



Terra Tasmania Resources

2015 ANNUAL REPORT
Exploration Licence EL30/2011

Exploration Activity of
Terra Tasmania Resources Pty Ltd

Submitted pursuant to the
Mineral Resources Development Act 1995

21 January 2016



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PREFACE

This Report has been prepared in accordance with the conditions outlined in Exploration Licence EL30/2011, subject to the Mineral Resources Development Act 1995 (As amended). To the best of Terra Tasmania Resources Pty Ltd ('TTR') knowledge, the report presented herein represents the intentions and work undertaken leading up to and including the time of printing of the report.

During preparation of this report TTR has relied upon data, surveys, analysis, designs, plans and other information provided by past reports, third parties, and other individuals and organisations referenced herein. Except as otherwise stated in this report, TTR has not independently verified the accuracy or completeness of all nominated data, surveys, analysis, designs, plans and additional supporting information.

Terra Tasmania Resources Pty Ltd does not accept any responsibility for use of any part of this report by third parties.

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TTR during 2015 was restricted in the implementation of its previously stated work program due to collapse of the initial funding from Global Emerging Markets ('GEM'), a multi-billion dollar hedge fund in New York who had guaranteed both TTR and MRT of its bona-fides during the application process of ERA791 in March 2011. The ongoing downward trend in global oil prices has frustrated capital raising efforts.

Recent discussions with two separate parties, has reinvigorated TTR's plans to produce hydrocarbons commercially on EL30.

The engagement of Petrogeos Consultants (Melbourne) has led to commencement of the Play Based Exploration study with plans to complete and process new seismic data from a 2D and 3D survey planned for the second half of 2016; complete a thorough study of all existing data, including existing core and well logs plus relevant spatial study reports and prepare for the commencement of drilling of seven high priority targets in 2017 - 2018.

TTR has focussed in 2015 on securing funding from its two primary sources while at the same time engaging Petrogeos Consultants in Melbourne who have commenced the Play Based Exploration Model ('PBE') on EL30/2011. Petrogeos Consultants intend to expand its geosciences study on the acreage of EL30 that includes new seismic data acquisition. The results of the seismic survey and the additional activities planned for the 2017 Work Program will lead to a ranking of seven drilling targets.

TTR has entered into a Memorandum of Understanding with ERC who are currently raising capital for the ongoing TTR Work Program with the intention of remaining the prime funder up to and including production from EL30.

A group of investors from Qatar and Saudi Arabia have remained interested in funding EL30, particularly in light of the unrest and security concerns in the Middle East. This (as with all oil and gas investments globally) has been tempered by the downward trend that is continuing to plague the world oil price, pushing the price below \$US30 per barrel.

TTR has concentrated its efforts during 2015 on:

- Sourcing funding from its key investors
- Analysing and prioritising existing data on the MRT database
- Engaging Petrogeos Consultants as the lead technical team to initiate (and eventually to complete) the Play Based Exploration Model on EL30.



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Geoscience Report on the Prospectivity of Petroleum Licence EL30/2011 Tasmania



TERRA TASMANIA RESOURCES (EL30/2011)

Petrogeos Consultants
Date Submitted: 20/01/16



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1. Executive Summary and Recommendations

EL30/2011

EL30/2011 has significant exploration potential, in part due to hydrocarbon seeps within and around the licence, but also hydrocarbon indicators in previously drilled holes within the licence area. This licence has the capacity to open up new plays in the Tasmania Basin, in which there are two main geological systems identified as having significant potential for hydrocarbons. These are the Larapintine System (Ordovician and Silurian) and the Gondwana System (Permian).

Using past reports and scientific papers, the team conducted a Play based Exploration exercise to suggest more and less prospective areas around the Tasmania Basin. Hydrocarbon system elements were investigated for each play and used to make convolved play “sweet-spot” maps. The resulting maps display that there are areas of relatively good prospectivity within EL30/2011 in both main plays.

- **TRAP:** EL30/2011 lies within the Tasmania Basin, which is filled with syn-rift deposition within a half graben. The seismic grid is sparse and insufficient to have confidence delineating any prospects. With that in mind, traps in the Gondwanan Petroleum Systems are predominantly structural (Bradshaw, 1993). Suitable hydrocarbon traps may have been formed in the Tasmania Basin by folding and faulting during a Mesozoic (pre-Middle Jurassic) compressional phase, Middle Jurassic dolerite intrusion and an Early to Middle Tertiary extensional phase. Traps are also probably formed by fault offsets.
- **RESERVOIR:** Reservoir presence is interpreted to be low risk in the Tasmania Basin with several potential reservoir units penetrated and identified in wells. The most likely reservoir within the Parmeener Supergroup is thought to be the Lower Fresh Water Sequence (Liffy -Faulkner Group) which occurs throughout the basin. It is a fluvial to paralic, quartz rich sandstone, with conglomerate and carbonaceous siltstone, mudstone and coal. Other potential reservoir units are the Bundella Mudstone, in the Lower Marine Sequence of the Lower Parmeener Supergroup, the Minnie Point Formation and the Risdon Sandstone within the Upper Marine Sequence of the Lower Parmeener Supergroup and Unit 2 of the Upper Parmeener Supergroup. For the older Wurawina Supergroup, potential reservoir units are found within the Gordon Group, such as Palaeokarst reservoirs in the Devonian to Late Carboniferous sediments, and calcarenitic, platform-margin facies which are expected to have high intergranular porosities in the uppermost parts of the Gordon Group. The only known unit within the Eldon/Tiger Range Groups is the Arndall Sandstone, although the porosities are thought to be relatively low. Locally there are possible seismic indicators for reservoir presence.



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Detailed well log analysis from surrounding wells, and geophysical data, is required to reduce the risk of reservoir presence.

- **CHARGE:** The main source rock in the Tasmania Basin is the Woody Island Siltstone (including the localised Tasmanite Oil Shale) which is part of the Lower Marine Sequence of the Lower Parmeener Supergroup. Oil seepage from the Jurassic Dolerite at Lonnavale has been identified as being derived from Tasmanite Oil Shale. This proves the presence of a working petroleum system within the basin. Other potential source units within the Parmeener Supergroup are the Macrae Mudstone, the Fresh Water Sequence and the Cygnet Coal Measures in Unit 1 of the Upper Parmeener Supergroup. The most likely source rocks from the Wurawina Supergroup are within the Gordon Group. Although this Group is relatively thick (up to 1.5km) its hydrocarbon generating potential is thought to be low and hydrocarbons produced to be of poor quality. Some other concerns for charge within the Tasmania Basin are lack of maturity, burial depth insufficient, shallow reservoirs with biodegradation risk, and the source rocks may not be rich enough or have the capacity to expel sufficient hydrocarbons.
- **SEAL:** There have been several potential seal units identified within the Parmeener Supergroup. The main seal units identified are the Ferntree Formation and the Jurassic Dolerite. Local seal units could be clays and mudstones within the Cascades and Poatina Groups. The tillite and mudstones of the Wynyard Formation at the base of the Parmeener Supergroup potentially forms a seal for the paleokarst reservoirs at the top of the Wurawina Supergroup. Mudstones in the Eldon Group are thought to possibly form a seal above the Gordon Group.

Recommendations

- Assess reservoir presence and quality, including potential Net-to-Gross, using well logs from local offset wells, i.e. Tunbridge-1, Ross-1 etc.
- Develop detailed reconstruction of the paleo-environment and basin profile
- Collate existing seismic data and interpret faults and reservoir horizons across the area to identify potential traps and direct hydrocarbon indicators
- Conduct field trip to investigate surface geology and oil seeps
- Acquire new seismic over the permit area and investigate non-seismic geophysical methods
- Conduct fault seal analysis to enhance understanding of controls on oil and gas seep locations
- Perform independent dry well analysis of nearby offset wells to mitigate charge migration issues



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- Complete charge and migration modelling from basin to acreage to better constrain charge migration issues

The Tasmania Basin is a frontier basin with limited exploration work to date. Very sparse, poor quality seismic is hampered by dolerite intrusive layer up to 500m thick. The dolerite greatly hinders the definition of structures and prospects. Subsequently, there has not been a well drilled to test seismically defined valid structural traps within the basin.

