# Roc discovery volumes

17 March 2016

CARNARVON PETROLEUM LTD

**Highlights**

- **Roc-1 well confirms up to 372 Bscf of gas and 18 million barrels of condensate recoverable (Gross 3C contingent resource)**
- **Additional prospective resources of 328 Bscf of gas and 16 million barrels of condensate recoverable (Gross high estimate prospective resource)**
- **The preliminary minimum economic field size as estimated by Carnarvon Petroleum is around 325 Bscf and 17 million barrels of condensate (Gross)**
- **Joint venture partners have unanimously agreed that the Roc discovery warrants appraisal**
- **Planning is underway to drill a Roc-2 appraisal well early in the second half of calendar 2016 to confirm the higher volumes as depicted in Figure 1**

Carnarvon Petroleum Limited ("Carnarvon") (ASX:CVN) is pleased to provide this update following a recent meeting of the WA-435-P and WA-437-P joint venture partners and Carnarvon's appointment of RISC to independently audit the WA-437-P Roc structure contingent and prospective resources estimates which have been volumetric defined. RISC's report summarised in Table 1 is consistent with the resource estimates recently presented by the Operator, Quadrant Energy to the joint venture partners.

**Table 1: Gross Volumetric Estimates[1] for Gas and Condensate in WA-437-P**

| **Contingent Resource** | **1C** | **2C** | **3C** |
|---|---|---|---|
| Recoverable gas (Bscf) | 42 | 270 | 372 |
| Recoverable condensate (MMSTB) | 2 | 13 | 18 |
| **Prospective Resource** | **Low Estimate** | **Mid or best Estimate** | **High Estimate** |
| Recoverable gas (Bscf) | 87 | 193 | 328 |
| Recoverable condensate (MMSTB) | 4 | 9 | 16 |

Note: Totals have been estimated using probabilistic methodology; Carnarvon has a 20% equity interest in these resources – see Table 2 for net resources

1. Refer to cautionary statement in the report (page 4) relating to estimates of contingent and prospective resources

Carnarvon Managing Director and CEO, Adrian Cook said, "*the Roc structure is a particularly compelling appraisal proposition.*

*We are confident about several important elements in the structure, including the quality of the gas and condensate discovered in the Roc-1 well, the quality of the reservoir rocks that contain the discovered hydrocarbons, the outer extent of the structure via the gas water contact and the size of the structure as mapped on modern 3D seismic data.*

*The Roc-2 well will seek to prove that gas and condensate exists down to the gas water contact ("GWC"), as depicted in Figure 1. In this case it is expected the volumetric range (refer Table 1) will narrow to the "Best" to "High" estimate for the aggregated contingent and prospective resources. This outcome, on our projections, would be above the minimum economic threshold.*

*Roc-2 has been assessed as a relatively low risk appraisal well with a successful outcome being a significant step forward in supporting a development hub for gas and liquids (oil and condensate) that also opens up the province to additional development and appraisal projects.*

*In terms of potential additional development and appraisal projects we continue to assess the Phoenix South structure. This project was always considered for its tie back potential to Roc and is still of interest in this regard. We are also considering the regional significance of compelling hydrocarbon shows recorded in the deeper section of the Roc-1 well, that were observed down to the well's total depth (TD). The science clearly shows us there are prolific hydrocarbon generating source rocks within the Bedout sub-basin and our new 3D seismic data stretching beyond the Roc structure is showing us there are a significant number of large structures warranting further exploration within the area."*

On 4 January 2016, Carnarvon announced that the Roc-1 well had discovered condensate-rich gas. The discovery was made in approximately 100 metres of water approximately 158 kilometres from Port Hedland. A gross hydrocarbon section of 40 metres was intersected between 4,384 metres and 4,424 metres providing a net pay of approximately 13 metres. Beneath the hydrocarbon bearing sands an additional 80 m of reservoir quality sands were encountered. The Roc discovery has a total areal extent of around 45 square kilometres (best estimate), with a vertical relief of up to 110 metres. The Roc-1 well drilled the south-western flank of the structure in a down dip location and the additional sands are potentially hydrocarbon bearing up dip.

