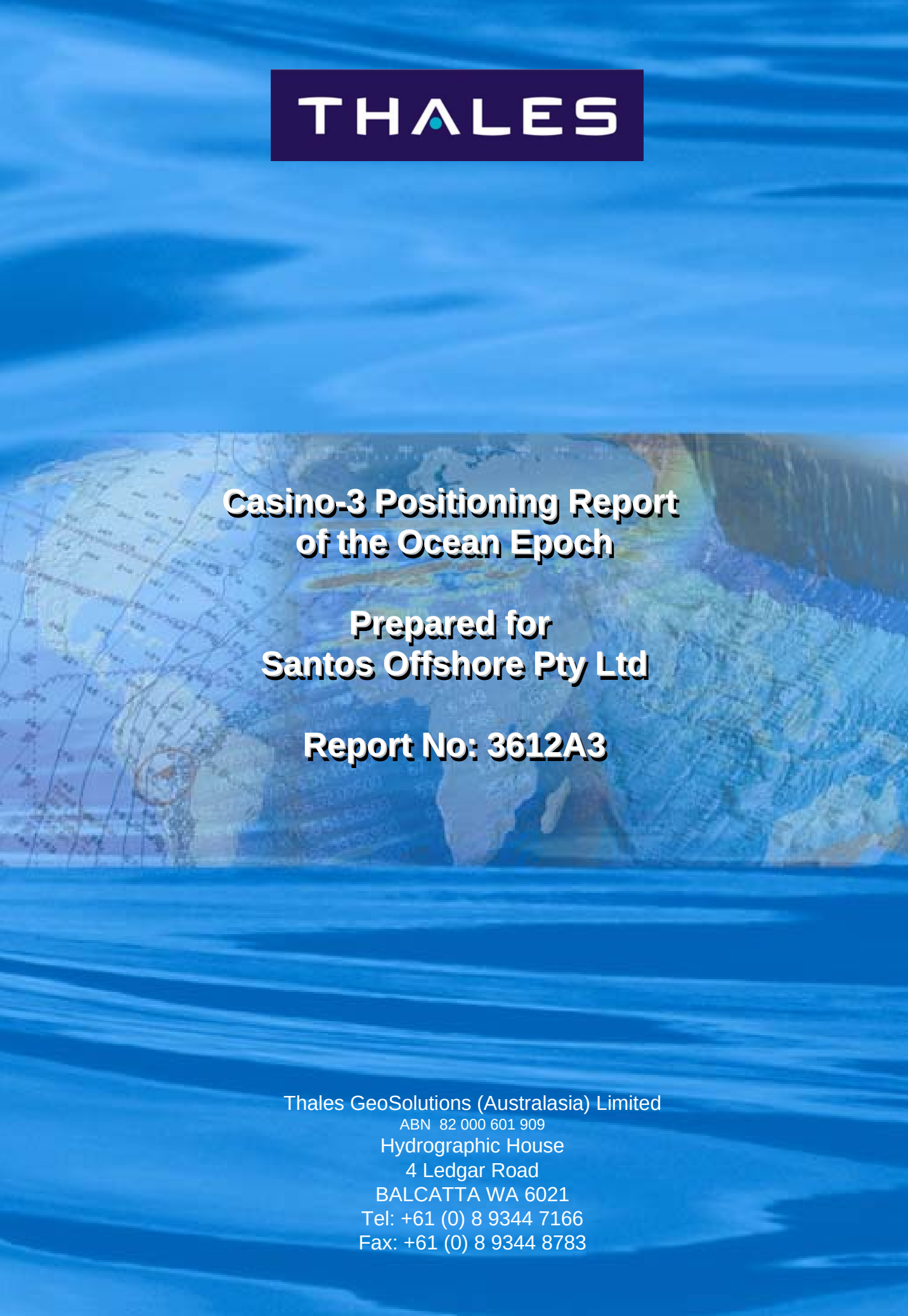

Casino-3 Positioning Report of the Ocean Epoch

Prepared for Santos Offshore Pty Ltd

Report No: 3612A3

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SANTOS OFFSHORE PTY LTD

DOCUMENT TITLE	**:**	**CASINO-3 POSITIONING REPORT OF THE OCEAN EPOCH**
CLIENT	**:**	**SANTOS OFFSHORE PTY LTD**
LOCATION	**:**	**OTWAY BASIN, BASS STRAIT**
PERMIT	**:**	**VIC-P-44**
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ABSTRACT

This report details the positioning services provided by Thales GeoSolutions (Australasia) Limited (Thales), prior to and during the positioning of the semi-submersible drilling rig Ocean Epoch at the Casino-3 location for Santos Offshore Pty Ltd (Santos).

Positioning of the Ocean Epoch during the approach to and at the Casino-3 location was provided by Thales' SkyFix/SkyFix Spot Differential GPS (Differential GPS) interfaced to Thales' MultiFix 3 multiple reference station positioning software and Thales' GNS2 navigation software. The two anchor handling vessels (AHVs), Lady Dawn and Pacific Challenger were positioned using Thales' Tracs/Tug Display Vessel Tracking System (VTS). The Ocean Epoch was positioned at the Casino-3 location at 1133 on 13 October 2003.

Intended Casino-3 Location

The coordinates of the intended Casino-3 location were provided by Santos as follows:

Datum: GDA94

Latitude : 38° 46' 34.390" South
Longitude : 142° 44' 05.590" East

Projection: MGA Zone 54, CM 141° East

Easting : 650 703.91m
Northing : 5 706 626.93m

Rig Positioning Tolerance : ± 25m

Intended Rig Heading : 240.0° (T)

Final Differential GPS Drillstem Position at the Casino-3 Location

The final Differential GPS Position of the Ocean Epoch drillstem at the Casino-3 location was computed from data observed between 2015 and 2115 on 14 October 2003. The final position is as follows:

Datum: GDA94

Latitude : 38° 46' 34.558" South
Longitude : 142° 44' 05.437" East

Projection: MGA Zone 54, CM 141° East

Easting : 650 700.11m
Northing : 5 706 621.82m

The final Differential GPS drillstem position is 6.37m on a bearing of 215.5° (T) from the intended Casino-3 location.

Final Rig Heading : 238.9° (T)

All times quoted in this report are Eastern Standard Time (UTC + 10.0 hours).

1. RESULTS

1.1 FINAL DIFFERENTIAL GPS POSITION OF THE OCEAN EPOCH DRILLSTEM AT THE CASINO-3 LOCATION

The Ocean Epoch was positioned at the Casino-3 location at 1133 on 13 October 2003.

The final Differential GPS position of the Ocean Epoch drillstem at the Casino-3 location, was determined using Thales' MultiFix 3 positioning software interfaced to a BD112 GPS receiver, with differential corrections being provided by Thales' SkyFix Spot Differential GPS services.

The final fix routine, within Thales' GNS2 navigation software version 2.48, was used to compute the final Differential GPS position of the drillstem at the Casino-3 location. A total of 720 position fixes were recorded at 5 second intervals between 2015 and 2115 on 14 October 2003.

Refer to Appendix A for the GNS2 final Differential GPS position printouts at the Casino-3 location. Associated graphs are located in Appendix B.

Differential corrections from the SkyFix Spot reference stations in Adelaide, Melbourne and Sydney were used in the MultiFix 3 software computations to derive the final Differential GPS position.

The final surface coordinates of the Ocean Epoch drillstem at the Casino-3 location, determined from Differential GPS observations are as follows:

Total number of samples used = 720.

The computed antenna position is as follows:

GPS Antenna Position

Datum: WGS84

Latitude	:	38° 46' 35.138" South	(S.D. 0.22m)
Longitude	:	142° 44' 03.772" East	(S.D. 0.28m)
Ellipsoidal Height	:	15.21m	(S.D. 0.38m)

Transforming the above WGS84 coordinates to GDA94 coordinates using the parameters in section 6, gives the following antenna coordinates:

GPS Antenna Position

Datum: GDA94

Latitude	:	38° 46' 35.138" South
Longitude	:	142° 44' 03.772" East
Ellipsoidal Height	:	15.21m

By applying a distance of 43.97m on a bearing of 66.0° (T) from the antenna position, the following drillstem coordinates are calculated:

Final Differential GPS Position of the Drillstem at the Casino-3 Location

Datum: GDA94

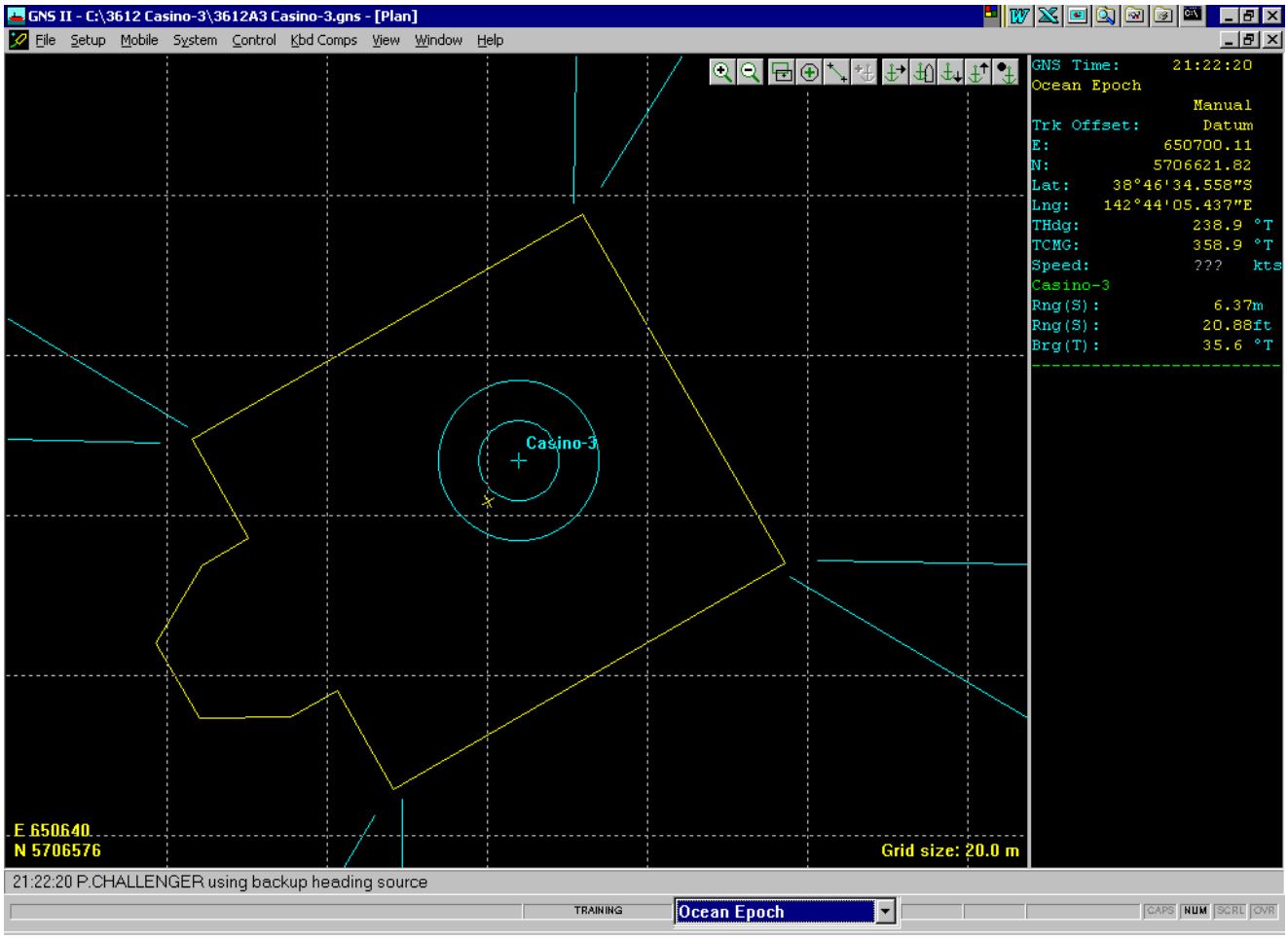
Latitude : 38° 46' 34.558" South
Longitude : 142° 44' 05.437" East

Projection: MGA Zone 54, CM 141° East

Easting : 650 700.11m
Northing : 5 706 621.82m

This final Differential GPS position of the drillstem is 6.37m on a bearing of 215.5° (T) from the intended Casino-3 location.

Final Rig Heading : 238.9° (T)



SkyFix Spot Differential GPS Position and Intended Position at the Casino-3 Location

1.2 OCEAN EPOCH ANCHOR POSITIONS

Deployed anchor positions were derived from the computed anchor function within the GNS2 software. The function takes into account the length of anchor chain out, water depth, anchor tension and the wet weight of anchor chain to compute the deployed anchor positions. The final anchor positions are tabulated below:

Datum: GDA94 Projection: MGA Zone 54, CM 141° East

Anchor	Intended Anchor Position		Final Anchor Position	
	Easting (m)	Northing (m)	Easting (m)	Northing (m)
Anchor 1	650 670.73	5 705 500.08	650 683.40	5 705 448.00
Anchor 2	650 128.41	5 705 656.46	650 091.40	5 705 609.77
Anchor 3	649 576.87	5 706 655.03	649 616.47	5 706 651.57
Anchor 4	649 733.27	5 707 197.35	649 683.19	5 707 223.92
Anchor 5	650 737.09	5 707 751.79	650 725.51	5 707 776.31
Anchor 6	651 279.41	5 707 595.40	651 287.29	5 707 601.07
Anchor 7	651 830.95	5 706 596.82	651 889.23	5 706 595.85
Anchor 8	651 674.55	5 706 054.50	651 682.69	5 706 048.90

Difference of final anchor positions from the intended anchor positions.

Anchor	Dropped by	Easting (m)	Northing (m)
Anchor 1	Lady Dawn	-12.67	+52.08
Anchor 2	Lady Dawn	+37.01	+46.69
Anchor 3	Lady Dawn	-39.60	+3.46
Anchor 4	Lady Dawn	+50.08	-26.57
Anchor 5	Lady Dawn	+11.58	-24.52
Anchor 6	Lady Dawn	-7.88	-5.67
Anchor 7	Ocean Epoch	-58.28	+0.97
Anchor 8	Lady Dawn	-8.14	+5.60

Horizontal distance and bearing from the Ocean Epoch fairleads to the final anchor positions.

Anchor	Bearing (T)	Horizontal Distance (ft)
Anchor 1	179.2°	3729.33
Anchor 2	210.3°	3740.91
Anchor 3	270.1°	3421.63
Anchor 4	300.1°	3756.04
Anchor 5	359.7°	3666.19
Anchor 6	30.3°	3612.23
Anchor 7	89.8°	3767.45
Anchor 8	119.7°	3610.16

Ocean Epoch anchor details are located in Appendices C, D and E of this report.

2. SAFETY

A pre-rig move meeting was held at Thales' Perth offices on 8 October 2003. Thales personnel M. Elmslie and B. Lobban were present. During the meeting safety procedures were discussed including correct operation and handling of equipment. It was also confirmed that personnel had been issued with the appropriate safety equipment.

On arrival at the Ocean Epoch M. Elmslie and B. Lobban attended a rig induction

Should an incident occur, Thales' procedures require the incident to be recorded on the appropriate forms and Thales' QA & Safety Manager to be notified immediately. The QA & Safety Manager will initiate a full and thorough investigation with corrective action being introduced to prevent further incidents.

There were no incidents involving Thales personnel during this project. Thales personnel carried out their duties at all times in accordance with Company and Statutory Regulations and Guidelines.

When demobilising the Ocean Epoch, all equipment was packed securely in the designated area where it would not cause obstructions. All heavy or fragile boxes were clearly labelled to avoid accidents during handling.

A project debrief was also held at Thales' Perth offices on 17 October 2003. During the meeting the safety procedures that had been undertaken were discussed and reviewed. It was noted that all personnel had taken due care and as a result there had been no incidents.

3. SUMMARY

3.1 REQUIREMENTS

Thales GeoSolutions (Australasia) Limited were contracted by Santos Offshore Pty Ltd to provide personnel and positioning equipment consisting of Thales' SkyFix/SkyFix Spot Differential GPS for the rig move of the Ocean Epoch to the Casino-3 location.

The project requirements were as follows:

(a) Provide real-time positioning of the semi-submersible drilling rig Ocean Epoch and the anchor handling vessels Lady Dawn and Pacific Challenger, during transit to the Casino-3 location.

(b) Differential GPS Positioning of the Ocean Epoch at the Casino-3 location.

(c) Real-time positioning (including GNS2 fixing/logging/streaming) of the Ocean Epoch, Lady Dawn and Pacific Challenger during anchor deployment operations at the Casino-3 location.

(d) Determine the final Differential GPS position of the Ocean Epoch drillstem at the Casino-3 location using a Multiple Reference Station Differential GPS solution.

(e) The provision of a comprehensive positioning report containing the final Differential GPS position of the Ocean Epoch drillstem and anchors at the Casino-3 location.

The positioning requirements were as follows:

(a) Intended Casino-3 location:

Datum: GDA94

Latitude	:	38° 46' 34.390" South
Longitude	:	142° 44' 05.590" East

Projection: MGA Zone 54, CM 141° East

Easting	:	650 703.91m
Northing	:	5 706 626.93m

(b) Positioning tolerance : ± 25m

(c) Intended rig heading : 240.0° (T)

3.2 SUMMARY OF EVENTS

All times quoted are in Western Standard Time (UTC + 8.0 hours).

10 October 2003

0905 Thales personnel depart Perth (UTC+8.00).
1450 Arrive Melbourne.
1520 Depart Melbourne for Mt Gambier.
1600 Arrive Mt Gambier (UTC+9.50).
1645 Check into Commodore Motel (UTC+9.50).

11 October 2003

1315 Check out of Commodore Motel (UTC+9.50).
1430 Depart Mt Gambier for Ocean Epoch (UTC+9.50).
1600 Arrive Ocean Epoch.
1630 Thales personnel attend rig induction.
1800 Complete rig induction. Rig under tow.

12 October 2003

0001 Rig still under tow.
0700 Commence mobilisation.
1100 Mobilisation complete.
1200 GNS2 and Mulitifix3 operational.
1400 Lady Dawn TRACS online. Power supply problem to the Geopod onboard P. Challenger unable to bring on line, unable to correct problem because P. Challenger on tow bridle, BL to be transferred at a later date to correct.
1615 Antenna offsets measured X=+5.45m Y=43.63m, entered into GNS2.
1815 Gyrocompass calibration sun obs commenced.
1825 Sun obs complete, C-O of -88.2° entered into GNS2.
1900 Winch offsets measured.
2359 Rig still under tow.

13 October 2003

0001 Rig still under tow.
0754 Rig at WP1, L. Dawn experiencing trouble with heading from fluxgate.
0830 L. Dawn experiencing mechanical problems cannot shorten up, waiting for repairs.
0900 Tow vessels shortening up.
1030 Rig at WP2.
1042 100ft paid out on #7.
1110 #7 on bottom, 651855.9 E 5706596.4 N.
1133 Rig on location.
1140 L. Dawn shortening tow wire.

