



**CARNARVON**  
PETROLEUM LTD

# Q1

Quarterly Report  
30 September 2016



## **Quarter Highlights:**

- **Outtrim East-1 oil discovery announced in July 2016**
- **Roc-2 drilling commenced in the quarter and the discovery announced in September 2016**
- **After quarter end, Carnarvon announced the successful Roc-2 flow test**
- **Awarded WA-524-P with multiple oil and gas fields surrounding the permit**
- **A\$65.1 million held in cash plus future receivable of up to US\$31.3**

## **Managing Director's Comments**

The company's focus on the North West Shelf (NWS) showed material progress during the quarter, particularly with the drilling of two wells, Outtrim East-1 and Roc-2. In addition to this drilling activity we added another attractive exploration permit to the portfolio and we also continued with the less obvious but equally important work to build on the quality of our technical database, giving the Carnarvon geoscientists the very best tools to explore for oil and gas.

The Outtrim East-1 well was drilled and declared an oil discovery on 11 July 2016. Approximately 90 metres of core was extracted from the well and is currently being assessed in laboratories in Perth. This core evaluation is important for determining the extent and quality of the reservoir discovered and therefore to determine the recoverable volumes in the Outtrim and Outtrim East structures.

The Roc-2 appraisal well successfully encountered gas and condensate over a 60m gross column. On 19 October 2016 Carnarvon announced the successful flow test of the Roc-2 well, with flow rates recorded of up to 51.2 million scf per day of gas and 2,943 barrels of condensate per day under equipment constrained flow conditions. This was a very good result and exceeded Carnarvon's expectations.

As mentioned in previous announcements, the company acquired a significant amount of 3D seismic data following the success at Phoenix South-1. Carnarvon has made significant progress interpreting this data, particularly around the Phoenix and Roc area. Revised resources for the Phoenix South Barrett and Caley structures, the Roc Caley structure as well as a number of other prospects including the very large Dorado structure are expected to be announced to the market in the coming quarter.

During the quarter, the company was awarded the WA-524-P permit situated on the flanks of the Dampier Sub-Basin, an important part of the highly prospective Greater Carnarvon Basin. Early technical evaluation identified three prospects in the Permo-Triassic stratigraphy within the permit – the same interval in which we've had the Phoenix South and Roc success. Carnarvon has also identified through its regional technical work, the potential for a similar pre-Jurassic play on the flanks of the Dampier Barrow Sub-Basin.

Finally, the company continued with its core activity of enhancing its database and identifying opportunities in the North West Shelf. In particular, a lot of progress was made in the Full Wave Inversion project in the Bonaparte Basin to solve regional depth conversion challenges and the industry leading North West Shelf stratigraphic database with MG Paleo which will result in Carnarvon having exclusive interpretations of approximately 3,000 wells that have been drilled on the NWS.

**Adrian Cook**  
**Managing Director**

### Roc Gas and Condensate

(Carnarvon 20%, Quadrant Energy is the Operator)

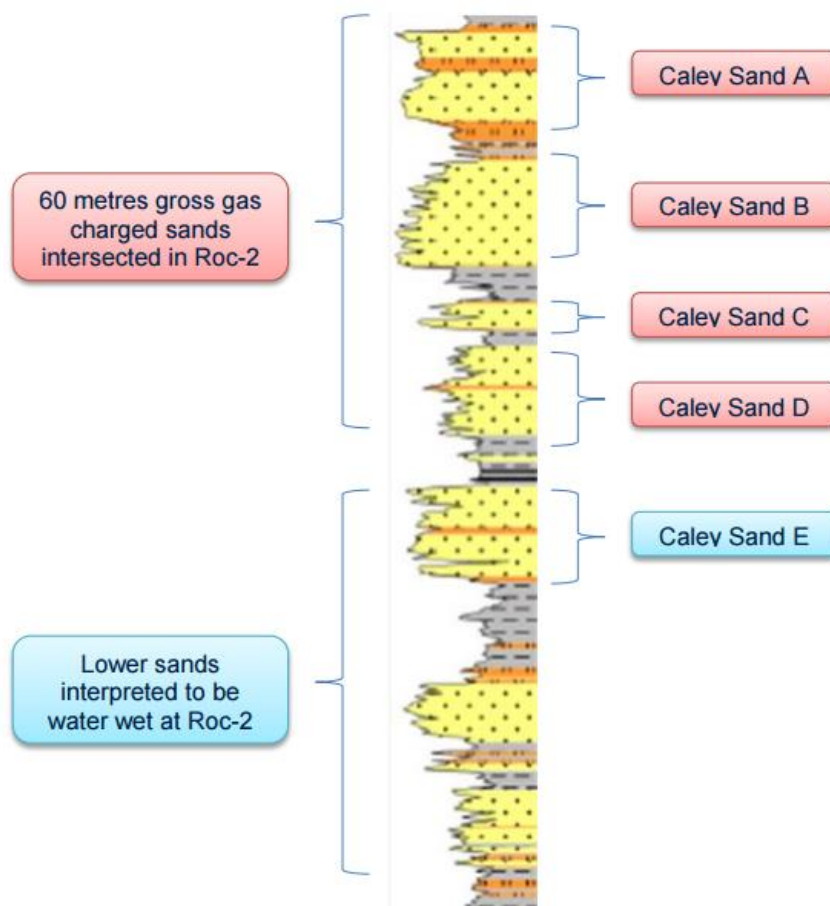
In January 2016, gas and condensate were discovered while drilling the Roc-1 well. This was the second well drilled by the current joint venture, both of which have been successful in discovering hydrocarbons. These discoveries complement the Phoenix-1 and Phoenix-2 hydrocarbon discoveries made some 30 years previously.