The Roc-1 well follows the Phoenix South-1 oil discovery drilled in late 2014, approximately 20 kilometres to the North West of Roc-1, by the same joint venture partners as the Roc-1 well. These wells together with the original Phoenix-1 and 2 discoveries drilled by BP in 1980 and 1982 in conjunction with the recent technical work completed, prove that an active petroleum system exists in the area.

The quality of the reservoir discovered in the Roc-1 well is an important and significant step forward in unlocking the commercial potential in the region.

The Operator is currently advancing a suite of technical projects that are expected to be completed over the course of the 2016 calendar year. This work will assist in future drilling activities including the Roc-2 appraisal well. Planning for this well is in progress and at this time drilling is expected to commence early in the second half of calendar 2016 and will include full conventional coring of the reservoir followed by flow testing. The Roc-2 well location is expected to be some 5 to 6 kilometres to the east of the Roc-1 well as illustrated in Figure 2. The well has an estimated 80% chance of geological success with the extent to which the Caley sandstone reservoir is present being the primary risk. The reason for this assessment being that seismic data quality and resolution precludes geophysical mapping each of the individual hydrocarbon bearing sands at this interval.

One of the development scenarios considered by the Operator, for minimum economic field consideration, is a Floating Production Storage and Offtake (FPSO) vessel for condensate production and a sales gas pipeline to shore to supply the domestic gas market. In completing the initial economic assessment, the Operator

allowed for a facility of a scale and nature capable of accommodating additional tie back of liquids and gas from nearby discoveries, prospects and leads.

Overall, while the potential in the region is significant, the exploration activities will be balanced with the appraisal of more certain resources capable of supporting a commercial hub development. The Roc discovery represents an attractive investment proposition with both its oil and gas income stream diversification.

The Roc prospective and contingent resources are within the WA-437-P exploration permit in the North West Shelf of Australia. The equity interest holders are:

| | |
|---|---|
| **Carnarvon Petroleum** | **20%** |
| Quadrant Energy (*Operator*) | 40% |
| JX Nippon | 20% |
| Finder Exploration | 20% |

Yours faithfully

**Adrian Cook**
Managing Director
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## Cautionary Statements

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 estimates have both 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.

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.

The estimates of contingent and prospective resources included in this report have been prepared in accordance with the definitions and guidelines set forth in the SPE-PRMS. The probabilistic method was used to prepare the estimates of contingent and prospective resources.

RISC is an independent energy advisory group whose expertise is in petroleum reservoir evaluation and economic analysis. This report is based on information compiled by professional staff members who are full time employees of RISC.

## Competent Person Statement Information

The resource estimates outlined in this report were reviewed 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.

**Table 2: Volumetric estimates for gas and condensate**

| | Gross (100%) | | | Net (20%) | | |
|---|---|---|---|---|---|---|
| **Contingent Resource** [(i)] | **1C** | **2C** | **3C** | **1C** | **2C** | **3C** |
| Recoverable gas (Bscf) | 41.8 | 269.7 | 371.9 | 8.4 | 53.9 | 74.4 |
| Recoverable condensate (MMSTB) | 2.0 | 13.0 | 18.2 | 0.4 | 2.6 | 3.6 |

(i) The Contingent Resources reflects the assessment of the discovered hydrocarbon column across the entire structure and have been estimated probabilistically.

| | Gross (100%) | | | Net (20%) | | |
|---|---|---|---|---|---|---|
| **Prospective Resource**[(ii)] | **Low Estimate** | **Mid or best Estimate** | **High Estimate** | **Low Estimate** | **Mid or best Estimate** | **High Estimate** |
| Recoverable gas (Bscf) | 86.6 | 192.6 | 327.6 | 17.3 | 38.5 | 65.5 |
| Recoverable condensate (MMSTB) | 4.1 | 9.2 | 16.2 | 0.8 | 1.8 | 3.2 |

(ii) The additional Prospective Resources have been estimated probabilistically and reflects the assessment of the good quality reservoir sands intersected in the Roc-1 well below the interpreted gas water contact which are anticipated to be hydrocarbon bearing in the updip location as targeted by the proposed Roc-2 well.

Refer to cautionary statement in the report (page 4) relating to estimates of contingent and prospective resources.