13 October 2003 (continued)

1200 L. Dawn stopped shortening for helicopter.
1230 L. Dawn shortening tow wire.
1245 Tow bridal passed from L. Dawn to rig.
1255 BL transferred to L. Dawn to correct problem with Fluxgate.
1302 #3 assigned to L. Dawn.
1329 #3 PCC passed to L. Dawn.
1345 L. Dawn experiencing winch problems.
1705 Repairs complete to L. Dawn winch.
1718 L. Dawn running out #3.
1722 All stop on runout rig has winch motor problem.
1738 #3 on bottom, 650310.3 E 5706654.1 N.
1840 L. Dawn recovering #3.
1911 L. Dawn running out #3.
1931 #3 on bottom, 649498.2 E 5706654.1 N.
2007 #3 PCC passed back to rig.
2016 #6 assigned to L. Dawn.
2042 #6 PCC passed to L. Dawn.
2052 L. Dawn running out #6.
2159 #6 on bottom, 651365.2 E 57707728.8 N.
2229 #6 PCC passed to rig.
2238 #2 assigned to L. Dawn.
2259 #2 PCC passed to L. Dawn.
2319 L. Dawn running out #2.
2336 #2 on bottom, 650058.9 E 5705556.6N.
2359 Challenger shortening tow wire.

14 October 2003

0006 #2 PCC passed to rig.
0012 #5 anchor assigned to L. Dawn.
0035 PCC passed to L. Dawn.
0043 L. Dawn running #5.
0045 P. Challenger released from tow bridle.
0103 #5 on bottom, 650729.0 E 5705838.8 N.
0120 #5 not holding tension, preparing to reset.
0135 #5 lifted from seabed.
0201 #5 on bottom, 650730.9 E 5707635.0 N.
0203 #5 not holding tension, anchor upside down preparing to reset.
0204 #5 L. Dawn recovering #5.
0216 #5 turned right way round, preparing to deploy.
0229 #5 on bottom, 650726.5 E 5707849.9 N.
0307 #5 PCC passed back to rig.

14 October 2003 (continued)

0322 #1 assigned to L. Dawn.
0332 #1 PPC passed to L. Dawn.
0345 P. Challenger offloading pot and drill water.
0346 L. Dawn running out #1.
0408 #1 on bottom, 650683.1 E 5705390.9 N.
0430 L. Dawn position jumping, number of SVs jumping between 4 & 7 effecting position, Rig SVs staying steady.
0442 #1 PCC passed back to rig.
0630 TRACS operating correctly.
0631 #4 assigned to L. Dawn.
0633 #1 PCC passed to L. Dawn.
0644 L. Dawn running #4.
0700 P. Challenger departs for Portland.
0705 #4 on bottom, 649603.3 E 5707272.3 N.
0735 #4 PCC passed back to rig.
0739 #8 assigned to L. Dawn.
0749 #8 PCC passed to L. Dawn.
0757 L. Dawn running #8.
0820 #8 on bottom, 651782.7 E 5705989.3 N.
0827 Rig starts ballasting down to drilling draft.
0849 #8 PCC passed back to rig.
1230 Ballasting complete, at 55’ draft.
1330 BL transferred to L. Dawn to check TRACS system.
1430 BL returned to rig.
1500 Spud in.
1627 Commence final fix.
1727 Complete final fix, drill stem is 1.46m on a bearing of 100.1°(T) from the intended location.
1805 Notified by Santos company man that rig is moving due to the well being out of vertical tolerances.
1910 Rig repositioning approx 5m towards the bow.
1924 Repositioning complete.
2010 Spudded in.
2015 Commence final fix.
2115 Complete final fix, drill stem 6.37m on a bearing of 215.5°(T) from intended location.
Thales personnel on standby, waiting for 30’ casing to be put run.

15 October 2003

0001 Thales personnel on standby for 30' casing run in.
1200 Thales personnel on standby for 30' casing run in.
1515 BL transferred to P. Challenger to correct problem with TRACS system.
1540 TRACS system onboard P. Challenger operational, power supply unit replaced.
1745 BL transferred to Ocean Epoch.
1830 30' casing landed.
1905 Notified by Santos company man Thales equipment now able to be demobed.
1930 Commence demob.
2030 Demob suspended due to high winds and poor light outside, cannot safely access container.

16 October 2003

0630 Recommence demob.
0710 Demob complete.
1400 Thales personnel depart rig for Essendon via helicopter.
1500 Arrive Essendon airport.
1530 Thales personnel transfer to Melbourne airport.
2000 Depart Melbourne for Perth.
2200 Arrive Perth (UTC+8.0).

4. EQUIPMENT ANALYSIS

4.1 EQUIPMENT PERFORMANCE

During the positioning of the semi-submersible drilling rig Ocean Epoch to the Casino-3 location, no significant problems were encountered with Thales' equipment or software.

A problem arose on the Anchor Handling Vessel (AHV) Pacific Challenger. The power supply to the Tracs Geopod was found to be faulty when the system was powered up after the transit from Fremantle, it should be noted that the power supply was operational when the system was installed.

The faulty power supply onboard the vessel has been replaced and all systems were functioning correctly upon completion of the project.

During anchor handling operations a problem arose on the AHV Lady Dawn. The GPS receiver was not receiving enough satellites to calculate a correct position for the vessel. This had the effect of making the position of the vessel jump by approximately 1km. After waiting a period of time the number of satellites increased and the system started to operate correctly. Thales personnel were transferred to the vessel and adjusted settings to the GPS receiver to correct the problem. All systems were functioning correctly upon completion of the project.

5. EQUIPMENT CHECKS AND CALIBRATIONS

5.1 GYROCOMPASS CALIBRATION

The S.G. Brown 1000S TSS Gyrocompass installed onboard the Ocean Epoch was calibrated on 12 October 2003 using a marine sextant. A series of measurements of the horizontal angle between the centreline of the rig and the sun was observed while accurately recording local time at the instant of each observation. The gyrocompass heading was simultaneously recorded within GNS2 data files.

Thales' Solar Observation software was used to determine the azimuth of the sun for each observation. The observed horizontal angle was applied to the sun's azimuth to determine the true heading of the rig. Each Computed (C) true heading was then compared with the Observed (O) gyrocompass heading to determine the Computed minus Observed (C-O) value for the gyrocompass. The C-O value in GNS2 was set to zero prior to conducting the gyrocompass calibration.

Observation Date : 12 October 2003

Average Local Time (HMS)	Average Horizontal Angle (DMS)	Azimuth Sun (DMS)	Azimuth RO (DMS)	Calculated (C) True Heading (D.D)	Observed (O) True Heading (D.D)	C-O (D.D)
18:15:30	261° 39' 12"	265° 20' 07"	093° 40' 55"	93.68°	181.70°	-88.02°
18:17:40	259° 06' 36"	265° 00' 01"	095° 53' 25"	95.89°	184.20°	-88.31°
18:19:50	260° 06' 12"	264° 39' 55"	094° 33' 43"	94.56°	182.50°	-87.94°
18:21:35	259° 59' 24"	264° 23' 41"	094° 24' 17"	94.40°	183.30°	-88.90°
18:23:20	256° 16' 00"	264° 07' 27"	097° 51' 27"	97.86°	185.80°	-87.94°
18:25:00	252° 22' 54"	263° 51' 59"	101° 29' 05"	101.48°	189.70°	-88.22°

Mean C-O = -88.22°

The mean C-O of -88.22° was input into the GNS2 navigation software and used during the final fix routine at the Casino-3 location. See Appendix F for the gyrocompass calibration results.

6. GEODETIC PARAMETERS

The datum for coordinates determined by Thales' SkyFix and SkyFix Spot Differential GPS are referenced to International Terrestrial Reference Frame 2000 (ITRF2000). The datum for coordinates listed in this report are referenced to the Geocentric Datum of Australia 1994 (GDA94).

6.1 ITRF2000 DATUM AND PROJECTION

Datum	:	**ITRF2000 (Epoch 1997.0)**
Ellipsoid/Spheroid	:	Geodetic Reference System 1980 (GRS80)
Semi-major Axis (a)	:	6 378 137.000m
Semi-minor Axis (b)	:	6 356 752.314m
Eccentricity Squared (e^2)	:	0.006 694 380
Flattening ($^1/_f$)	:	298.257 222 101
Projection Name	:	**Universal Transverse Mercator (UTM)**
Projection Type	:	Universal Transverse Mercator (UTM)
UTM Zone	:	54 South
Central Meridian (CM)	:	141° East
Scale factor on the CM	:	0.9996
False Easting	:	500 000m
False Northing	:	10 000 000m
Latitude of Origin	:	0° (Equator)
Unit of Measure	:	International Metre

Note: The WGS84 datum and the ITRF2000 datum are consistent in the order of a few centimetres and are considered to be the same.

6.2 GDA94 DATUM AND PROJECTION

Datum	:	**Geocentric Datum of Australia 1994 (GDA94)**
Ellipsoid/Spheroid	:	Geodetic Reference System 1980 (GRS80)
Semi-major Axis (a)	:	6 378 137.000m
Semi-minor Axis (b)	:	6 356 752.314m
Eccentricity Squared (e^2)	:	0.006 694 380
Flattening ($^1/_f$)	:	298.257 222 101
Projection Name	:	**Map Grid of Australia (MGA)**
Projection Type	:	Universal Transverse Mercator (UTM)
MGA Zone	:	54
Central Meridian (CM)	:	141° East
Scale factor on the CM	:	0.9996
False Easting	:	500 000m
False Northing	:	10 000 000m
Latitude of Origin	:	0° (Equator)
Unit of Measure	:	International Metre

Note: Where an accuracy of a metre or greater is required, the WGS84 datum and the GDA94 datum are considered to be the same.

6.3 DATUM TRANSFORMATION - ITRF2000 TO GDA94

From the Geocentric Datum of Australia Technical Manual (Version 2.2) produced by the Inter-governmental Committee on Surveying & Mapping (ICSM), the ITRF2000 datum and the WGS84 datum are consistent at a level in the order of a few centimetres and are considered to be the same. Similarly, where an accuracy of a metre or greater is required, the GDA94 datum and the WGS84 datum are considered to be the same. In January 1994 the GDA94 datum and the ITRF datum were coincident, however the GDA94 datum is moving with the Australian tectonic plate in a North northeastly direction at a rate of approximately 7 centimetres per year.

The following 7-parameter datum transformation was used by Thales' GNS2 software to convert ITRF2000 coordinates to GDA94 coordinates:

Dx	=	0.000m
Dy	=	0.000m
Dz	=	0.000m
Rx	=	0.000"
Ry	=	0.000"
Rz	=	0.000"
Scale	=	0.000 p.p.m.

The sign convention used in Thales' GNS2 software is that used by the US Department of Defence, where a positive rotation about the Z axis is an anti-clockwise movement of the X and Y axes (when viewed from the North Pole looking towards the centre of the Earth).

7. EQUIPMENT DESCRIPTIONS

7.1 GNS2

GNS2 (General Navigation System) is Thales' third generation of On-line Navigation Survey Control software. It has been written by Thales' Software Support Group in C++ for operation under Windows® 95 or Windows® 98 or Windows® NT. GNS2 adheres to the operation and dialogue conventions of the Microsoft Windows® environment. Attention has been paid to preserving a consistent operator interface, while at the same time modifying individual dialogue boxes to reflect specific logical circumstances. It has been designed for operation with a pointing device such as a mouse or a tracker ball but control can still be effected in case of the absence or failure of such a device.

The program has the ability to accommodate a large number and variety of mobiles, including surface vessels/ships, anchor handling vessels, tugs, barges, ROVs, towfish, aircraft, vehicles and submersibles etc. The only limiting factors on the number of mobiles that can be tracked in GNS2 are the number of input/output serial communication ports available on the computer and the computer's memory.

For the input/output (I/O) of navigation and sensor data, GNS2 employs intelligent multi-channel serial communications boards to expand a computer's serial input/output facility. Currently GNS2 can support up to 26 communication (Comm) ports, which would consist of the computer's two internal Comm ports and three 8 channel serial communications boards fitted in the computer's internal expansion slots.

If Least Squares Computations (LSCs) are employed for positional calculations, whether two-dimensional (2D), three-dimensional (3D) or altitude aided, GNS2 uses standard iteration routines for the minimisation of residuals using 'variation of coordinate' algorithms. The number of positioning systems/computations that GNS2 can handle, is only limited by the number of I/O serial communication ports available on the computer and the computer's memory.

All input observables are accepted on interrupt. Screen updates and other internal triggers are paced to once per second but time critical activities occur at discrete moments as required.

The GNS2 application workspace can extend beyond the display area, which is normally restricted to a single monitor connected to the computer. By using one or more multiple VGA cards, an enlarged display area can spread across multiple monitors.

Currently GNS2 can display 14 different types of view windows. Several copies of the same type of view window can be invoked at any one time. This may be required when several mobiles are being tracked and a Plan, Helmsman's or Bullseye display are required for each one or when the data on several Comm ports are to be viewed simultaneously. Each window can be individually sized to optimise use of the available display area.

GNS2 can be operated in 2 modes; GNS2 Master or GNS2 Remote. GNS2 Master has the full functionality of GNS2. GNS2 Remote is run on a separate computer and allows independent configuration of the graphics display and its associated numeric information. GNS2 Remote is operated on Anchor Handling Vessels or anywhere where positional information is required. (eg. Vessel Masters, ROV Pilots, Winch Control Stations). The link between GNS2 Master and GNS2 Remote can be via a telemetry link or hard wired cable.

7.2 GLOBAL POSITIONING SYSTEM (GPS)

System Description

The NAVSTAR GPS (Navigational Satellite Timing and Ranging Global Positioning System) is a USA Military all-weather, space-based positioning system that transmits signals from a constellation of satellites orbiting the Earth. It is capable of providing suitably equipped users worldwide with accurate three-dimensional positions on, or near, the Earth's surface. The accuracy of these determined positions can vary from a few millimetres to several 10's of metres depending on the GPS receiver and on the method of data acquisition and processing. System design consists of three integrated parts: the Ground Control Segment, the Space Segment and the User Segment.

The operational space segment consists of 24 production satellites and 3 active spares; the term Space Vehicle (SV) is used as a synonym for satellite. The satellites are in high orbits, at approximately 20,200km, having an orbit period of 12 hours. They are arranged in 6 orbital planes, inclined at 55 degrees with near circular orbits. The configuration provides complete 4-satellite (3D) coverage worldwide.

GPS Observations

There are two important types of GPS observations (observables): Pseudo-range and Carrier Phase. Carrier phase is sometimes also referred to as carrier beat phase. Pseudo-range techniques are generally used for navigation. In high-precision baseline surveying the carrier phase is used. Although the (undifferenced) phase can be used directly, it has become common practice, at least in surveying applications, to process certain linear combinations of the original carrier phase observations (double differences and triple differences).

Pseudo-ranges

The pseudo-range is a measure of the distance between the satellite and the receiver at the epochs of transmission and reception of the signals. The transit time of the signals is measured by comparing (correlating) identical pseudo-random noise (PRN) codes generated by the satellite and by the receiver. A code-tracking loop within the receiver shifts the internal replica of the PRN code in time until maximum correlation occurs. The codes generated at the receiver are derived from the receiver's own clock, and the codes of the satellite transmissions are generated by the satellite system of clocks. It follows that unavoidable timing errors in both the satellite and the receiver clock will cause the measured quantity (pseudo-range) to differ from the geometric distance.

Where instantaneous positions are required, pseudo-range is the preferred observable. Given the satellite ephemeris (i.e. the position of the satellite at the epoch of transmission), there are seven unknowns: two clock errors, three receiver coordinates and the ionospheric and tropospheric delays. The effect of the satellite clock error is negligible for the typical navigation solution, particularly considering that the time errors are indistinguishable from the ionospheric and tropospheric delays. The satellite clocks are constantly monitored and synchronised with GPS time as maintained by the control centre. Actual offsets of the satellite clocks are approximated by polynomials in time and transmitted as part of the navigation message to the user for the correction of the measured pseudo-ranges. The ionospheric and tropospheric delays can be computed on the basis of ionospheric and tropospheric models, thus there are four unknowns left X, Y, Z and receiver clock error. These can be determined from four pseudo-ranges measured simultaneously to four GPS satellites.

Carrier Phase

The phase observable is the difference between the phase of the carrier signal of the satellite, measured at the receiver, and the phase of the local oscillator within the receiver at the epoch of measurement. This can be regarded as a biased range measurement of the satellite-receiver distance with the integer number of carrier waves being unknown. The wavelength of the L1 carrier is about 19cm. Because of the fraction of the carrier phase is measured, the term "interferometry" is often used to describe carrier phase techniques.

7.3 SkyFix/SkyFix Spot Differential GPS (DGPS)

Differential GPS (DGPS)

GPS is primarily a USA Defence space-based positioning system capable of operating worldwide and in all weather conditions. The USA Military can degrade the accuracy of GPS with the use of Selective Availability (SA) to control the accuracy of Pseudo-range measurements. Essentially, the user is given a false Pseudo-range for each satellite so that the resulting measurement is in error by a controlled amount. On the 1 May 2000 SA was discontinued conditionally and coincided with the successful demonstration of the ability to selectively deny GPS signals on a regional basis. SA has been set to zero and can be reinstated during periods of heightened global tension.

GPS signals are affected by several sources of positional bias, the largest of which was SA. The remaining biases of the ionosphere, the troposphere, time, satellite ephemeris and inherent reciever noise also give rise to substantial bias of position.

Differential GPS is a means by which the civil user can improve the accuracy and quality of GPS to the 1-3 metre level. It requires a receiver be located at a precisely known point from which pseudo-range corrections for each satellite can be determined and monitored. These pseudo-range corrections are then communicated by means of a telecommunications link to users at unknown locations. In the relative mode, most of the important systematic errors common to the known station and at the unknown location cancel out to improve the accuracy of the computed position.

SkyFix/SkyFix Spot Differential

SkyFix

Thales GeoSolutions (Australasia) Limited introduced its SkyFix Differential GPS System in Australia in February 1991, using the Inmarsat Pacific and Indian Ocean marine communications satellites as the differential data broadcast link. Extensive performance trials and projects undertaken to date have shown SkyFix to meet the best industry expectations in terms of quality of service and accuracy.

Satellite communications systems, particularly at the Inmarsat L-band frequencies of 1.5 GHz are reliable and free of the interference associated with the crowded MF/HF bands. This high data integrity gives users confidence that the corrections will be continuously received without interference.

The SkyFix Australian network comprises of reference stations at Dampier, Broome, Perth, Adelaide, Melbourne, Sydney, Cairns and Darwin.

SkyFix Spot

The SkyFix Spot Differential GPS System was launched in Australia in December 1994, using the OPTUS high powered focused communications satellite as the differential data broadcast link. Projects undertaken to date have shown SkyFix Spot to meet the industry expectations in terms of quality of service and accuracy.

