

Madigan Trough Prospect

This part of the survey was aimed at the further detailing of leads developed from the 1986 Bejah Survey (Madigan Trough). The lines of the 1987 survey were as follows:

Line	Range	Dir	Km	Field Reels
S87-SI-09	100-370	NW	8.1	5021
S87-SI-11	100-370	SE	8.1	5022
S87-SI-13	100-370	NW	8.1	5023
S87-SI-14	100-765	NE	19.95	5028/5029
S87-SI-15	110-369	SE	8.1	5024
S87-SI-16	100-930	NE	24.9	5030/5031
S87-SI-17	100-370	NW	8.1	5025
S87-SI-19	100-370	SE	8.1	5026
S87-SI-21	100-370	NW	8.1	5027
			101.55	

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Thus both projects consisted of a total of 225.90 km of seismic data, which were recorded using 120 channel DFSV instruments, to obtain 1200% subsurface coverage using a group interval of 30m and a vibroseis source spacing of 150m.

The data was recorded to 4 seconds using a sample rate of 2 msec, and processed to 3 seconds using a sample rate of 4 msec.

The results of the survey were good with all lines ranging in data quality from good to excellent.

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2. PROCESS SEQUENCE INITIALISATION

2.1 Gain Recovery

The records were output onto tape in both uncorrelated SEGB format and correlated SEGY format by the field crew.

The SEGY tapes were transcribed into Hoskings in-house format of Phoenix I and resampled at the same time from 2 to 4 msec sample rate.

A theoretical spherical divergence correction was applied to the data to help balance the effective energy return level down the record in time.

The optimum gain curve was found to relate to an $\alpha = 0.2$ function over the record length. This output a well balanced record suffering neither under nor over modulation problems, and was used for the entire survey.

2.2 Deconvolution

At this stage testing was performed to optimise the deconvolution to be applied. The following deconvolution operators were tested (see encl.1) by comparing their response on brute stack panels:-

Panel #	Type	
1	No deconvolution	
2	Predictive operator of 120 msec length, 8 msec gap.	1% WNL
3	Predictive operator of 120 msec length, 16 msec gap.	1% WNL
4A	Predictive operator of 120 msec length, 20 msec gap.	1% WNL
4B	Predictive operator of 120 msec length, 24 msec gap.	1% WNL
5	Predictive operator of 120 msec length, 32 msec gap.	1% WNL
6	Predictive operator of 120 msec length, 48 msec gap.	1% WNL
7	Predictive operator of 100 msec length, 16 msec gap.	1% WNL
8	Predictive operator of 200 msec length, 16 msec gap.	1% WNL
9	Predictive operator of 250 msec length, 16 msec gap.	1% WNL
10	Predictive operator of 300 msec length, 16 msec gap.	1% WNL
11	Spiking operator 120 msec length	2% WNL
12	Surface consistent spiking 120 msec operator length	2% WNL

All operators except the long 48 msec gap (panel 6) were superior to the undeconvolved (panel 1) section, which was dominated by low frequency components and short period multiples.

Each operator showed a good increase in the high frequency signal content and good control of the short period multiple or reverberation.

The undeconvolved auto-correlation display (encl.2, panel 1) showed the period of the main reverberation or sidelobe to be approximately 60 msec. This was well collapsed by all of the operators tested. The longer operators (shown on panels 8 to 10) demonstrated slightly better attenuation of the second sidelobe, but on the stack panels were seen to attenuate the steeply dipping data below 1.8 seconds.

Although the previously used 20 msec gapped operator did a good job it was felt that the shorter gapped operator of 8 msec (panel 2) showed much better resolution and high frequency content without adversely effecting the low frequency continuity. This is very apparent at between 0.4 and 0.7 seconds and also between 0.9 and 1.4 seconds.

The spiking operator (panel 11) was no better than the 8 msec gap, while the surface consistent spiking operator panel showed an excess of high frequency noise. It also failed to deal adequately with the noise trains in the first 0.5 second of the data.

It was decided upon these results to select the predictive 120 msec, 8 msec gapped operator with 1% white noise level. The design gates were 0.6 - 2.6 seconds on the near trace and 1.3 - 2.9 seconds on the far trace. A single gate was used as two gates could not be fitted into the relevant 'low noise' portion of the section while observing the 10:1 ratio, design gate to operator length rule of thumb.

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2.3   Filter Tests

After the deconvolution tests a filter analysis was performed on a field
record (see encl.3). Discrete 10 Hz passband filters were used ranging
from 0-80 Hz. These panels were followed by a low cut sweep of 10, 15,
17, 20, 25 and 30 Hz while keeping the high side constant at 80 Hz.

Good signal content was observed at all frequencies between 10 and 60
Hz. Little signal was observed above 60 Hz and none at all over 70 Hz.
The low frequency noise was dealt with effectively by using a 10 Hz low
cut filter.

A filter of 10-80 Hz, similar to the sweep frequency range was
implemented after the deconvolution as part of the production mainstream.

2.4   Spectral Balancing

A spectral balancing operator was applied both separately and in
conjunction with the deconvolution operator. Although the results were
interesting in that some areas responded to its application by an
increase in resolution, the introduction at depth of a high frequency
noise overlay distracted from the overall effectiveness of this
processing option.

It was decided not to use this option in a noisy pre-stack mode, but to
try the same technique as a post stack test later on in the processing
sequence.

2.5   F-K Filtering

After review of the filter analysis, whereby the only noticable coherent
noise train was effectively reduced by a low cut filter, the single fold
shot records from a number of lines were inspected. No serious noise
trains were observed. All of the brute stacks showed complete
cancellation of all noise trains due to the stack fold cancellation.