The first tranche of sidewall core analysis from Roc-1 shows permeability of the reservoir is up to 500mD, with Carnarvon's interpreted average being approximately 130mD. This is significantly better than the permeability required to achieve commercial flow rates.

Carnarvon commenced drilling the Roc-2 appraisal well in July 2016. This well successfully encountered gas and condensate which was announced to the market on 23 September 2016. There were a number of gas and condensate bearing sands discovered over a 60m gross column. The average porosity of the sands was 9% with some sections showing porosities of up to 15% which is very encouraging for the area.

Following the end of the quarter the joint venture successfully completed a drill stem test to determine the flow rate in the Roc structure.

Given the number of sands encountered in Roc-1 and Roc-2, Carnarvon is re-calculating the resources for the Roc structure. These will be released following the results of the drill stem testing.



Caley sands encountered in the Roc-2 well



**Phoenix South Light Oil**

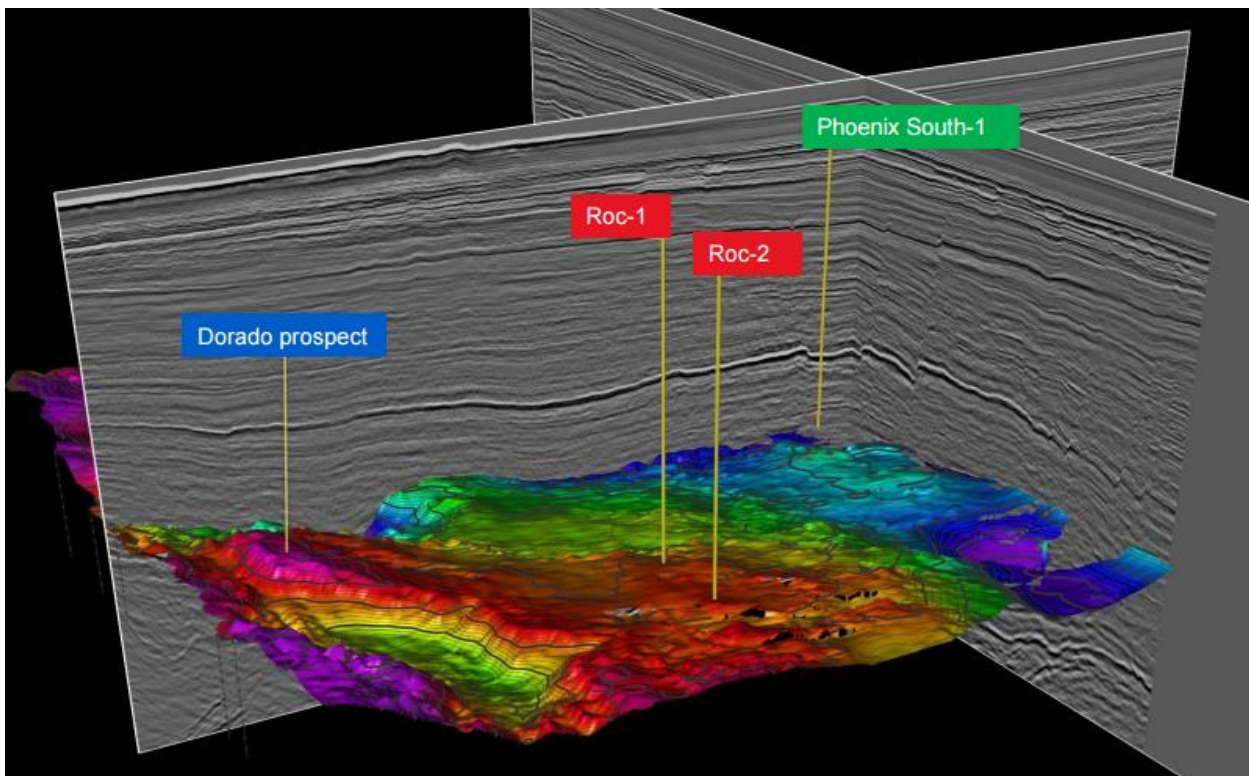
(Carnarvon 20%, Quadrant Energy is the Operator)

Light oil was discovered in the Phoenix South-1 well in the second half of 2014. The discovery excited the industry and importantly changed its perception of the Bedout sub-basin.

