# Phoenix – Independent Resource Assessment 7 April 2015

## Highlights

- Independent technical advisor appointed to estimate recoverable oil in Phoenix 3D area.
- Contingent and Prospective recoverable oil assessed between 48 to 232 million barrels (gross), with a best estimate of 104 million barrels (gross), including:
  - Phoenix South oil recoverable of between 6 and 56 million barrels, with a best estimate of 19 million barrels, classed as Contingent Resource; and

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- Roc prospect oil recoverable of between 12 and 133 million barrels, with a best estimate of 42 million, classed as Prospective Resource.
- Roc-1 well is planned to commence drilling in the fourth quarter of calendar 2015.

Carnarvon Petroleum Limited ("Carnarvon") (ASX:CVN) commissioned independent technical advisor, DeGolyer and MacNaughton, to assess the potential recoverable oil within the Phoenix 3D seismic area (as outlined in the map below), which includes the Phoenix South-1 discovery and the Roc prospect, based on data provided by Apache.

The results of the study are outlined in the attached reports and are summarised in the Annexure below.

Carnarvon's Managing Director, Mr Adrian Cook said:

"In the context of recent Australian oil discoveries, these estimates of recoverable oil within the Phoenix South and nearby structures are significant and great news in terms of our strategy of opening up an entirely new oil province on the North West Shelf.

The provision of a range of outcomes is normal industry practice; and the extent of the range indicates that we are still in the early stage of understanding what we have. In particular, the recoverable volumes have been calculated using a reasonably conservative and broad range of recovery factors. The ongoing technical work, including "special core analysis", is expected to refine this range.

The Roc-1 well is a standout exploration opportunity given the best estimate Prospective Resource of 42 million barrels of oil, which is definitely a commercially attractive proposition if confirmed, and a high 42% chance of success. A high-side outcome of up to 133 million barrels of recoverable oil would be an outstanding result and there is little capital risk to investors as the first US\$14 million of Carnarvon's share of any drilling activity in the permit will be paid for by Apache and JX Nippon.

DeGolyer and MacNaughton also verified Apache's initial oil in place estimate of up to 300 million barrels for the Phoenix South structure alone, assessing 296 million barrels of oil in place and 56 million barrels recoverable in the high side case.

This continues to be an exciting time for Carnarvon, with the ongoing assessment of further prospective resources, Roc-1 drilling scheduled for this year and further data acquisition to identify additional prospectivity in the region held by the Joint Venture Partners.

We appreciate the patience of our shareholders while we have been working through the technical data and test programs and will continue to provide ongoing updates as we progress."



The Joint Venture, led by Apache as operator, continues its work on the Phoenix South-1 well data and the data from previously drilled wells in the permit. This work addresses many geological aspects including reservoir development and quality, the type and potential source of the oils discovered and determining where the same results may occur elsewhere in the blocks. The work is expected to continue for a significant period of time and further updates will incorporate this work as it progresses.

Importantly, these volume estimates are subject to ongoing technical analysis that is currently being undertaken by the operator, Apache, including "special core analysis". As Apache does not have a firm timetable for completion of volume estimates, Carnarvon initiated the DeGolyer and MacNaughton assessment using available Joint Venture data.

The cost of the Roc-1 well will be covered by Apache and JX Nippon to US\$70 million (gross cost of well) thereafter the parties pay their respective share. DeGolyer and MacNaughton have assessed a high technical chance of success on this well of 42%.

The equity interest holders are:

WA-435-P and WA-437-P

Carnarvon Petroleum	20%
Apache Energy (Operator)	40%
JX Nippon	20%
Finder Exploration	20%

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### Yours faithfully

Adrian Cook Managing Director Carnarvon Petroleum

This news release contains 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 news release 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.



## Annexure to Phoenix Resource Assessment – Contingent and Prospective Resources

Following is a summary of the attached DeGolyer and MacNaughton reports.