In view of the foregoing it was decided not to use an F-K filter as its application was essentially redundant.

2.6   Amplitude Scalar

After deconvolution and filtering were performed a simple whole trace scalar was applied to bring all the traces and shots up to the same average power. This was a precaution against suspect geophone locations, differences in shot environment, offset - power deterioration and near surface changes.

Unfortunately, the zones between approximately 0.6 - 1.0 sec and 1.1 - 1.3 seconds remained at a very low amplitude level compared to the high amplitude events at 0.5 and 1.0 seconds.

The only satisfactory way to resolve this unacceptable contrast level was to use an AGC scalar. This was kept as long as possible at 800 msec, enabling the most relevant amplitude differentials to remain while increasing the amplitude of the events from the 'dead zones' just enough for them to be readily seen.

This also matched the previous processing in the area and would help a good character tie between the vintages of data to be made.

2.7   Display

The single fold records were then played out for quality control purposes and to aid the trace/record edit procedure. Cable configuration, offsets and slipped shots were also checked at this juncture.

2.8   Brute Stack

A brute stack was generated for each line using a previously determined velocity function from this area. This was used as a quality control measure and also to assist in the detailed positioning of the velocity analysis sets on the data. This stack was also used to check the provisional tie information at intersections.

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2.9 Weathering Statics

As previously mentioned, the uphole drilling crew had logistical support problems and was running behind. This and the fact that the survey computations and base maps were late in arriving led to some delays in being able to come up with a weathering model for the area based on uphole coverage. To enable the new data to tie the old data, both the new and old upholes needed to be used in the generation of such a model.

In the meantime a trial was run comparing brute stacks with the following statics computed and applied:-

a)   Brute Stack, Elevation statics only   (encl.4)

b)   Brute Stack, Uphole statics only   (encl.5)

c)   Brute Stack, refraction statics from first breaks
      calibrated to spacial uphole control   (encl.6)

As can be seen from the referenced enclosures the stack relating to item c) above is clearly better in terms of its static solution. The stack response particularly at the marker horizons at approx. 1.0 and 1.4 seconds is far superior on encl.6 for instance than on enclosure 5 (upholes only). Shotpoints 160/170, 345 and 410 are dramatic examples of its success. At SP 305 there is some limited disruption but it is still superior to the elevation statics only stack (enclosure 4).

For the short period static resolution, the first break refraction method, is obviously preferrable in terms of its stack response and would be a distinct advantage in subsequent processing stages. Control of the long wavelength was assured by way of the uphole control that was available.

To marry the two solution together we calculated both refractions statics and uphole statics. The computed refraction static at any particular uphole location was forced to equal the static determined from that uphole, thus preventing any drift.

It was essential however for the success of this static solution and for
the structural integrity of the final sections that the new and old
upholes be consistent. A detailed study comparing the two sets of
upholes determined that the observed results were good enough for this
method to work. Although the layer thickness and velocities were not
necessarily consistent the total delay time of weathering unit was (see
Appendix 1 for details).

Delay times were computed for all lines to a datum of 91m ASL using a
replacement velocity of 2200 m/sec. The integrated technique of using
first break refraction statics calibrated to the uphole control was
implemented are providing very good results.

2.10 Residual Statics (Surface Consistent)

The fully corrected unstacked data was input to the surface consistent
static routine.

A design window was used that encompassed all of the main reflection
sequence. This ran from 0.8 to 1.8 secs. A maximum static of ±30 msecs
was allowed in the computation. The resulting stack was a clear
improvement over the Brute Stacks.

The resolution of the reflection sequence was greatly improved with fine
high frequency data segments becoming apparent. Even the design
excluded shallower data between 0.3 and 0.7 seconds was greatly improved.

2.11 Velocity Analysis

A velocity analysis package was used on this project which output
Constant Velocity Gathers (CVG's), Constant Velocity Stacks (CVS) each
power picked automatically and posted on an accompanying 'scattergram'
plot. The data was also NMO corrected, by using this machine picked
function, and displayed next to the actual analysis. This function was
not necessarily the function to be used as its results depend entirely
on a power pick, which may not be the optimum geophysical velocity.

The input to this processing routine was sets of twelve adjacent CDP's
at discrete locations, approximately 0.75km apart, along each of the
lines.

Time-velocity pair co-ordinates of the optimised stack responses were
hand-picked and compiled into a velocity function at the appropriate
shotpoint location. This was checked against the associated CVG output
to optimise the degree of flatness achieved. Adjustments were made to
the selected velocities as required.

The resulting velocity functions were used to correct the data for
normal moveout corrections (NMO).

2.12 First Break Mutes

These were originally determined from the single fold records and
applied in the Brute Stack and Velocity Analysis. The final mute
applied on the subsequent stacked outputs were determined from an
inside/outside stack offset mute test and the common offset stacks (see
next section) and was as follows:

Offset (m)	Time (msec)
375	0
675	650
975	1150
1875	1400

2.13 Common Offset Stacks (COS)

As well as checking the accuracy of the velocities and statics
application this output was used to aid in the design of the first break
schedule.

These were run at velocity analysis locations. The degree of flatness observed on the corrected COS was an indication of the accuracy of the velocity picks. While the degree of smoothness indicated the accuracy of the statics applied.

Fine tuning of the velocity functions at each COS location was performed when inaccuracies were found. Generally the statics looked good but there were some exceptions.

