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Santos

10 March 2010

Dr A V Brown
Director of Mines
Department of Infrastructure, Energy and Resources
Mineral Resources Tasmania
PO Box 56
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Dear Dr Brown

Re: Exploration Permit T/36P – Seismic Interpretation Report

Santos Offshore Pty Ltd as Operator of Exploration Permit T/36P hereby submits the SOSN08B Strahan 3D Seismic Interpretation Report.

If you have any further questions, please do not hesitate to contact me on 08 8116 7644.

Kind Regards

Peter Vincent
Manager Reservoir Studies
Eastern Australia

Seismic Interpretation Report

Exploration Permit T/36P

SOSN08B Strahan 3D Seismic Survey

Prepared for and on behalf of:

T/36P Joint Venture

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Introduction

The SOSN08B Strahan 3D Seismic Survey was acquired by Santos in April 2008 in accordance with the T/36P Permit work commitments for Permit Year 5.

Acquisition occurred between 09 April and 22 April 2008. The survey was acquired by the PGS MV Pacific Explorer seismic vessel. A total of 255.7 km^2 of seismic data were acquired (Figure 2).

All processing was undertaken at the CGGVeritas office in Perth, Western Australia. Processing commenced in April 2008 and was completed in December 2008.

Permit History

Exploration Permit T/36P is located in the Sorell Basin, offshore, western Tasmania (Figure 1), and was awarded to Santos Offshore Pty Ltd and Unocal South Australia Pty Ltd on 27 November 2003 for an initial term of 6 years.

The permit is assessed to contain 64 whole, and 18 part, (82 total) graticular blocks covering an area of approximately 4628 km^2 (GDA).

In 2005 Unocal South Australia Pty Ltd was taken over by Chevron Australia (SE Australia) Pty Ltd.

On 3 July 2008 notification was received that Perenco (SE Australia) Pty Ltd purchased Chevron Australia (SE Australia) Pty Ltd.

Santos Offshore Pty Ltd is Operator of the Permit. The current interest holders in the permit are :

Table 1: T/36P Permit Equity Distribution

Company	Percentage Interest
Santos Offshore Pty Ltd (Operator)	50%
Perenco (SE Australia) Pty Ltd	50%

The work obligations for Exploration Permit T/36P are set out below:

Table 2: T/36P Permit Work Requirements.

PERMIT YEAR *(Duration)*	PRIMARY WORK PROGRAM	INDICATIVE EXPENDITURE
One *(27 November 2003 – 26 November 2004)*	Reprocess 1100 km 2D seismic data; G&G and environmental studies	$500,000
Two *(27 November 2004 – 26 November 2005)*	Acquisition of 576 km of 2D seismic data and G&G studies	$1,200,000
Three *(27 November 2005 – 26 November 2006)*	G & G studies (seismic mapping)	$400,000
	TOTAL FIRM PROGRAM	**$2,100,000**

PERMIT YEAR (Duration)	SECONDARY WORK PROGRAM	INDICATIVE EXPENDITURE
Four *(27 November 2006 – 26 November 2007)*	G&G studies and 3D design	$500,000
Five *(27 November 2007 – 26 February 2010)*	Acquisition of 210 km^2 of 3D seismic data, G&G studies and detailed well design	$3,800,000
Six *(27 February 2010 – 26 February 2011)*	Drill one exploration well	$11,000,000
	TOTAL SECONDARY PROGRAM	**$15,300,000**

Exploration History

Permit T/36P was gazetted in 2003 as area T03-4 (Figure 1). Santos and Joint Venture partner Unocal were awarded the permit on 27 November 2003.

The permit contained one exploration well, Cape Sorell-1, drilled in 1982 by Amoco, and several vintages of 2D seismic data of variable quality and coverage.

One ODP well is located near the permit. The ODP 1168 well, drilled as part of the Ocean Drilling Program, prior to award, is located approximately 14 km to the south west of T/36P in 2463 m of water (Figure 1).

The nearest offshore exploration wells in the Sorell Basin at the time of award were Clam-1, Whelk-1 and Prawn A-1. All of these wells are located north of the permit in the Sorell Basin.

No new wells were drilled within the permit by the Joint Venture.

Table 3a: Wells drilled within the T/36P permit area

Well Name	Operator	Spud Date	TD mKB	Status
Cape Sorell-1	Amoco	05/07/1982	3528	P&A

Table 3b: Wells drilled in the Sorell Basin surrounding permit T/36P

Well Name	Operator	Spud Date	TD mKB	Status
Prawn A-1	Esso	29/12/1967	3193	P&A
Clam-1	Esso	19/07/1969	1622	P&A
Whelk-1	Esso	06/03/1970	1466	P&A
ODP 1168	ODP	17/03/2000	3358	P&A
Jarver-1	Santos	16/05/2008	3062	P&A

Described below are the results of key offshore wells relevant to the T/36P exploration permit. Well completion reports issued by the Operator and the updated interpretation of seismic data provide the primary source of information for detailing the exploration history. No new wells have been drilled on the permit since Cape Sorell-1 in 1982.

Cape Sorell-1 (Amoco, 1982). Drilled within the T/36P permit to a depth of 3528 m. Sand-rich Upper Cretaceous sediments were penetrated deeper in the well and live oil shows were recorded in the Maastrichtian Timboon Formation equivalent from 3170m to near the bottom of the hole at 3445 m. Few significant seals were encountered above 3050 m. Interbedded sands from 3050 m to TD have poor to moderate porosities (10-15%).

Prawn A-1 (Esso, 1967). Intersected 712 m of Waarre Formation equivalent. Measured porosities in the sandstone exceeded 20% with permeabilities up to 235 mD.

Clam-1 (Esso, 1969). Tested structural closure of the basal Tertiary and updip pinchout of Cretaceous sediments against the Clam High. Good reservoir sandstones with porosities up to 20% were intersected. Clam-1 reached a depth of only 1592 m, intersecting interpreted Devonian conglomerates on Pre-Cambrian metamorphic basement. The penetrated sedimentary section is immature for hydrocarbon generation.

Whelk-1 (Esso, 1970). Drilled an anticlinal closure to test anticipated Waarre Formation sandstones with good reservoir characteristics. Although 94 m of Waarre Sandstone was intersected, top seal (Belfast Mudstone) lithologies were not developed.

Jarver-1 (Santos, 2008). Drilled an anticlinal closure at Thylacine Member level. No hydrocarbons were intersected in the borehole, with only minor fluorescence observed in the Paaratte Fm.

Geology and Hydrocarbon Prospectivity

Permit T/36P is situated in the Sorell Basin at the south-eastern end of Australian Southern Margin. The Australian Southern Margins basin-trend was formed during the separation of the Antarctic and Australian plates commencing in the Late Jurassic. The basin is an extensional passive margin basin that formed as part of the Southern Rift System during the Late Jurassic-Late Cretaceous in reaction to the continued breakup of the Gondwanan Supercontinent. There are four distinct sub-basins in the Sorell Basin: the King Island, in the north, followed by Sandy Cape, Strahan and Port Davey Sub-Basins in the south. Permit T/36P encompasses the Strahan Sub-Basin, which contains in excess of 8 km of sedimentary section.

Basin formation in the Southern Margins of Australia originated with the onset of rifting of the Gondwana continent in the Late Jurassic. Continental stretching resulted in the deposition of a variety of coarse-grained clastics through to lacustrine sediments into restricted grabens and half-grabens (The Crayfish Sub-group). This was succeeded by regional subsidence and the deposition of widespread, in-part volcanogenic, sediments of the Eumeralla Formation. It is uncertain whether these Early Cretaceous Otway Group sediments are present in the Strahan Sub-Basin.

Inversion resulted in widespread uplift and erosion in the Late Cretaceous (Cenomanian / K70 Unconformity) before a second rifting episode ensued with deposition of the Shipwreck (Waarre/Flaxman/Belfast A/B formations) and Sherbrook Group (Paaratte formation/Timboon sandstone) equivalents.

The Sorell Basin is oriented at an oblique angle to the Australian/Antarctic rifting extension direction. This has resulted in a strong sinistral strike-slip component to the extension. Whilst sea-floor spreading initiated in the Great Australia Bight during the Cenomanian, the Antarctic Plate remained attached to Tasmania until the Late Eocene, at which time the continents finally separated and rapid sea-floor spreading began. The opening of the Antarctic-Tasmanian seaway resulted in the development of the circum-Antarctic current and the ensuing period has been dominated by the deposition of cool-water carbonates (bryozoan-dominated) through to present day.

The Strahan Sub-Basin is imaged as a series of half-grabens initiated during the oblique extension phase in the Cretaceous with movement of basin-bounding faults along pre-existing lines of weakness. This has allowed deepening of the Crayfish and Eumeralla formations and has accommodated significant sediment infill of Late Cretaceous and younger sediments. The estimated sediment thickness up to 8 km is deemed adequate for hydrocarbon maturity. While results to date show possible indications of a working hydrocarbon system (live oil at Cape Sorell-1, occurrence of sea floor gas, and possible gas chimneys visible on seismic data), separate modelling studies show potential source presence and migration pathways through the permit, and detailed mapping studies support the existence of reservoir & seal couplets and attractive structures, so far only a single well, Cape Sorell-1, has been drilled within this sub-basin. Cape Sorell-1, drilled in 1982 by Amoco reached a total depth of 3798 mKB, and is recorded as having intersected oil shows in the Maastrichtian section. The well is interpreted as having failed due to inadequate seal.

The Sorell Basin shares many of the stratigraphic and structural influences of the adjacent Otway Basin, where nine offshore discoveries have been made to date proving in excess of 1.6 TCF recoverable gas. The Sorell Basin is influenced by the interaction of the Antarctic continent and Tasmania where the highly oblique angle of the Sorell Basin to the Australian/Antarctic rifting extension direction has resulted in a strong sinistral strike-slip component to the extension. This has included large extensional faults which not only bound the Strahan Sub-Basin to the east and north but which have also resulted in locally discrete structural timing. A revised stratigraphic chart for the Sorell Basin is presented in Figure 3b.

Seismic Mapping

Area and Data Mapped

The SOSN08B Sorell 3D seismic survey is located in the southeast of Permit T/36P (Figure 2). The survey, which covers an area of approximately 256 km^2, was designed to image the Olive and Sunflower Prospects and to mature them to drillable status. The 3D survey is intersected by the previously acquired SS04 2D survey which comprised the Joint Venture's Permit Year 2 commitment, and by older vintage 2D seismic data, including 2D data reprocessed as part of the Joint Venture's Permit Year 1 commitment.

Interpretation Methodology

Paradigm 3D Canvas and Schlumberger GeoFrame-IESX interpretation systems were used in the structural interpretation of this seismic data.

Seismic interpretation was undertaken using primarily the all-offset pre-stack time migrated volume, with reference to the near, mid and far angle stacks. Coherency volumes (which assist with the fault mapping) and intercept, gradient and Scaled Poisson's Ratio volumes (which assist with fluid and lithology analysis) were used to support the interpretation. Detailed seismic stratigraphic interpretation, referenced by new Palynological data from Cape Sorell-1, was carried out and helped derive a much greater and more detailed understanding of the geology. This was facilitated by the high quality of the Strahan 3D data. Mapped horizons on the new SOSN08B Strahan 3D data were tied to synthetics at the Cape Sorell-1 well (Figure 4) using available 2D lines.

Horizons Interpreted

Key horizons interpreted included the water bottom (WB), top Wangerrip Group (T20), top Lower Pebble Point (T10), near base Tertiary (T5), Maastrichtian / Top Upper Timboon (K110), and Basement. A typical seismic line showing the interpretation is provided in Figure 7. Seismic amplitudes on the T5 horizon do not show conformance to structure although they are elevated over the prospect relative to the surrounding canyon cuts (Enclosure 7). Most major faults were clearly imaged on the Strahan 3D seismic data and were easily interpreted. Isochore maps, in particular between the near base Tertiary and Maastrichtian / Top Upper Timboon were successfully used to understand the depositional architecture near the K/T boundary within the study area containing the Greater Olive prospect.