The discovery opened up the prospectivity of this largely underexplored basin, demonstrating the first new play concept in the North West Shelf since the prolific Exmouth sub-basin some 20 years previously. This is the first time an oil discovery has been made in Lower Triassic aged sediments on the North West Shelf.

DeGolyer and MacNaughton were engaged by Carnarvon to provide an independent assessment of volumes in the area. They assessed the mid case estimate of recoverable oil at Phoenix South to be 19 million barrels, with upside potential of up to 55 million barrels of recoverable oil\*. This Phoenix South oil is of a similar quality to the Roc condensate and could be tied in and produced within a common development infrastructure. For more information on the Phoenix South discovery and resource estimates, refer to the ASX announcement made on 7 April 2014.

Carnarvon is currently in the process of reviewing its resources in the area which will include revised Phoenix South resources based on updated technical information that has been received.



Well location image within the Greater Phoenix Area. New seismic is being licensed and interpreted south of Roc-1 and Roc-2 where new prospects have been identified including the Dorado prospect

**Exploration – Greater Phoenix Area**

The success at Phoenix South and Roc has established the existence of an excellent petroleum system in the region. The joint venture has been focussing on the follow up potential in the region. A number of exciting prospects and leads have already been identified and these will be made public shortly following the completion of final technical evaluation.

The first 3D in the area was the Phoenix MC3D covered an area of approximately 1,100 km<sup>2</sup> or approximately 5% of Carnarvon's total permit holding of over 21,000 km<sup>2</sup>. Following the initial success in these permits, the joint venture partners licenced the Zeester MC3D seismic survey that covers the Northern parts of WA-436-P and WA-435-P. The Zeester survey covers an area of 3,854 km<sup>2</sup> and incorporates the very large Bandy lead amongst others.

The joint venture partners also acquired and licenced the Capreolus MC3D. This survey contains an additional 6,500 km<sup>2</sup> of 3D seismic coverage in the basin. The joint venture partners have commenced interpretation of the data and have identified two new leads to the south of the Roc discovery.

In addition to the Capreolus 3D seismic acquisition, the joint venture partners are acquiring and licensing approximately 10,000 km of 2D seismic data to further understand the prospectivity in the south eastern portion of the acreage. This acquisition is approximately 85% complete (Bilby MC2D).

**WA-521-P**

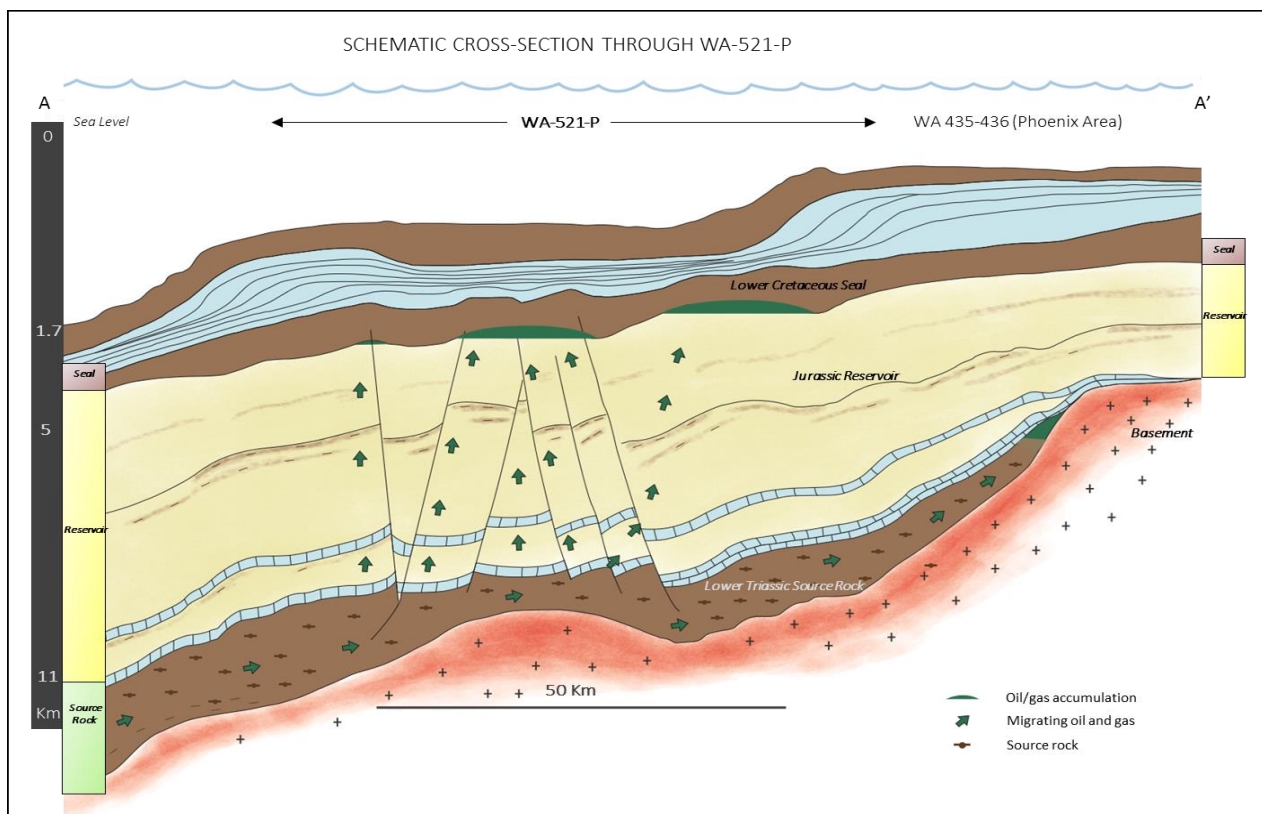
(Carnarvon 100% and operator)