The SkyFix Spot system has a link capacity of 1200 bits per second, similar to the SkyFix system but because it is only transmitting corrections from the Australian network an update rate of better than five seconds is achieved.

The OPTUS satellite uses the L-band frequencies of 1.5586 GHz and are very reliable and free of interference avoiding data loss associated with the crowded MF/HF bands.

The SkyFix Spot network comprises of reference stations at Dampier, Broome, Perth, Adelaide, Melbourne, Sydney, Cairns, Darwin, Alice Springs and also Ujung Pandang and Jakarta in Indonesia and Wellington, New Zealand.

The differential corrections generated at each reference station are brought via landline links to the data hub and control centre in Singapore, where the system is monitored for performance and quality. From there, a composite message containing full RTCM 104 version 2 formatted data from all reference stations are sent via dual redundant links to Satellite Earth Stations at Sentosa Island, Singapore, O.T.C. Perth, Western Australia and OPTUS, Perth, Western Australia, for uplink and broadcast over the Inmarsat Pacific and Indian Ocean Region satellites and the OPTUS Satellite.

The SkyFix/SkyFix Spot system includes a 24 hour monitoring facility to ensure the validity of data received at the control centre from the Differential GPS reference stations, and that the same data are received over the SkyFix/SkyFix Spot satellite data link.

7.4 TRIMBLE BD112 GPS CARD

Standard Features
Sub-meter accuracy
Real-time positioning
12 Channel GPS receiver 1, 5 or 10 Hz update rate
Two RS-232 serial ports
RTCM SC-104 input
NMEA-0183 output
TSIP interface protocol
Carrier phase
1 PPS output

Physical Characteristics

Size	115mm L x 80mm W x 22 mm D
Weight	68.1 g (.15 lbs)
Operating temperature	-40°C to +70°C (-40°F to +158°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)

Compact Dome Antenna

Diameter	5.68″ D (14.6cm)
Height	3.38″ (8.6cm)
Weight	294g
Power	35–40 mA @ +5 VDC @ 25°C

Technical Specifications

General	12 parallel channels track up to 12 satellites, L1 C/A code with carrier filtering
Update rate	1, 5 or 10Hz. Default is 5 Hz
Accuracy	Typically less than one meter RMS; Assumes at least 5 satellites, PDOP less than 4, and RTCM SC-104 standard format broadcast from a Trimble 4000RS™, BD112 reference station or equivalent reference station
Time to first fix	< 30 seconds, typical
NMEA messages	ALM, GCA, GLL, GSA, GSV, VTG, ZDA
Power consumption	500 mA @ +5 V (Includes compact dome antenna power, typical at 25°C)

7.5 MultiFix 3

7.5.1 System Overview

MultiFix 3 is Thales GeoSolutions third generation *multiple reference station* differential GPS (DGPS) real time position computation and quality control program. It is an integral part of the Thales SkyFix Premier service but can also be used with the standard SkyFix service. MultiFix 3 has more advanced features than its predecessor, MultiFix 2, including being able to use dual frequency receivers and form real time 'Iono-Free DGPS position solutions'.

MultiFix 3 is one of a series of programs available under the group name Zero, which includes other tools and utilities with a similar user interface and layout structure, like static and dynamic position comparison programs, a correction monitor program, a terminal program and a replay utility.

MultiFix 3 takes in Almanac, Ephemeris and Raw Code and Carrier measurements from a single or dual frequency GPS receiver (or, for replay, from logged files). It takes in RTCM SC104 Version 2 differential correction messages from one or more RTCM correction delivery systems. It also takes in RTCM Type 15 or Thales Proprietary RTCM Type 55 Ionospheric range corrections generated at selected SkyFix Premier reference stations and broadcast via the Thales global network of high (SkyFix Spot-Optus) and low (SkyFix-Inmarsat) power satellite based L-Band beams.

Key features of the program are:

- No limit on the number of RTCM correction delivery systems (data links)
- No limit on the number of RTCM differential reference stations
- No limit on the number of computations (solutions)
- Each computation can employ corrections from any combination of reference stations available
- Computations are weighted least squares with statistical evaluation based upon the UKOOA recommendations
- No limit on the number of outputs
- No limit on the number of view windows
- View windows can be customised
- Extra NMEA outputs can be defined
- TCP/IP communication via sockets for GPS, RTCM and position data transfer between networked computers

MultiFix 3 has been designed in a modular fashion such that data is passed between modules as if over a computer network. The core module MultiFix 3 performs the computation of position. Additional modules are available and more will be made available in the future. While a single computer can be used, the various modules will equally be able to be run on different computers, provided there is a network interconnection.

MultiFix 3 uses the EGM96 geoid/spheroid separation model.

The RTCM corrections that are generated at reference stations are contaminated by a variety of error components, one of which is Ionospheric delay. The Ionospheric delay is currently more variable because of greater sun spot activity. MultiFix 2 and MultiFix 3's standard computation uses the Klobuchar Ionospheric delay model. This model is updated periodically but is not responsive to the current short-term variability. MultiFix 3 has an additional calculation option when working with dual frequency receivers and in receipt of Type 15 or 55 RTCM messages. With dual frequency receivers, estimates can be made of the Ionospheric delay by examining the differences between the measurements from the two frequencies. If the same procedure for estimation of Ionospheric delay is performed at the reference stations and on the mobile, both the RTCM corrections and the pseudo-ranges can have the Ionospheric delay removed, effectively providing an Iono-Free DGPS position solution.

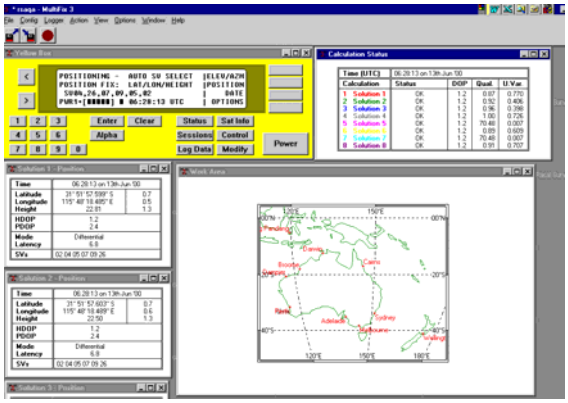
7.5.2 Hardware Requirements

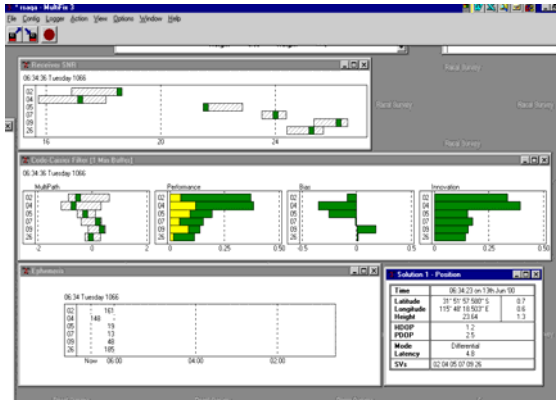
Optimum requirements for MultiFix 3 are:

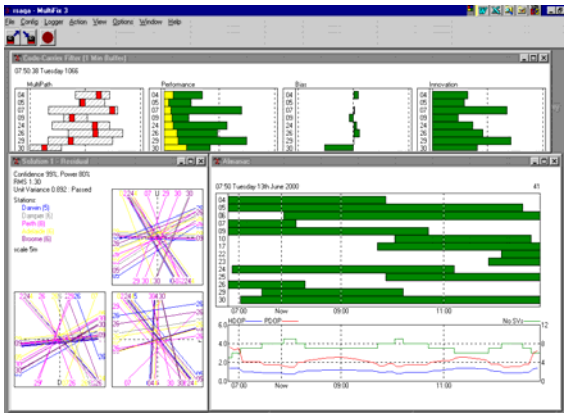
- 350 MHz Pentium II computer
- 32 Mb RAM
- Windows 95, 98 or NT operating system
- Graphics resolution of at least 800 x 600 pixels
- Intelligent multi-port serial I/O board

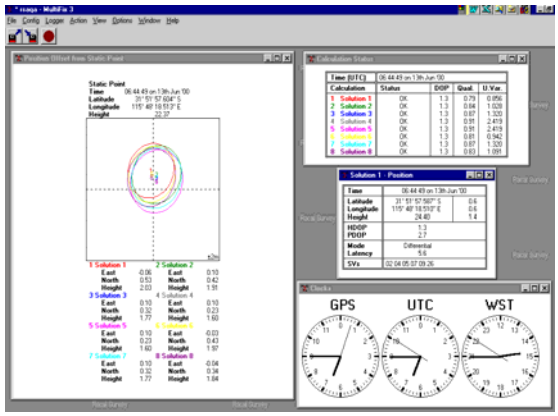
7.5.3 Positioning and Quality Control Displays

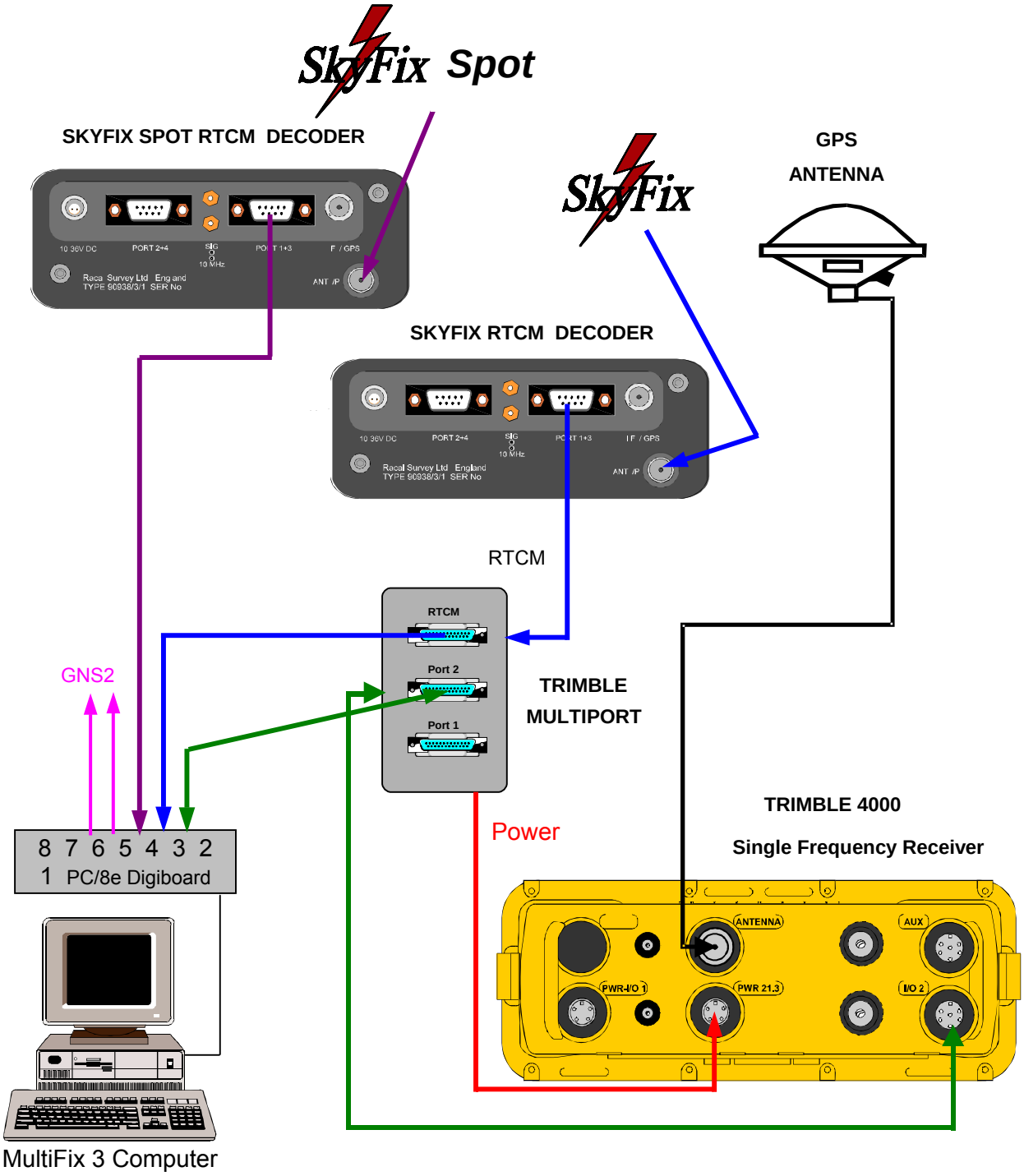
MultiFix 3 has a large number of features to accomodate the user requirements of highly accurate positions with quality control (QC) information and outputs in different formats. MultiFix 3 runs in a Windows environment, which allows the user to design a preferred screen layout by opening, sizing and placing the numerous displays that are available. Examples of the various displays can be found below.











Typical MultiFix 3 Interconnection With Trimble 4000 GPS Receiver

7.6 TRACS TDMA

Tracs TDMA (Time Division Multiple Access) is a high speed, intelligent network radio datalink which can operate in the VHF or UHF bands to provide an addressable network with integrated position reporting from an integrated/internal GPS receiver. The standard Tracs units are fitted with a Trimble SK8 GPS receiver, or a Trimble DSM GPS receiver.

Each unit in the network is assigned a unique address (1 to 255) enabling messages can be specifically addressed to that unit. A broadcast address (0) is provided to allow multiple units to receive a message, for example RTCM corrections. The system manages the data bandwidth by dividing it into timeslots synchronised by means of GPS 1PPS (pulse per second) timing pulse from an internal GPS receiver.

The standard Tracs system has a frequency band of 455.0MHz to 465.0MHz (frequency module 53R). The channel frequencies can be selected in 25kHz steps and the units are equipped with the facility to pre-store 10 selected frequencies within the 10MHz band. Units for use in Australia are fitted with 471MHz radios.

There are four types of messages that can be transmitted in a Tracs network.

- Position Reports automatically generated from the SK8 or DSM GPS receiver as a NMEA type or Raw Pseudo Range information.
- Transparent messages used to send unformatted data across the network eg. RTCM corrections.
- Open messages used to provide a general-purpose data link between units. This format is used by GNS to transfer information.
- Configuration messages used for remote configuration of units using the Destination ID to identify which unit is being configured.

7.7 S.G. BROWN 1000S GYROCOMPASS

The S.G. Brown 1000S Gyrocompass is a compact, simple-to-operate master heading reference instrument employing the effect of gravity and the earth's rotation to produce a True North reference. This reference may be read off the compass card or from a digital display and can be interfaced to the GNS2 navigation system.

The normal starting cycle of the instrument is fully automatic and is initiated when the system power supply is switched on. A fail safe control circuit is incorporated which ensures that the compass is not damaged after a power failure when power is restored; the compass will restart automatically and carry out its normal settling program.

8. PERSONNEL AND EQUIPMENT

8.1 PERSONNEL

The following personnel were employed on this project:

For : Thales GeoSolutions (Australasia) Limited

M. Elmslie	:	Surveyor/Team Leader
B. Lobban	:	Engineer

For : Santos Offshore Pty Ltd

K. O'Halloran	:	Client Representative

8.2 EQUIPMENT

The following equipment was provided for this project:

Ocean Epoch

2 x Compaq Computer, inc monitor, keyboard (for GNS2 / MultiFix 3)
1 x Thales SkyFix Mini Rig Portable
3 x SkyFix/SkyFix Spot MK II Receivers
1 x Compaq Computer, inc. monitor, keyboard (for GNS2 Remote)
1 x S.G. Brown 1000S Gyrocompass
1 x Uninteruptable Power Supply (UPS)
1 x Canon BJC-1000 Printer
1 x Epson LX300 Printer
2 x SkyFix Spot Antenna 90962/3/1
2 x BD112 GPS Receivers
2 x Tracs Bricks
2 x Tracs Multiplexer
2 x UHF Antennae
1 x Marine Sextant
1 x Laptop Computer

Lady Dawn And Pacific Challenger (Each)

1 x Tracs Geopod
1 x Fluxgate compasses
1 x Tracs Box and Interface Box
1 x Compaq computer, inc. monitor, keyboard (GNS2 Tug Display)
1 x Uninteruptable Power Supply (UPS)

plus all associated software (GNS 2 version 2.48, MultiFix 3 version 1.32) c/w cables, consumables, software dongles etc.

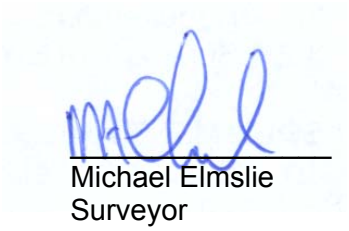
Spare

1 x Tracs Geopod
1 x Fluxgate Compass
1 x Tracs Box and Interface Box

9. DISTRIBUTION

Copies of this report have been distributed as follows:

Santos Offshore Pty Ltd	: 3 copies
Attn: Mr Ole Moller	: 1 electronic copy
Thales GeoSolutions (Australasia) Limited	: 1 copy



Michael Elmslie
Surveyor

Anthony Kerr
Survey Manager

APPENDIX A

FINAL DIFFERENTIAL GPS DRILLSTEM POSITION AT CASINO-3

THALES **Thales GeoSolutions Group Ltd**

FINAL POSITION FIX – DIFFERENTIAL GPS

Job Description: Rig Move
Job Number: 3612A3
Thales Surveyor: M.Elmslie
Client: Santos
Client Representative: G.Howard

Sampling started: 14 Oct 2003 20:15:37
Sampling end: 14 Oct 2003 21:15:30

Ocean Epoch

Intended datum location

Datum: GDA94 (GRS80)
Latitude: 38°46'34.390"S Longitude: 142°44'05.590"E
Projection: UTM Zone 54 (S)
Easting: 650703.91 m Northing: 5706626.93 m

Final Antenna Position (T1 Thales UKOOA):

Sample size: 720 fixes used out of a total of 720.

Antenna offset

X: 5.45m Y: 43.63m Z: 0.00m
Range: 43.97m Rel Brg from datum to antenna: 7.1°

Datum: WGS 84
Latitude: 38°46'35.138"S Longitude: 142°44'03.772"E Spheroidal Ht: 15.21m
Datum: GDA94 (GRS80)
Latitude: 38°46'35.138"S Longitude: 142°44'03.772"E Spheroidal Ht: 15.21m
Projection: UTM Zone 54 (S)
Easting: 650659.61 Northing: 5706604.71 Spheroidal Ht: 15.21m

Standard deviations

Long or E: 0.28m
Lat or N: 0.22m
Height: 0.38m
Position: 0.36m

Final Datum Position

Datum: GDA94 (GRS80)
Latitude: 38°46'34.558"S Longitude: 142°44'05.437"E

Projection: UTM Zone 54 (S)
Easting: 650700.11 m Northing: 5706621.82 m

Mean corrected heading: 238.9°T
SD heading: 0.1°T
Intended heading: 240.0°T
Difference from intended: -1.1°
Gyro C-O: -88.2°
Convergence: -1.09°

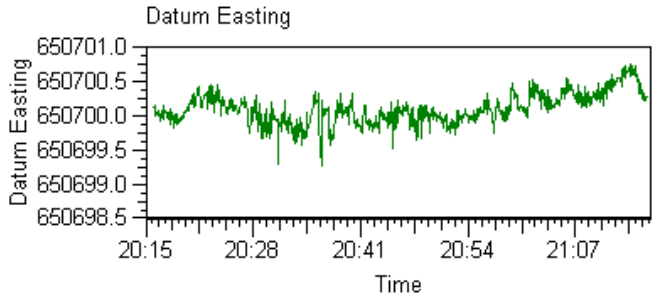
Final Datum Position is 6.37m on a bearing of 215.5°T (216.6°G) from the intended location.