Depth Conversion

Depth conversion was undertaken using 3D seismic velocities. Cape Sorell 1 well velocity data were available within the permit, but not within the 3D survey outline. Seismic velocities provide a more accurate velocity field for depth conversion than regional time-depth trends. Therefore RMS stacking velocities were converted to interval velocities and average velocities using Paradigm software and were then used to depth convert the 5 key time horizons. Final depth maps within the Strahan 3D were not tied to wells, but regional horizons could be tied to the depth picks at Cape Sorell-1.

Structure Maps Prepared

Structure maps prepared include the water bottom (WB), top Wangerrip Group (T20), top Lower Pebble Point (T10), base Tertiary (T5), Maastrichtian / Top Upper Timboon (K110), and Basement. Final depth maps, and an amplitude map are provided in Enclosures 1 – 7.

Discussion of Seismic Record Quality

Prior to the start of acquisition, weather conditions were extremely bad with 80 knot winds and 12-14 metre seas. Acquisition was partly delayed by 8 days due to the bad weather. Towards the start of acquisition, conditions had improved, but were still poor, with 5 m sea swells delaying streamer deployment. Continued improvement in weather conditions for 4 days allowed good production except for 24 hours of poor weather, when acquisition was suspended with swells exceeding 5 m. Acquisition continued through gradually improving weather conditions resulting in all but two acquisition sequences (41 and 42) being acquired. At the end of acquisition, seas were down to 2 m swells, and the survey was completed with reshoots of lines impacted by swell noise, equipment failure and cetacean sightings after 14 days from start of acquisition.

Sail direction during acquisition was oriented approximately SSE. This helped reduce effects of swell noise. With dips of the subsurface reflectors predominantly to the NNW this direction provided adequate imaging of the moderately dipping water bottom and subsurface reflectors.

The SOSN08B Sorell 3D was processed by pre-stack time migration (PSTM). Due to the rough weather conditions during recording considerable time was spent mitigating the resultant noise problems. A fast track post-stack migration was carried out, but tests showed that the PSTM delivered improvements over the fast track in aspects of band-width, continuity and fault definition. In view of these improvements it was decided to continue with the more comprehensive PSTM processing. It is recognised that Pre-stack time migration requires more processing time than post-stack time migration and extensions to Permit Year 5 were approved to allow this processing to be completed. The final data comparison showed that the PSTM delivered about 10% uplift in quality over the post stack time migration, but was deemed appropriate as is demonstrated by the excellent quality of the final seismic data.

Most of the SOSN08B Sorell 3D seismic data are of excellent quality (Figures 5, 6b and 7). Imaging quality is reduced near the centre of the survey where large faults and an intrusive feature create steep dips, which are hard to image (Figure 5). Key events are generally still mappable in these areas, but with reduced confidence.

The quality of the SOSN08B Sorell 3D seismic survey is significantly better than the older vintage 2D seismic data, but is comparable with reprocessed seismic data (Figure 6). The greatest value of the Strahan 3D comes from its 3-dimensional, dense coverage (25 x 6.25 m bin width) and its ability to image the subsurface in detail.

Play Types

The key play types targeted by this survey are Cretaceous in age, with the primary being Late Cretaceous Uppermost Timboon highstand shoreface sandstones providing reservoir in the form of an erosional remnant, Wangerrip Group equivalent shales supplemented by composite deep-marine shale-filled canyons providing top and side seals respectively, and clinoform toeset muds coeval with the intraformational Massacre Shale providing base seal. Additional play types considered may be provided by Late Cretaceous incised valley-fill (late lowstand fluvial and early transgressive estuarine sands) bound within the Massacre (Upper Timboon equivalent) and also by the underlying Middle Timboon Sandstone. Hydrocarbons sourced from expected mature oil prone Timboon & Eumeralla coals and carbonaceous shales within deepened and rotated fault blocks in the vicinity are expected to provide charge. These plays are analogous in part to plays in the Gipsland Basin, for example in fields such as the Blackback / Terakihi field.

Leads and Prospects

Prior to acquisition of the SOSN08B Sorell 3D survey, there were five identified prospects and leads within Permit T/36P, namely Olive, Sunflower, Macadamia, Almond and Flaxseed. The Sorell 3D survey was designed to image the Olive, Sunflower and Macadamia prospects and mature them to drillable status.

Following interpretation, the Olive and Sunflower prospects were determined to be the same prospect, separated by a fault, and were merged into a single prospect called Greater Olive.

Macadamia was removed from the prospect and lead inventory due to reservoir risk and small size.

Interpretation of amplitude data over the Greater Olive Prospect shows that raised amplitudes do not appear to conform to structural closure or an easily identifiable stratigraphic trap as indicated previously on 2D seismic data. This remaining amplitude character is now believed to be partly related to lithology, although cause by oil charge can not be ruled out. Following interpretation, the Greater Olive prospect remains; albeit with an increased seal risk.

Greater Olive

This prospect was previously interpreted on 2D data as two prospects: Olive and Sunflower. Raised amplitudes and discordant dips that appeared horizontal-to-sub-horizontal in places and a possible structural conformance of an onset of higher amplitudes were considered possible indicators of presence of gas and present day GWC.

Detailed seismic stratigraphic interpretation of the SOSN08B Sorell 3D seismic data, coupled with additional palynological studies has determined that the sub horizontal events are part of a Late Cretaceous incised valley system, corresponding to the Massacre Shale and underlying Middle Timboon Sansdstone and hence are likely to be lithological in nature. The corresponding sand-shale couplets do provide a potential secondary target, but with the current mapping this target is not considered material due to high seal risk and small size.

The primary reservoir target at Greater Olive is an erosional remnant of Latest Cretaceous age, laterally bound by composite, transpressionally amplified, deep-marine shale-filed canyons. From Seismic Stratigraphy analogues it is expected to contain good quality, highly porous and permeable shoreface sands. The top seal to this Uppermost Timboon highstand shoreface sandstone reservoir is postulated to be the interpreted overlying Wangerrip Group equivalent shale, and lateral seal is provided by the aforementioned composite deep-marine canyons.

There is considerable uncertainty about the composition of the canyon fill and whether they are shale-filled and deep enough to provide seal. This uncertainty is attributed as the main risk.

While higher amplitudes are mapped at Greater Olive, these show only mild conformance with structure. The lack of compelling amplitude data could be due to hydrocarbon phase being oil, although this cannot be confirmed from the seismic data, as the acoustic properties of an oil-filled reservoir are similar to a wet reservoir.

With the high risk on seal, and the likelihood that observed amplitudes are related to lithology, rather than fluid content, the Greater Olive prospect remains high risk.

Conclusions

The SOSN08B Sorell 3D seismic dataset is of excellent quality. It is significantly better quality than the older vintage 2D data, and generally better quality than the more recently acquired, or reprocessed 2D surveys. The improvement in imaging provided by the high quality 3D acquisition (despite heavy weather during acquisition), coupled with pre-stack time migration justifies the extra care and time required.

Interpretation of the 3D survey is significantly easier than on the previous 2D dataset and certainly much more informative. The confidence in picking seismic horizons on the 3D is only reduced in localised areas, namely around the intrusive feature in the centre of the survey and at the edges of the survey, in particular to the south east, where the geologic section thins as the basement shallows.

Interpretation of the SOSN08B Sorell 3D seismic data has provided much clearer imaging of the subsurface and has enabled detailed seismic stratigraphic analysis to yield a greatly improved and more detailed understanding of the Greater Olive prospect and surrounding area.

While the Greater Olive prospect is the best-defined undrilled prospect in the permit, there appears to be no amplitude conformance associated with the Greater Olive prospect. This lack of amplitude support substantially increases risk on presence of hydrocarbons. Greater Olive and other prospects within the permit would be more attractive if an oil case could be proven.

Despite the benefits provided by the Strahan 3D seismic survey, the Greater Olive prospect remains high risk, particularly the seal risk, and relatively small.

Figures

Permit Location Map

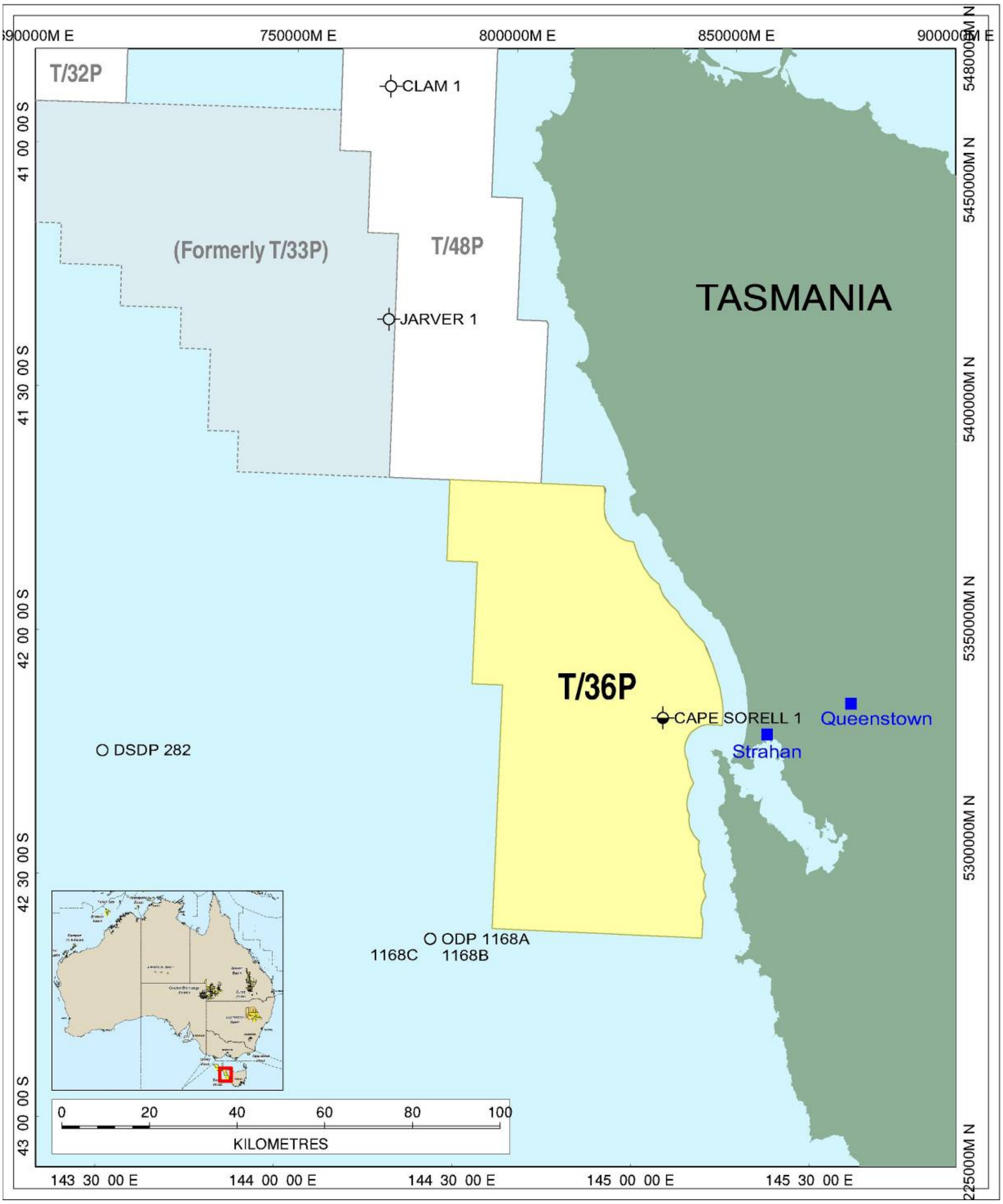


Figure 1. Exploration Permit T/36P Location Map. Exploration wells, an Ocean Drilling Project / Deep-Sea Drilling Project sites shown.