2. Objectives

Petrogeos Consultants has been engaged by Terra Tasmania Resources (TTR) to write a report outlining the petroleum prospectivity of their licence EL30/2011 utilising available data. Petrogeos used the fundamentals of Play Based Exploration (PBE) to study existing reports and scientific papers. At the time of writing this report, well completion reports, well logs, seismic and other geological data and documents were unavailable to the consultants. Accordingly, the findings of this report are largely based on publicly available data, preventing a thorough independent analysis. The results of this assessment are based on Play-Based Exploration techniques and are accordingly presented through discussion of the hydrocarbon system elements for each play within the licences. The report is supplemented by maps and figures modified from publicly available literature.

3. Methodology – Play Based Exploration

The outcomes of this report are based on an exploration method known as Play Based Exploration. A play is a **group of related hydrocarbon fields and prospects that have similar controls on charge, reservoir, seal and trap**. Play Based Exploration is a method for building an understanding of basins and petroleum systems based on the hydrocarbon plays, and in its simplest form, can be described by the following:

- The convolution of hydrocarbon system element maps to create common risk segments
- Overlaying the resulting common risk segments to determine prospective vs. non-prospective areas

The Play Based Exploration method starts with a broad basin-scale focus on tectonics and its influence on sedimentary basin fill patterns, and progressively narrows focus towards the various plays and their delineation with maps of the hydrocarbon system elements (Figure 1). These tiers form the basis of this report. The final tier involves maturing prospects within licences, including risking and ranking of various prospects. Prospect maturation will be a key focus of the ongoing G&G work program presented to the client by Petrogeos Consultants.

The Play Based Exploration maps that are produced compile the data into coloured risk segment maps throughout each of the petroleum systems and



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eventually a common risk segment map is produced based on a traffic light system. For example, in the green area there will 100% chance of discovering that particular hydrocarbon system element; in the yellow area there will be 50% chance of success and in the red area there will be 0% chance of the particular hydrocarbon system element. As a result of the time constraints on this study, in conjunction with and a paucity of data, the methodology will be utilised across a small area of the Papuan Basin that is local to the acreage. Literature and readily available data has been predominately utilized in this evaluation.

Play Based Exploration – from Basin to Prospect

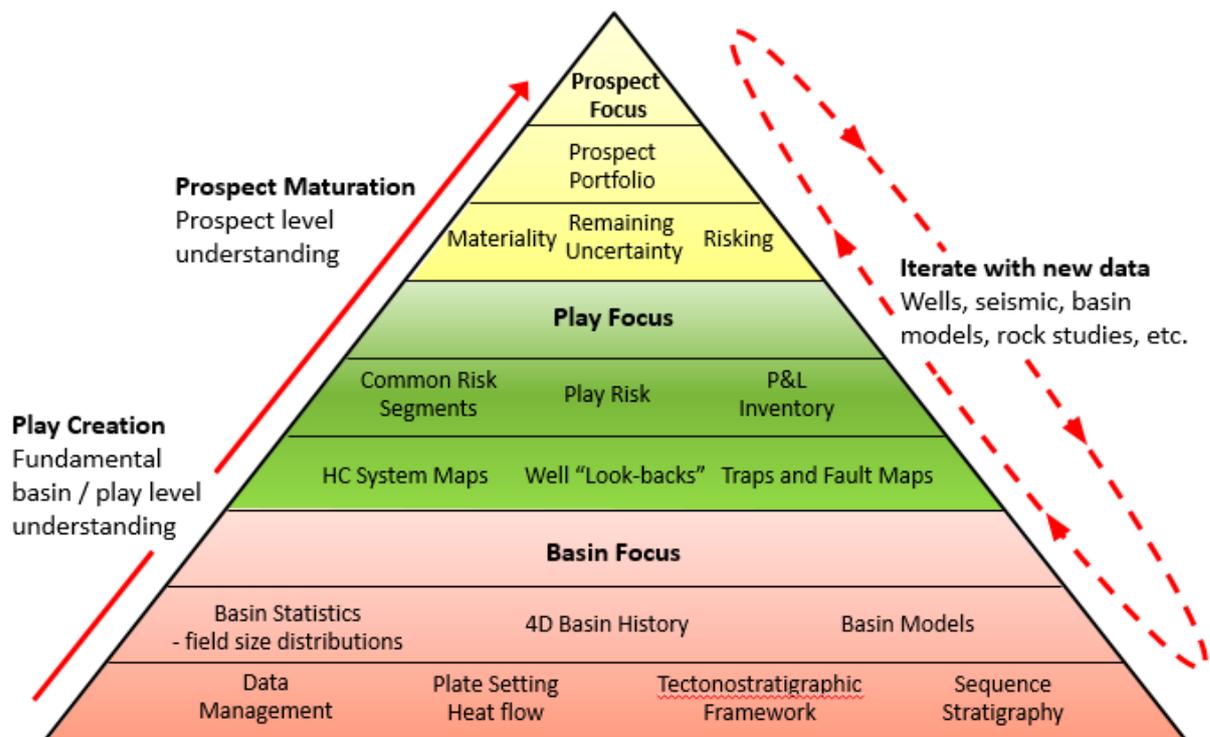


Figure 1 – Play Based Exploration pyramid



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BASIN FOCUS

4. Geological background

The licence area is located in the central part of the Tasmania Basin. The Tasmania Basin is an intra-cratonic basin formed during the Permian. Underlying the basin is a combination of Proterozoic and lower Palaeozoic Cambrian to Early Devonian (Wurawina Supergroup) rocks which were deformed by the Tabberabberan Orogeny (mid Devonian).

The Wurawina Supergroup is comprised of the Dension Group, shallow marine to fluvial siliclastics of Late Cambrian to Early Ordovician, overlain by the Gordon Group, micritic, shallow-marine, Ordovician limestone and then the Eldon Group, a thick sequence of shallow marine, Silurian to Early Devonian siliclastic rocks.

The basin is predominantly made up of the flat lying Carboniferous to Late Triassic sediments of the Parmeener Supergroup which was deposited after a long hiatus. The Basin is comprised of both marine and non-marine sediments.

The Lower Parmeener Supergroup was deposited during the Upper Carboniferous to Upper Permian and consists mainly of glaciogene and shallow-water glaciomarine rocks unconformably overlying basement paleo-topography with up to 1000m relief. Late Carboniferous to Early Permian involved extension across the platform after the amalgamation of Pangea, with the easternmost parts of Australia subjected to dextral extension and widespread volcanism (Stacey, 2009). The basal unit of the Lower Parmeener Supergroup is the late Carboniferous Wynyard tillite and is a maximum of 500m to 600m thick.

This is overlain by Permian age dark, massive-bedded, pyritic and carbonaceous siltstones with abundant glendonites known as the Quamby Mudstone in the north and Woody Island Formation in the central and southern parts of the basin. It was deposited during glacial retreat combined with marine transgression and reaches a maximum thickness of around 250m. An oil shale locally formed near the base of this sequence, which contains the alga *Tasmanites punctatus* and is known as the Tasmanite oil shale is up to 2m thick.

Overlying this is a thick expansive sequence of richly fossiliferous siltstone, sandstone and minor limestone called the Golden Valley Group in the north and the Bundella Formation elsewhere. In the Western Tiers region a quiet water organic siltstone was deposited (Macrae Mudstone) which may have contributed hydrocarbons to the basin.

During the Early Permian, the Bundella Formation is succeeded by a 20 to 40m thick unit of fluvial to paralic origin known as the Lower Freshwater Sequence (also locally as the Faulkner Group, the Liffy Group or the Mersey Coal Measures). It consists mainly of well-sorted, cross-bedded quartz-arenite with siltstone and carbonaceous mudstone dominant in the southeast interpreted as being the seaward margin of the coastal plain as a result of the filling of the basin causing a relative regression of the shoreline to the south. Prominent coal beds developed in the north, sandier coastal deposits in the central and southern areas grading to marine conditions in the southern reaches.



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Deposition of the Cascade Group followed the extensive freshwater deposition in the Early Permian. Marine transgression saw the deposition of marginal marine calcareous siltstone of the Nassau Formation followed by a bioclastic limestone (Berriedale Limestone). The Cascade Group has a maximum thickness of roughly 100m and was deposited in a shallow, cold-water environment.