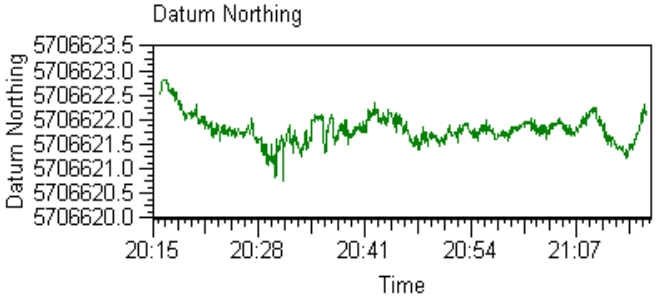
APPENDIX B

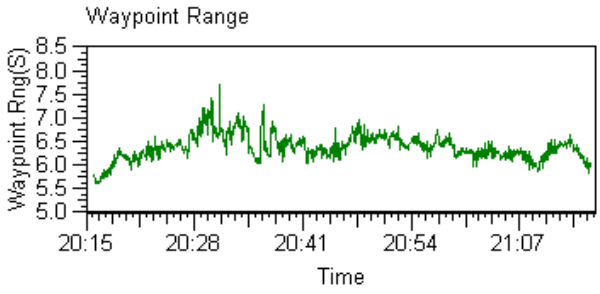
GNS2 STATIC DIFFERENTIAL GPS FIX GRAPHS

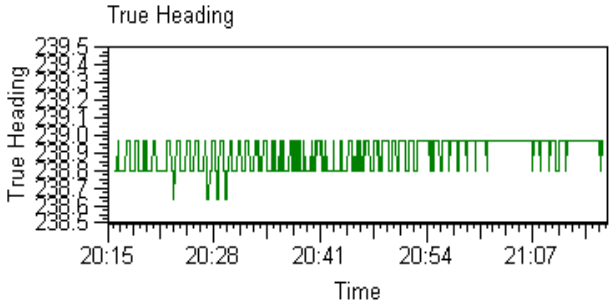
Thales GeoSolutions (Australasia) Limited

Project: Positioning Report of the Ocean Epoch
Client: Santos



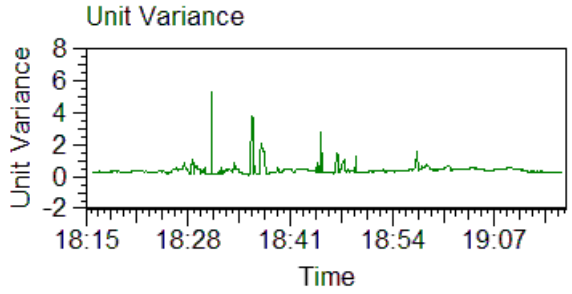


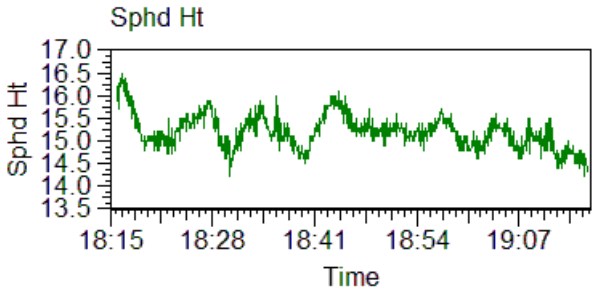


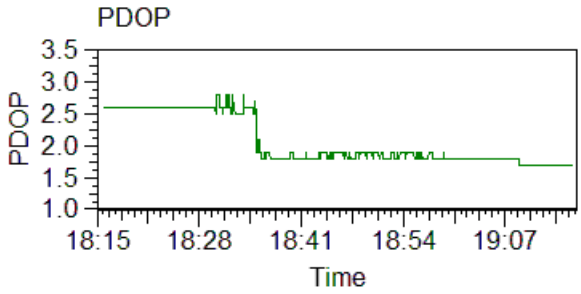


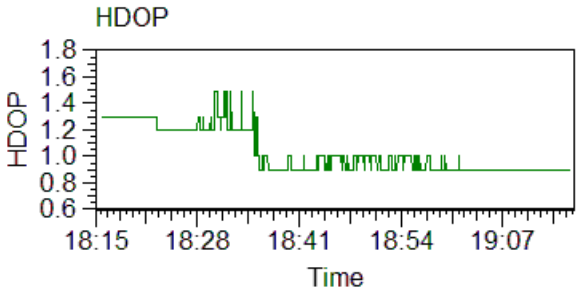
THALES **Thales GeoSolutions (Australasia) Limited**

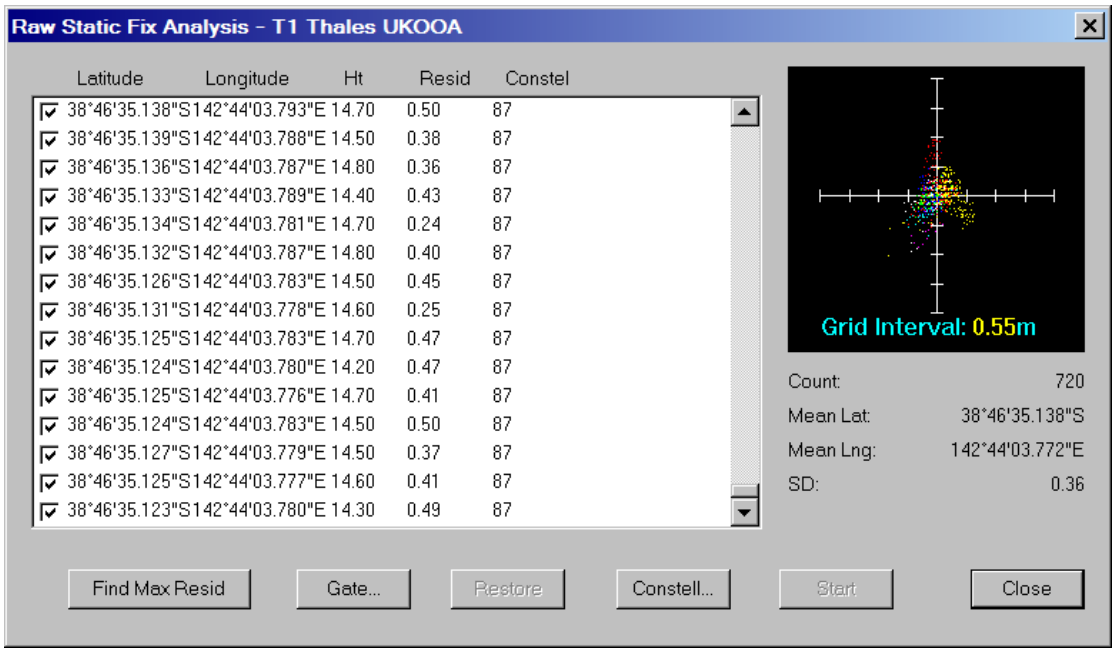
Project: Positioning Report of the Safe Caledonia
Client: Pro-Safe










Raw Static Fix Analysis - T1 Thales UKOOA
Latitude Longitude Ht Resid Constel
38°46'35.138"S 142°44'03.793"E 14.70 0.50 87
38°46'35.139"S 142°44'03.788"E 14.50 0.38 87
38°46'35.136"S 142°44'03.787"E 14.80 0.36 87
38°46'35.133"S 142°44'03.789"E 14.40 0.43 87
38°46'35.134"S 142°44'03.781"E 14.70 0.24 87
38°46'35.132"S 142°44'03.787"E 14.80 0.40 87
38°46'35.126"S 142°44'03.783"E 14.50 0.45 87
38°46'35.131"S 142°44'03.778"E 14.60 0.25 87
38°46'35.125"S 142°44'03.783"E 14.70 0.47 87
38°46'35.124"S 142°44'03.780"E 14.20 0.47 87
38°46'35.125"S 142°44'03.776"E 14.70 0.41 87
38°46'35.124"S 142°44'03.783"E 14.50 0.50 87
38°46'35.127"S 142°44'03.779"E 14.50 0.37 87
38°46'35.125"S 142°44'03.777"E 14.60 0.41 87
38°46'35.123"S 142°44'03.780"E 14.30 0.49 87
Grid Interval: 0.55m
Count: 720
Mean Lat: 38°46'35.138"S
Mean Lng: 142°44'03.772"E
SD: 0.36
Find Max Resid
Gate...
Restore
Constell...
Start
Close

APPENDIX C

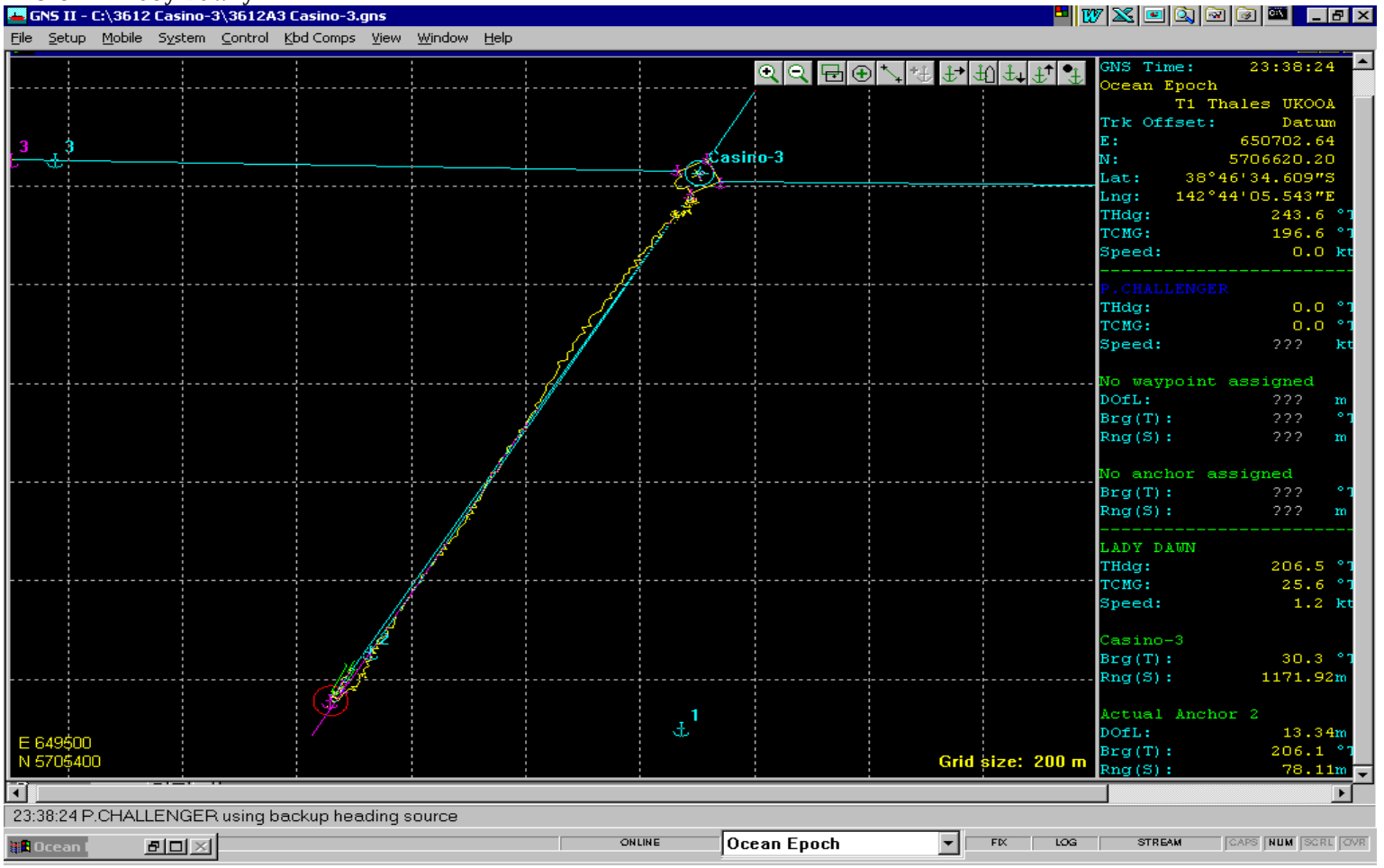
ANCHOR DEPLOYMENT GRAPHICS

Thales GeoSolutions (Australasia) Limited

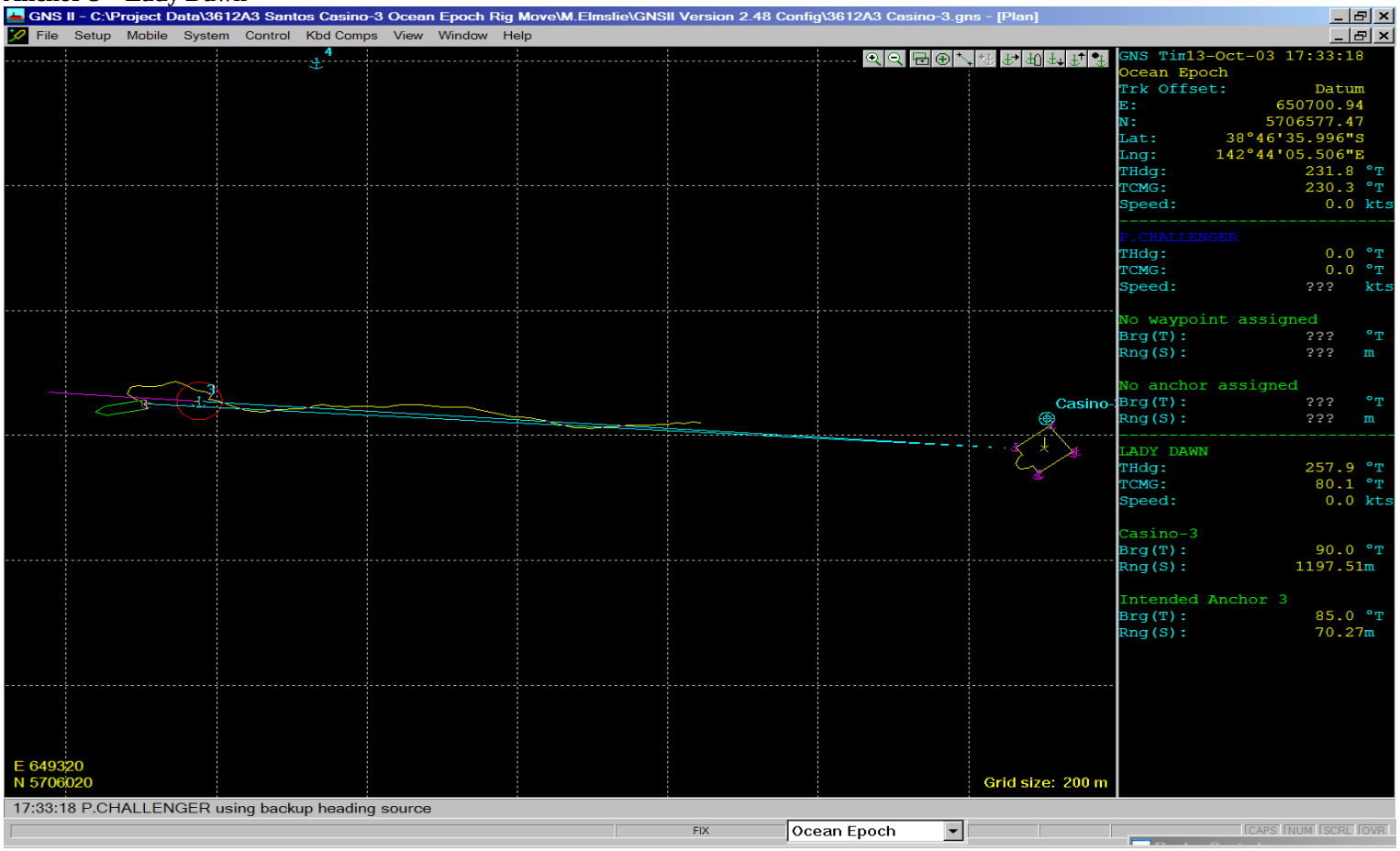
Project: Positioning Report of the Ocean Epoch
Client: Santos