Data Location Map

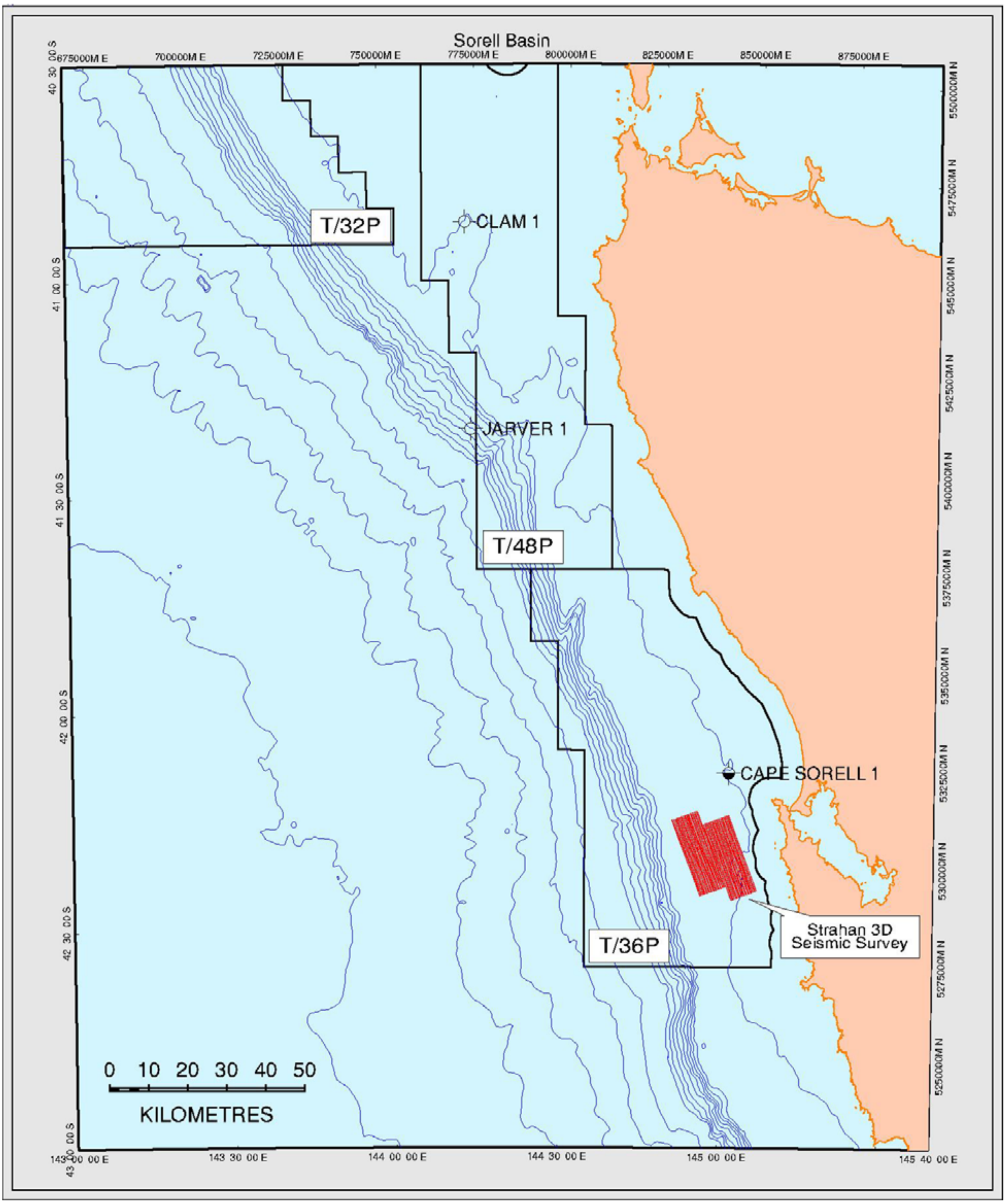


Figure 2a. Map showing Strahan 3D Seismic Survey Location within T/36P permit area.

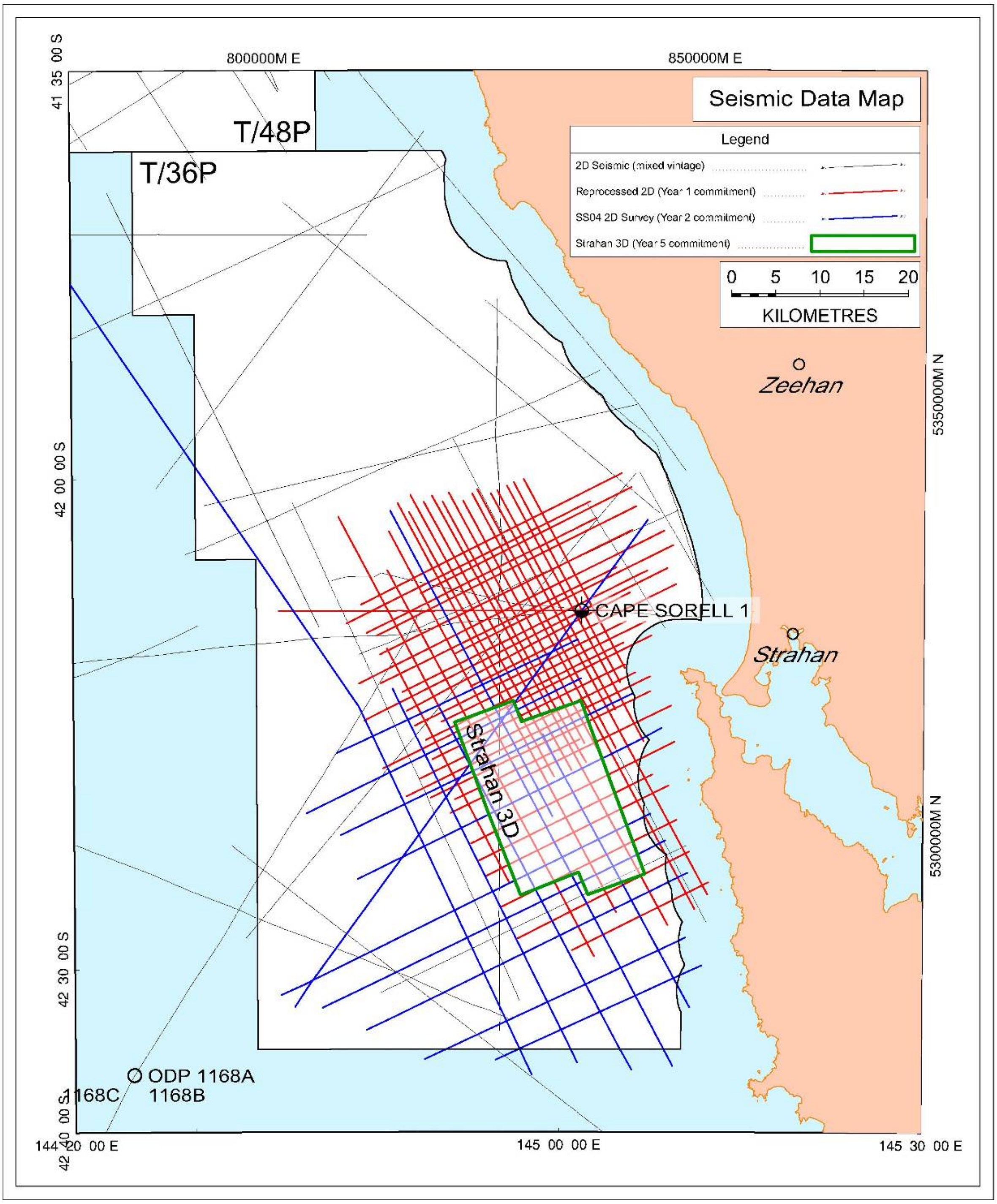


Figure 2b. Location of Strahan 3D in the T/36P area with previous 2D seismic surveys

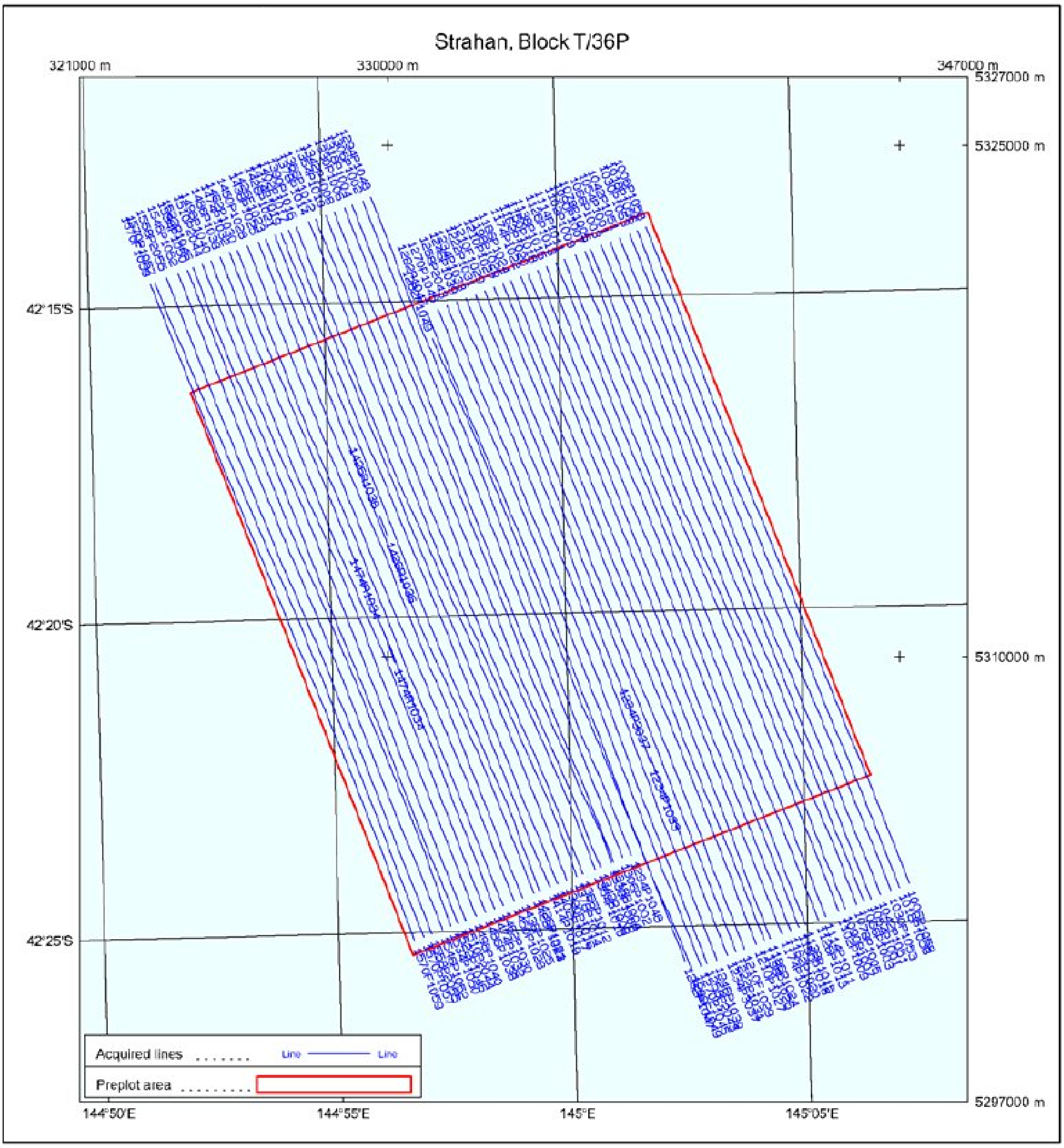


Figure 2c. Strahan 3D Seismic Survey Location Map, showing acquired lines and extent of full fold area.