Malbina Formation (Minnie Point Formation, Garcia Sandstone) followed the Cascade Group with initial sediment deposition in a deepening basin in the south. These are thick fossiliferous sandstone and siltstone beds and are well developed in the southern part of the Tasmania Basin, while towards the north sandstone decreases and less fossiliferous siltstone is more prevalent.

Following this was a brief period of marine transgression and the deposition of a fine-grained siltstone and mudstone, with sandstone persisting to the north. These sediments make up the Ferntree Formation (Bogan Gap Group). Preceding the deposition of fine-grained sediments in the south, regression led to the formation of an offshore barrier bar facies (Risdon Sandstone), which is a well-washed quartz sandstone with a pebbly base and cross-bedding indicating derivation from the south and southwest (Stacey, 2009). Behind the barrier bar, a dark bioturbated siltstone containing sporadic marine fossils and often carbonaceous (Ferntree Formation) was accumulated in a shallow, brackish estuarine or lagoonal environment. The Ferntree Formation of southern Tasmania is a 145 – 210 m thick, generally monotonous sequence of non-fossiliferous siltstone and mudstone, with rare fossiliferous and conglomeratic horizons (Reid et al., in prep).

The Upper Parmeener Supergroup (Late Permian to Late Triassic) represents all the units deposited in freshwater that lie above the dominantly glaciomarine Lower Parmeener Supergroup. The change from rocks of a glaciomarine origin to those deposited in a fluvial environment is abrupt and may result from eustatic sea-level fall or regional uplift in Eastern Australia. The boundary between the Upper and Lower Parmeener Supergroup is a transitional although in some areas it is eroded and displays an abrupt lithological change.

The Upper Parmeener Supergroup consists predominantly of sandstone, siltstone, mudstone and coal measures, with subordinate conglomerate and tuff usually found in lenses (Forsyth, 1987). The sequence, which is less than one kilometre thick, was deposited in fluvial and fluviolacustrine environments by both low and high sinuosity rivers.

This Upper Parmeener Supergroup has been separated into 4 units (Unit 1-4) with Unit 1 (Late Permian) predominantly being a carbonaceous interbedded, well-sorted, cross-bedded or ripple laminated sandstone and lutite. The sandstone is characteristically carbonaceous, arkosic or richly feldspathic, micaceous, quartz sandstone. Thin coal measures are commonly associated with this sequence. The depositional environment is generally regarded as a coastal plain, where the sequence was deposited over the marginal marine facies at the top of the Lower Parmeener Supergroup by sand-laden rivers, rapidly prograding towards the east and southeast.



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Unit 2 represents an abrupt change in depositional environment is reflected by the development of a thick, dominantly quartz sandstone sequence. The sequence consists predominantly of well sorted, commonly crossbedded quartz sandstone, and feldspathic quartz sandstone, with subordinate lutite.

Unit 3 represents a broad, basin wide change in sandstone composition followed the quartz sandstone dominated sequence, with the deposition of dominantly lithic sandstone and some coal measures.

Unit 4 consists predominantly of volcanic lithic sandstone, lutite and coal seams, with rare tuff and conglomerate beds. The sequence is about 270m thick in the Midlands area, and up to 350m thick in the coal field near St Marys (Bacon, 2000) and is preserved beneath Jurassic or Tertiary igneous rocks or in graben. Sandstone comprises about 70% of the sequence, lutite and coal measures making up the remainder.

Multiple periods of extension related to the break-up of the eastern margin of Gondwana affected the Tasmanian region from the Late Jurassic. Stress in the upper crust resulted from three main regional events: 1). an easterly propagating rift between Australia and Antarctica to the west of Tasmania, 2). rifting associated with the formation of the Tasman Basin to the east and 3). The prolonged fragmentation, separation and clearance of the Australian and Antarctic plates along Tasmania's western margin.

The Tasmania Basin currently covers most of central and eastern Tasmania. The boundaries are defined as erosional implying the original size of the basin to be much larger. Basement highs within the basin have a relief of up to one kilometre. The Parmeener Supergroup is essentially sub-horizontal, there is evidence of structures formed by the combination of thick Jurassic dolerite intrusions and Tertiary faulting.

During the Australian-Antarctic plate break-up at the end of the Cretaceous, the basin was uplifted. This resulted in the erosion of approximately two kilometres of sediment. After which there was no further deposition until the Cenozoic.



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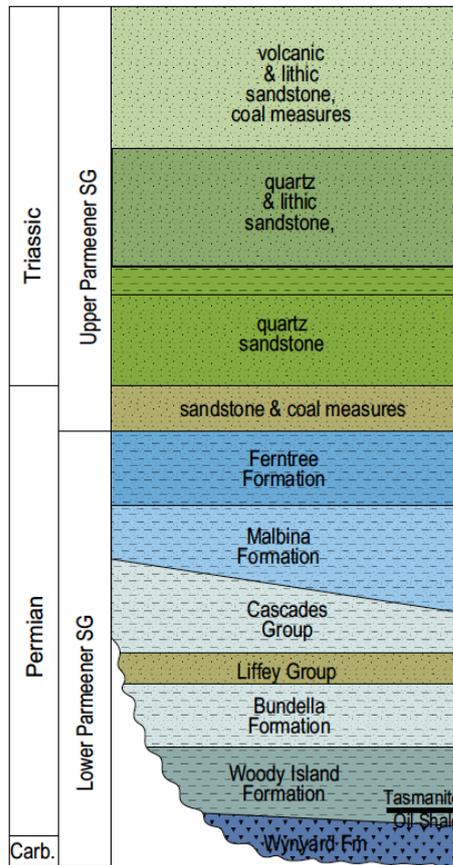


Figure 2 A generalised stratigraphic column and nomenclature for the Parmeener Supergroup of the Tasmania Basin (Reid 2004).



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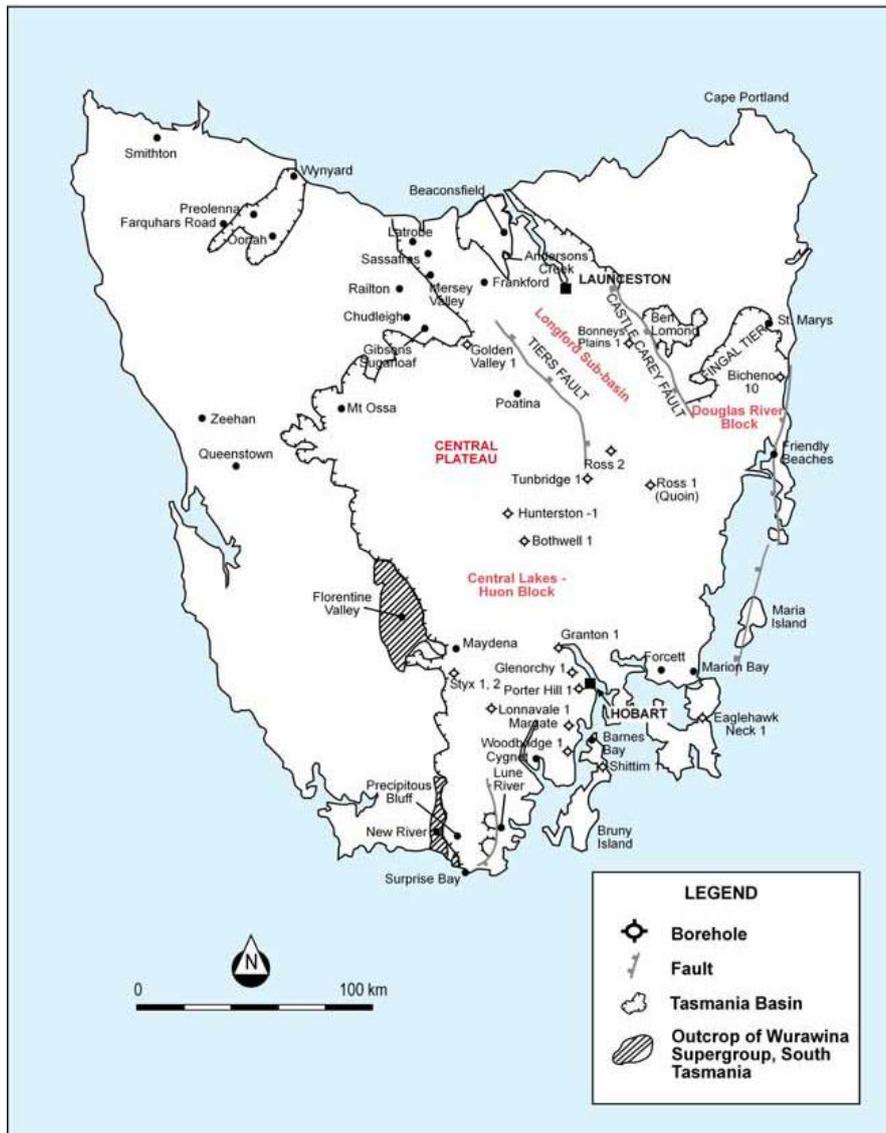


Figure 3 Extent of the Tasmania Basin and outcrop and inferred subsurface extent of potentially oil and gas mature Ordovician – Devonian basement rocks (After RPS Energy, 2008).