The COS were rerun with the revised velocity function and then used to select first break mute schedule. These were applied prior to stacking, and optimised the signal in the shallow section by eliminating first break noise by selective editing.

2.14 Residual Statics (Surface Consistent)

At this stage of the processing sequence a second surface consistent residual static calculation was made. This time we used a routine option which also gave common shot and receiver stacks. This was a very valuable quality control tool.

The statics calculated in this pass were small ($\pm$ 4 msec) and did not change the stacks noticably. In several locations in this prospect, where observation of the stacks and COS had brought attention to apparent static anomalies, hand-picked correlation statics were used. These were picked directly from common shot/receiver stacks. In all cases this technique solved the observed anomalies.

2.15 Residual Static (CDP Consistent)

The alternative and sometime complement to surface consistent statics is CDP consistent residual statics.

The CDP consistent residual static routine statically measures and removes the small remnant statics apparent between adjacent CDP's. These corrections are intrinsically small. This routine used a 5 trace

pilot, a maximum allowable static of $\pm$ 12 msec (actual statics picked were $\pm$ 3 msec) and a design gateover the entire section of interest between 0.3 and 1.8 seconds.

The output was a further processing improvement to the section.

2.16 Final Stack

The final stacks produced by this processing job stream were of good to very good quality with sporadic but well defined segments of events between 0.1 to 0.9 sec. Between 1.0 to 1.5 seconds a strong sequence of high resolution continuous events was evident. At the base of this sequence there were some strong buried focus diffraction patterns. This sequence of events were generally flat with gentle undulations over most of the area but with up to a dramatic 100 msecs of structure in other parts.

3. POST STACK PROCESSING

3.1 Filter and Frequency Balancing (Post Stack)

Two zones of unfiltered stack data were filtered using a suite of
high-low bandpass filters. An optimum filter was selected by comparing
the data from each of the panels (see enclosure 7).

In this test the limit of the effective amplitude diminished over 40 Hz
and little signal was seen above 60 Hz. This was somewhat of a concern
as the sweep frequency went up to 80 Hz.

To investigate this further a power spectrum was performed on a raw
field record (enclosure 8) and the same record after deconvolution was
applied (enclosure 9). On enclosure 8, using the 'DB Power Spectrum'
plot, the lack of any frequency content can be seen from above the 50 Hz
level. Frequencies between 60 and 80 Hz are some 10 or 16 dB's down on
the energy level observed at 50 Hz.

The same graph on enclosure 9 shows that the deconvolution operator is
doing a very good job at reconstructing the frequency bandwidth, with
apparent frequencies between 10-80 Hz becoming evident. This covers the
whole range of the vibroseis input source. However, it is still
noticable that the average amplitude level between 60 to 80 Hz is some 4
dB's down on the level observed between 40 to 60 Hzs which is itself 4
dB below the average level between 10 and 40 Hz.

Obviously some further amplitude shaping could be attempted here.

A spectral whitening operator showed some interesting results earlier on
in the test sequence, at the deconvolution stages, but was not used.
This time the technique was optimised in a series of tests using the raw
stack data as input. The output stacks from this routine showed a good
improvement over the original input stacks. There was a good increase
in the resolution of the data and of course the high frequency content.
The general wavelet character remained fairly consistent and still
allowed a good tie to be made with the older vintage sections.

A further filter test (enclosure 10) run on the spectrally balanced data shows an increased level of amplitude from the 40 to 50 Hz range and the 50 to 60 Hz range. No response was forthcoming in the ranges over 60 Hz.

A low cut filter test (enclosure 11) was used to determine the final frequency passbands to use. In this test the highside was kept at 60 Hz, being the maximum high frequency contribution of signal to the data. No high frequency noise overlay was observed either shallower or at depth.

The low cut was selected to enhance the resolution of the data without effecting the continuity of the lower frequencies.

They were as follows:-

Time (sec)	Frequency Bandpass (Hz)
0	16-60
0.5	16-60
1.3	14-60
2.3	10-60
3.0	10-60

The resulting section looked clean and well presented with no ringing.

3.2 Trace Scaling

A final trace sector of 0 - 3.0 secs was applied to the output in order to evenly modulate all of the project data prior to filming.

3.3 TAU-P and Coherence Scaling

Both of these routines were attempted but neither added to the resultant sections without detracting an equal amount. That is, the increased continuity was achieved but at the expense of the signal characters. These techniques were not subsequently used in the processing sequence.

3.4   Migration

Migration of the final stacks was recommended due to the fractured
nature and accompanying diffractions patterns, of the strong basement
feature.

Migration velocity percentage tests were run. As a result of these 100%
of stacking velocities were used. This gave the best contraction of the
diffractions arcs.

Some of the more highly structured areas of the project benefited
greatly from the use of this migration with an increase in the clarity
of the transition zones and a minimising of the 'clutter'.

The result of this wave equation finite difference migrations were good
for all lines of the project.

3.5   Display

Film modulation level tests were peformed and a value of 74 dB's was
used.

Film sections for both the final stack and the migrated stack were
displayed on film at normal polarity. The top label consisted of the
following annotation:-

Velocity function boxes
Elevation and datum plot
Shot/Receiver static plot
Residual static plot
CDP fold counter
Shotpoint numbers and line ties.

A scale of 26 tpi (10 tpc) and 5 ins/sec (12.7 cm/sec) was used on both
outputs.

4. PROCESSING MAINSTREAM

4.1 General

All of the lines recorded in this project ranged in data quality between good and very good. No major problems were encountered with the recording crew and the geometries/co-ordinates of the lines were relatively simple.

All of the lines followed a standard job flow.