Stratigraphic Chart

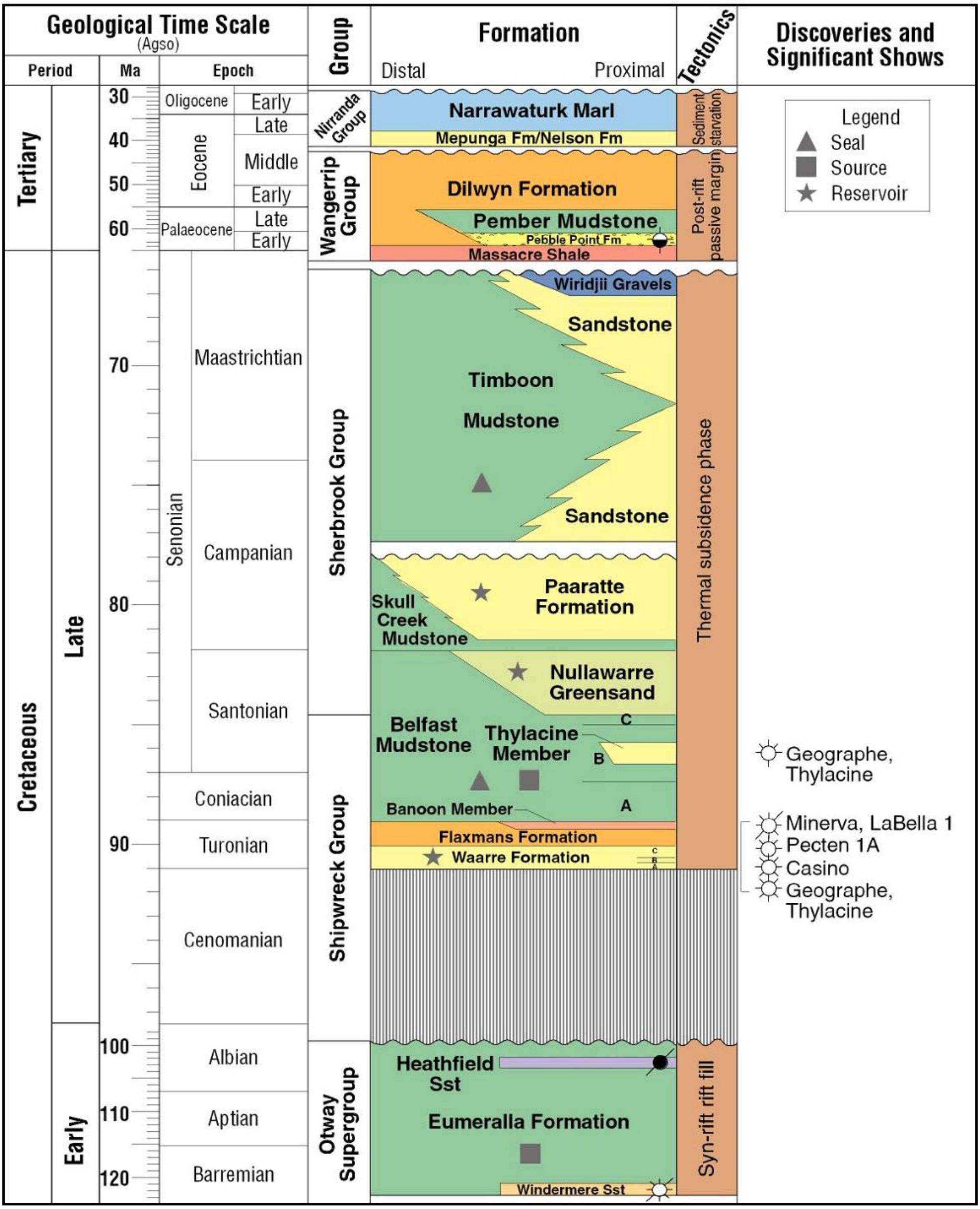


Figure 3a: Stratigraphy of the Sorell Basin

Stratigraphic Column - Sorell Basin

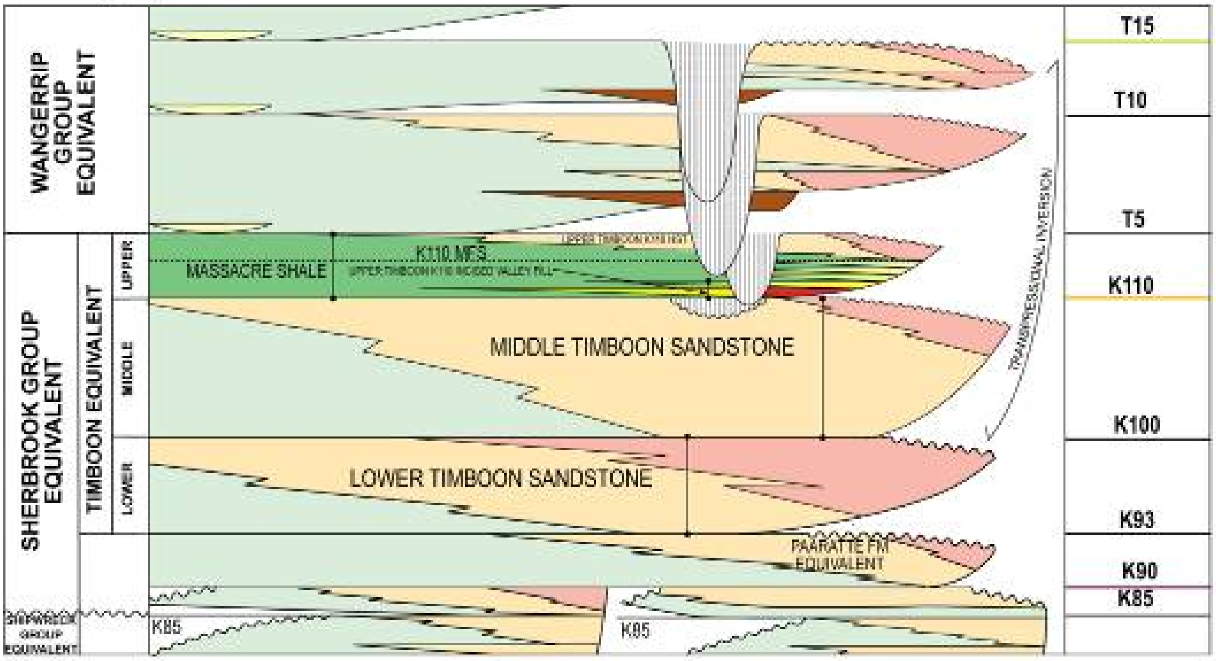


Figure 3b: Detailed, revised Late Cretaceous and Palaeocene stratigraphy, showing incised valley fill architecture within Upper Timboon and Lower Wangerrip Group.

Synthetic Seismograms

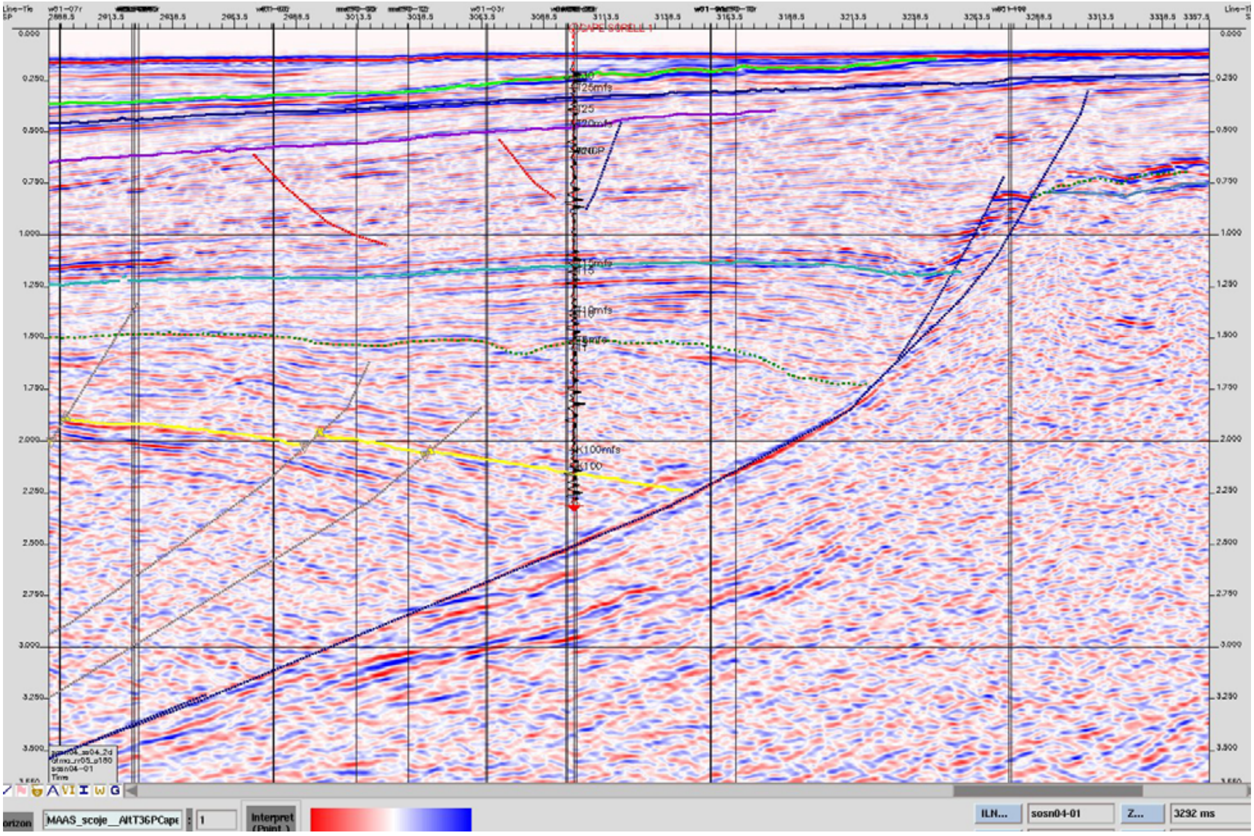


Figure 4. Synthetic seismogram at Cape Sorell 1 on 2D line SOSN04-01, outside the Strahan 3D.