5. Tectono-stratigraphic evolution

The Tasmania Basin developed in a back-bulge depozone inboard of the major foreland basin formed behind the Andean-style eastern margin of Gondwana. The eroded remnant of the Tasmania Basin covers an area greater than 30,000km² in central and eastern Tasmania (Stacey 2009). The oldest basement consists of Proterozoic rocks which are exposed on the Western half of Tasmania. Later basement rocks of Cambrian to Early Devonian age are known as the Wurawina Supergroup. All of these rocks were deformed by the mid Devonian tectonic event called the Tabberabberan Orogeny, which was a major Australian event (RPS 2008).

Four periods of deformation have affected onshore Tasmania since the Devonian. In the basement, a zone of north-east dipping thrusts lies beneath the Launceston Tertiary Basin. These thrusts form the boundary between the Western



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and Eastern Tasmania Terraces. Southwest of this boundary between the basement becomes increasingly fold dominated with kilometre scale folding identified on the westernmost seismic sections. The folds and thrusts seen in the seismic sections are similar to structures mapped in nearby basement outcrop which formed during the Middle Devonian Tabberabberan Orogeny (Stacey, 2009).

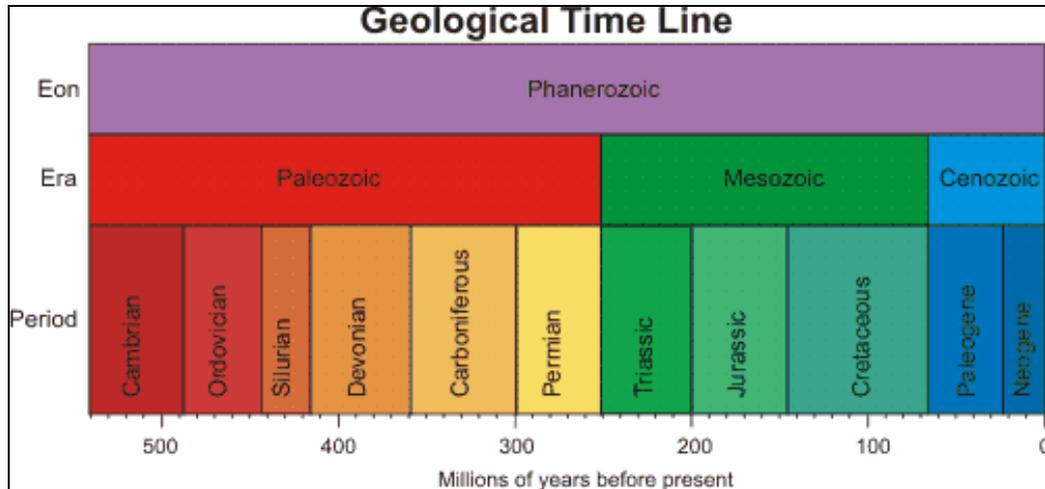


Figure 4 Geological Timescale (adapted from Lakewood HS)

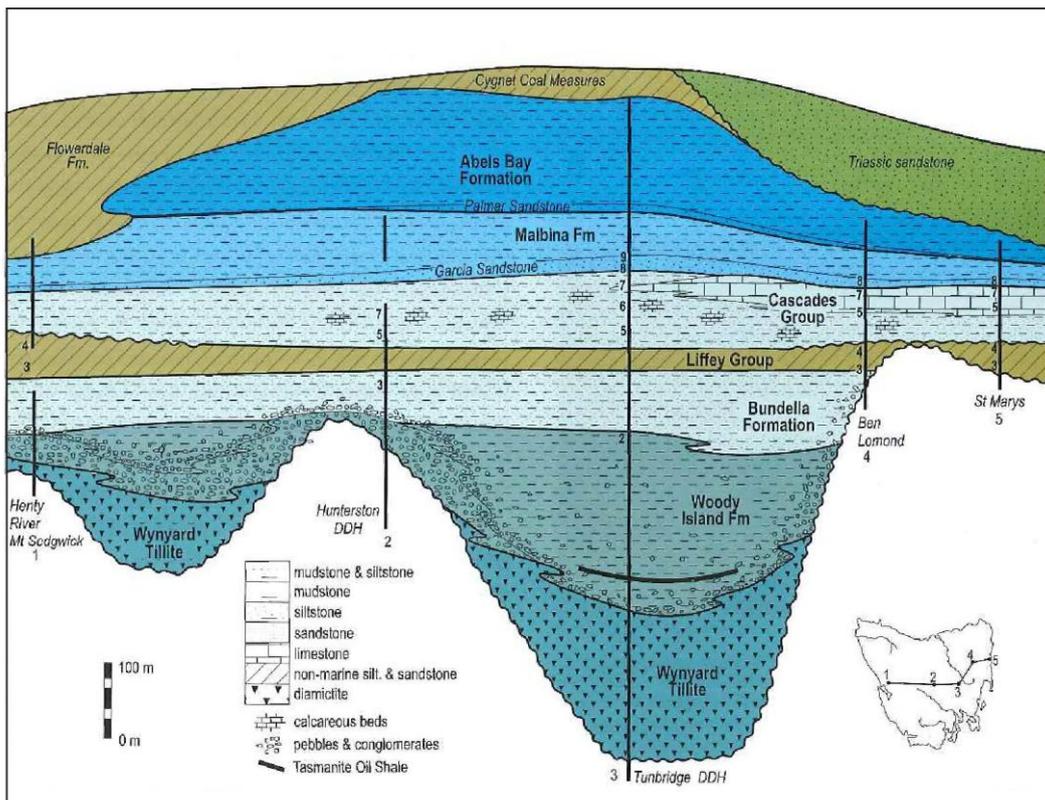


Figure 5 Cross-section through the Tasmania Basin showing the tectono-stratigraphy of the Basin and petroleum system elements (modified Reid, 2004).



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6. Petroleum plays

The team investigated several petroleum plays and give recommendations as to which plays are more or less prospective in the proximity of the EL30/2011 held permit.

Proven plays in the Tasmania Basin are as follows (Figure 8):

- Liffey / Faulkner Sandstones from oil inclusions in Tunbridge-1 and Hunterston-1 wells
- Woody Island formation from Ross-2 core “bleeding oil”
- Oligocene source signature in Johnstones Well (1929) oil and gas flowed from 30m depth – reservoir unknown

Potential plays relevant to EL30/2011:

- Middle Triassic Upper Parmeener Unit 3 fluvial sandstone structural play
- Early Triassic Upper Parmeener Unit 2 fluvial sandstone structural play
- Middle Permian Malbina Sandstone (Minni Pt Fm)
- Early Permian Liffey / Faulkner Group coastal channels
- Late Silurian Currawong Quartzite
- Late Ordovician Arndell Sandstone
- Late Ordovician Palaeokarst Benjamin Limestone

The principal reservoir and primary exploration target in the Tasmania Basin is the **Liffey Faulkner coastal sandstone channels of the Early Permian**. The gross unit is found all over the Tasmania Basin in various stratigraphic wells. Its thickness varies from 20 to 40 metres, with fair to good porosity. However, reservoir presence is not certain due to the relatively thin unit identified in few wells. It has been characterised as a fluvial, well-sorted, cross-bedded quartz arenite with siltstone and carbonaceous mudstone towards the south east.