Some of the lines had static anomalies and cycle skips but these were solved by using a combination of additional velocity analyses and hand-picked correlation statics as previously discussed.

The new data tied well in time and character to the older data and was in general of the same quality as the previous processing but with perhaps a little better resolution of the high frequencies.

4.2 Simpson Prospect

All lines in this location progressed fairly well. There was some residual normal moveout (RNMO) observed on the common offset stacks (COS) for which an adjustment was made before further processing. In particular lines S87-SI-10 and S87-SI-12 responded very well to the second pass of residual statics after this detailed velocity analysis.

Several of the lines however had apparent busts due to still unresolved statics anomalies. These were lines S87-SI-01, 03, 05 which all contained fairly rough patches of data. Common shot and common receiver stacks were generated for these lines and hand-picked statics used as a final solution. All of the noted anomalies were satisfactorily resolved using this approach.

On line S87-SI-02, at 1.08 sec there remained a problem however. This looked very much like a cycle skip although the feature in question also had some expression on the intersecting line, S87-SI-03.

This feature could easily have been a legitimate fault but it was none the less investigated further.

Common shot and receiver stack of this line failed to show any irregularities. Residual normal moveout scans also failed to solve the zone. A sort was made of the final gathers and they were reformatted into shot orientated records. This was in an endeavour to track the feature across the single fold record and to see if the observed anomaly related to the subsurface or whether it was surface consistent, thus indicating a static problem. Unfortunately, the feature was not sharp enough to track as the signal to noise level of the records was too poor.

Continuous common offset stacks were produced to see if any disturbance was visible. No static or velocity problems were apparent.

The line was restacked several times using various offset restrictions. This enabled the structures viability in terms of its form for different wavepath windows to be checked. It was fairly consistent for all offset windows and thus not wavepath variant.

Some careful trace editing was performed but again the anomaly could not be smoothed.

As all of our testing procedures had indicated that no measurable problem existed, and that the anomaly was resisting our efforts to remove it, the feature was deemed to be real. Hence this feature on S87-SI-02 and SI-03 could be interpreted as a fault with some high degree of confidence.

During the initial tieing stage, which was delayed by the lack of both a base map and intersection listing until the second week December, several misties were observed. Most related to the non-integrated use of the old uphole data. These were recalibrated and the appropriate correction made to the data.

An error in application of the refraction statics was observed on Line S87-SI-12 where it intersected Line 86BT-1 and S87-SI-01. The correct values were subsequently applied to the data. Two misties remained.

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On line S87-SI-07 at the intersection of 86BT-2, the new data used the
value of the uphole from the old data tie. This led to a mistie with
the old data of approximately 16 msec. Apparently, an incorrect uphole
static value was used on the old data as the static profiles (total
statics applied) also mistied by the 16 msec (2 x 8 msec one way time).
No correction was made for this but the interpreter was made aware of
the mistie.

The second problem concerned the intersection of Line S87 SI-03 and 86
BT-02. Both lines were apparently processed using the same elevations,
statics and velocities. Despite this a mistie of approximately 20 msec
was observed (SI-03 needing +20 msec of additional static to tie
properly). The processing application of S87 SI-03 was thoroughly
checked and found to be sound. Data from the original processing of
86BT-02 was not available, in a timely manner, to enable a thorough
check of its processing application to be made. However, I had Hoskings
reload an archive system tape and dump an archival history for the
line. This was checked and no error could be detected.

The only explanation that could be formulated was by observing the kind
of terrain traversed by each line. Line 86BT-2 an was interdune valley
line with smoothly changing elevations and statics. Lines 87-SI-03
however, ran across the undulating dunes and had a very rugged elevation
and static profile. The residual static plots of each line show the
same properties. Therefore it is likely that the 'run-in' or averaging
effect on the surrounding terrain caused a mean shift of one of the
lines. Unfortunately, it cannot be determined which profile gave the
most structurally sound information. Hence the error was not corrected
but the interpreter was informed.

For more details of uphole locations reference is made to the uphole map
of Appendix 8.

4.3   Madigan Trough Prospect

The quality of the first breaks and hence the refraction static values
for this area were not good. At the preliminary final stack stage many

data busts and cycle skips were observed. Most of the lines were effected. It was requested that each line have common shot and receiver stacks generated and that they be hand picked to resolve the problems. This and extra velocity analysis solved all of the observed problems.

Mistie analysis of this area was similarly delayed due to the absence of a base map and/or intersection listings until the second week of December. Once these were received an analysis took place. At this stage the structural control was found to be poor.

Reference is made to Appendix 4, a memo to Richard Schroder dated 12 January 1988 outlining the problems in this area.

The static changes necessary to correct for the differences between the original weathering model and the final weathering model are listed in Appendix 5. All final stacks have effectively the final weathering statics applied and hence the structure is deemed accurate within the constraints of the uphole grid available.

The resulting unsolved misties involved the old line 86MTB and were all caused by the effective use of the new uphole control. As a result of the upholes from the new survey we now had additional uphole control on line 86MTB that was not available when it was processed for obvious reasons.

Thus small misties of approximately 8/10 msecs were apparent between it and lines S87-SI-09, SI-15, SI-19 and SI-21.

The new uphole at S87-SI-19 vs 86 MTB was preferred to the old uphole, the results being somewhat different, because new uphole was more consistent with surrounding values. Once again the interepreter was informed of these.

For a more detailed review of the location of the upholes reference is made to the uphole map of Appendix 7.

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5. CONCLUSIONS

The project was finished in early January 1988 for interpretative purposes and completed in February 1988 with delivery of the final films.