Seismic Data Quality

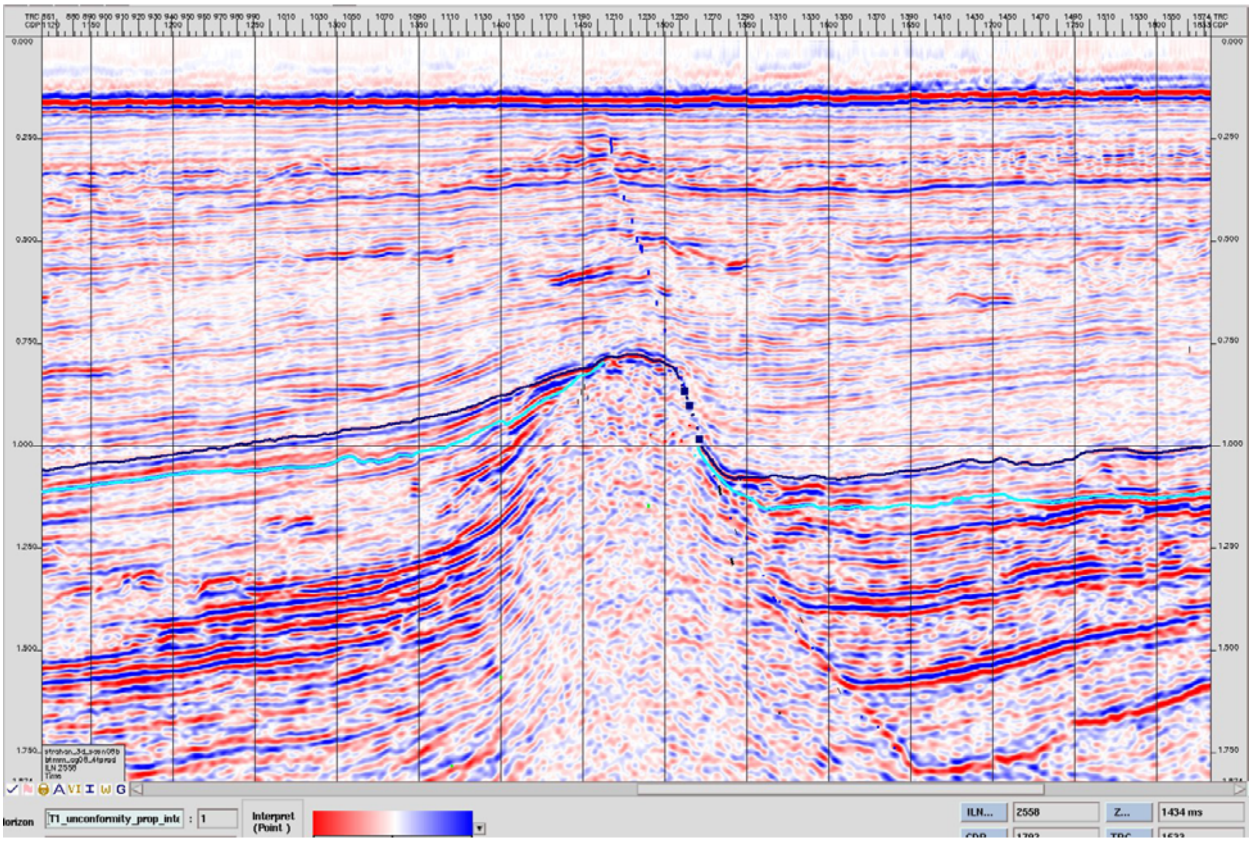


Figure 5. Strahan 3D, IL 2558 showing the presence of an intrusive body resulting in signal deterioration associated with steep dips.

Seismic Data Quality Comparison

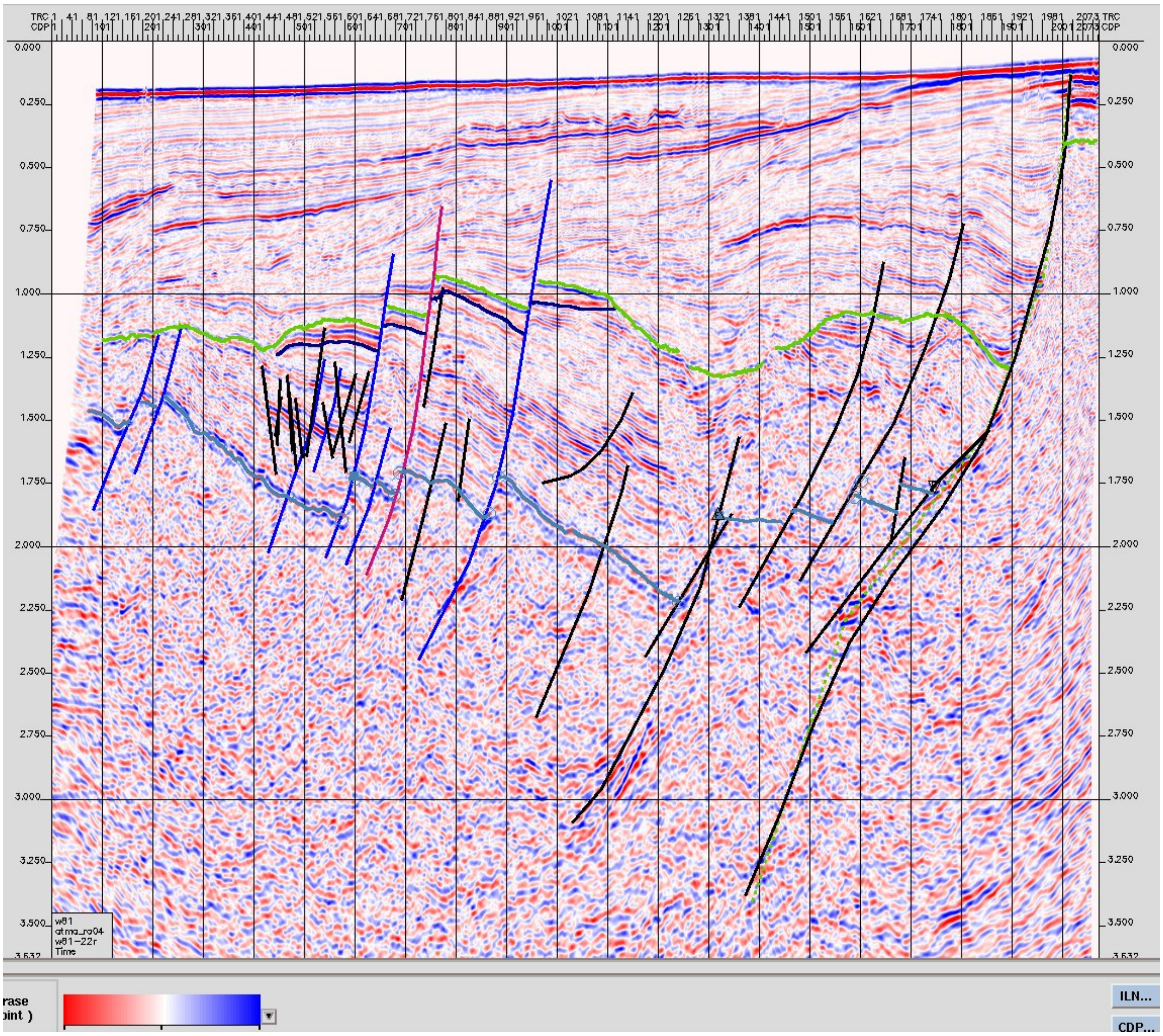


Figure 6a 2D line W81-22r (reprocessed version of 2D line W81-22) for data quality comparison with Sorell 3D data, next figure. Horizons displayed are near T5 (green), near K110 (black), and Basement (blue).

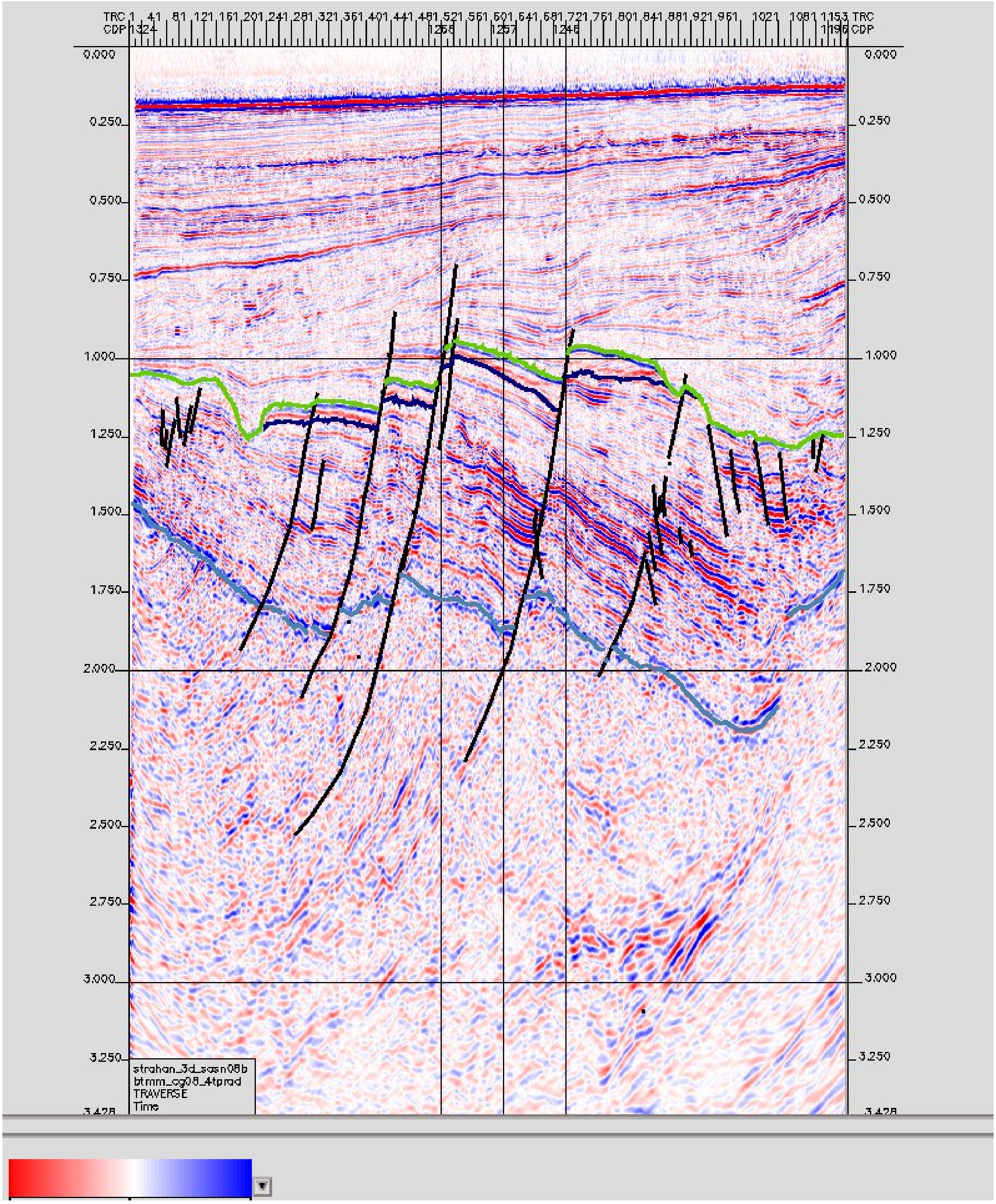


Figure 6b Arbitrary traverse through Sorell 3D along path of W81-22r (shown Figure 7a) for data quality comparison. Main improvements in imaging provided by the 3D data are (i) higher frequency which improves interpretation at reservoir level, and (ii) improved imaging of basement faults. However, the biggest value of the 3D is its superior spatial sampling density compared to 2D data. Horizons displayed are near T5 (green), near K110 (black), and Basement (blue).