WA-521-P is located in the Roebuck Basin and positioned immediately adjacent to the Phoenix/Roc acreage on the North West Shelf.

For the past five years Carnarvon has been technically evaluating the potential of the Lower Triassic petroleum system that Carnarvon believes lies along the entire length of the NWS. The discovery of hydrocarbons (oil, condensate and gas) at the Phoenix South-1, Roc-1 and Roc-2 wells in this Lower Triassic stratigraphy validates this theory.

Preliminary technical work indicates that the Lower Triassic source rocks have potentially generated and trapped migrated oil and gas into the shallower overlying Jurassic sands, and our technical team has identified several target structures that are significantly larger than the Phoenix South and Roc discovery areas.

Like the Phoenix area, prior to the Phoenix South and Roc discoveries, WA-521-P has seen very little exploration activity in the last decade and Carnarvon believes the area would benefit from modern exploration processes and technologies together with the new geological information that has arisen from the Phoenix South and Roc discoveries.



**Illustration of oil & gas migrating from the the Lower Triassic source rock which was discovered in the Phoenix South-1 and Roc-1 wells**

**Outtrim East - WA-155-P(1)**

(Carnarvon 28.5%, Quadrant Energy is the Operator)

During the quarter the joint venture completed the drilling the Outtrim East-1 well which was declared an oil discovery in July 2016. The objective of the well was to target oil to form the hub of an oil aggregation play using the same principles as the Harriet Joint Venture.

The well was drilled down to final depth of 1,441 metres and a total of 91 metres of core was cut through the reservoir section with virtually 100% of the core being recovered to surface. The core is currently being evaluated in laboratories in Perth.

The core evaluation is critical to determine the size and quality of the net reservoir and estimate the in place and recoverable volumes of oil in the Outtrim and Outtrim East structures. A number of months of laboratory work are necessary before the Company will be in a position to report on these final results.

**Cerberus Blocks****EP-490, EP-491, EP-475 and TP/27**

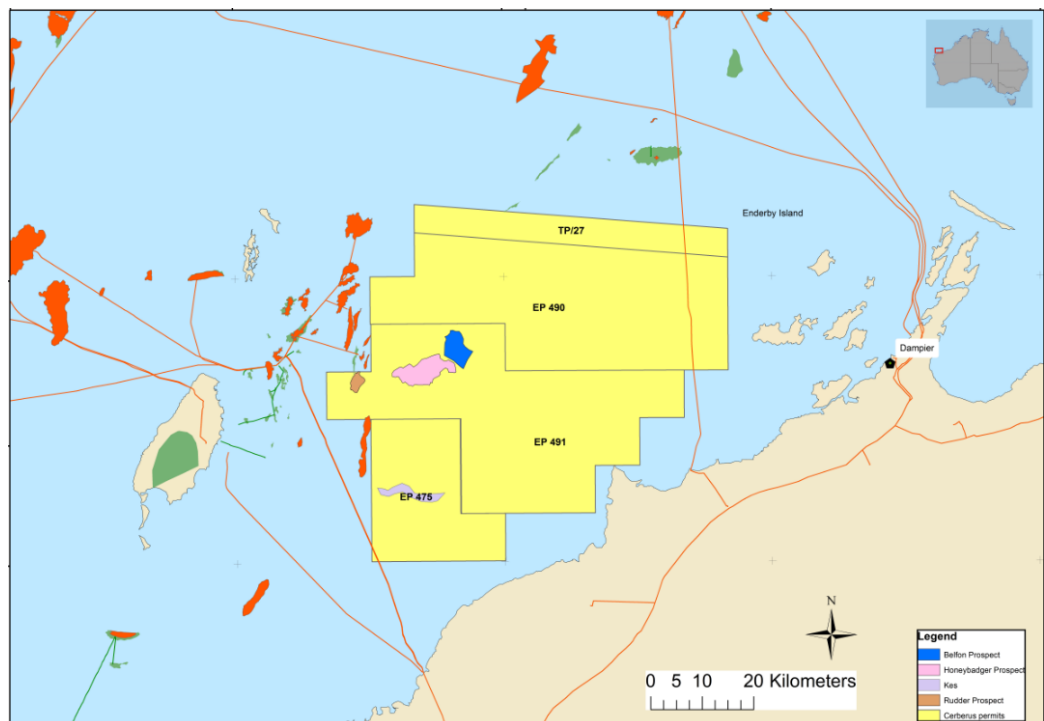
(Carnarvon 100% and operator)

Carnarvon has identified a number of new material oil prospects in these permits. These prospects are associated with Lower Triassic source rocks that have been identified in nearby wells through recently completed geochemistry, petrophysics and biostratigraphic studies. The Triassic source rocks are analogous to proven oil-prone source rocks at Phoenix, Roc and the Perth Basin. These Triassic sourced targets are in addition to the more traditional oil plays across the area, which are primarily sourced from the Jurassic and Cretaceous aged sediments, for example the nearby Stag, Wandoo and Harriet oil fields.