Being in the centre of the Tasmania Basin, EL30/2011 is well situated to take advantage of various plays. The plays with the greatest exploration potential, and that have the greatest amount of data available, are the **Middle Triassic Upper Parmeener fluvial sandstone and the Late Ordovician Arndell sandstone**. These two plays have been documented in detail in this report according to Play-Based Exploration techniques.

7. Overview of licence

7.1 EL30/2011

This exploration licence is located in the northern part of the Tasmania Basin onshore eastern Tasmania, south of Launceston. The block is 4952.6 km² in area, which makes it the biggest onshore conventional petroleum exploration tenement in Australia. There are 19 2D seismic lines within the area of the tenement, which can



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be considered to be regional in nature. There is 1150 line kilometres of 2D seismic in the area of the tenement and approximately 400 line kilometres on the tenement itself. TTR has access to all the seismic but the lines are generally poor quality and are not adequately tied or processed. The 2D seismic will have to be reprocessed and correctly tied to for leads to be properly characterised. Nine leads have been identified from interpreting the current seismic lines. However, most leads are only identified on one seismic line. Therefore, proper characterisation to progress leads to “drill-ready” prospects is not possible without more seismic data. There are also four stratigraphic wells drilled on the tenement providing stratigraphic control. However, there is a large variation in the stratigraphy indicating varying tectonostratigraphic settings throughout the large tenement. For example, the thick Woody Island Formation intersected in the Tunbridge well is relatively thin at the Hunterston well in the western part of the tenement. Due to sparse well and seismic control it is difficult to determine the distribution of hydrocarbon system elements. Nevertheless, seven hydrocarbon plays have been identified in the tenement’s stratigraphic wells. This study aims to give an initial assessment of the tenement’s prospectivity by studying the hydrocarbon system elements of each play. Using existing data and maps; the reservoir, seal, trap and charge distribution will be characterised from a regional perspective.

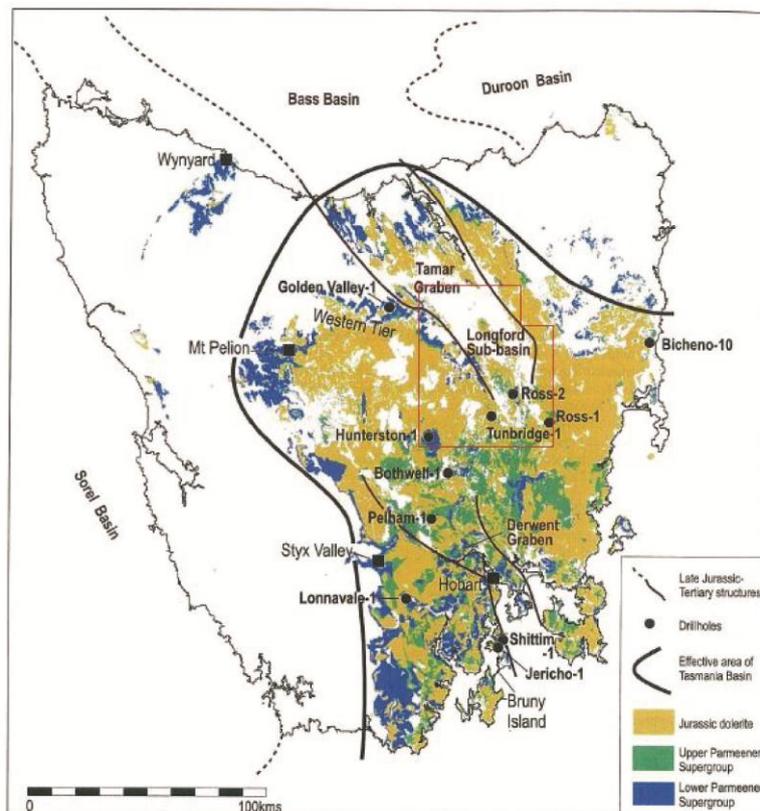


Figure 6 Surface outcrop map showing a rough outline of the Tasmania Basin and an outline of the EL30 licence area (adapted from Reid 2004). Wells and boreholes drilled to date are spread relatively evenly across the entire basin.



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PLAY FOCUS

8. Permian Liffey / Faulkner Group play

8.1 Reservoir

The Early Permian palaeo shore-line is located in the south-east part of EL30/2011. As such, the coastal channels characteristic of the Liffey-Faulkner group are better developed in the north-west of the tenement. Reservoir presence (i.e. thicknesses) and accordingly, the Liffey and Faulkner near shore channel sand reservoirs are likely to be present in and around the block. The formations have been penetrated in up to 10 wells within and around the permit. Provenance seems to be from the North West to South East. Therefore, there are potential marine bypass zones to the south east, where reservoir would be riskier than the coastal and fluvial plain zones. This is also demonstrated by the decrease in reservoir quality to the south east.

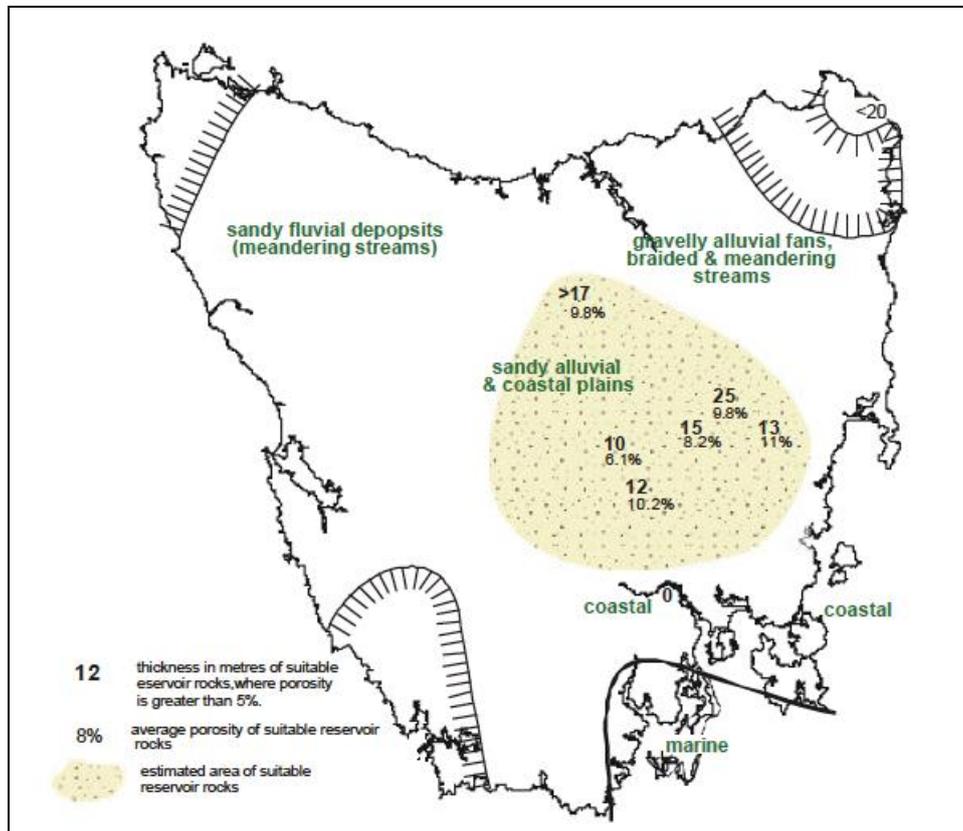


Figure 7 Freshwater Sequence distribution and palaeo-marine shoreline (After Reid, 2002).