Interpreted Seismic Sections

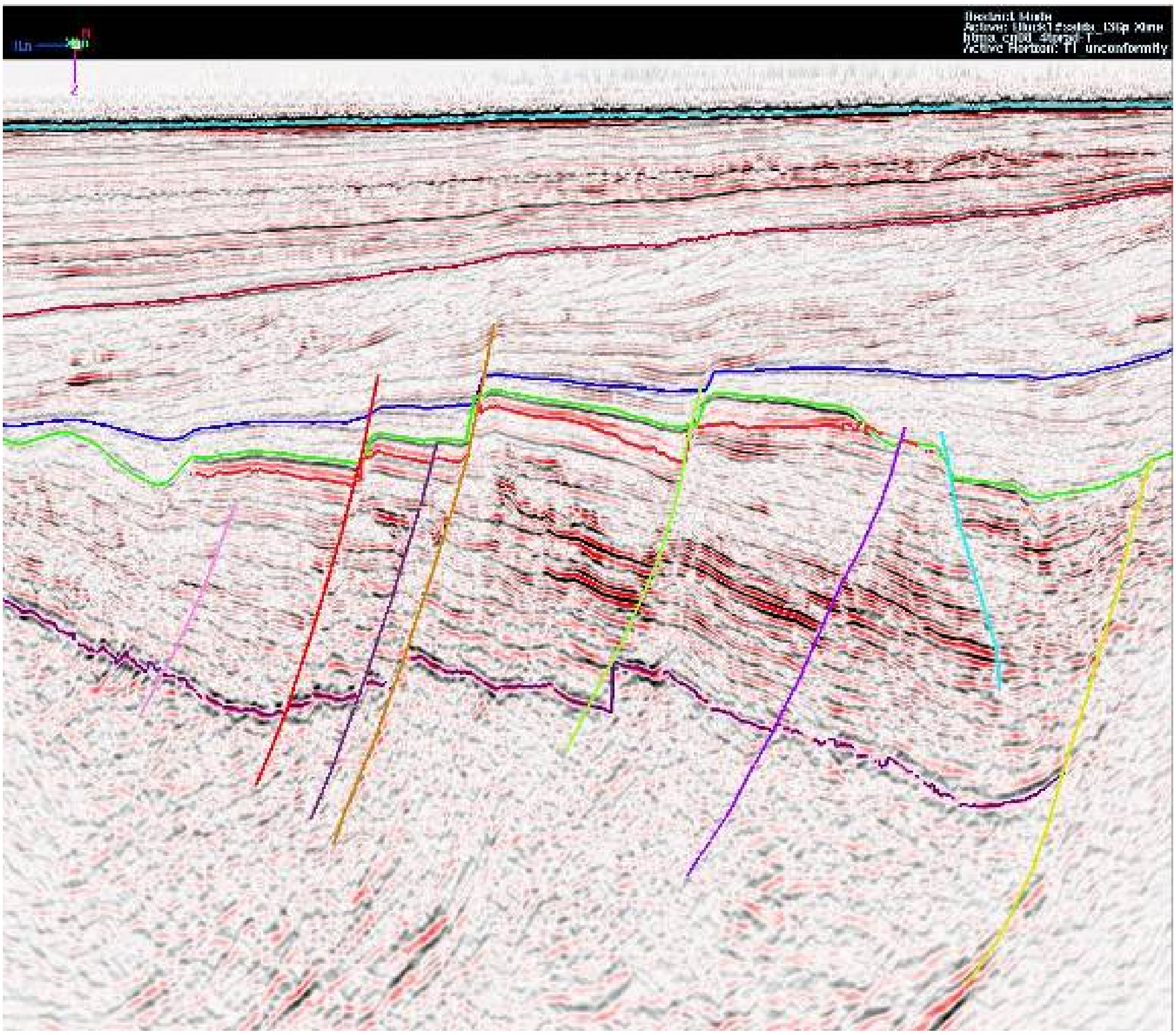


Figure 7a. Interpreted seismic Cross line 1232 through Greater Olive. Interpreted horizons shown are: Water Bottom (cyan), near T20 (dark red), near T10 (blue), near T5 (green), near K110 (red), Basement (purple).

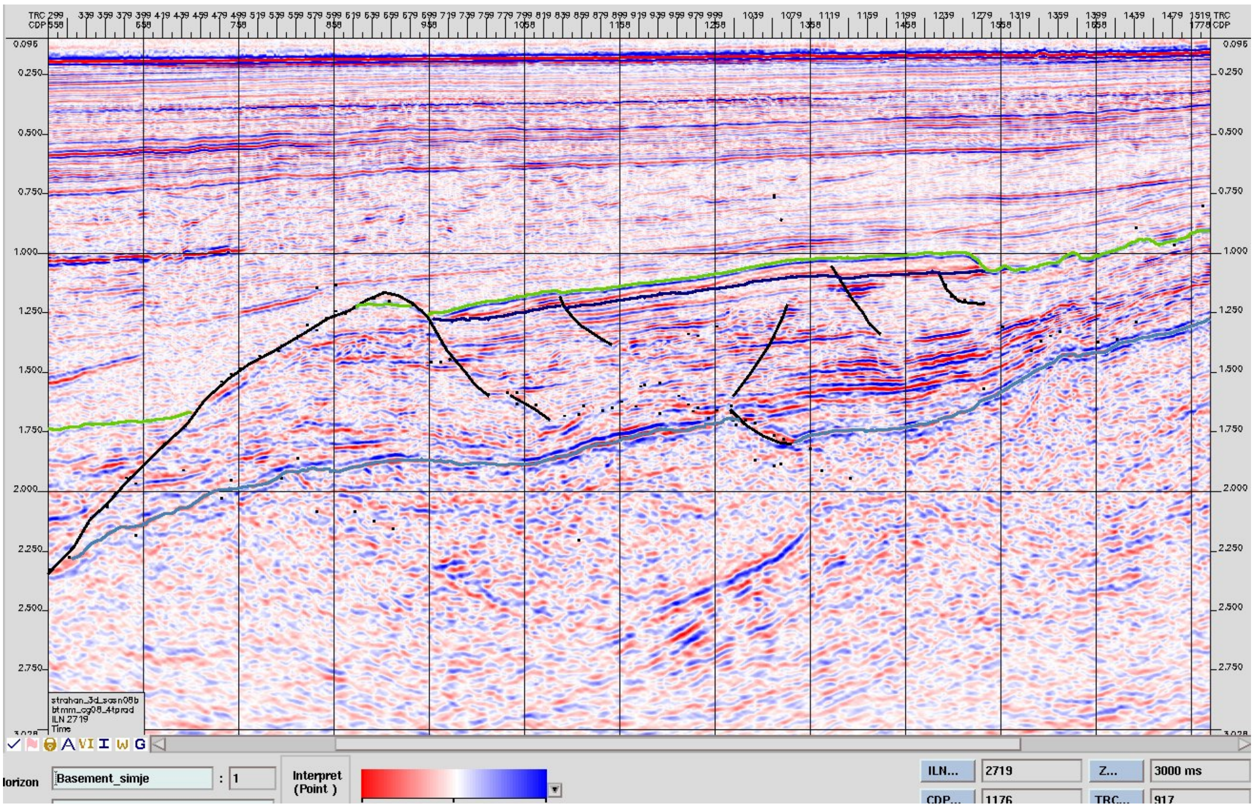


Figure 7b. Seismic In line 2719 through Greater Olive showing interpreted horizons and deep-marine canyon cuts. Horizons displayed are near T5 (green), near K110 (black), and Basement (blue).

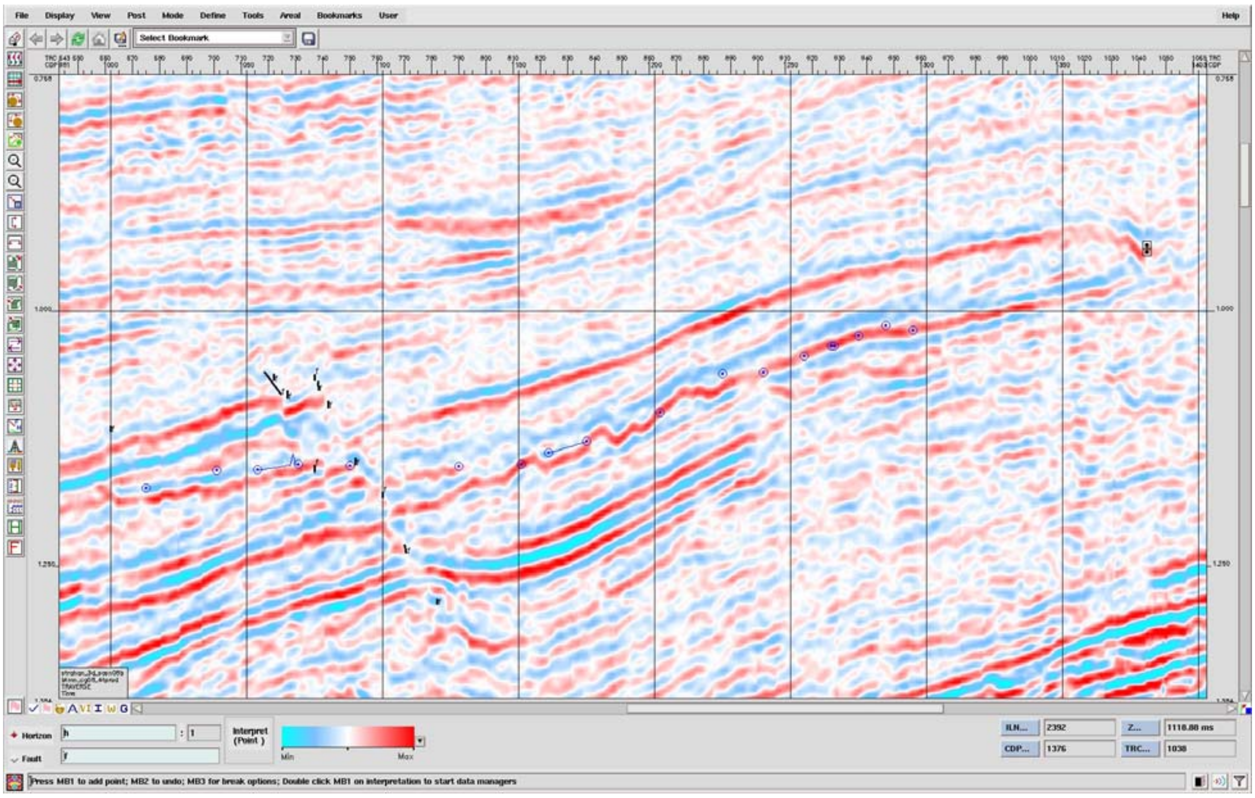
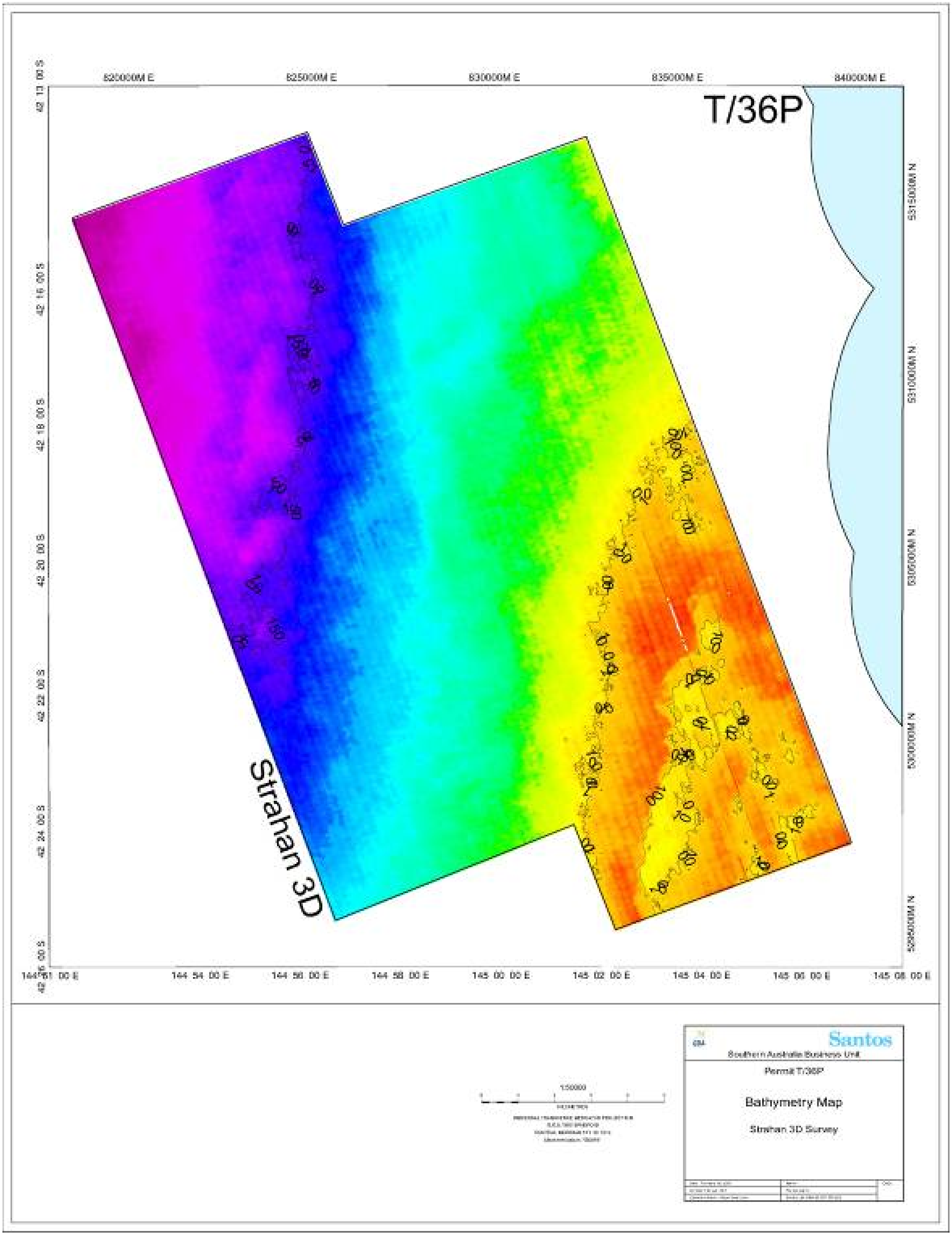
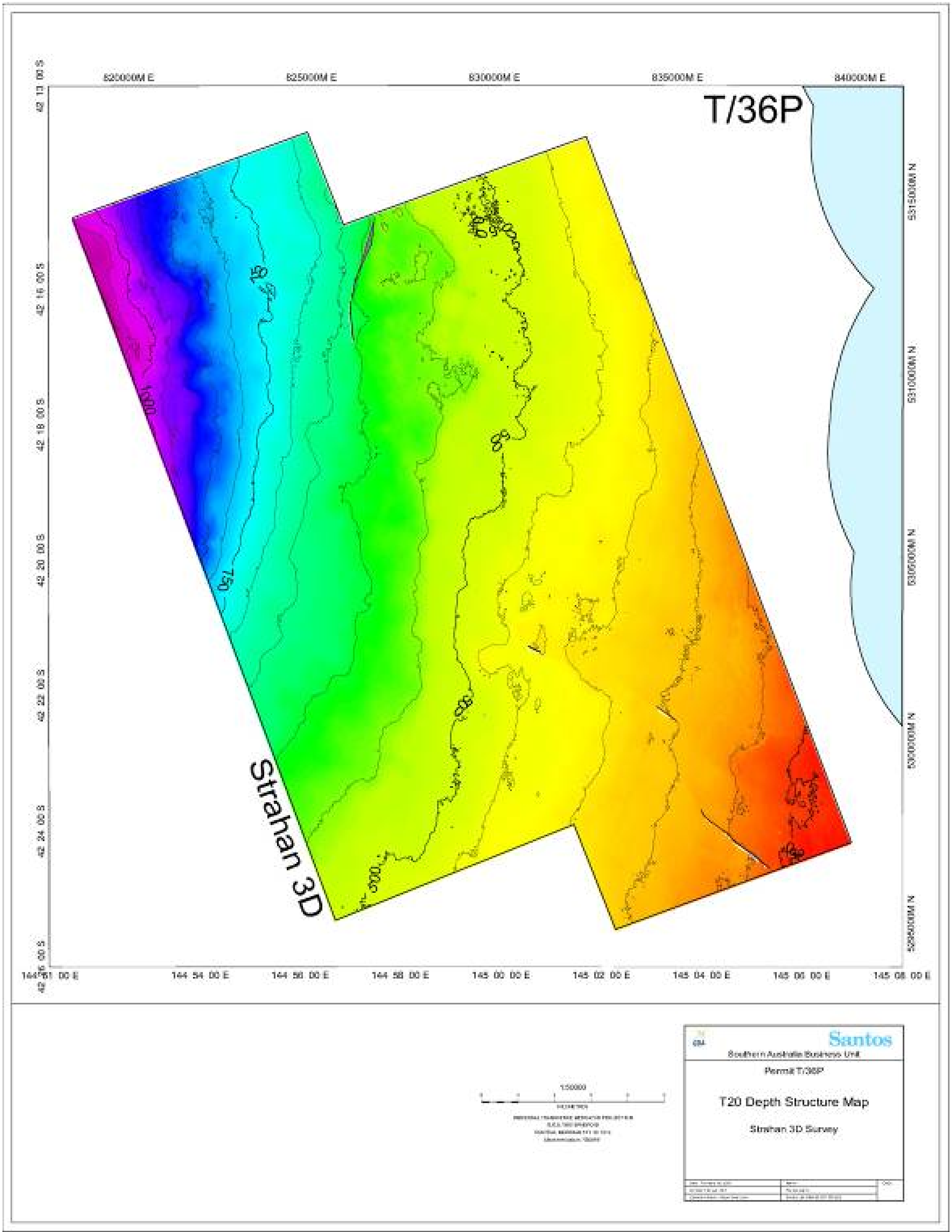