The processing of this project progressed well with some delays due to problems in the field with the uphole control. However the biggest delay in completing the project was the lack of a final base map and an intersection listing. This delayed the final tieing of all of the lines involved in both the Simpson and Madigan Trough Prospects. This problem should be addressed.

A good improvement was observed at all stages of the processing sequence.

Good structural control was maintained by the use of uphole statics and the data tied well with previous data recorded in the area. The use of the refraction first break weathering analysis calibrated to the upholes worked out extremely well. This approach if fully recommended for future work.

Although there were quite a few problems with the initial processing results, Hoskings acted very quickly to resolve them. However as these all occurred at the same time (middle of November) with the first proper quality control inspection an inevitable back log developed. This was attended to quickly and Hoskings overall performance was very good.

In conclusion I would like to extend thanks to the Hoskings Processing staff and to Darryl Kingsley of Gumlu Pty Limited for their advice and co-operation throughout the processing phase of this project.

Respectfully submitted.

Mr N. Blake
SEDAPRO CONSULTANTS

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LINE INDEX MAP

(SOC)
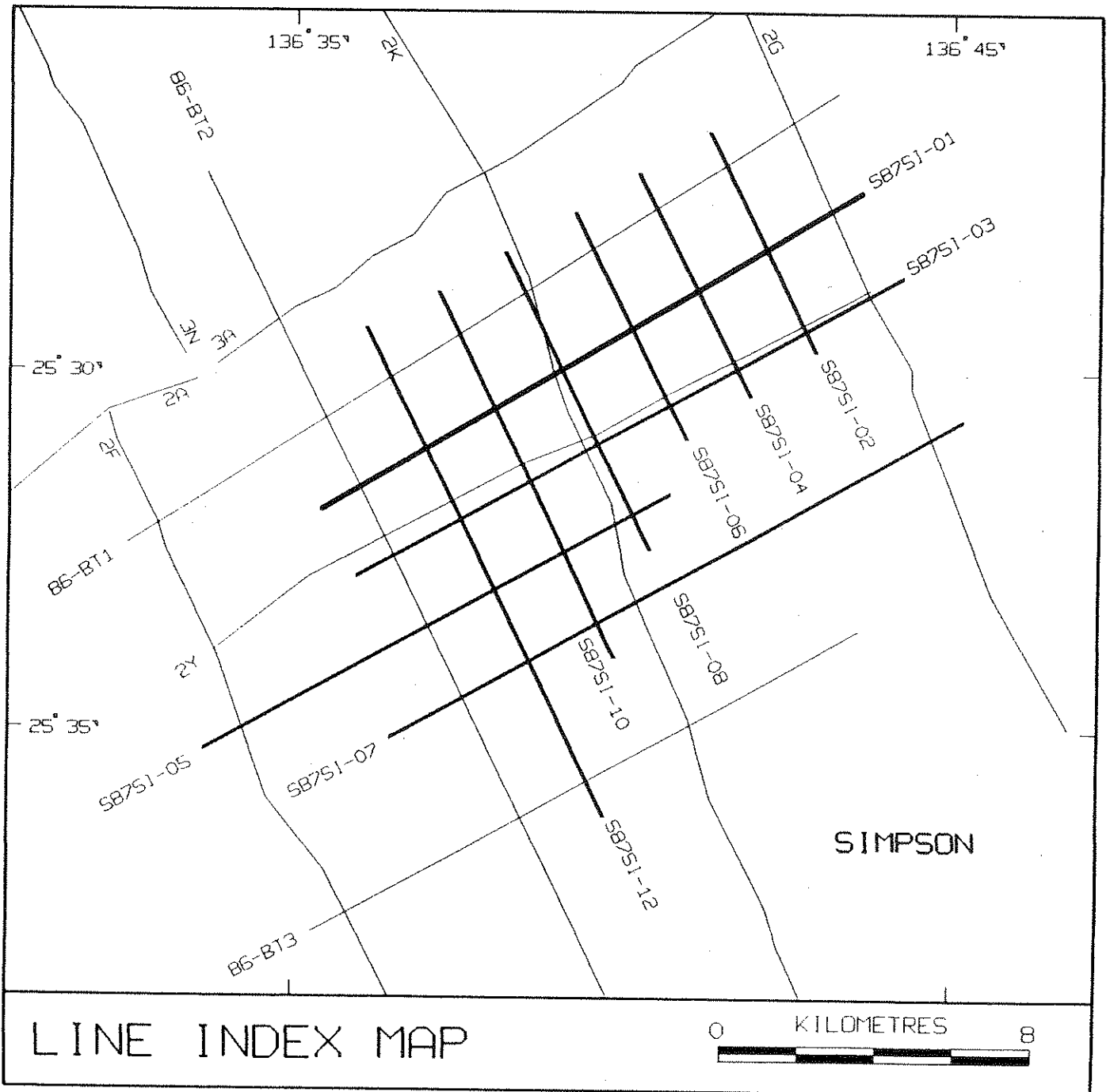
SYDNEY OIL COMPANY LIMITED
INCORPORATED IN N.S.W

OUR REF.

YOUR REF.

ROOM 227, 2ND FLOOR,
44 MARGARET ST.
SYDNEY 2000, AUSTRALIA.
TELEPHONE: (02) 29 8061
TELEX: 72094 (SOCSYD)

M E M O R A N D U M

TO: HOSKINGS GEOPHYSICAL, PERTH

ATTENTION: PETE SCRUTON, MICK CURRAN

CC: R SCHRODER, S MUNRO

FROM: NICK BLAKE S.O.C.