The wide range in volumetric analysis is a reflection of the un-appraised nature of the discovery and the subsurface uncertainties yet to be addressed, particularly as the discovery well intersected the Roc structure in a flank position.

As currently characterised, the most important uncertainties are the lateral extent of the gas bearing sands encountered in the Roc-1 well and the extent of the predicted gas and condensate column in the reservoir quality sands intersected water wet below the interpreted gas water contact. The Roc-2 well proposed to be drilled in 2016 will go a long way to addressing these uncertainties and to firm up the recoverable resource volumes in the discovered gas condensate pool.

Success at the Roc-2 well is expected to move Prospective Resources into Contingent Resources and prove the base for a viable field development.

**Figure 1: Depiction of Top Caley and gas charged sands and gas water contact**

The Roc-1 well encountered sands at the edge of the Roc structure, thereby helping to identify potential gas water contacts in the field. This provides an important data point for the outer edge of the hydrocarbon bearing structure in this area. The composition of the reservoir encountered above and below the interpreted gas water contact in Roc-1 was of conventional reservoir quality. The Roc-2 well will target a more crestal location within the Roc structure. The objective being to determine whether the gas and condensate extends laterally and vertically to this location. The interpretations are that there should be a high chance of this outcome occurring.

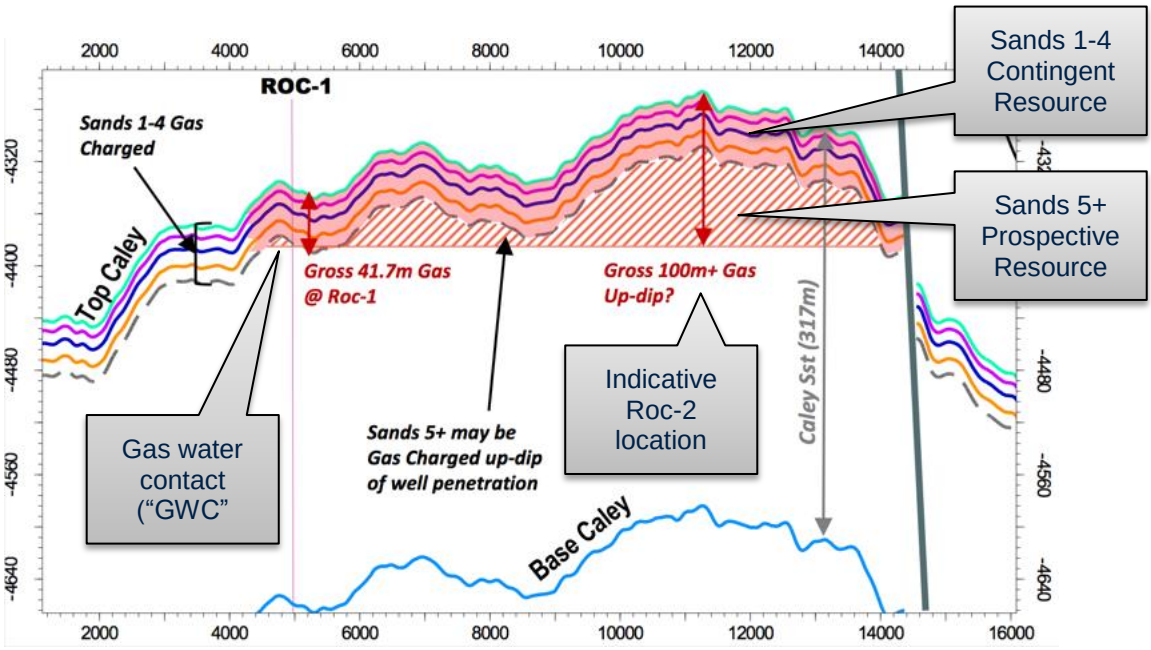

**Figure 2 – Depth map based on 3D seismic interpretation, showing the location of the Roc-1 and proposed Roc-2 wells**

This image shows the location of the Roc-1 well and the proposed Roc-2 well together with the interpreted gas water contact in the "Best or mid" case used for volumetric estimation. The best estimate of the areal extent of this structure as mapped is significant at approximately 45km$^2$.