In particular, the Belfon (Upper Permian) and Honeybadger (Early Triassic) prospects are estimated to contain significant volumes of recoverable oil. Detailed analysis is ongoing to refine these prospect volume estimates and further updates are planned to provide shareholders with this information in due course. These prospects (Honeybadger and Belfon) have been de-risked following the results of Roc-1. Five conventional Jurassic prospects also exist (1,000-1,500 metre target depths) with a further set of Cretaceous, shallow (circa 500 metres target depth) oil prospects, which could be volumetrically large, in the context of North West Shelf oil prospects and are the focus of the current stage of geological studies.

The investment case in this area is particularly attractive because of the combination of very sizeable targets and low exploration costs. The shallow water depths (approximately 50m) and shallow oil target depths (500m - 3,000m) means drilling and development costs are expected to be low relative to normal expectations in the North West Shelf. Multiple development options are available due to the shallow depths, proximity to shore and existing production infrastructure.

The Company is looking to progress its exploration plans with a partner with the intention of drilling one or more prospects while retaining a significant equity interest in this project.



Location map of the Cerberus blocks with Belfon, Honeybadger, Kes and Rudder prospects



## Buffalo Project – WA-523-P

(Carnarvon 100% and operator)

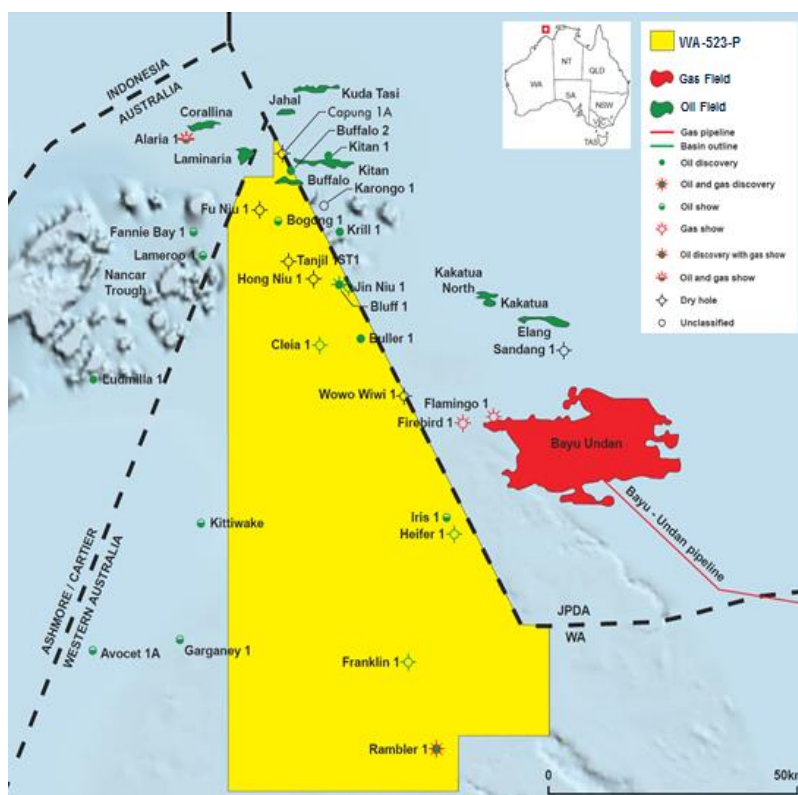
WA-523-P is surrounded by nearby oil and gas fields and pipelines. WA-523-P includes the Buffalo Oil Field and the undeveloped oil discoveries in the Bluff-1 and Buller-1 wells. The permit is also close to proven oilfields at Laminaria, Corallina, Kitan, Jahal, and Kuda Tasi that collectively contain approximately 280 mmbbl initially recoverable, all lying within 15 kilometres of WA-523-P. Further south, the giant Bayu-Undan gas/condensate field, and the Kakatua and Elang oil fields lie just 25-40km to the east of WA-523-P. In total, within a 40km radius of WA-523-P, these discovered fields are estimated to collectively contain about 730 million barrels of oil and 3.4 Tcf of gas.

WA-523-P includes the Buffalo Oil Field that produced around 20 million barrels of high quality oil and was flowing around 4,000 barrels of oil a day when operations ceased in 2004. Depending on oil price and remapping of the field, Buffalo may be a commercially attractive re-development opportunity in the future, perhaps for tie-back to nearby facilities.