Figure 7c. Transect through Greater Olive showing progradational geometries within the Upper Timboon equivalent section.

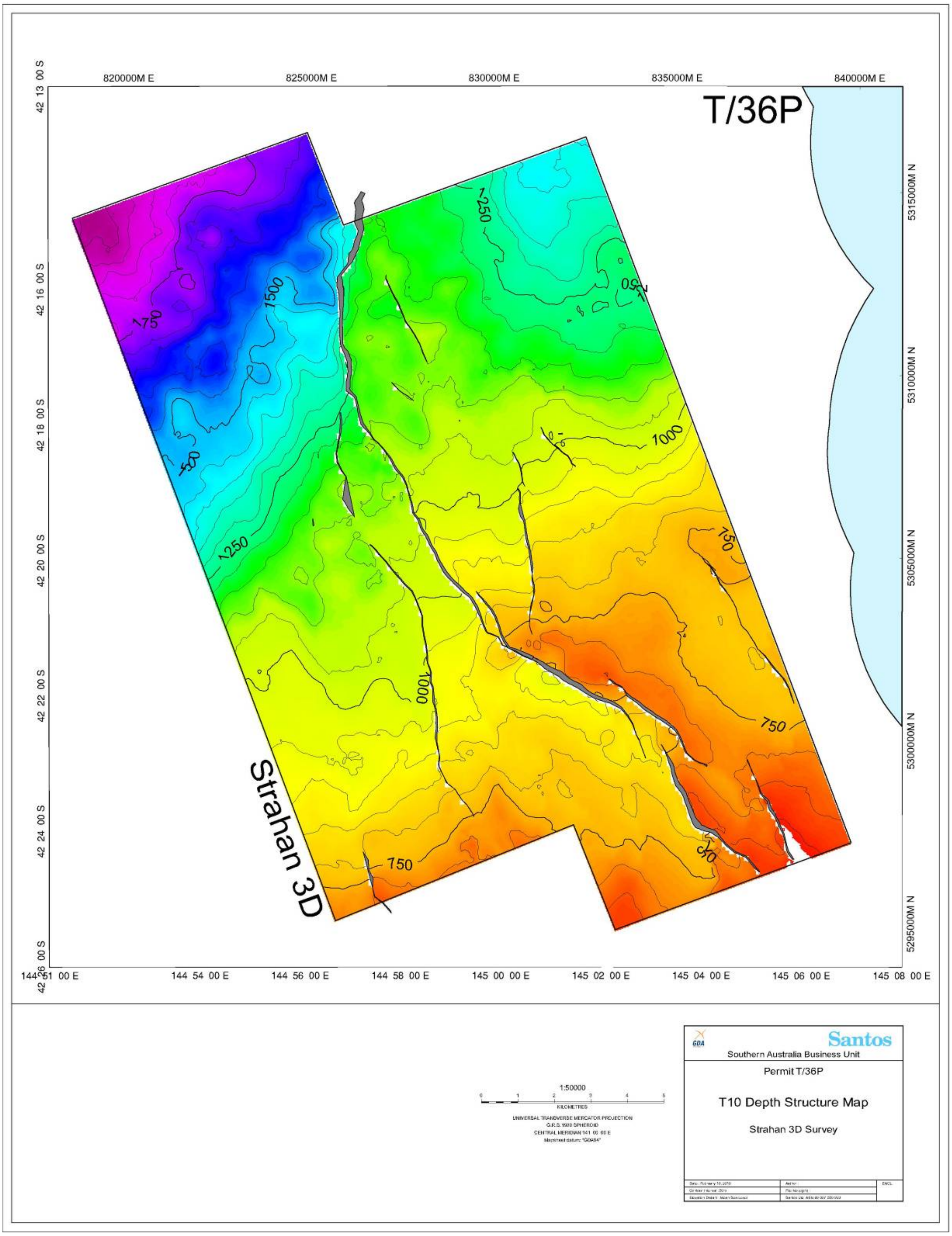
Enclosures - Maps of Key Horizons



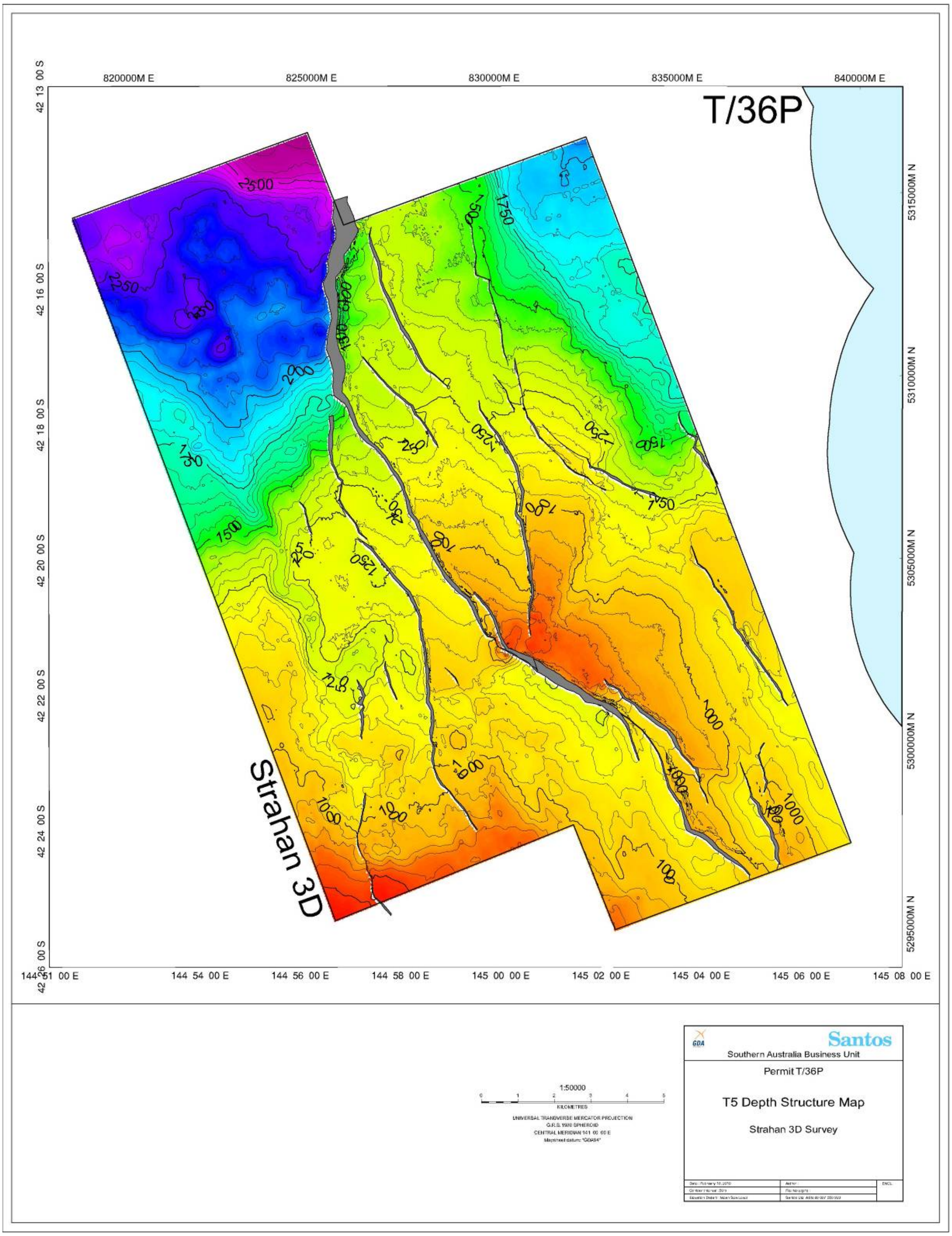
Enclosure 1. Bathymetry map.