Anchor 1 – Lady Dawn

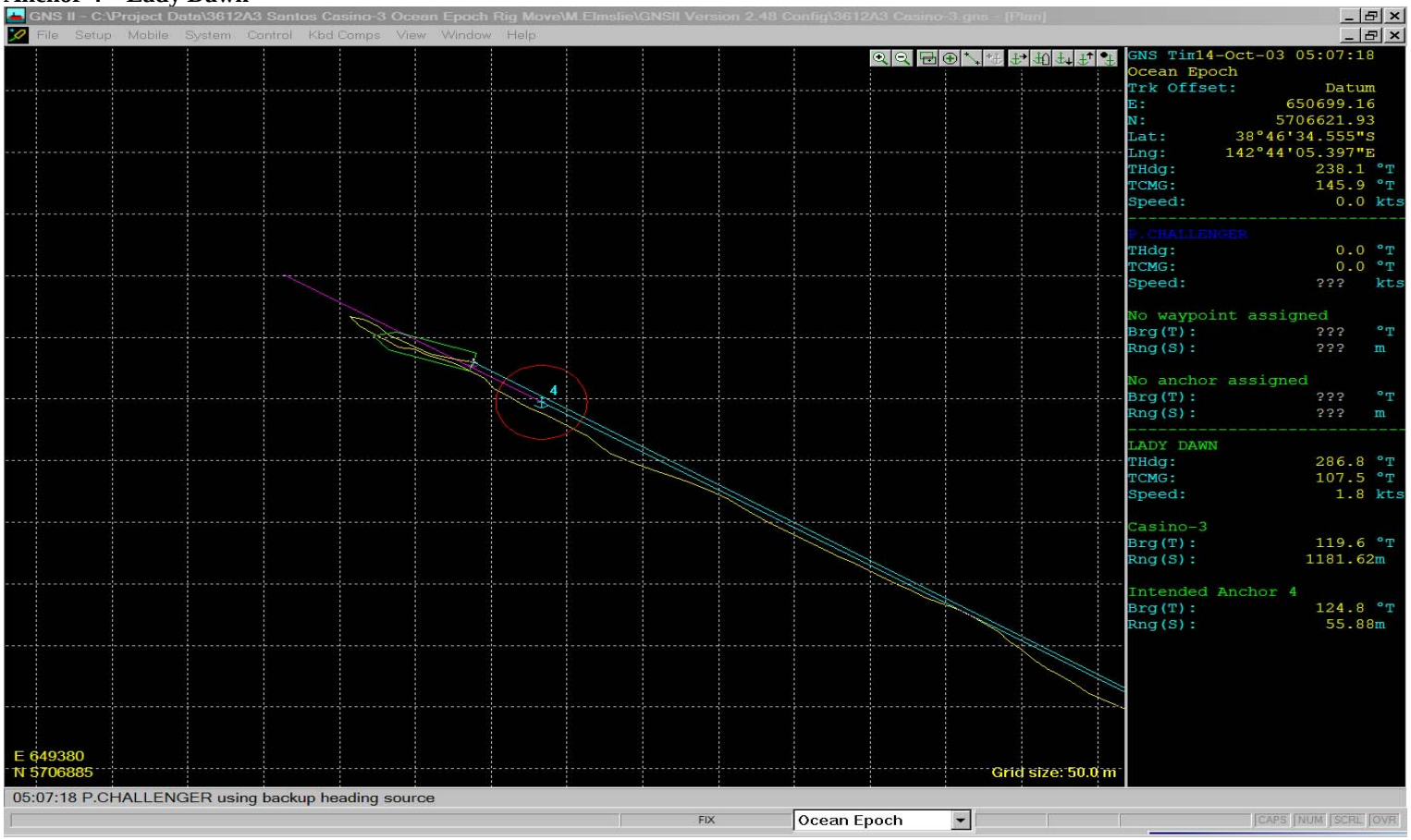
Anchor 2 – Lady Dawny



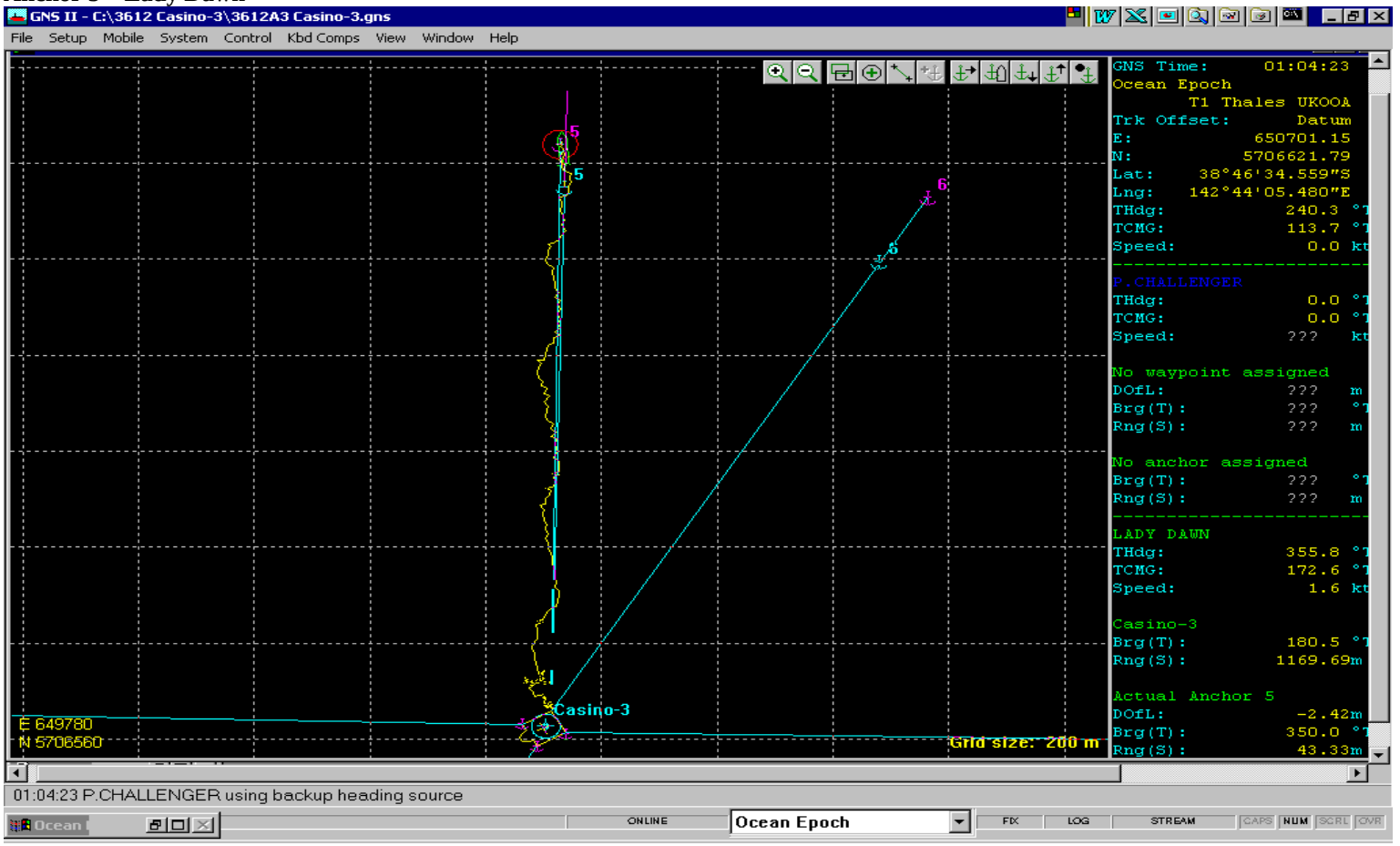
Anchor 3 – Lady Dawn



Anchor 4 – Lady Dawn



Anchor 5 – Lady Dawn



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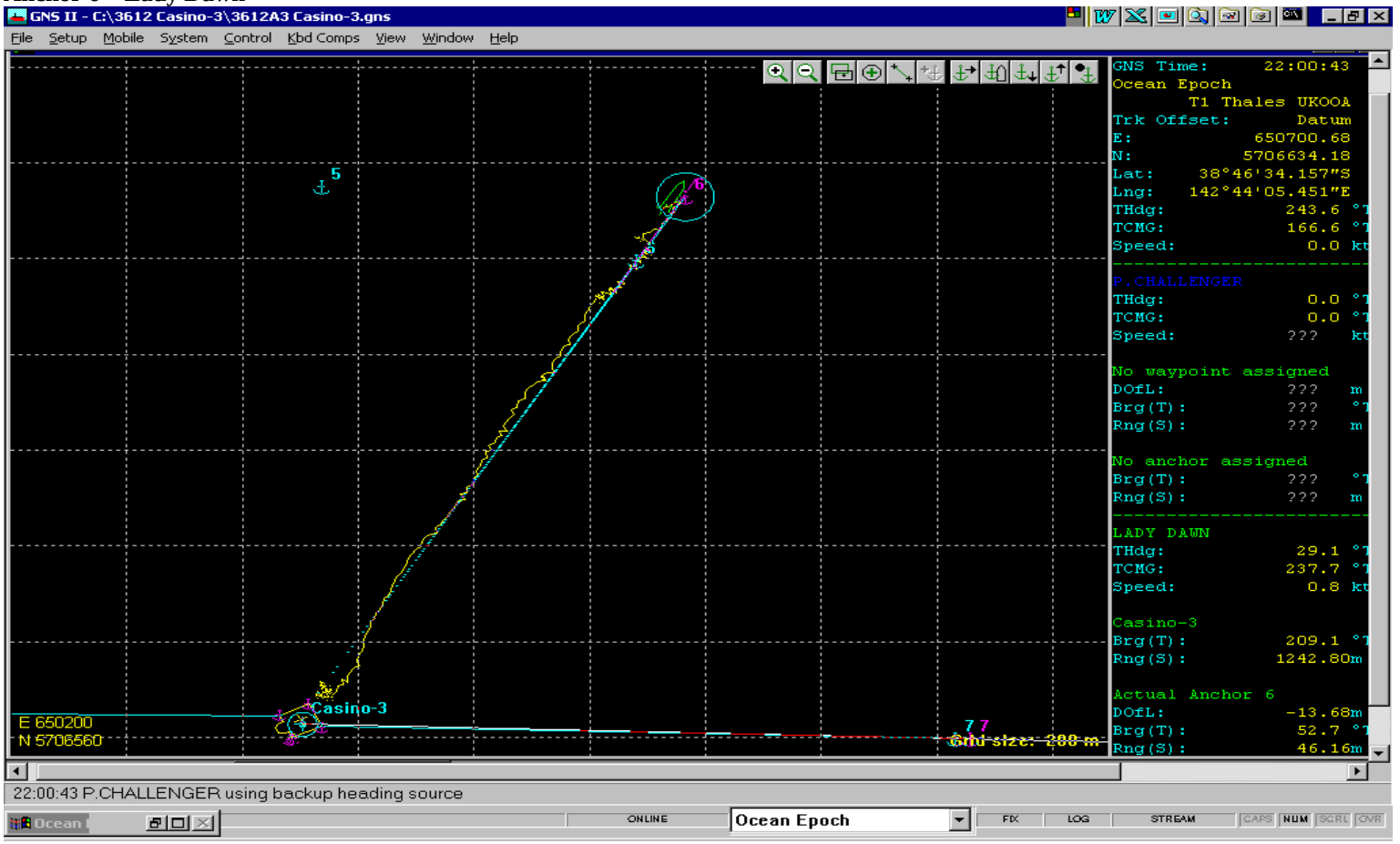
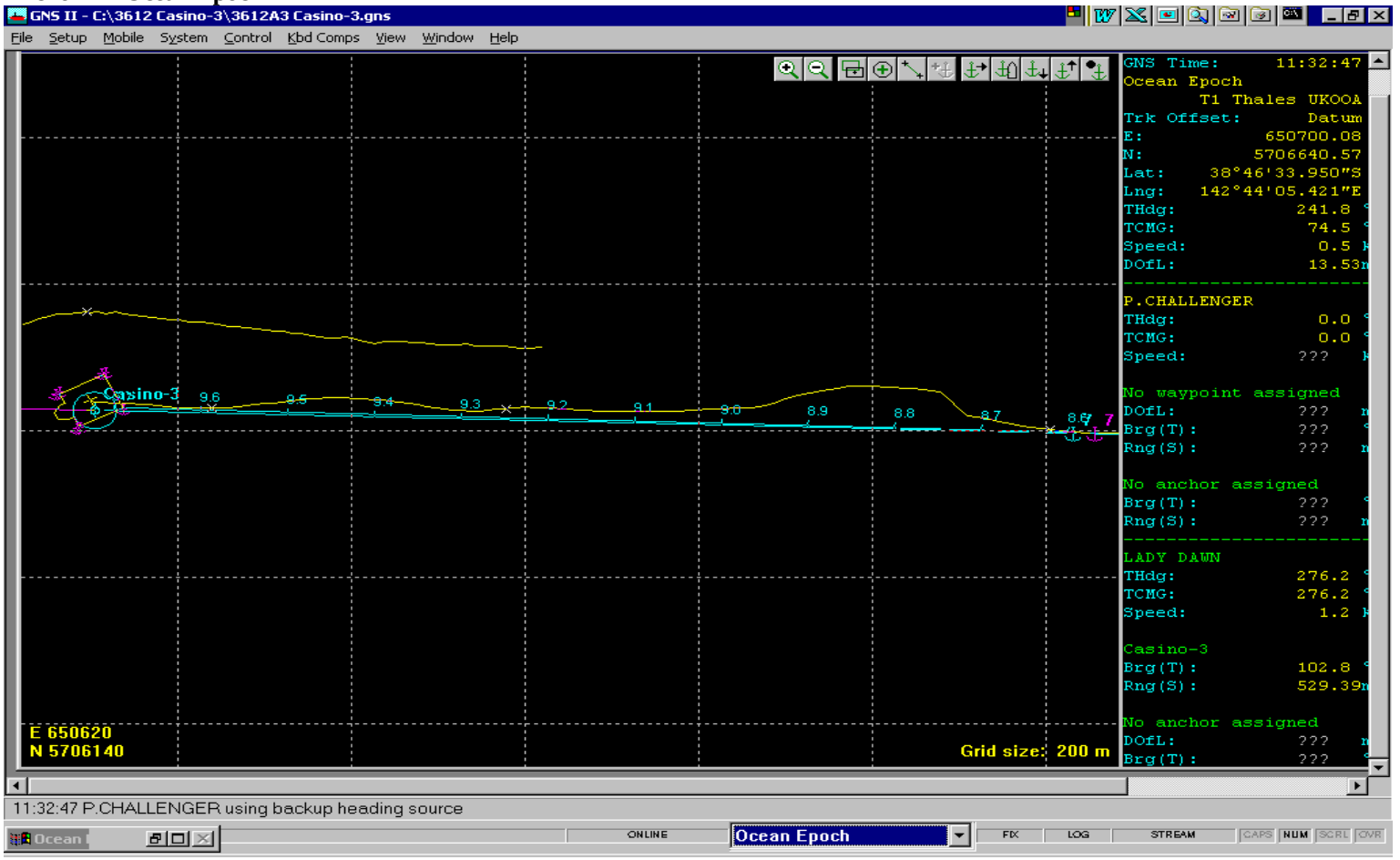
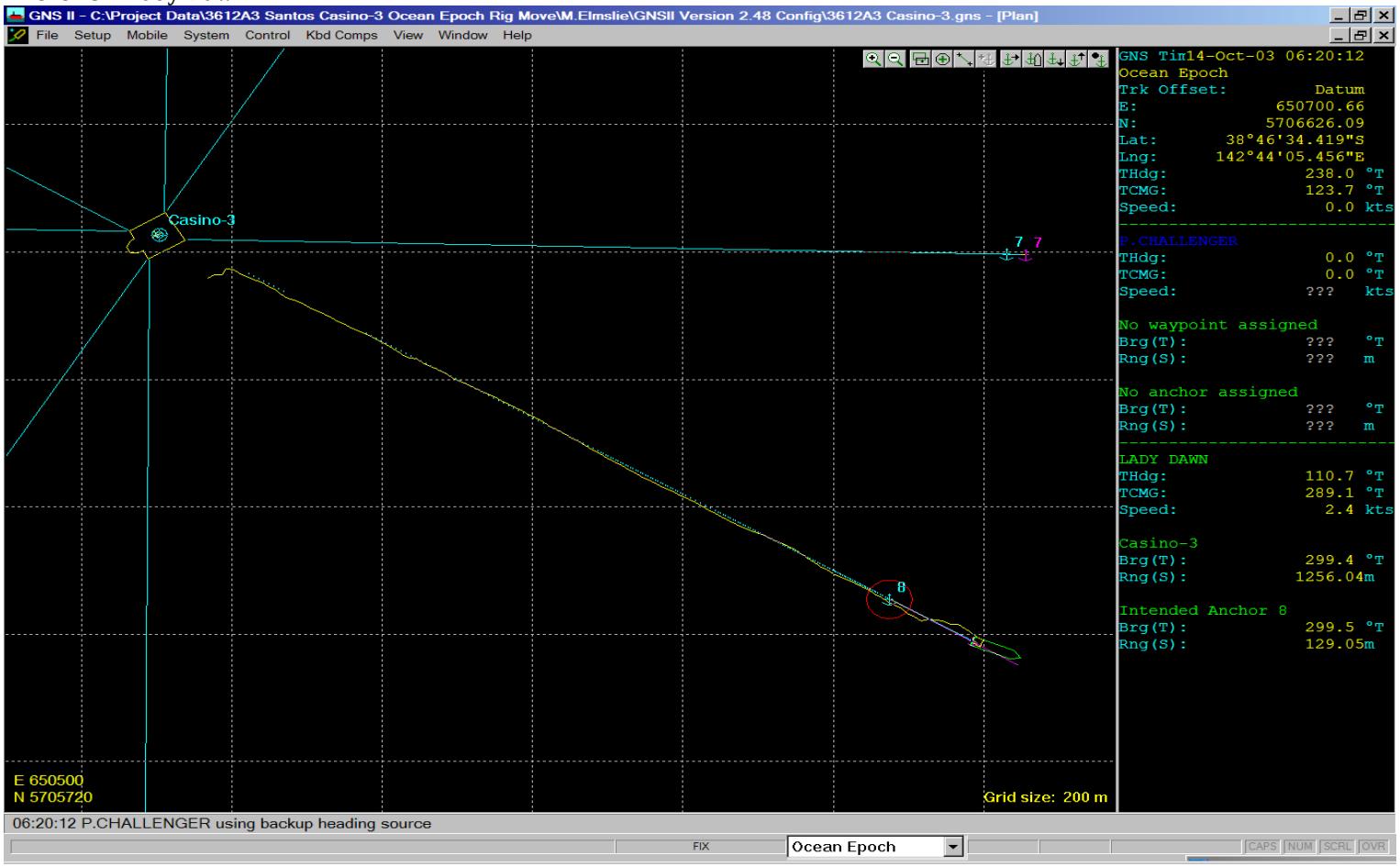


Anchor 7 – Ocean Epoch



Anchor 8 – Lady Dawn



APPENDIX D

OCEAN EPOCH ANCHOR PATTERN DETAILS AT CASINO-3

THALES

OCEAN EPOCH ANCHOR POSITIONS

14 Oct 2003 21:47

Main Anchors

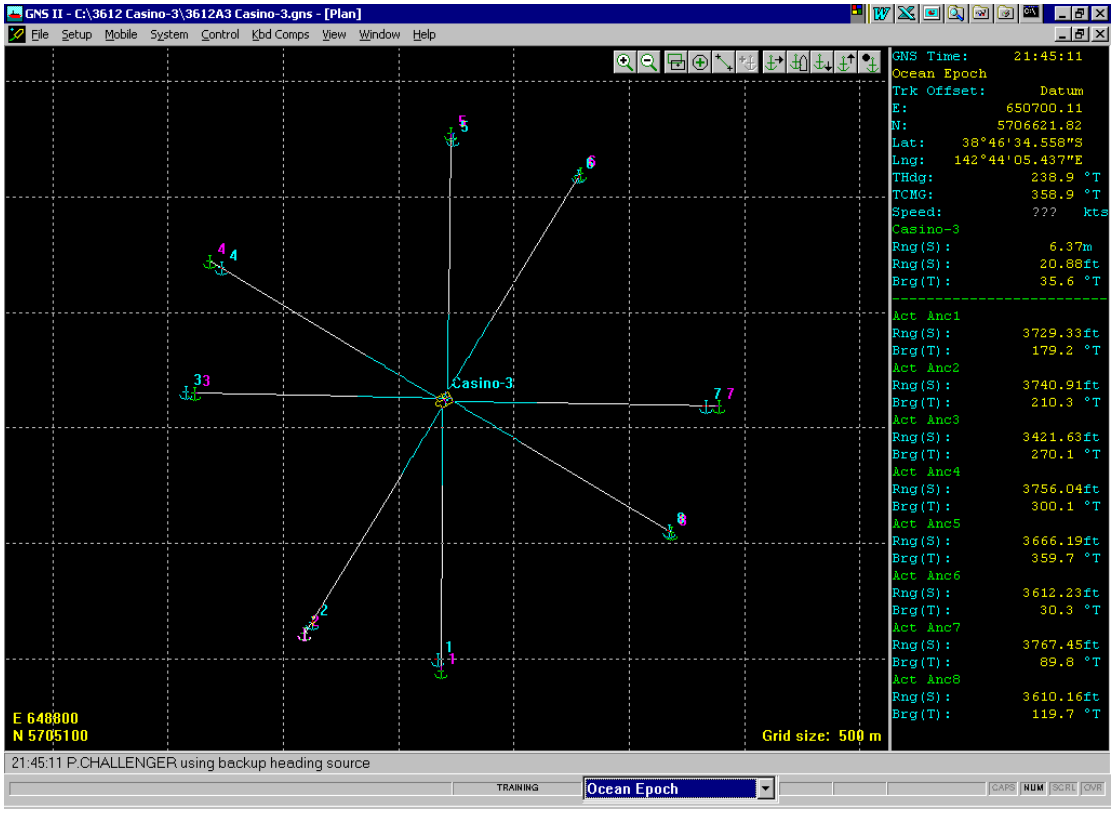
Name	Intended E	Intended N	Dropped E	Dropped N
Anchor 1	650670.73	5705500.08	650683.40	5705448.00
Anchor 2	650128.41	5705656.46	650091.40	5705609.77
Anchor 3	649576.87	5706655.03	649616.47	5706651.57
Anchor 4	649733.27	5707197.35	649683.19	5707223.92
Anchor 5	650737.09	5707751.79	650725.51	5707776.31
Anchor 6	651279.41	5707595.40	651287.29	5707601.07
Anchor 7	651830.95	5706596.82	651889.23	5706595.85
Anchor 8	651674.55	5706054.50	651682.69	5706048.90