In looking at historical drilling across the area, Carnarvon Petroleum observes that the absence of accurate seismic depth imaging of the target reservoirs has resulted in a very poor track record for well depths ‘coming in on prognosis’, even when they are drilled close to existing well control. This problem in getting the depth mapping right has resulted in major difficulty defining field development locations and prospects, describing volumes, reducing risk and justifying drilling. Carnarvon’s proposed new seismic imaging processes are intended to address these historical depth imaging challenges by using modern processes that the company has been testing on other permits in its portfolio.

In the past three years, advances in computing technology now enable very significant geophysical capabilities that were previously only theoretically possible. Of particular relevance to the seismic data in WA-523-P is the recent emergence of Full Waveform Inversion (FWI) as a working tool to provide the required higher resolution velocity field measurement for input to Pre-Stack Depth Migration (“PSDM”) and to provide the required improved depth imaging.

A key component of Carnarvon’s work program for WA-523-P is therefore application of FWI, and other modern processing technologies to the reprocessing of the existing 3D data to deliver greatly improved depth imaging. The improved data will enable detailed remapping, and facilitate work towards a drilling program.



Location map of the Buffalo project and nearby oil & gas fields

**Maracas Project – WA-524-P**

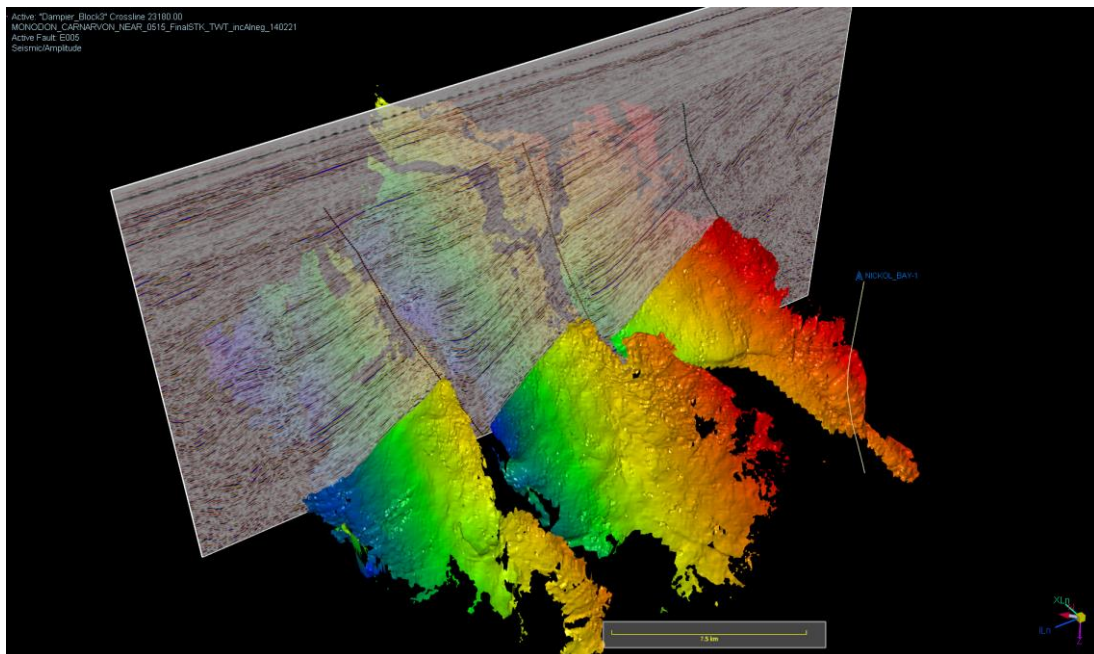
(Carnarvon 100% and operator)

Carnarvon was awarded the WA-524-P permit during the quarter. The permit is situated on the flanks of the Dampier Sub-Basin, an important part of the highly prospective Greater Carnarvon Basin, on Western Australia's North West Shelf. This large 1,210km<sup>2</sup> permit is located on the Enderby Terrace, which contains a number of untested yet attractive play types in a proven basin which includes the Stag, Wandoo and Legendre oil fields, plus the Reindeer gas field.

Carnarvon was attracted to the Permo-Triassic stratigraphy within the permit. The success of drilling the Early Triassic play types in the Roebuck Basin is well documented, and Carnarvon has identified through its regional technical work, the potential for a similar pre-Jurassic play on the flanks of the Dampier Barrow Sub-Basin.

Carnarvon has identified three potential leads within the block and aims to de-risk the elements of the play, with a number of geoscience work flows. This will include a regional source rock study and 3D seismic reprocessing with modern Full Wave form Inversion (FWI) aimed at greatly improving the quality of the 3D seismic interpretation, which also act as a precursor to rock physics studies aimed at improving our confidence around the reservoir properties. These work flows allow Carnarvon to add significant value to the asset by undertaking a forward work program that has a modest financial obligation.

Carnarvon's technical team will also further investigate the potential of a secondary play system in the shallower Cretaceous stratigraphy, which has seen great success in the nearby Stag and Wandoo oil accumulations.