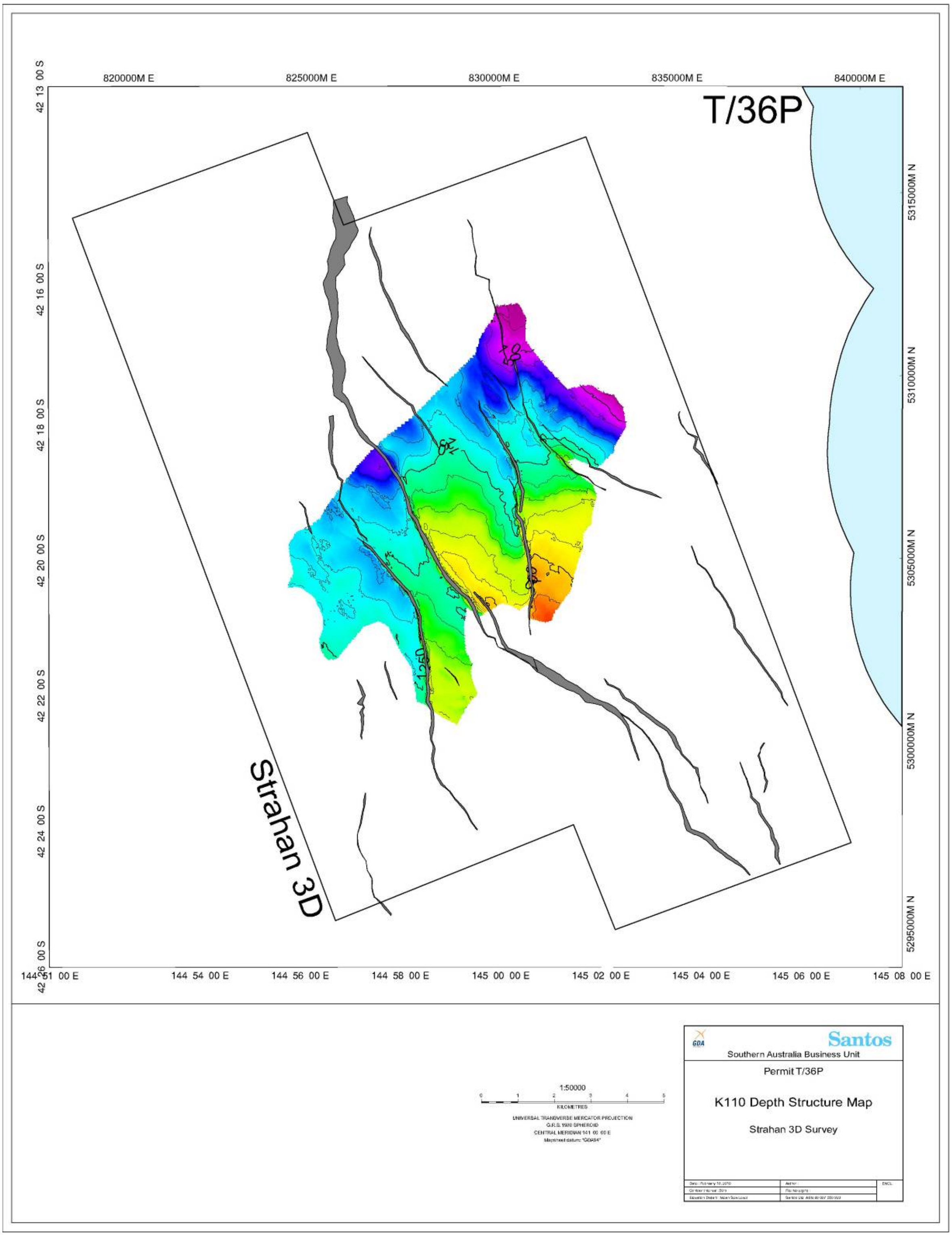
Enclosure 2. Near T20 Depth map.



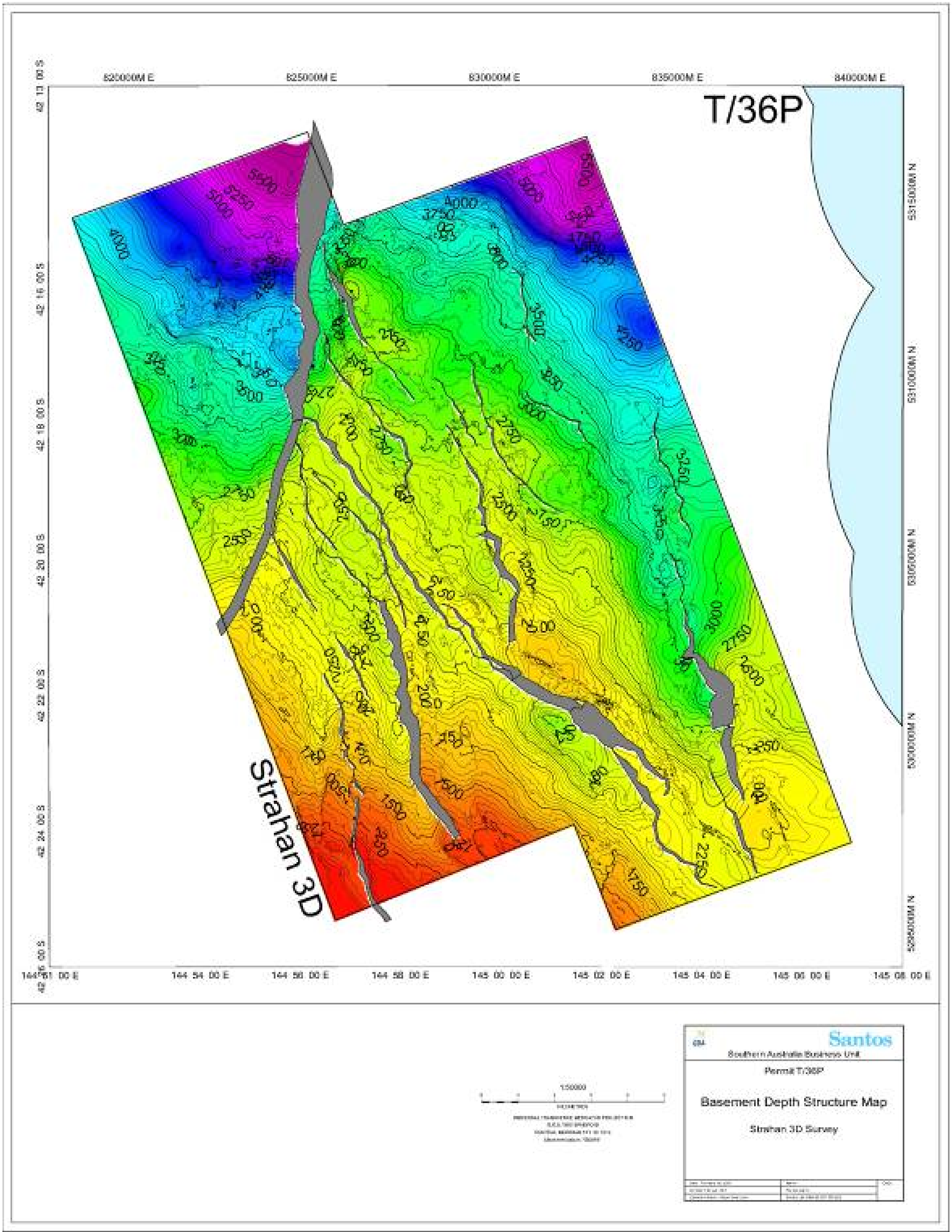
Enclosure 3. Near T10 Depth map.



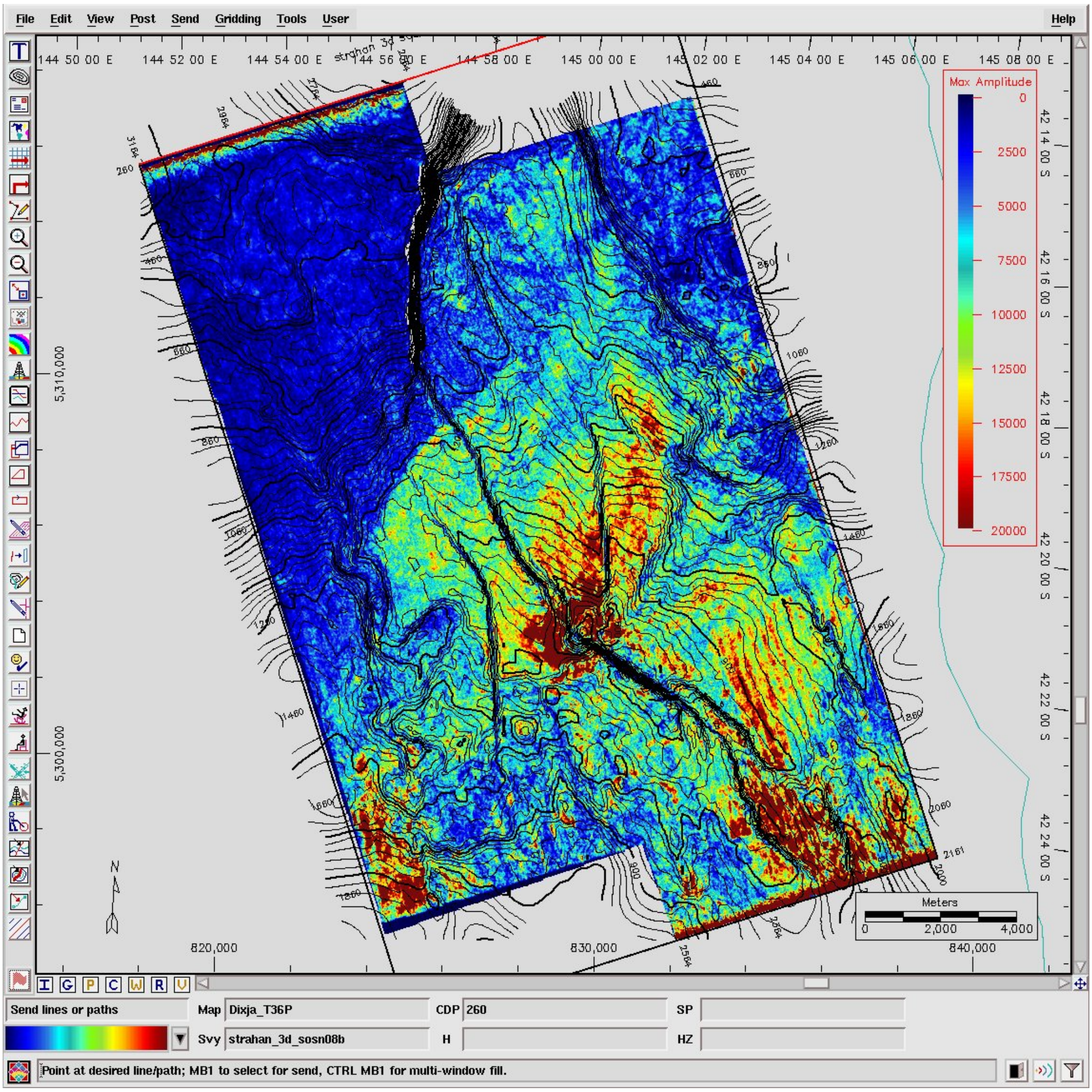
Enclosure 4. Near T5 Depth map.



Enclosure 5. Near K110 depth map.



Enclosure 6. Basement depth map.



Enclosure 7. Amplitude map on Near T5 surface extracted from the Scaled Poisson's Ratio Coefficient (SPRC) volume. Amplitude shown is Maximum in 24 ms window below horizon.