THALES

Thales GeoSolutions (Australasia) Limited

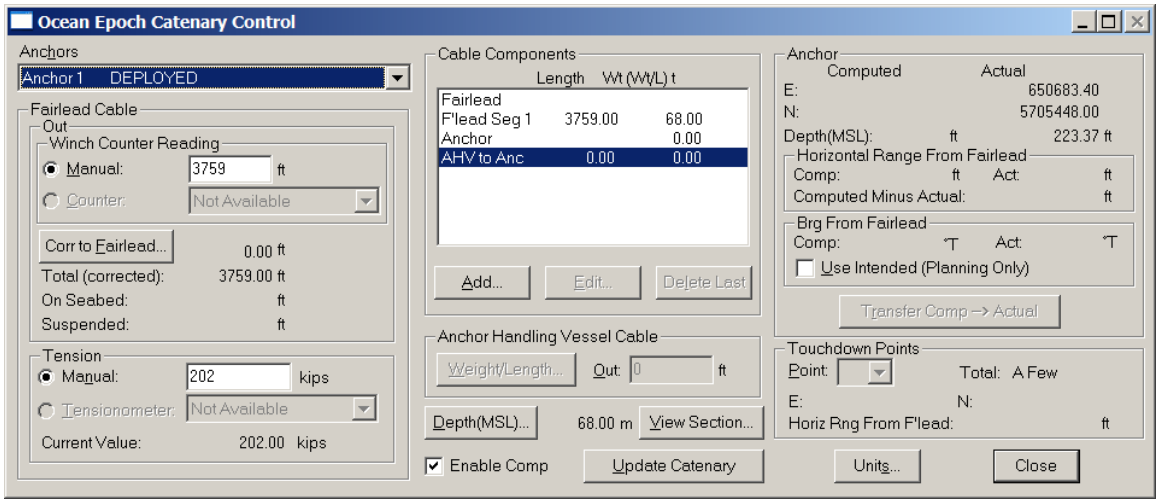
Project: Positioning Report of the Ocean Epoch

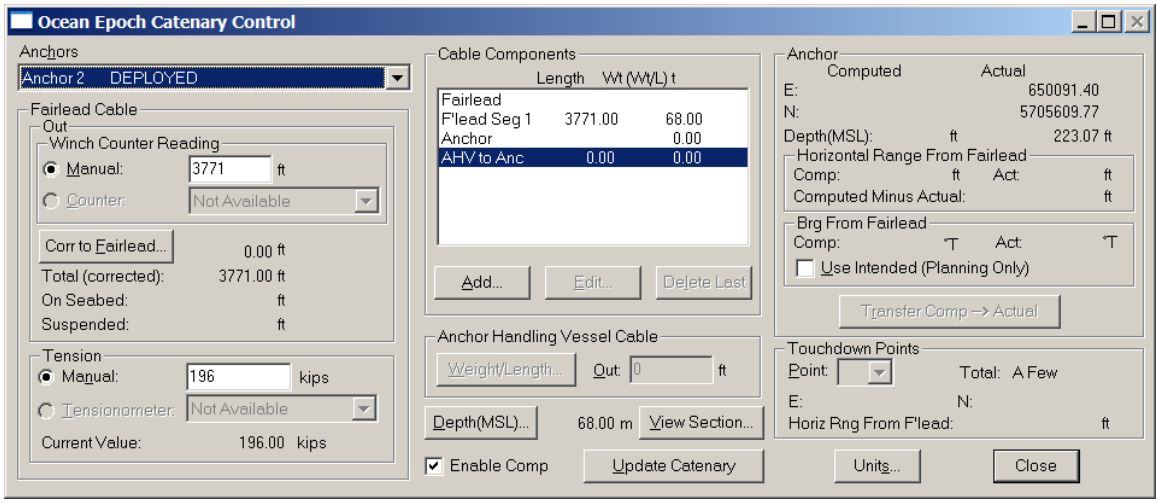
Client: Santos

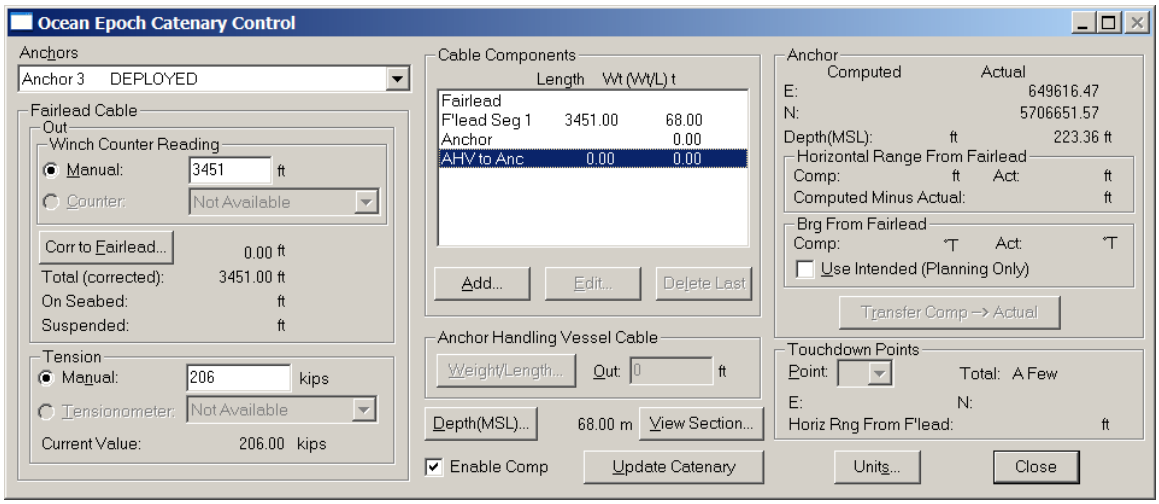


APPENDIX E

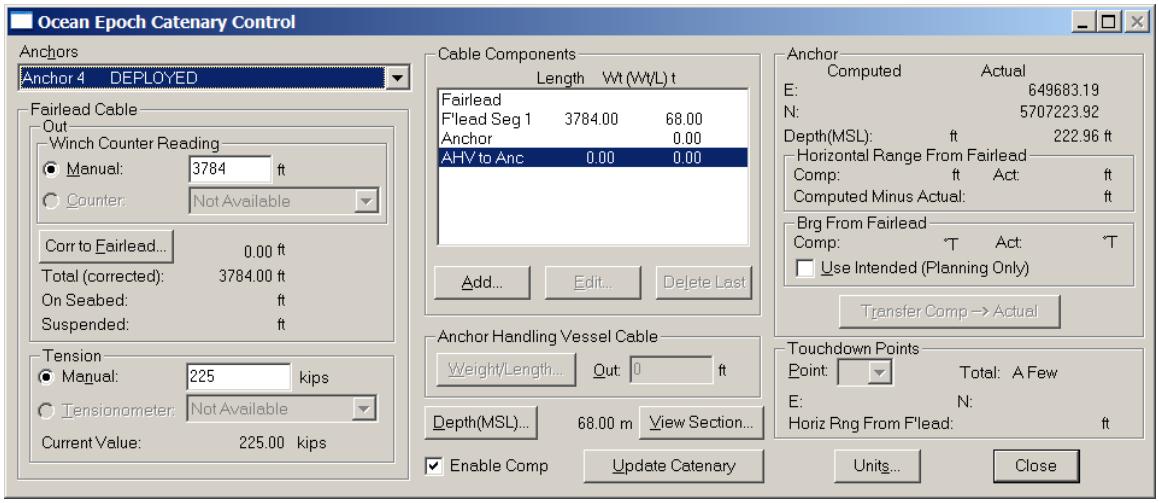
OCEAN EPOCH ANCHOR CATENARY CALCULATIONS

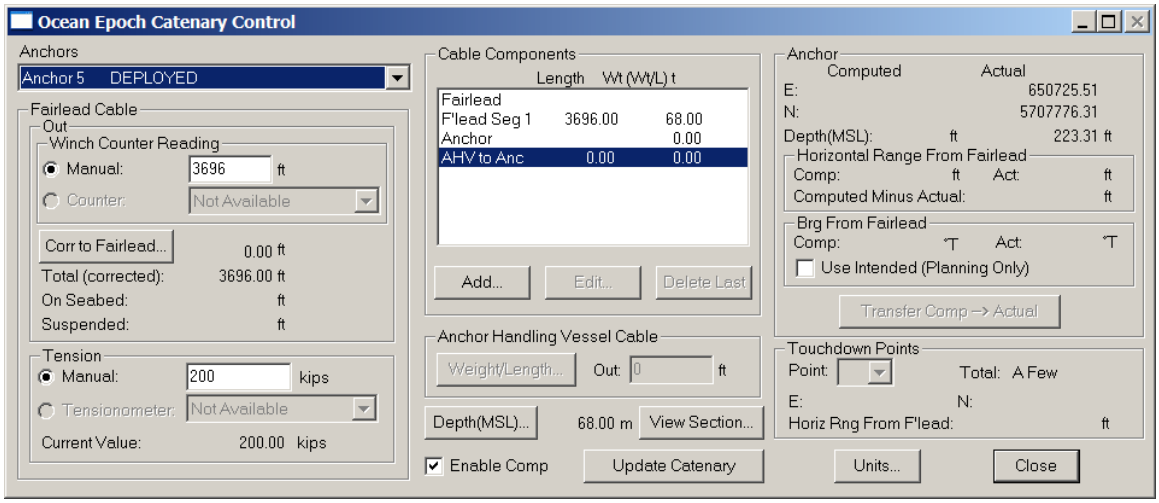

Ocean Epoch Catenary Control
Anchors
Anchor 1 DEPLOYED
Fairlead Cable
Out
Winch Counter Reading
Manual: 3759 ft
Counter: Not Available
Corr to Fairlead... 0.00 ft
Total (corrected): 3759.00 ft
On Seabed: ft
Suspended: ft
Tension
Manual: 202 kips
Tensionometer: Not Available
Current Value: 202.00 kips
Cable Components
Length Wt (Wt/L) t
Fairlead
F'lead Seg 1 3759.00 68.00
Anchor 0.00
AHV to Anc 0.00 0.00
Add... Edit... Delete Last
Anchor Handling Vessel Cable
Weight/Length... Out: 0 ft
Depth(MSL)... 68.00 m View Section...
Enable Comp Update Catenary
Anchor
Computed Actual
E: 650683.40
N: 5705448.00
Depth(MSL): ft 223.37 ft
Horizontal Range From Fairlead
Comp: ft Act: ft
Computed Minus Actual: ft
Brg From Fairlead
Comp: °T Act: °T
Use Intended (Planning Only)
Transfer Comp -> Actual
Touchdown Points
Point: Total: A Few
E: N:
Horiz Rng From F'lead: ft
Units... Close

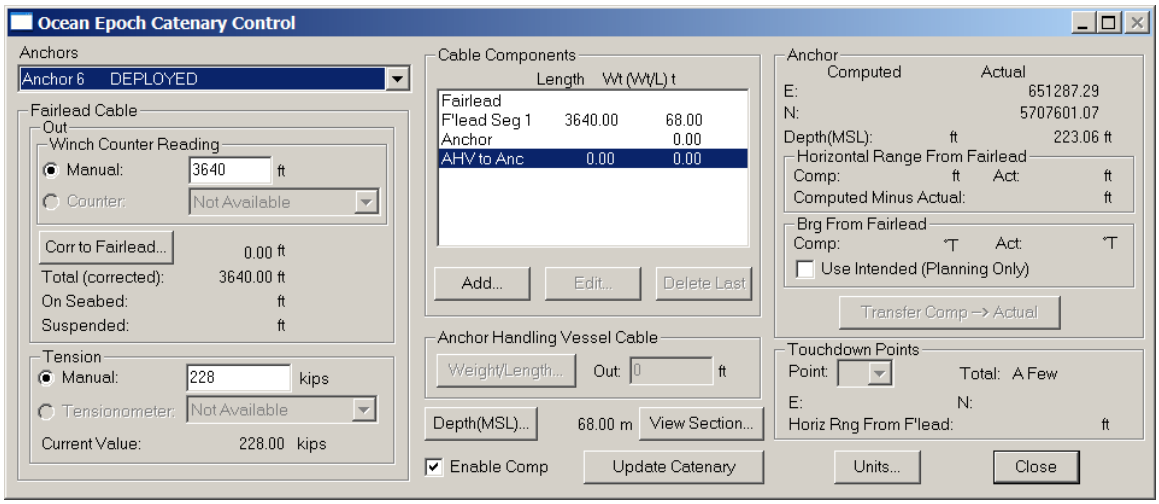

Ocean Epoch Catenary Control
Anchors
Anchor 2 DEPLOYED
Fairlead Cable
Out
Winch Counter Reading
Manual: 3771 ft
Counter: Not Available
Corr to Fairlead... 0.00 ft
Total (corrected): 3771.00 ft
On Seabed: ft
Suspended: ft
Tension
Manual: 196 kips
Tensionometer: Not Available
Current Value: 196.00 kips
Cable Components
Length Wt (Wt/L) t
Fairlead
F'lead Seg 1 3771.00 68.00
Anchor 0.00
AHV to Anc 0.00 0.00
Add... Edit... Delete Last
Anchor Handling Vessel Cable
Weight/Length... Out: 0 ft
Depth(MSL)... 68.00 m View Section...
Enable Comp Update Catenary
Anchor
Computed Actual
E: 650091.40
N: 5705609.77
Depth(MSL): ft 223.07 ft
Horizontal Range From Fairlead
Comp: ft Act: ft
Computed Minus Actual: ft
Brg From Fairlead
Comp: °T Act: °T
Use Intended (Planning Only)
Transfer Comp -> Actual
Touchdown Points
Point: Total: A Few
E: N:
Horiz Rng From F'lead: ft
Units... Close

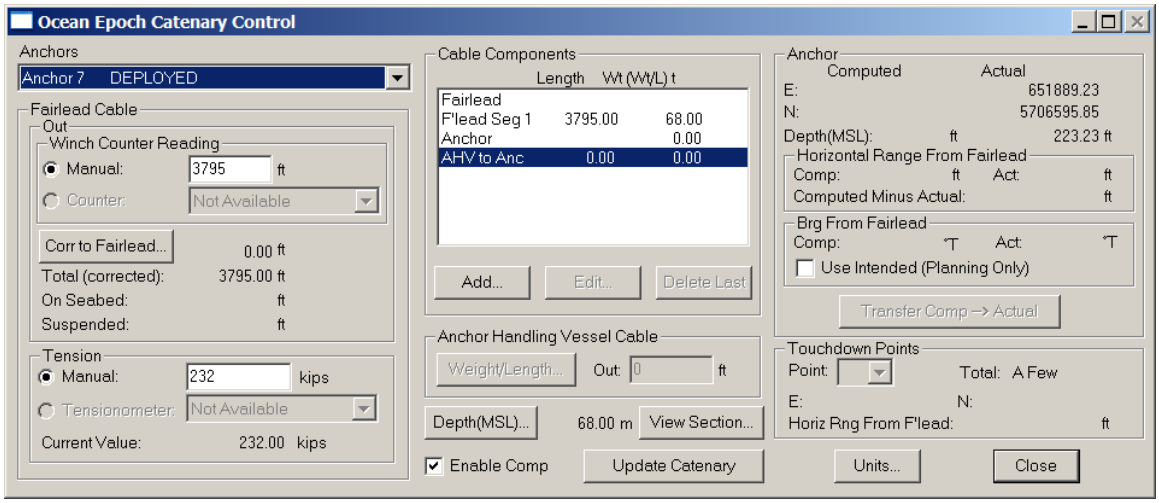

Ocean Epoch Catenary Control
Anchors
Anchor 3 DEPLOYED
Fairlead Cable
Out
Winch Counter Reading
Manual: 3451 ft
Counter: Not Available
Corr to Fairlead... 0.00 ft
Total (corrected): 3451.00 ft
On Seabed: ft
Suspended: ft
Tension
Manual: 206 kips
Tensionometer: Not Available
Current Value: 206.00 kips
Cable Components
Length Wt (Wt/L) t
Fairlead
F'lead Seg 1 3451.00 68.00
Anchor 0.00
AHV to Anc 0.00 0.00
Add... Edit... Delete Last
Anchor Handling Vessel Cable
Weight/Length... Out: 0 ft
Depth(MSL)... 68.00 m View Section...
Enable Comp Update Catenary
Anchor
Computed Actual
E: 649616.47
N: 5706651.57
Depth(MSL): ft 223.36 ft
Horizontal Range From Fairlead
Comp: ft Act: ft
Computed Minus Actual: ft
Brg From Fairlead
Comp: °T Act: °T
Use Intended (Planning Only)
Transfer Comp -> Actual
Touchdown Points
Point: Total: A Few
E: N:
Horiz Rng From F'lead: ft
Units... Close