DATE: 23 OCTOBER 1987

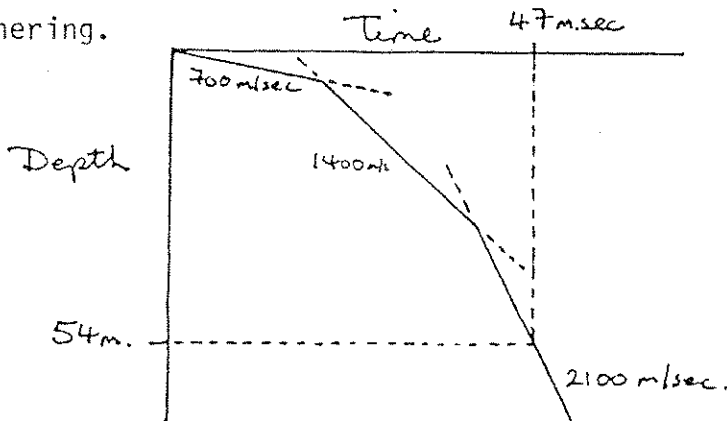SUBJECT: DUNE, SIMPSON UPHOLE SURVEYS

Dear Pete and Mick

Sending you today by courier photocopies of the upholes recorded for the
following seismic lines:- S86MT-01, 02, 04, 06, 08,

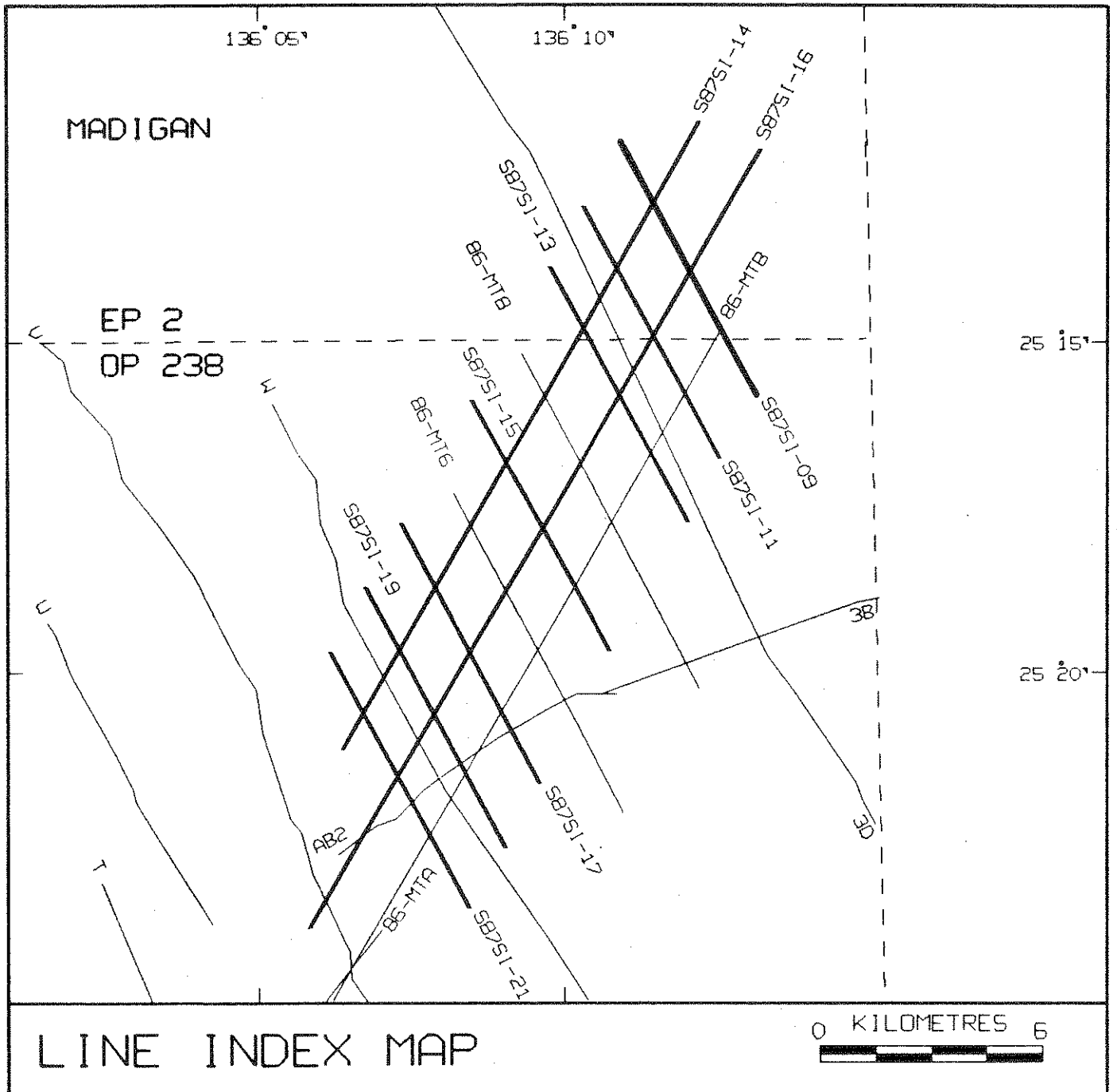S86MY-01, 02, 03, 04,

S86BT-01, 02, 03, 04, 05

One way of using these and the newly acquired upholes would be to;

a) Subtract the processing datum (91m ASL) from the elevation of the uphole
   to get the depth in the hole that relates to the datum level.

ELEV. 145m.

54m.