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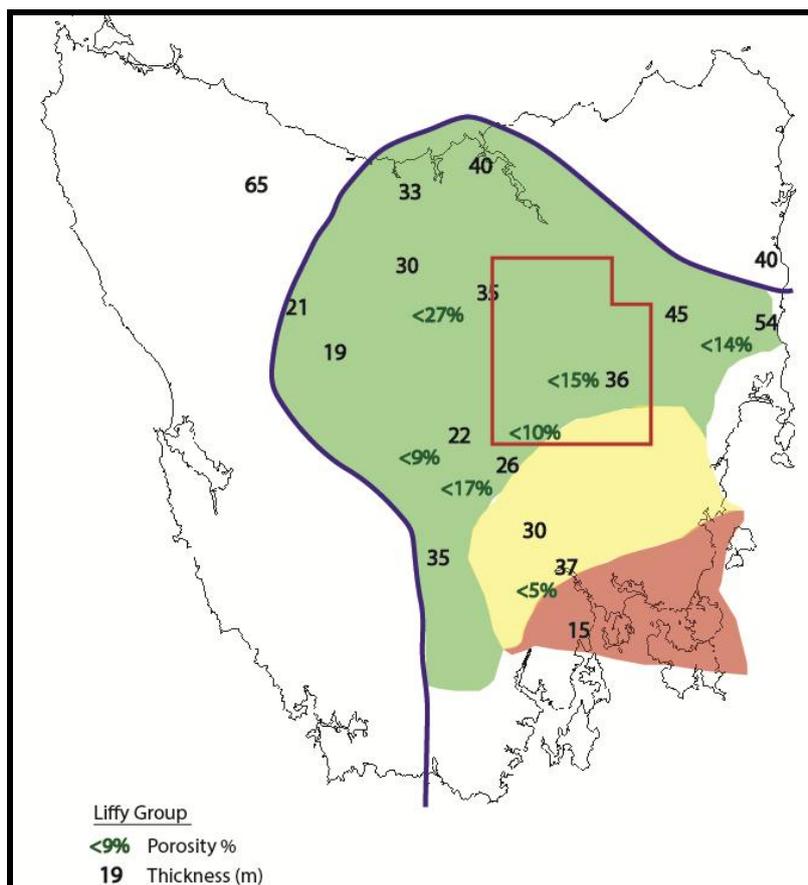


Figure 8 Liffey / Faulkner Group isolith map (m) on the left (adapted from Reid 2004)) indicates that a moderately thick reservoir is to be expected in the area of EL30.

8.2 Source / charge migration

There are several good potential source rocks in the Tasmania Basin, including Woody Island Formation, which includes the algal rich, high TOC shale beds of *Tasmanites punctatus*. Additional source rocks may be the Macrae Mudstone immediately below the Liffey Group, the Liffey Group and coal measures within Unit 1 of the Upper Parmeener Supergroup.

The primary source rock within EL30/2011 is the Tasmanite Oil Shale situated in the lower part of the Woody Island (Quamby) Formation. The Woody Island Formation has been intersected in at least three stratigraphic drill holes within EL30/2011 (Tunbridge-1 & Ross-1, -2). The shale is an exceptionally rich potential source rock consisting of silty shale with a high content (ca. 10-70%) of compacted cysts of the green alga *Tasmanites punctatus*. From fluid inclusion analysis the maturation and expulsion of hydrocarbons started in the early Cretaceous and continued throughout the Cretaceous. Therefore, traps would have had to form before the Cretaceous. Any post-Cretaceous structuration and trap formation would have missed hydrocarbon expulsion.



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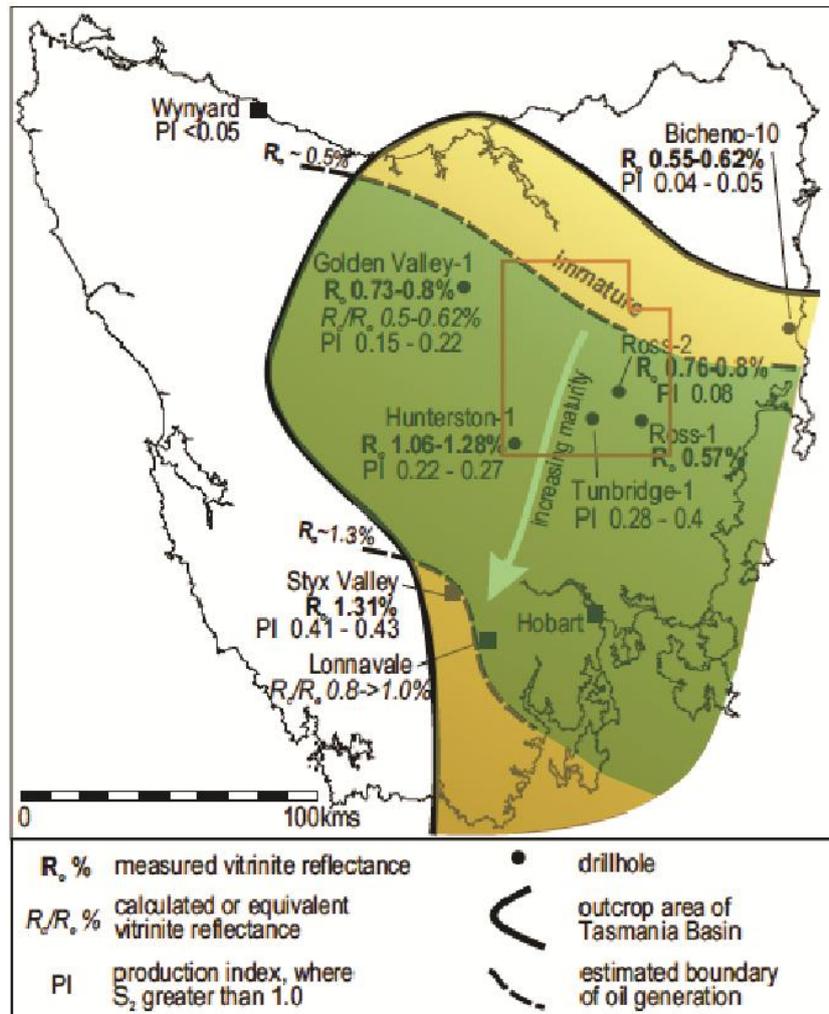


Figure 9 Maturity index from the kitchen in the Tasmanian Basin. The area to the north east of EL30 may be under mature for hydrocarbon generation and therefore may require lateral charge migration from the southwest or west. (Adapted from Stacey, 2009).

8.3 Seal or Cap Rock Formations

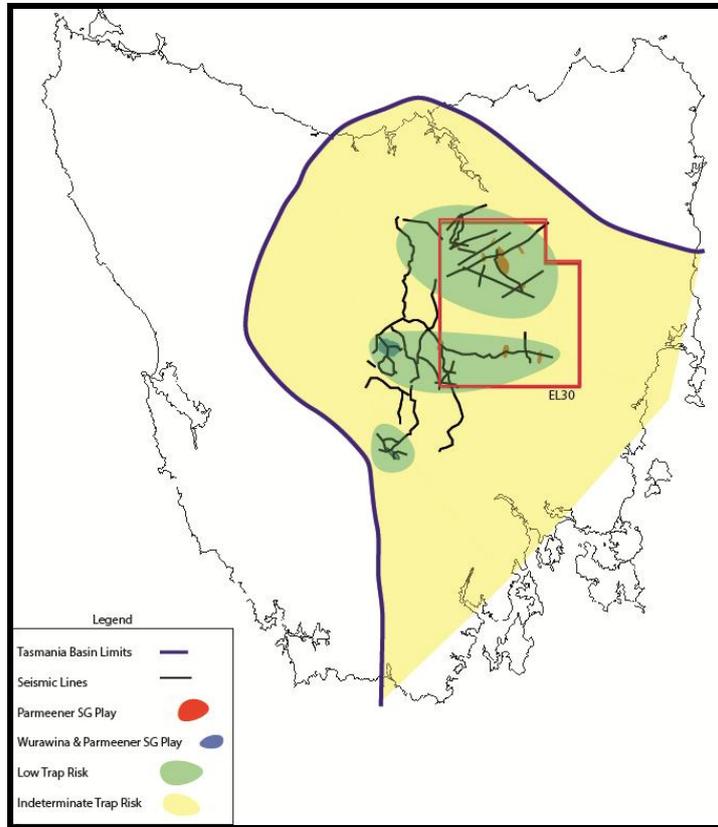
Marine clays and silty mudstones of the Cascade Group are thought to provide local seals above the Liffey Group reservoir. The Ferntree Formation and the thick Jurassic Dolerite intrusions are thought to be regional seals for the Parmeener Supergroup Play across the entire licence area. The Cascades Group comprises calcareous, fossiliferous siltstone and limestone. This unit varies in thickness and composition across the basin and therefore may only act as a local seal. The Ferntree Formation is a poorly fossiliferous marine mudstone and siltstone which lies at the top of the Lower Parmeener Supergroup and is generally between 100 and 200 metres thick. It is laterally extensive covering most of the basin. The thick Jurassic Dolerite is thought to act as a regional seal. It is thought to be present across the



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whole study area. There is very low risk that seal is not present throughout the area. The common risk segment map for this would be all green.