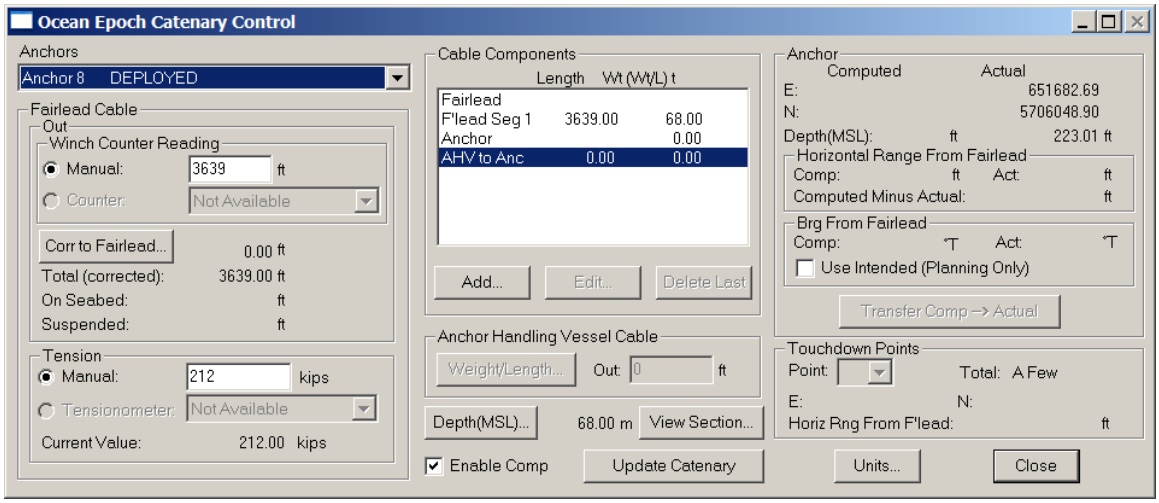
Project: Positioning Report of the Ocean Epoch
Client: Santos








Ocean Epoch Catenary Control
Anchors
Anchor 7 DEPLOYED
Fairlead Cable
Out
Winch Counter Reading
Manual: 3795 ft
Counter: Not Available
Corr to Fairlead... 0.00 ft
Total (corrected): 3795.00 ft
On Seabed: ft
Suspended: ft
Tension
Manual: 232 kips
Tensionometer: Not Available
Current Value: 232.00 kips
Cable Components
Length Wt (Wt/L) t
Fairlead
F'lead Seg 1 3795.00 68.00
Anchor 0.00
AHV to Anc 0.00 0.00
Add... Edit... Delete Last
Anchor Handling Vessel Cable
Weight/Length... Out: 0 ft
Depth(MSL)... 68.00 m View Section...
Enable Comp Update Catenary
Anchor
Computed Actual
E: 651889.23
N: 5706595.85
Depth(MSL): ft 223.23 ft
Horizontal Range From Fairlead
Comp: ft Act: ft
Computed Minus Actual: ft
Brg From Fairlead
Comp: °T Act: °T
Use Intended (Planning Only)
Transfer Comp -> Actual
Touchdown Points
Point: Total: A Few
E: N:
Horiz Rng From F'lead: ft
Units... Close


Ocean Epoch Catenary Control
Anchors
Anchor 8 DEPLOYED
Fairlead Cable
Out
Winch Counter Reading
Manual: 3639 ft
Counter: Not Available
Corr to Fairlead... 0.00 ft
Total (corrected): 3639.00 ft
On Seabed: ft
Suspended: ft
Tension
Manual: 212 kips
Tensionometer: Not Available
Current Value: 212.00 kips
Cable Components
Length Wt (Wt/L) t
Fairlead
F'lead Seg 1 3639.00 68.00
Anchor 0.00
AHV to Anc 0.00 0.00
Add... Edit... Delete Last
Anchor Handling Vessel Cable
Weight/Length... Out: 0 ft
Depth(MSL)... 68.00 m View Section...
Enable Comp Update Catenary
Anchor
Computed Actual
E: 651682.69
N: 5706048.90
Depth(MSL): ft 223.01 ft
Horizontal Range From Fairlead
Comp: ft Act: ft
Computed Minus Actual: ft
Brg From Fairlead
Comp: °T Act: °T
Use Intended (Planning Only)
Transfer Comp -> Actual
Touchdown Points
Point: Total: A Few
E: N:
Horiz Rng From F'lead: ft
Units... Close

APPENDIX F

GYROCOMPASS CALIBRATION REPORT

Thales GeoSolutions (Australasia) Limited

ABN 82 000 601 909

Solar Observation for Azimuth (Hour Angle) 2003

Thales Job Number: 3612A3
Job Description: Casino-3 Ocean Epoch Rig Move
Client: Santos
Party Chief: M.Elmslie
Surveyor: M.Elmslie
Rig Name: Ocean Epoch
Date: 12 October2003

Control Point Co-ordinates

Datum: GDA94 Projection: UTM Zone 54S CM 141° East

Latitude (DMS):	-038	35	46
Longitude (DMS):	141	05	30
UTC Correction (HMS):	10.00		

Total Station Observations:

Face	Local Time (HMS)			Observed Direction to R.O. (DMS)			Observed Direction to Sun (DMS)			Observed (O) True Heading (D.D)
Left	18	15	30	090	00	00	261	39	12	181.70
Right	18	15	30	270	00	00	081	39	12	
Left	18	17	40	090	00	00	259	06	36	184.20
Right	18	17	40	270	00	00	079	06	36	
Left	18	19	50	090	00	00	260	06	12	182.50
Right	18	19	50	270	00	00	080	06	12	
Left	18	21	35	090	00	00	259	59	24	183.30
Right	18	21	35	270	00	00	079	59	24	
Left	18	23	20	090	00	00	256	16	00	185.80
Right	18	23	20	270	00	00	076	16	00	
Left	18	25	00	090	00	00	252	22	54	189.70
Right	18	25	00	270	00	00	072	22	54	
Left										
Right										
Left										
Right										
Left										
Right										
Left										
Right										
Left										
Right										
Left										
Right										

Signature

SURVEYOR/PARTY CHIEF

CLIENT SURVEY REPRESENTATIVE

THALES

Thales GeoSolutions (Australasia) Limited

ABN 82 000 601 909

Solar Observation for Azimuth (Hour Angle) 2003

Thales Job Number: 3612A3
Job Description: Casino-3 Ocean Epoch Rig Move
Client: Santos
Party Chief: M.Elmslie
Surveyor: M.Elmslie
Rig Name: Ocean Epoch
Date: 12 October2003

Datum: GDA94 Projection: UTM Zone 54S CM 141° East

Average Local Time (HMS)			Average Horizontal Angle (DMS)			Azimuth Sun (DMS)			Azimuth RO (DMS)			Calculated (C) True Heading (D.D)	Observed (O) True Heading (D.D)	C-O (D.D)
18	15	30.0	261	39	12	265	20	07	093	40	55	93.68	181.70	-88.02
18	17	40.0	259	06	36	265	00	01	095	53	25	95.89	184.20	-88.31
18	19	50.0	260	06	12	264	39	55	094	33	43	94.56	182.50	-87.94
18	21	35.0	259	59	24	264	23	41	094	24	17	94.40	183.30	-88.90
18	23	20.0	256	16	00	264	07	27	097	51	27	97.86	185.80	-87.94
18	25	00.0	252	22	54	263	51	59	101	29	05	101.48	189.70	-88.22

Mean C-O -88.22

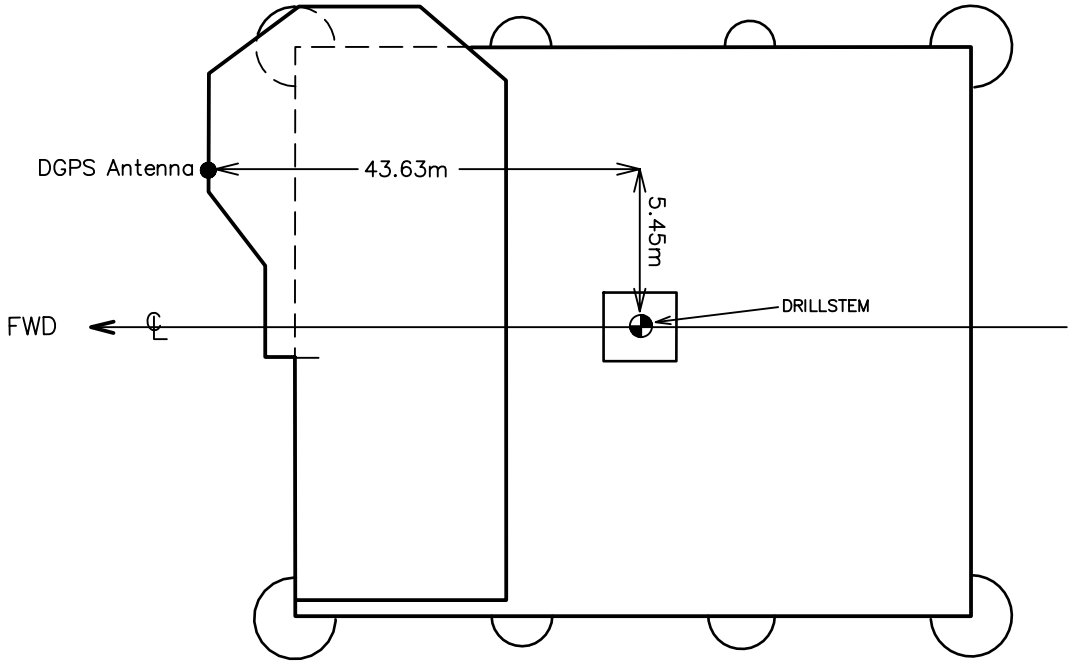
Signature

SURVEYOR/PARTY CHIEF

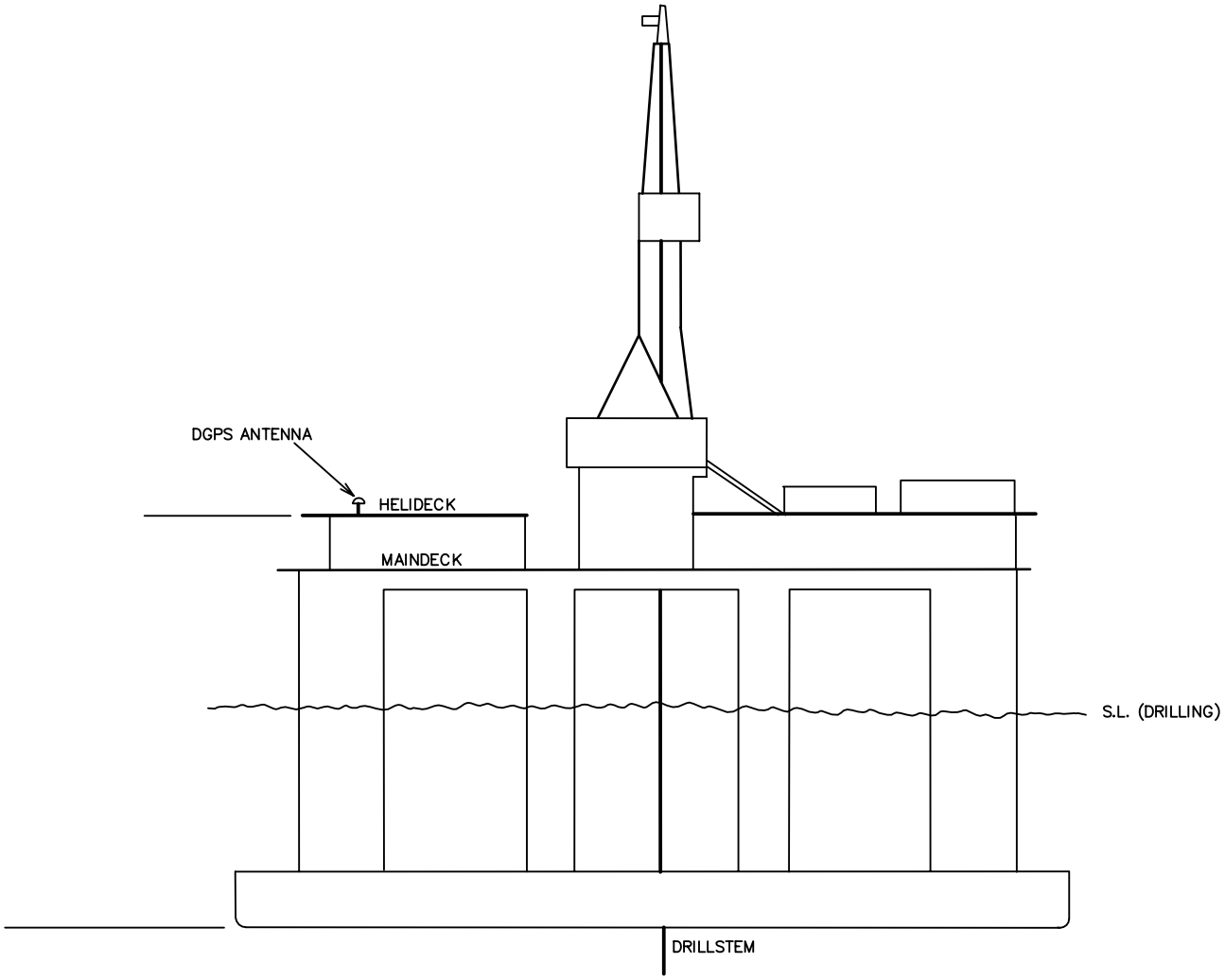
CLIENT SURVEY REPRESENTATIVE

APPENDIX G

OCEAN EPOCH OFFSET DIAGRAM



PLAN VIEW MAIN/HELIDECK



SEDCO 703 - OFFSET DIAGRAM

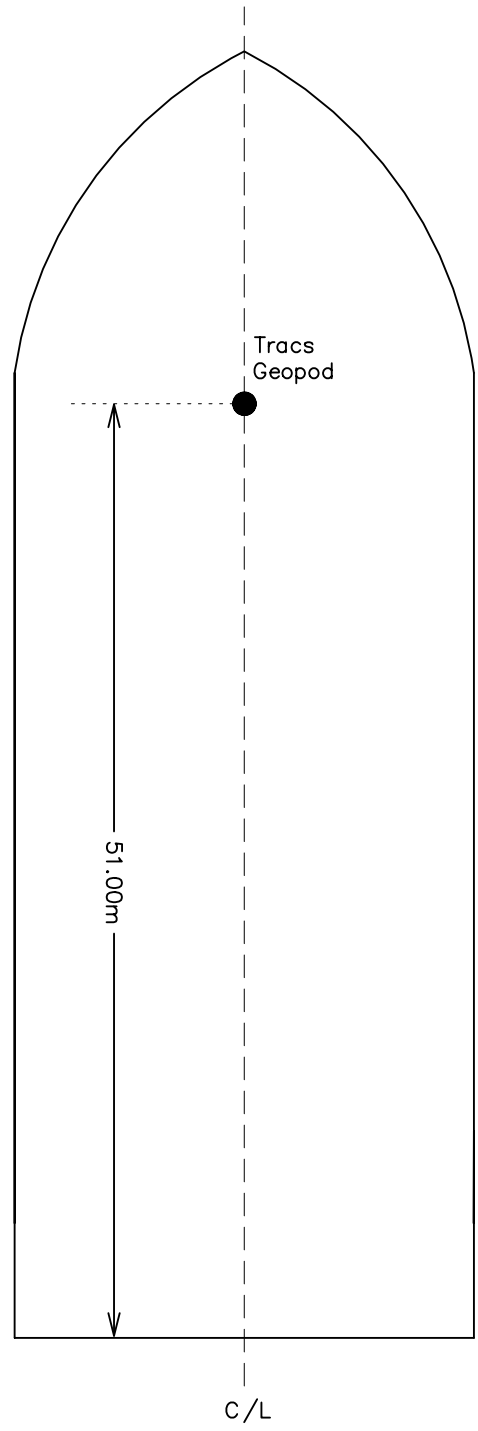
(NOT TO SCALE)

APPENDIX H

LADY DAWN AND PACIFIC CHALLENGER OFFSET DIAGRAMS

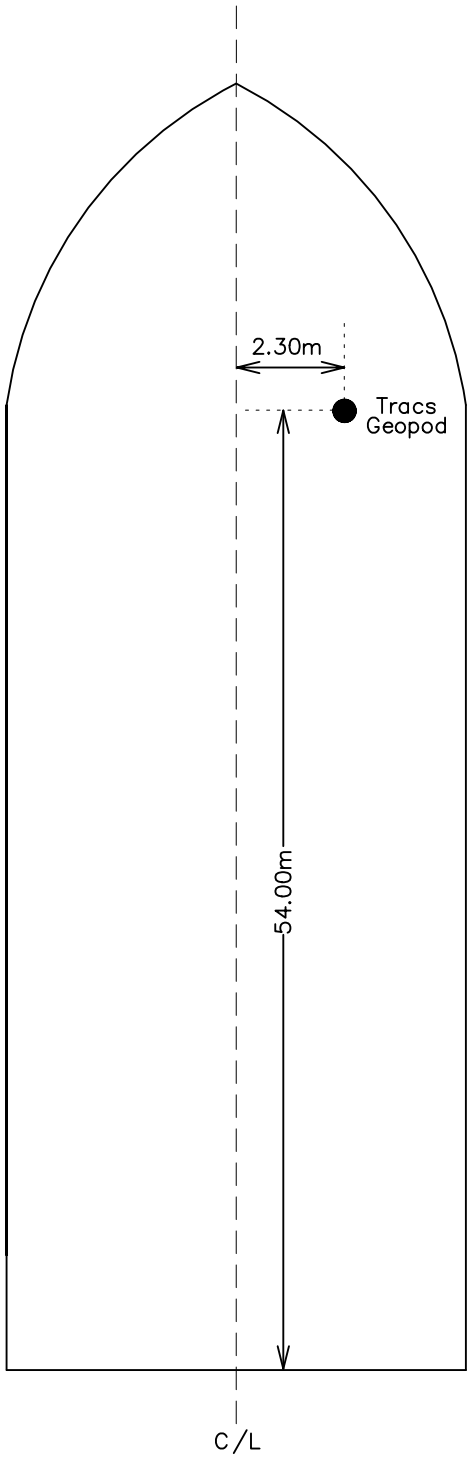
LADY DAWN

(NOT TO SCALE)



PACIFIC CHALLENGER

(NOT TO SCALE)



APPENDIX I

GNS2 CONFIGURATION FILE PRINTOUT

GNS II CONFIGURATION FILE C:\Project Data\3612A3 Santos Casino-3 Ocean Epoc

JOB DETAILS
Job Number : 3612A3
Job Description : Rig Move
Company : Thales GeoSolutions Group Ltd
Client : Santos
Time Zone : GMT +10:00

WORKING SPHEROID
GDA94 (GRS80)
Semi-major : 6378137.000 m
e Squared : 0.006694380023

WORKING PROJECTION
UTM Zone 54 (S)
Lat of Origin : 00°00'00.000"N
Long of Origin : 141°00'00.000"E
False Easting : 500000.00
False Northing : 10000000.00
Scale Factor : 0.999600
Units : Metres