DATUM 91 m. ASL
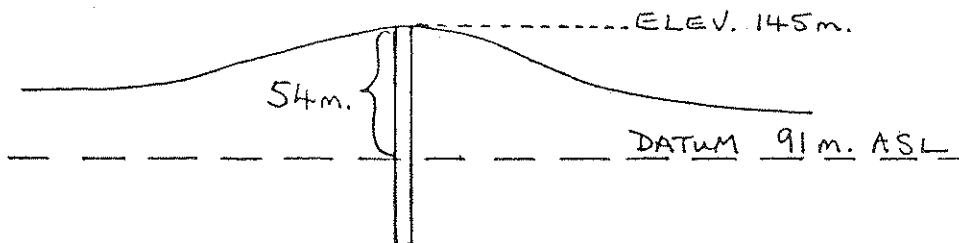
b) In this example scan across from the 54m hole depth to where it intersects
   the plotted velocity lines. This will correspond to the delay time due to
   weathering.

Time   47 m.sec

Depth

700 m/sec

1400m

54m.

2100 m/sec.

4692G/NB

MADIGAN

EP 2
OP 238

LINE INDEX MAP

136° 05'
136° 10'
25° 15'
25° 20'

S87SI-14
S87SI-16
S87SI-13
86-MT8
86-MT8
S87SI-15
86-MT6
S87SI-09
S87SI-11
S87SI-19
S87SI-17
S87SI-21
86-MTA
AB2
3B
3D

0 KILOMETRES 6

c) This assumes that the hole goes to a level below datum and that at the depth we are checking the delay time for will be in the sub-weathering or consolidated layer ie. approx 1800 m/sec upward.

Upholes outside of this criterion can be used but you must add back a factor at V_R.
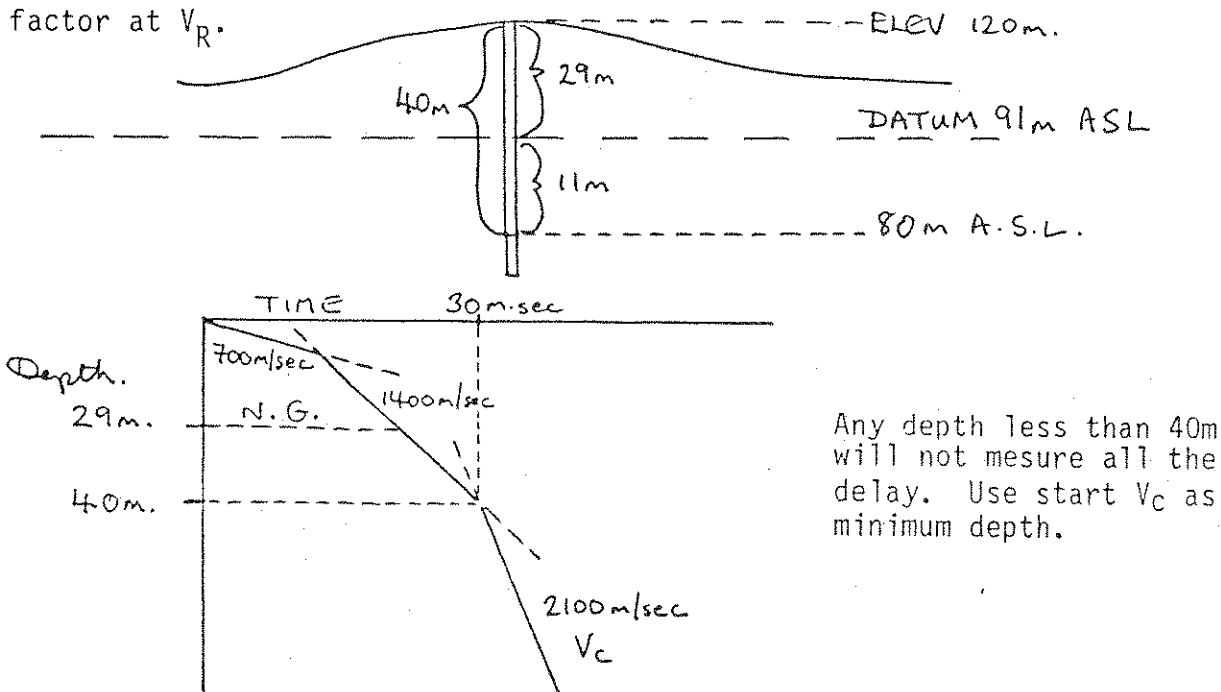
Any depth less than 40m will not mesure all the delay. Use start V_C as minimum depth.

$\therefore$ Static = Delay Time + correction factor

$$= -30 + \frac{(91 - 80)}{V_R} = -30 + \frac{11}{2.4} = -30 + 5$$

$$= -25 \text{ msec}$$

Any uphole that does not penetrate the sub-weathering you should ignore.

d) For every uphole location, the static developed by either b) or c) above should correspond to the total one way static you have calculated at that shotpoint, due to both elevation and refraction study components.

Although they should be the same I'm sure that they won't be as most things never seem to work out that well in practice. More important however, is that the differential observed between two particular upholes, of say x msecs should also be the differential of your calculated weathering (elevation and refraction) statics at the same locations. If this is so then we can feel fairly comfortable that we have modelled the weathering correctly and any structure observed on the section will be real or relate to changes in the Sub-weathering/consolidated layers that are too subtle for our velocity analysis techniques to measure, and too deep to be near surface static effects.