**3D interpretation of the top reservoir section, highlighting the large throw of the fault blocks in WA-524-P which host each of the three leads**

**Corporate / Financial**

The Company's cash holdings at the end of the quarter were \$65.1 million, compared to \$87.7 million at the end of the previous quarter.

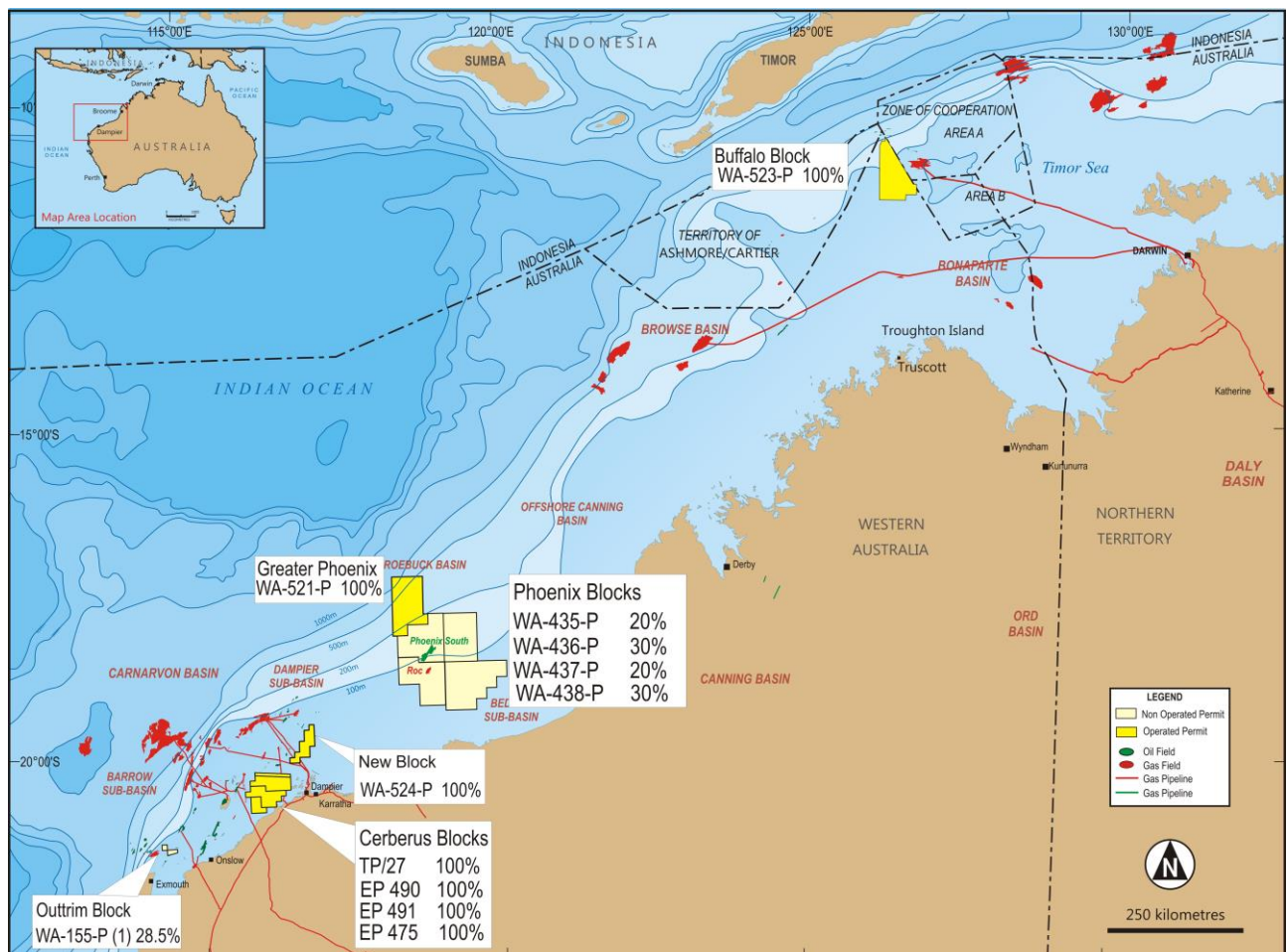
At the end of the quarter, the Company's United States Dollar holdings were US\$49.2 million with the balance being Australian Dollars. The retention of predominantly US dollars demonstrates the sensitivity of Carnarvon's reported cash holdings to the AUD / USD exchange rate. Carnarvon retains the majority of its cash in USD as a natural hedge to likely future expenditures expected to be denominated in USD.

A slight strengthening of the Australian Dollar relative to the United States Dollar during the quarter resulted in a foreign exchange translation loss to the Company's reportable cash holdings of A\$1.7 million.

During the quarter \$20.2 million was spent on exploration activities in the North West Shelf which includes Outtrim East-1 and Roc-2 drilling costs. In addition to this \$0.7 million was spent on business development and corporate costs.