GPS TRANSFORMATION
From : WGS 84
Semi-major : 6378137.000 m
e Squared : 0.006694380067
To : GDA94 (GRS80)
Dx : 0.000 m
Dy : 0.000 m
Dz : 0.000 m
Rot x : 0.0000 secs
Rot y : 0.0000 secs
Rot z : 0.0000 secs
Scale : 0.0000 ppm

WAYPOINTS
Casino-3 E: 650703.91 N: 5706626.93 Ht: 0.00 m Horz Tol1: 5.00 r
WP1 E: 652072.55 N: 5709511.70 Ht: 0.00 m
WP2 E: 655702.13 N: 5706493.40 Ht: 0.00 m

TRACK GUIDANCE
None defined

MOBILES
Ocean Epoch (semi-sub rig)
Shape Definition: Ocean Epoch
Line:-
X: -5.40 m Y: 44.80 m
X: -11.00 m Y: 34.90 m
X: -11.00 m Y: 28.20 m
X: -25.20 m Y: 28.20 m
X: -25.20 m Y: -28.20 m
X: 25.20 m Y: -28.20 m
X: 25.20 m Y: 28.20 m
X: 11.00 m Y: 28.20 m
X: 11.00 m Y: 34.90 m
X: 5.40 m Y: 44.80 m
X: -5.40 m Y: 44.80 m

Verified by: (sign)_____ (print)_____

```
  Tracking Point       : Datum
  Pitch and Roll Centre: Datum

  Selected Sources:-
   Primary Position : Manual
   Backup Position  : T6 Thales UKOOA (Using Antenna Offset : Gps_ae)
   Primary Heading  : Manual
   Primary Height   : Datum Displacement
   Pitch and Roll   : Manual
   Soundings        : Manual
   Speed            : Position Filter
   Course Made Good : Posn Filter CMG

  Equipment:-
   T6 Thales UKOOA
    Status:  ON   Interface: Sock3
    Antenna Offset Selected: Gps_ae
     X:    5.45 m Y:   43.63 m Z:    0.00 m Rng:   43.97 m Brg:  7.1°
    Apply Pitch Roll: Off  Stale Time: 5.0 s  Posn SD: 3.0 m  Ht SD: 1.0 m
    Update posn only when diff corrected
    Filter: Off  Time Constant:60.0 s  Sample Dwell: 0.5 s
    Gate: Off  Gate Width: 9.0 xSD  Minimum Gate: 0.0 m

   T1 Thales UKOOA
    Status:  ON   Interface: Sock1
    Antenna Offset Selected: Gps_ae
     X:    5.45 m Y:   43.63 m Z:    0.00 m Rng:   43.97 m Brg:  7.1°
    Apply Pitch Roll: Off  Stale Time: 5.0 s  Posn SD: 3.0 m  Ht SD: 1.0 m
    Update posn only when diff corrected
    Filter: Off  Time Constant:60.0 s  Sample Dwell: 0.5 s
    Gate: Off  Gate Width: 9.0 xSD  Minimum Gate: 0.0 m

   T2 Thales UKOOA
    Status:  ON   Interface: Sock2
    Antenna Offset Selected: Gps_ae
     X:    5.45 m Y:   43.63 m Z:    0.00 m Rng:   43.97 m Brg:  7.1°
    Apply Pitch Roll: Off  Stale Time: 5.0 s  Posn SD: 3.0 m  Ht SD: 1.0 m
    Update posn regardless of whether diff corrected
    Filter: Off  Time Constant:60.0 s  Sample Dwell: 0.5 s
    Gate: Off  Gate Width: 9.0 xSD  Minimum Gate: 0.0 m

   T3 Tracs TDMA Master
    Status:  OFF  Interface: COM7
    Antenna Offset Selected: Datum
     X:    0.00 m Y:    0.00 m Z:    0.00 m Rng:    0.00 m Brg:  0.0°

   S1 SGB 1000S
    Status:  ON   Interface: COM6
    C-O: -88.2 degs  Stale Time: 5.0 s  SD: 0.1 degs
     Filter: Off  Gate: Off  Time Constant: 5.0 s  Sample Dwell: 0.5 s

  Defined Offsets:-
   Datum
    X:    0.00 m Y:    0.00 m Z:    0.00 m Rng:    0.00 m Brg:  0.0°
   Gps_ae
    X:    5.45 m Y:   43.63 m Z:    0.00 m Rng:   43.97 m Brg:  7.1°
   Fairlead 7
    X:  -26.93 m Y:  -31.90 m Z:    0.00 m Rng:   41.75 m Brg:220.2°
   Fairlead 1
    X:  -26.93 m Y:   27.90 m Z:    0.00 m Rng:   38.78 m Brg:316.0°
```

Verified by: (sign)_____ (print)_____

LADY DAWN (ship)
  Shape Definition: Lady Dawn
   Line:-
    X: 0.00 m Y: 0.00 m
    X: 7.50 m Y: 0.00 m
    X: 7.50 m Y: 56.00 m
    X: 0.00 m Y: 69.00 m
    X: -7.50 m Y: 56.00 m
    X: -7.50 m Y: 0.00 m
    X: 0.00 m Y: 0.00 m

  Tracking Point   : Datum
  Pitch and Roll Centre: Datum

  Selected Sources:-
   Primary Position : T5 Tracs TDMA Remote (Using Antenna Offset : POD)
   Primary Heading : T5 Tracs TDMA Remote
   Primary Height   : Datum Displacement
   Pitch and Roll   : Manual
   Soundings   : Manual
   Speed   : Position Filter
   Course Made Good : Posn Filter CMG

  Equipment:-
   T5 Tracs TDMA Remote
    Status: ON   Interface: Not defined
    Antenna Offset Selected: POD
     X: 0.00 m Y: 51.00 m Z: 0.00 m Rng: 51.00 m Brg: 0.0°

  Defined Offsets:-
   Datum
    X: 0.00 m Y: 0.00 m Z: 0.00 m Rng: 0.00 m Brg: 0.0°
   POD
    X: 0.00 m Y: 51.00 m Z: 0.00 m Rng: 51.00 m Brg: 0.0°

P.CHALLENGER (ship)
  Shape Definition: P_Challenger
   Line:-
    X: -6.50 m Y: 0.00 m
    X: -6.50 m Y: 50.00 m
    X: 0.00 m Y: 63.00 m
    X: 6.50 m Y: 50.00 m
    X: 6.50 m Y: 0.00 m
    X: -6.50 m Y: 0.00 m

  Tracking Point   : Datum
  Pitch and Roll Centre: Datum

  Selected Sources:-
   Primary Position : T4 Tracs TDMA Remote (Using Antenna Offset : POD)
   Primary Heading : T4 Tracs TDMA Remote
   Primary Height   : Datum Displacement
   Pitch and Roll   : Manual
   Soundings   : Manual
   Speed   : Position Filter
   Course Made Good : Posn Filter CMG

  Equipment:-
   T4 Tracs TDMA Remote

Verified by: (sign)_____ (print)_____

GNS II CONFIGURATION FILE C:\Project Data\3612A3 Santos Casino-3 Ocean Epoc

Status: ON Interface: Not defined
Antenna Offset Selected: POD
X: -2.30 m Y: 54.00 m Z: 0.00 m Rng: 54.05 m Brg:357.6°

Defined Offsets:-
Datum
X: 0.00 m Y: 0.00 m Z: 0.00 m Rng: 0.00 m Brg: 0.0°
POD
X: -2.30 m Y: 54.00 m Z: 0.00 m Rng: 54.05 m Brg:357.6°

ANCHORS
Ocean Epoch
Fairleads:-

Name	X	Y	Z	Rng	Brg
Fairlead 1	-26.93 m	27.90 m	0.00 m	38.78 m	316.0°
Fairlead 2	-26.93 m	31.90 m	0.00 m	41.75 m	319.8°
Fairlead 3	26.93 m	31.90 m	0.00 m	41.75 m	40.2°
Fairlead 4	26.93 m	27.90 m	0.00 m	38.78 m	44.0°
Fairlead 5	26.93 m	-27.90 m	0.00 m	38.78 m	136.0°
Fairlead 6	26.93 m	-31.90 m	0.00 m	41.75 m	139.8°
Fairlead 7	-26.93 m	-31.90 m	0.00 m	41.75 m	220.2°
Fairlead 8	-26.93 m	-27.90 m	0.00 m	38.78 m	224.0°

Main Intended Positions:-

Name	Easting	Northing	Depth	Tolerance
Anchor 1	650670.73	5705500.08	0.00 m	30.00 m
Anchor 2	650128.41	5705656.46	0.00 m	30.00 m
Anchor 3	649576.87	5706655.03	0.00 m	30.00 m
Anchor 4	649733.27	5707197.35	0.00 m	30.00 m
Anchor 5	650737.09	5707751.79	0.00 m	30.00 m
Anchor 6	651279.41	5707595.40	0.00 m	30.00 m
Anchor 7	651830.95	5706596.82	0.00 m	30.00 m
Anchor 8	651674.55	5706054.50	0.00 m	30.00 m

Main Actual Positions:-

Name	Easting	Northing	Depth	Tolerance
Anchor 1	650683.40	5705448.00	68.08 m	30.00 m
Anchor 2	650091.40	5705609.77	67.99 m	30.00 m
Anchor 3	649616.47	5706651.57	68.08 m	30.00 m
Anchor 4	649683.19	5707223.92	67.96 m	30.00 m
Anchor 5	650725.51	5707776.31	68.07 m	30.00 m
Anchor 6	651287.29	5707601.07	67.99 m	30.00 m
Anchor 7	651889.23	5706595.85	68.04 m	30.00 m
Anchor 8	651682.69	5706048.90	67.97 m	30.00 m

Verified by: (sign)_____ (print)_____

APPENDIX J

DAILY REPORT SHEETS

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:10-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix		
SkyFix Spot		
Gyro		
GNS 2		
MultiFix 3		
GRREP		
Tracs		

Equipment	Op	
AHV's		
TRACS		
Fluxgate		

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Friday, 10 October 2003**
0905	Thales personnel depart Perth(UTC+8.00)
1450	Arrive Melbourne.
1520	Depart Melbourne for Mt Gambier.
1600	Arrive Mt Gambier(UTC+9.50).
1645	Check into Commodore Motel(UTC+9.50).

Forms are to be completed daily in duplicate on all vessels. Each form should be countersigned by the Clients Representative, the original being retained on board until the next crew change or at the end of job, whichever is the earlier, when they should be returned to the PERTH office.

Signature _____
SURVEYOR/ENGINEER

WHITE	: Accounts Department
BLUE	:Operations Department
YELLOW	: Clients Representative

Signature _____
CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:11-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix		
SkyFix Spot		
Gyro		
GNS 2		
MultiFix 3		
GRREP		
Tracs		

Equipment	Op	
AHV's		
TRACS		
Fluxgate		

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
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0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Saturday, 11 October 2003**
1315	Check out of Commodore Motel(UTC+9.50).
1430	Depart Mt Gambier for Ocean Epoch(UTC+9.50).
1600	Arrive Ocean Epoch.
1630	Thales personnel attend rig induction.
1800	Complete rig induction. Rig under tow.

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SURVEYOR/ENGINEER

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BLUE	:Operations Department
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Signature _____
CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:12-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	1
Fluxgate	✓	1

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
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0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Sunday, 12 October 2003**
0001	Rig still under tow.
0700	Commence mobilisation.
1100	Mobilisation complete.
1200	GNS2 and Mulitifix3 operational.
1400	Lady Dawn TRACS online. Power supply problem to the Geopod onboard P.Challenger unable to bring on line, unable to correct problem because P.Challenger on tow bridle, BL to be transferred at a later date to correct.
1615	Antenna offsets measured X=+5.45m Y=43.63m, entered into GNS2.
1815	Gyrocompass calibration sun obs commenced.
1825	Sun obs complete, C-O of -88.2° entered into GNS2
1900	Winch offsets measured.
2359	Rig still under tow.

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Signature _____ SURVEYOR/ENGINEER

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YELLOW	: Clients Representative

Signature _____ CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:13-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	1
Fluxgate	✓	1

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
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0600			
1200			
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DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Monday, 13 October 2003**
0001	Rig still under tow.
0754	Rig at WP1, L.Dawn experiencing trouble with heading from fluxgate
0830	L.Dawn experiencing mechanical problems cannot shorten up, waiting for repairs.
0900	Tow vessels shortening up.
1030	Rig at WP2.
1042	100ft paid out on #7.
1110	#7 on bottom, 651855.9 E 5706596.4 N
1133	Rig on location.
1140	L.Dawn shortening tow wire.
1200	L.Dawn stopped shortening for helicopter.
1230	L.Dawn shortening tow wire.
1245	Tow bridal passed from L.Dawn to rig.
1255	BL transferred to L.Dawn to correct problem with Fluxgate.
1302	#3 assigned to L.Dawn.
1329	#3 PCC passed to L.Dawn.
1345	L.Dawn experiencing winch problems.
1705	Repairs complete to L.Dawn winch.
1718	L.Dawn running out #3.
1722	All stop on runout rig has winch motor problem.
1738	#3 on bottom, 650310.3 E 5706654.1 N.
1840	L.Dawn recovering #3.
1911	L.Dawn running out #3.
1931	#3 on bottom, 649498.2 E 5706654.1 N.
2007	#3 PCC passed back to rig.

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BLUE	:Operations Department
YELLOW	: Clients Representative

Signature _____ CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:13-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	1
Fluxgate	✓	1

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Monday, 13 October 2003**
2016	#6 assigned to L.Dawn.
2042	#6 PCC passed to L.Dawn.
2052	L.Dawn running out #6.
2159	#6 on bottom, 651365.2 E 57707728.8 N.
2229	#6 PCC passed to rig.
2238	#2 assigned to L.Dawn.
2259	#2 PCC passed to L.Dawn.
2319	L.Dawn running out #2.
2336	#2 on bottom, 650058.9 E 5705556.6N.
2359	Challenger shortening tow wire.

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SURVEYOR/ENGINEER

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BLUE	:Operations Department
YELLOW	: Clients Representative

Signature _____
CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:14-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	1
Fluxgate	✓	1

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Tuesday,14 October 2003**
0006	#2 PCC passed to rig.
0012	#5 anchor assigned to L.Dawn.
0035	PCC passed to L.Dawn.
0043	L.Dawn running #5.
0045	P.Challenger released from tow bridle.
0103	#5 on bottom, 650729.0 E 5705838.8 N.
0120	#5 not holding tension, preparing to reset.
0135	#5 lifted from seabed.
0201	#5 on bottom, 650730.9 E 5707635.0 N.
0203	#5 not holding tension, anchor upside down preparing to reset.
0204	#5 L.Dawn recovering #5.
0216	#5 turned right way round, preparing to deploy.
0229	#5 on bottom, 650726.5 E 5707849.9 N.
0307	#5 PCC passed back to rig.
0322	#1 assigned to L.Dawn.
0332	#1 PPC passed to L.Dawn.
0345	P.Challenger offloading pot and drill water.
0346	L.Dawn running out #1.
0408	#1 on bottom, 650683.1 E 5705390.9 N.
0430	L.Dawn position jumping, number of SVs jumping between 4 & 7 effecting position, Rig SVs staying steady.
0442	#1 PCC passed back to rig.
0630	TRACS operating correctly.
0631	#4 assigned to L.Dawn.
0633	#1 PCC passed to L.Dawn.
0644	L.Dawn running #4.

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BLUE :Operations Department

Signature _____ CLIENT REPRESENTATIVE

YELLOW : Clients Representative

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:14-10-03 Client:Santos Job No.:3612A3 Vessel:Ocean Epoch Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	1
Fluxgate	✓	1

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Tuesday,14 October 2003**
0700	P.Challenger departs for Portland.
0705	#4 on bottom, 649603.3 E 5707272.3 N.
0735	#4 PCC passed back to rig.
0739	#8 assigned to L.Dawn.
0749	#8 PCC passed to L.Dawn.
0757	L.Dawn running #8.
0820	#8 on bottom, 651782.7 E 5705989.3 N.
0827	Rig starts ballasting down to drilling draft.
0849	#8 PCC passed back to rig.
1230	Ballasting complete, at 55' draft.
1330	BL transferred to L.Dawn to check TRACS system.
1430	BL returned to rig.
1500	Spud in.
1627	Commence final fix.
1727	Complete final fix, drill stem is 1.46m on a bearing of 100.1°(T) from the intended location.
1805	Notified by Santos company man that rig is moving due to the well being out of vertical tolerances.
1910	Rig repositioning approx 5m towards the bow.
1924	Repositioning complete.
2010	Spudded in.
2015	Commence final fix.
2115	Complete final fix, drill stem 6.37m on a bearing of 215.5°(T) from intended location.
	Thales personnel on standby, waiting for 30' casing to be put run.

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YELLOW : Clients Representative

Signature _____ CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:15-10-03	Client:Santos	Job No.:3612A3	Vessel:Ocean Epoch	Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix	✓	
SkyFix Spot	✓	2
Gyro	✓	
GNS 2	✓	
MultiFix 3	✓	
GRREP	✓	
Tracs	✓	

Equipment	Op	
AHV's		
TRACS	✓	2
Fluxgate	✓	2

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Wednesday, 15 October 2003**
0001	Thales personnel on standby for 30' casing run in.
1200	Thales personnel on standby for 30' casing run in.
1515	BL transferred to P.Challenger to correct problem with TRACS system.
1540	TRACS system onboard P.Challenger operational, power supply unit replaced.
1745	BL transferred to Ocean Epoch.
1830	30' casing landed.
1905	Notified by Santos company man Thales equipment now able to be demobed.
1930	Commence demob.
2030	Demob suspended due to high winds and poor light outside, cannot safely access container.

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Signature _____
SURVEYOR/ENGINEER

WHITE	: Accounts Department
BLUE	:Operations Department
YELLOW	: Clients Representative

Signature _____
CLIENT REPRESENTATIVE

THALES GEOSOLUTIONS (AUSTRALASIA) LIMITED
DAILY RECORD SHEET

Date:16-10-03 Client:Santos Job No.:3612A3 Vessel:Ocean Epoch Location:Casino-3

Equipment	Op	
Ocean Epoch		
SkyFix		
SkyFix Spot		
Gyro		
GNS 2		
MultiFix 3		
GRREP		
Tracs		

Equipment	Op	
AHV's		
TRACS		
Fluxgate		

Thales Personnel
M.Elmslie(ME)
B.Lobban(BL)
Client Personnel
G.Howard

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS

TIME	Time Zone=UTC+10.00 **Thursday, 16 October 2003**
0630	Recommence demob.
0710	Demob complete.
1400	Thales personnel depart rig for Essedon via helicopter.
1500	Arrive Essedon airport.
1530	Thales personnel transfer to Melbourne airport.
2000	Depart Melbourne for Perth.
2200	Arrive Perth(UTC+8.0)

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SURVEYOR/ENGINEER

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YELLOW : Clients Representative

Signature _____
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