I have completed an analysis of the upholes, both new and old, in the area and most are fairly stable with respect to delay times. They are not stable with respect to observed layer thickness's or interval velocities. Hence I have given up trying to come up with a meaningful detailed layer model.

These are just some thoughts I have had on the weathering here. Maybe your calibration method does the same thing. Anyway your comments on this would be appreciated. The main thing is that we use both the new and old upholes to their maximum effect to ensure the best quality stacking statics and a structually sound final section that ties the old data.

Thanks for all the brutes.

Regards

NICK BLAKE

APPENDIX 4

M E M O R A N D U M

TO: RICHARD SCHRODER

CC: STEVE MUNRO

FROM: NICK BLAKE

DATE: 12 JANUARY 1988

SUBJECT: OP 238 SEISMIC SURVEY MADIGAN TROUGH   OP 238/05.05.04

With reference to your queries about my fax to Hoskings, of the 7th January,
concerning the post stack statics listed.

One of the initial tests we performed was that of comparing a brute stack with
elevation statics versus one with elevation and refraction statics. The
latter was far superior in terms of stack response and thus allowed us to
achieve greater accuracy in our velocity analysis and residual static routines.

Structurally these refraction statics have little effect on the data as they
were calibrated to the upholes at regular intervals. This worked very well on
all of the Dune Survey and for the Simpson Prospect part of the Simpson
Survey. However, in the Madigan Trough area we ran into a couple of hitches.

In this area the first breaks were of slightly inferior quality. Even here
though the general stack response was very good with the brutes showing only a
little remanent static. A more serious problem was due to the paucity of the
uphole control at the following intersections:-

SI 9 vs SI 16, SI 11 vs SI 14, SI 11 vs SI 16.

Also the old upholes on lines MT6, MT8 and MTB were not integrated in the
original calibrations.

I reworked in some detail each uphole static value and managed to consolidate both the results of the new and old upholes into a consistent weathering model. In the area of little control I backed out the elevation component of the total static to come up with a purely weathering component. This was used to calculate an interpolated value of weathering where there was no previous control.

The uphole at the intersection of SI15 and SI14 gave an anomalously high time delay value and hence a deep layer of weathering, mainly due I think, to the location of the uphole being on the crest of a dune. When allowances were made for this, the depth of weathering corresponded quite well to those of the surrounding values.

Because the changes indicated by the reworking of the calibrations are of a long wave length structural type nature they can be applied adequately in a post stack manner without a time penalty being suffered.

The other post stack statics indicated are to eliminate the end of section curl (up or down) due to reduced statics, in both refraction static and residual static calculation routines. This is a fairly common prodedure involving the 20 or so CDPS at line ends. The structure observed on the brute staks can be used as a guide to the correct structure, as was performed in this case.

I hope this goes some way to explain why these statics were appropriate here. The details of this entire procedure will be given in the final processing report to be submitted.

APPENDIX 5

WEATHERING STATIC AMENDMENTS

SI-09   SP 103, 0; SP 164, 0; SP 235, 10; SP 300, +8; SP 368, +8

SI-11   SP 102, +12; SP 200, +11; SP 235, +26; SP 270, +11;
             SP 300, +10; SP 367, +10

SI-13   SP 102, +12; SP 125, 0; SP 368, 0

SI-15   SP 102, +6; SP 162, +6; SP 231, 0; SP 290, +4; SP 340, 0;
             SP 352, +10; SP 368, +30

SI-17   No change

SI-19   SP 102, 0; SP 350, 0; SP 368, +10

SI-21   No change

SI-14   SP 102, 0; SP 340, 0; SP 403, +6; SP 475, +6; SP 545, 0;
             SP 583, +14; SP 612, +14; SP 680, 0; SP 763, 0.

SI-16   SP 102, 0; SP 670, 0; SP 735, +24; SP 803, +12; SP 873, 0;
             SP 928, 0.

SEQUENCE	PROCESSING PARAMETERS
TRANSCRIPTION	SEGY TO PHOENIX I FORMAT RESAMPLED FROM 2 TO 4 MSEC
GAIN RECOVERY	ALPHA : 0.2
DECONVOLUTION	PREDICTIVE DECONVOLUTION - 120 MSEC OPERATOR 1% WHITE NOISE - .1 DESIGN GATE - 8 MSEC GAP DESIGN: NEAR 600 2600 msec FAR 1300 2900 msec
FILTER	10 - 80 HZ
TRACE SCALING	800 MSEC AGC
STATICS	FLOATING DATUM CORRECTION. TIED TO UPHOLES FIRST BREAK STATICS. 2200M/SEC CONSTANT VR
RESIDUAL STATICS	1ST PASS SURFACE CONSISTENT USING BRUTE VELOCITY MAX STATIC ALLOWED 30 MS (GATE 1000 - 2200 MSEC)
NMO CORRECTIONS	REFERENCED TO SURFACE CDP MEAN STATIC ANNOTATED UNDER VELOCITY BOXES
INITIAL MUTE	OFFSET : 375 675 975 1875 M TIME : 0 650 1150 1400 MSEC
STATICS	FLOATING DATUM TO DATUM (DATUM : 91 M ABOVE MEAN SEA LEVEL)
RESIDUAL STATICS	2ND PASS SURFACE CONSISTENT AND CDP TRIM STATICS MAX STATIC ALLOWED 12 MS (GATE 300 - 2200 MSEC)
STACK	12 FOLD CDP STACK
BALANCE	SPECTRAL AND AMPLITUDE
FILTER	0.0 0.5 1.3 2.3 SEC 16-60 16-60 14-60 10-60 HZ
SCALING	1 GATE 0 - 3000 MSEC