8.4. Trap



Due to the lack of seismic coverage in the Tasmania Basin structures are difficult to determine within the majority of the basin. Half-graben structures in the Ordovician basement sediments form traps within for Wurawina Supergroup Play. Multiple structures in the Parmeener Supergroup Play have been delineated along the current seismic grid. Given the frequency, one can only assume that with a more extensive seismic coverage more traps would be found. The majority of traps in this play are half-graben associated fault blocks and anticlinal structures.

Figure 10 Common risk segment map for traps within the Tasmania Basin.



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9. Common Risk Segment Map – Permian Liffey / Faulkner Group Play

The common risk segment map in figure 11 shows that there is a significant broad swath of non-prospective red area to the southeast of the defined study area in the Liffey / Faulkner Group play, which is due to the palaeo marine shoreline. The lack of exploration wells and seismic data throughout the basin means that there are large areas with a reasonable degree of uncertainty associated with them. This is the yellow area on the map. Finally the three green areas on the map indicate where the 'low risk' areas on the basin maturity map, the reservoir risk map and the structure risk map overlap. Most of the current prospect targets fall within these areas.

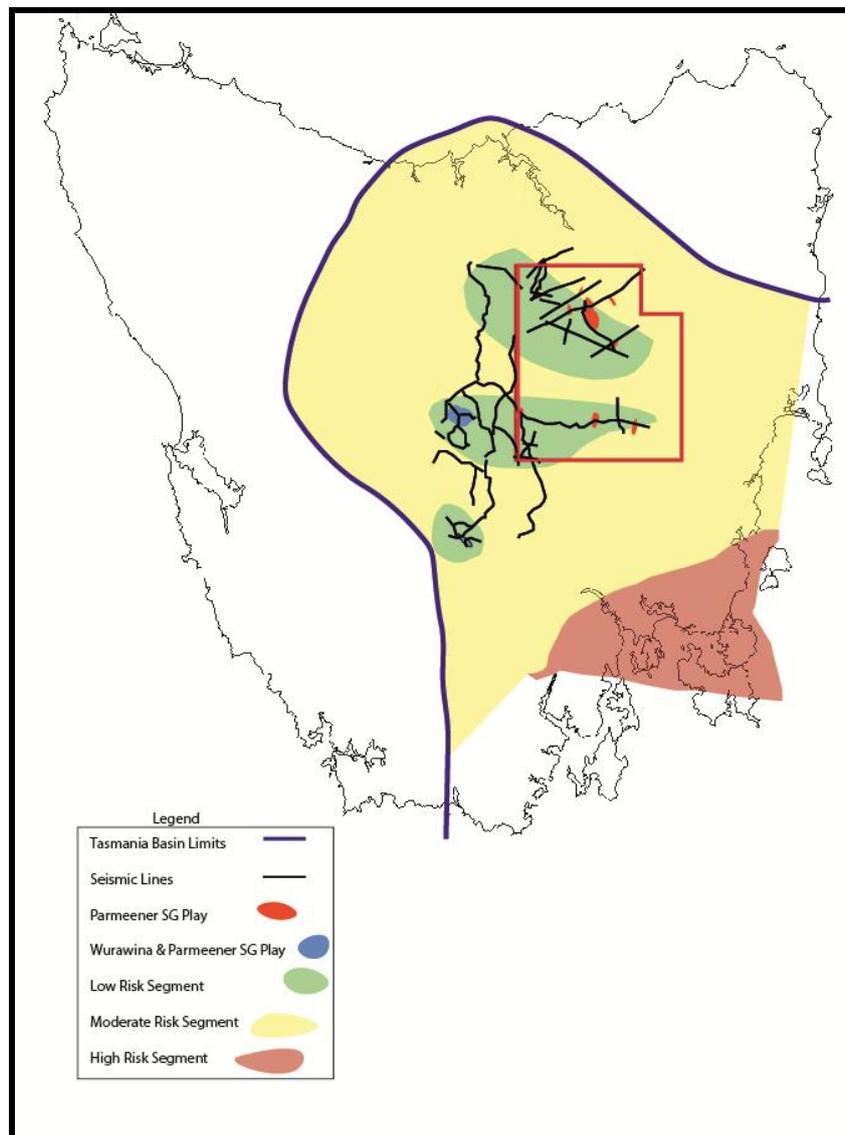


Figure 11 Common risk segment map for the Liffey / Faulkner Group play.



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10. Gordon Group Play

10.1 Reservoir

There are multiple reservoir options in the Wurawina Supergroup. Due to the recent karstification in exposed Benjamin Limestone sediments to the west of the Tasmania Basin, it is thought that there is a possibility of palaeo-karst reservoirs toward the top of the Benjamin Limestone within the basin. At the base of the Tiger Range Group, the Arndell Sandstone is a potential reservoir. In the upper section of the Tiger Range Group, the fine grained quartz sandstone of the Currawong Quartzite is also thought to have reservoir potential.

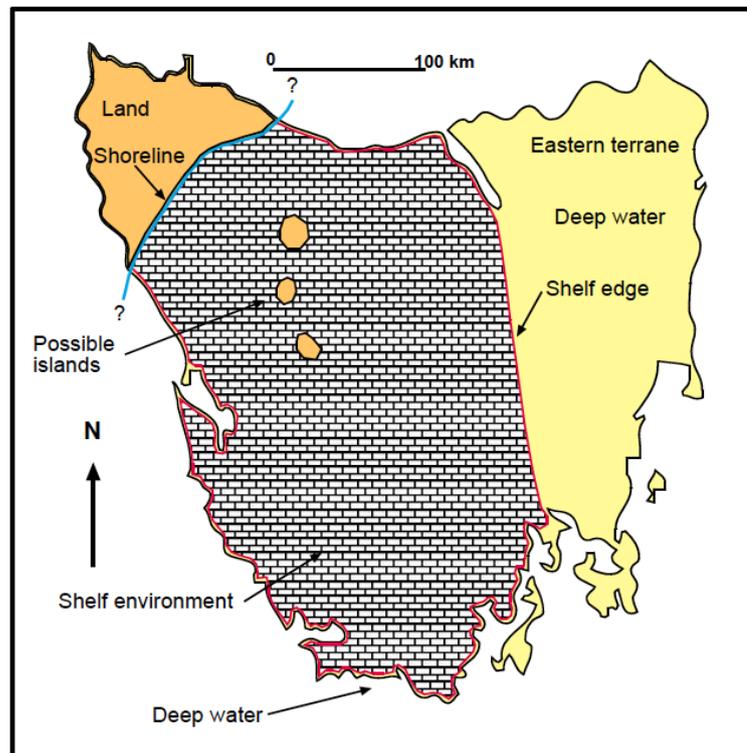


Figure 12 Late Ordovician Benjamin Limestone reservoir formation map. (Adapted from Chester 2007)



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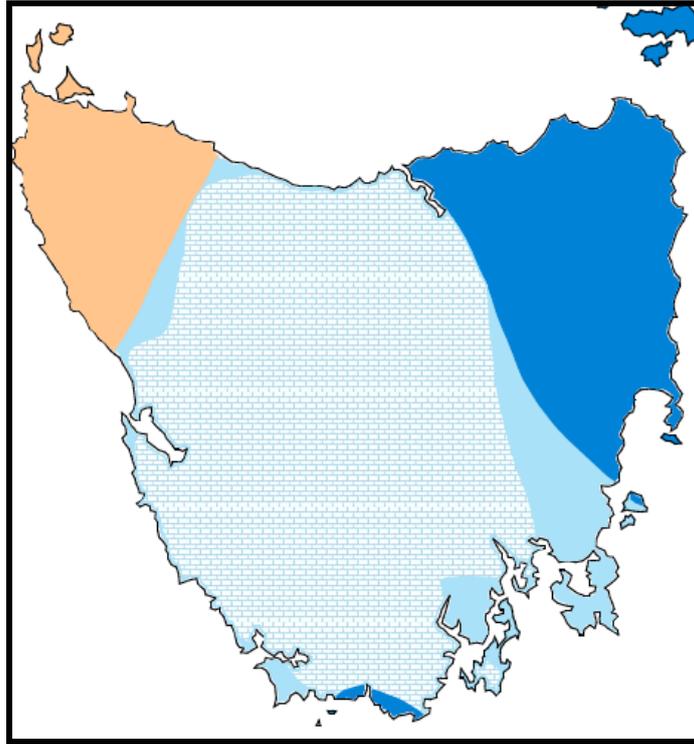


