

**Preliminary Report of a Technical Audit for Apache Energy Ltd.  
M/V Western Trident, Gippsland Basin 3D Marine Surveys  
30<sup>th</sup> December 2004 – 10<sup>th</sup> January 2005**

**Conclusion and Recommendations**

The equipment is in a satisfactory condition for use on this survey. The equipment can be classified as follows:

Instrumentation:	Fair
Streamers:	Acceptable
Airgun Arrays:	Fair
Airgun Controller:	Fair

For clarification, Verif-i operates a four tier grading process. Equipment is defined as 'Good' if the auditor cannot find any faults or any areas of reduced performance; equipment is defined as 'Fair' if it requires only minor adjustments or modifications to be classified as 'Good'. 'Acceptable' means meeting basic industry and contract specifications and 'Unacceptable' is defined as not meeting those same specifications.

The following recommendations are made to improve the performance and reliability of the equipment.

- Continue to substitute Guardian sections for ageing Sentry sections.
- Replace the two failing streamer sections at the first opportunity.
- Replace bad streamer depth controllers and adjust ballasting where necessary at first opportunity.
- Continue to use the Omega analysis of daily and semi-monthly tests for streamer quality control, but ensure MSX results are checked in real time for anomalies.
- Monitor the performance of the nearfield hydrophone signals, ensuring that they are recorded to tape.
- Include a channel assignment for the nearfield hydrophones with the line logs.
- Adjust gun array depth ropes as necessary using depth indicator information.
- Check gun strings 7 and 8 for slight air leaks.

**Instrumentation**

The instrumentation generally worked well throughout the audit period. The system clock has drifted to a value of 3.2 parts per million slow, from a value of 2.5 parts per million slow during the last audit on this vessel. This will not present any problems with the data acquired on this survey.

It was noted that a fault developed after the first recorded sequence such that the nearfield hydrophones of gun string 6 were not being recorded to tape. This was being investigated by the crew.

Internal analysis of the MSX instrument tests produces results for tests including hydrophone channels that can be difficult to interpret, due to specifications being issued which should only be applied to new streamers. As a consequence, this crew uses the WesternGeco Omega system to analyse daily and semi-monthly instrument tests. The instrument tests recorded at deployment were analysed using Verif-i's proprietary test suite and using the Omega analysis and were shown to produce similar results. It is concluded that the Omega analysis is a true reflection of the condition of the streamers.

Real-time analysis of the tests using the MSX Event Visualisation Processor (EVP) was performed using on-screen information during deployment, and this information should continue to be used when recording daily tests.

## **Streamers**

The crew continue to replace ageing Sentry sections with new Guardian sections as they are supplied to the vessel. Currently just less than 30% of the spread consists of Guardian sections, all placed at the front of the streamers. The outer streamers have most Guardian sections (streamer 1 has 20 sections – 160 channels, streamer 8 has 18 sections – 144 channels), while streamers 3, 4, 5 and 6 all have 12 sections – 96 channels.

A total of 43 channels failed the hydrophone impulse test specification although it was noted that of these 23 were marginal failures possibly due to the weather conditions and sea state. Of the 20 significantly bad channels, 10 are included on two sections marked for replacement.

A total of 21 channels fail the channel gain similarity test specification. Of these, 6 are considered marginal and 9 are on the sections marked for replacement.

Crossfeed tests showed a total of 54 channels outside the specification, although from experience it is felt unlikely that the vast majority of these will have a significant effect on the data. A total of nine channels, all included on the two sections marked for replacement were significant failures.

From production data recorded during the early sequences, it was found that a small number of channels were outside the contractual specification of 3dB for channel sensitivity. A total of eight channels failed the specification on sequence 7, of which five appear to be caused by depth anomalies that the crew will address with depth controller changes and ballasting adjustments when the weather allows workboat operations. Two of the others are bad channels noted on other tests, and the other is a noisy channels.

In summary, there are a total of 23 channels currently having a significant impact on the data, of which 10 are on sections to be replaced by the crew at the first opportunity. These results are considered acceptable, although it should be noted that there is a significant improvement in the number of bad channels since this vessel was last audited. This is to be commended. It was noted that all channels on Guardian sections passed the instrument tests, and it is recommended that WesternGeco continue to replace the Sentry sections as more Guardian sections become available.

## **Airgun Arrays**

Array measurements were taken, and all guns were found to be within 10 centimetres of design position. Fittings, chains and shackles were seen to be in acceptable condition.

Nominal depths were measured although as new ropes had been fitted, allowance had been made for stretching. The crew plan to adjust the ropes as the gun strings are cycled through for maintenance. The Depth Indicators were checked using a calibrated manometer and found to be accurate to within 20 centimetres, so it is recommended that the depth ropes be adjusted using the reported depths for reference.

Pressure control was seen to be good throughout testing and the early sequences. Single gun volume checks showed good results and a source comparison using frequency analysis from streamer data also showed good compatibility.

During production it was found that the nearfield hydrophone signals from string 6 were not being recorded to tape after the first sequence. This is currently under investigation but appears to be an intermittent communication fault between the analogue to digital converter at the front of the string and the MSX GSM unit recording the signals. Re-setting the GSM appears to have resolved the problem.

There are six nearfield hydrophones on each string although each analogue to digital converter has eight channels. Although this gives flexibility in case of bad channels within the converter, it also means that the strings can be of non-standard channel assignment. Currently strings 6 and 7 are non-standard. A nearfield hydrophone channel assignment should be included with each data set.

## **Airgun Controller**

The I/O Source Synchronizer System worked well throughout the audit. Gun timing errors were limited, and these errors, along with variations in depth, autofires and other errors were properly flagged. The displays are good, with the gun mechanics regularly monitoring the slave unit in the gunshack.

The SSS has limited memory, and as such if too many windows are opened the system is more likely to crash. The crew therefore limit the number of QC windows, resulting in nearfield hydrophone monitoring not being permanently enabled. This is not ideal and a substitute QC tool should be used.

System timing checks were made, monitoring the command signals from the independent navigation systems, recording system, gun controller and source array timebreaks. Timings were found to be as published, and consistent throughout the testing.

This system uses TriNav as the primary navigation system, with Spectra used as a source selection tool and to control the data flow from the MSX GSM to the PDL unit for writing to tape. To enable the PDL to attach the gun signature data to the correct

file the crew have found that it is necessary to enter a slightly shorter layback parameter into Spectra forcing it to start its cycle slightly earlier than TriNav. This parameter is set as published and correct operation was seen.

This vessel records even shotpoints with the port source, and this was confirmed by observations from the stern.

### **Health, Safety and the Environment**

A practical approach to HSE was apparent during the audit. Back deck operations were seen to be conducted in a controlled fashion.

A full tour of the vessel was given shortly after joining in Portland. An abandon ship drill was conducted on the 9<sup>th</sup> January.

### **Crew Competence**

The crew showed good knowledge of their positions and work practices during the audit, although two observers were new to the vessel. Good quality control was shown during the deployment and testing of the streamers and guns was conducted efficiently. Equipment problems were quickly investigated and resolved. All requests from the auditor were dealt with promptly.

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**10<sup>th</sup> January 2005**