## Project Table

Project	Permit(s)	Operator	Interest held	Interest Acquired during quarter
Greater Phoenix	WA-435-P	Quadrant Energy	20%	-
Greater Phoenix	WA-436-P	Quadrant Energy	30%	-
Greater Phoenix	WA-437-P	Quadrant Energy	20%	-
Greater Phoenix	WA-438-P	Quadrant Energy	30%	-
Greater Phoenix	WA-521-P	Carnarvon Petroleum	100%	-
Buffalo	WA-523-P	Carnarvon Petroleum	100%	-
Maracas	WA-524-P	Carnarvon Petroleum	100%	100%
Outtrim East	WA-155-P(1)	Quadrant Energy	28.5%	-
Cerberus	EP-490	Carnarvon Petroleum	100%	-
Cerberus	EP-491	Carnarvon Petroleum	100%	-
Cerberus	EP-475	Carnarvon Petroleum	100%	-
Cerberus	TP/27	Carnarvon Petroleum	100%	-



Carnarvon Petroleum permit map

### Abbreviations

<b>Bopd</b>	Barrels of oil per day
<b>Bwpd</b>	Barrels of water per day
<b>Bbls</b>	Barrels of oil
<b>OWC</b>	Oil water contact
<b>CVN</b>	Carnarvon Petroleum Limited
<b>JV</b>	Joint Venture
<b>Km</b>	Kilometres
<b>Km2</b>	Square kilometres
<b>m</b>	Millions
<b>Qtr</b>	Quarter
<b>Q/Q</b>	Quarter on Quarter
<b>Tcf</b>	Trillion cubic feet (gas)
<b>2D</b>	Two dimension seismic data
<b>MC2D</b>	Multi-client 2D – seismic data acquired for multiple parties that require licensing
<b>3D</b>	Three dimensional seismic data
<b>MC3D</b>	Multi-client 3D – seismic data acquired for multiple parties that require licensing
<b>US\$</b>	United States of America dollar

### About Carnarvon Petroleum

Carnarvon Petroleum Limited (Carnarvon) is a Perth based company listed on the Australian Securities Exchange (ASX: CVN). The Company's principal activity is oil and gas exploration.

Carnarvon's objective is to create material returns on its shareholder's investments, through delivering profitable and sustainable growth from the development, exploitation and commercialisation of oil and gas assets.

Carnarvon is focused on oil & gas exploration in the world-class province of the North West Shelf area off the coast of Western Australia.

For Further Information please contact:

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**Cautionary Statement**

There are numerous uncertainties inherent in estimating reserves and resources, and in projecting future production, development expenditures, operating expenses and cash flows. Oil and gas reserve engineering and resource assessment must be recognised as a subjective process of estimating subsurface accumulations of oil and gas that cannot be measured in an exact way.

Prospective Resources are the estimated quantities of petroleum that may potentially be recovered by the application of a future development project and may relate to undiscovered accumulations. These prospective resource estimates have an associated risk of discovery and risk of development. Further exploration and appraisal is required to determine the existence of a significant quantity of potentially moveable hydrocarbons.

**\*Resources**

All contingent and prospective resources presented in this report are prepared as at 7 April 2015 and 17 March 2016 (Reference: CVN ASX releases of 7 April 2015 and 17 March 2016). The estimates of contingent and prospective resources included in this announcement have been prepared in accordance with the definitions and guidelines set forth in the SPE-PRMS and have been prepared using probabilistic methods.

Carnarvon is not aware of any new information or data that materially affects the information included in this report and that all material assumptions and technical parameters underpinning the estimates in this presentation continue to apply and have not materially changed.

**Competent Person Statement Information**

The Resource estimates outlined in this report were compiled by the Company's Chief Operating Officer, Mr Philip Huizenga, who is a full-time employee of the Company. Mr Huizenga has over 20 years' experience in petroleum exploration and engineering. Mr Huizenga holds a Bachelor Degree in Engineering and a Masters Degree in Petroleum Engineering. Mr Huizenga is qualified in accordance with ASX Listing Rules and has consented to the form and context in which this statement appears.

**Forward Looking Statements**

This document may contain forward-looking information. Forward-looking information is generally identifiable by the terminology used, such as "expect", "believe", "estimate", "should", "anticipate" and "potential" or other similar wording. Forward-looking information in this document includes, but is not limited to, references to: well drilling programs and drilling plans, estimates of reserves and potentially recoverable resources, and information on future production and project start-ups. By their very nature, the forward-looking statements contained in this news release require Carnarvon and its management to make assumptions that may not materialize or that may not be accurate. The forward-looking information contained in this news release is subject to known and unknown risks and uncertainties and other factors, which could cause actual results, expectations, achievements or performance to differ materially, including without limitation: imprecision of reserve estimates and estimates of recoverable quantities of oil, changes in project schedules, operating and reservoir performance, the effects of weather and climate change, the results of exploration and development drilling and related activities, demand for oil and gas, commercial negotiations, other technical and economic factors or revisions and other factors, many of which are beyond the control of Carnarvon. Although Carnarvon believes that the expectations reflected in its forward-looking statements are reasonable, it can give no assurances that the expectations of any forward-looking statements will prove to be correct.