Figure 13 Middle to Late Ordovician Gordon (Group Benjamin Limestone) charge map. (Adapted from Chester 2007)

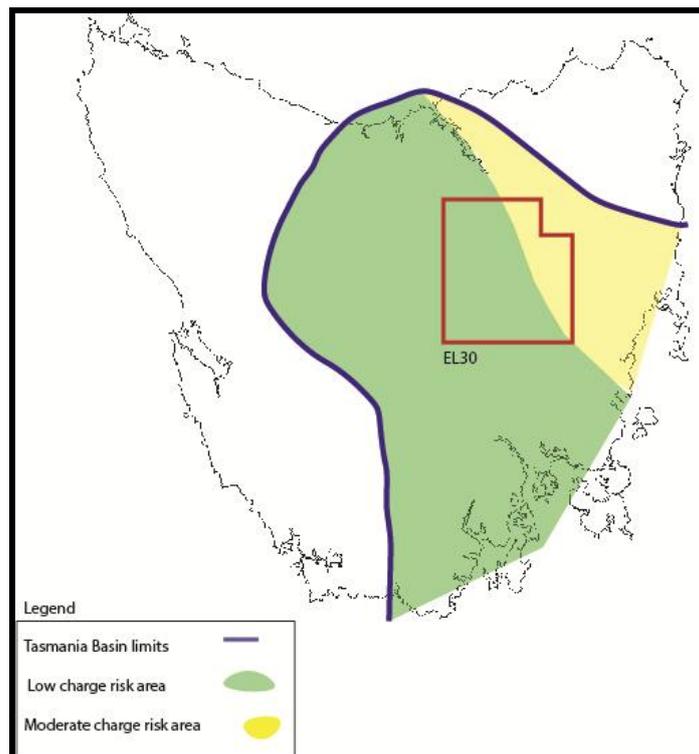


Figure 14 Middle to Late Ordovician Gordon (Group Benjamin Limestone) charge common risk segment map. (Adapted from Chester 2007)



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10.2 Seal

Thick mudstones at the top of the Tiger Range Group are thought to form an effective seal for the Gordon Group.

10.3 Source / charge migration

The most likely source rocks from the Wurawina Supergroup are within the Gordon Group (Stacey 2009). Although the Gordon Group has been assessed as having low hydrocarbon producing potential, it is a relatively thick unit (up to 1.5km). There is limited data for this unit in eastern Tasmania.

10.4 Trap

Large structures were formed during the Tabberabberan Orogeny. These structures have been identified on the available seismic. Seismic coverage of the basin is very sparse; therefore with an increase in the overall seismic coverage additional structures are likely to be identified. Please refer to figure 10 for a common risk segment map of the traps within the Tasmania Basin.

11. Common Risk Segment Map – Ordovician Gordon / Tiger Range Group Play

The common risk segment map in figure 15 shows that the majority of the area within the Tasmania Basin is yellow, indicating that there is a reasonable degree of uncertainty associated with this area. This is primarily due to the lack of exploration wells and seismic data throughout the basin. Finally the three green areas on the map indicate where the 'low risk' areas on the charge risk map, the reservoir risk map and the structure risk map overlap. Most of the current prospect targets fall within these areas.



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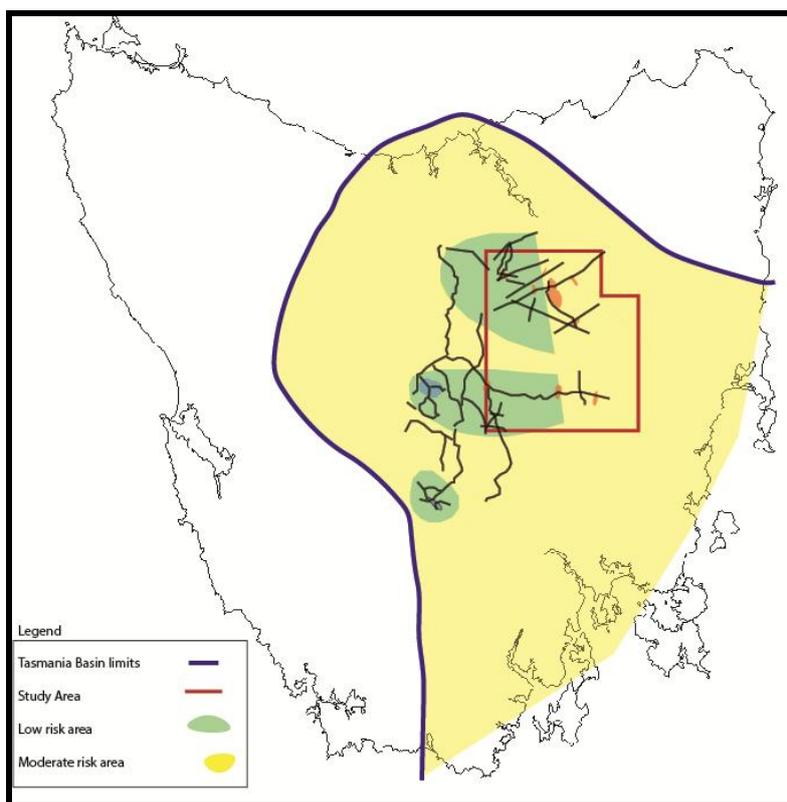


Figure 15 Common risk segment map for the Wurawina Supergroup.

12. Key outcomes

The licence has significant exploration potential because all hydrocarbon system elements are present. There is a working petroleum system as several seeps have been discovered, the most significant being the Lonnavale Seep. Analysis of 2 samples (bitumen and liquid) confirmed a Tasmanite-bearing source. Stratigraphic wells and seismic lines provide evidence for effective reservoirs, traps and seals.

TRAP: Large structures are noted on 2D seismic sections. These tilted fault block structures were the results of early Mesozoic rifting. Sedimentary drapes on horsts could form anticline traps. Faults along the grabens are potential fault traps. The Gordon play structures would have been formed during the Devonian Orogeny as compressional features. Although the seismic imaging is very poor, especially at deeper intervals, high amplitude folds can be theorised to capture the Triassic and Jurassic HC expulsion of the Gordon Group source rocks. With both plays, traps are probable due to faulting and folds inferred on seismic and from known tectonic events. Therefore, some sort of trap is highly likely to exist within the permit. New seismic must be acquired, properly processed and interpreted to find these traps.

RESERVOIR: Reservoir presence is interpreted to be low risk due to multiple wells having penetrated the Liffy/Faulkner Play. However, the Gordon Group Plays are



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riskier since they have not been penetrated by as many wells. Reservoir effectiveness is more likely in the northern section of the block purely due to closer proximity with the paleo-shelf and cleaner sandstones. Gordon Group carbonates and sandstones are largely theorised so their effectiveness is a risk. The only way to mitigate reservoir risk is to study palaeo-geography and existing core/well logs to possibly interpret previously unidentified sections.

CHARGE: The presence of local oil seepages in the surrounding area of the basin, indicates that source maturation and charge migration are low risk. It is unclear whether these oil seeps are controlled by leaky 'open faults', breached cap rocks or full to spill oil fields beneath. However, charge is one of the main risks. HC generation may not have been in sufficient quantities to fill prospects with commercial accumulations. Structures may have not been in place at the right time to capture HC migration or they may have been shallow for long enough to biodegrade captured HCs. Deep gas in the Gordon Group plays may be a more viable play from this perspective.

SEAL: There are regional and local effective seal units present in the Tasmania Basin so the risk of seal is very low.

Recommendations and Conclusions

The Play Based Exploration project and investigation results obtained thus far by Petrogeos Consultants are the initial steps. Before any area can be thoroughly assessed the play based exploration methodology must be based on original well data, gravity magnetic maps, seismic and field based surveys. This work has demonstrated the potential in poorly understood areas. Now work can continue by highlighting areas based on existing and new data. Leads and prospects can then be ranked and risked to determine reasonable drill locations.

13. References

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