Field	Reservoir Interval	Contingent Resources (MM bbls)		
		1C	2C	3C
Phoenix South	Lower Keraudren	6	19	56
Phoenix	Lower Keraudren	3	9	28
Total Contingent (i)		13	31	78

## Table 1: Gross Contingent Resource estimate for Phoenix and Phoenix South

(i) Statistical aggregate of Contingent Resources

## Table 2: Gross Prospective Resource estimates only within the Phoenix 3D area (unrisked)

Field	Reservoir Interval	-	e <b>ctive Res</b> (MM bbls)	Probability Geological Success	
		Low	Best	High	
Roc	Lower Keraudren	12	42	133	42%
Bewdy	Lower Keraudren	3	9	26	42%
Bottler	Lower Keraudren	2	7	20	42%
Phoenix 2 Updip	Lower Keraudren	1	4	14	27%
Phoenix West	Lower Keraudren	Not yet determined			
Total Phoenix 3D					
Prospects (ii)		35	73	154	

(ii) Statistical aggregate of Prospective Resources

## **Table 3: Aggregated Contingent and Prospective Resource estimates**

Classification	Reference	<b>Resources</b> (MM bbls)		
		Low	Best	High
Contingent	Table 1	13	31	78
Prospective	Table 2	35	73	154
Total (arithmetric Sum)		48	104	232



### **Resource Assessment**

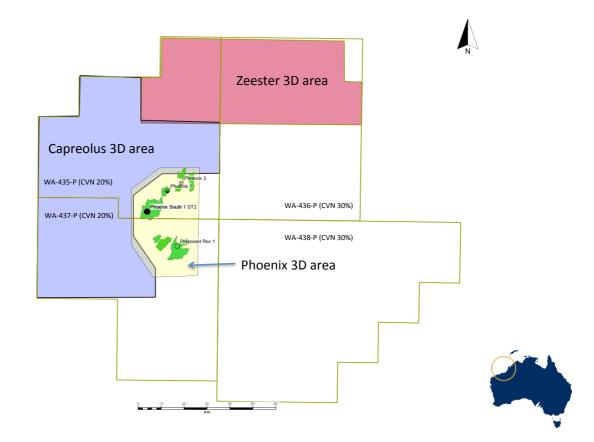
The estimates of contingent and prospective resources included in this announcement have been prepared in accordance with the definitions and guidelines set forth in the SPE-PRMS.

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

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.

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.

## Permit map showing assessed prospects (green polygons) and 3D seismic areas



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#### REPORT

as of APRIL 1, 2015 on the CONTINGENT RESOURCES attributable to CERTAIN PROPERTIES owned by CARNARVON PETROLEUM LTD. in the BEDOUT SUB-BASIN AUSTRALIA

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#### DEGOLYER AND MACNAUGHTON

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# REPORT as of APRIL 1, 2015 on the CONTINGENT RESOURCES attributable to CERTAIN PROPERTIES owned by CARNARVON PETROLEUM LTD. in the BEDOUT SUB-BASIN AUSTRALIA

### FOREWORD

Scope of InvestigationThis report presents estimates, as of<br/>April 1, 2015, of the extent of the 1C, 2C,<br/>and 3C contingent resources of certain properties located in the Bedout Sub-Basin<br/>in Australia in which Carnarvon Petroleum Ltd. (Carnarvon) has represented that<br/>it owns a 20-percent working interest.

The contingent resources estimates presented in this report have been prepared in accordance with the Petroleum Resources Management System (PRMS) approved in March 2007 by the Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, and the Society of Petroleum Evaluation Engineers. These contingent resources definitions are discussed in detail in the Definition of Contingent Resources section of this report.

Contingent resources estimated in this report are expressed as gross contingent resources. Gross contingent resources are defined as the total estimated petroleum that is potentially recoverable from known accumulations after March 31, 2015.

Table 1 summarizes accumulation names, ownership, and location of the properties presented herein. Tables 2 and 3 summarize the contingent resources quantities for the properties presented herein.

In this report, probabilistic methods have been used. For probabilistic estimates of contingent resources, the low estimate reported herein is the  $P_{90}$  quantity derived from probabilistic analysis. This means that there is at least a 90-percent probability that the quantities actually recovered will equal or exceed the low estimate. The best estimate is the  $P_{50}$  quantity derived from probabilistic analysis. This means that there is at least a 50-percent probability that the quantities actually recovered will equal or exceed the best estimate. The high estimate is the  $P_{10}$  quantity derived from probabilistic analysis. This means that there is at least a 10-percent probability that the quantities actually recovered will equal or exceed the high estimate.

The contingent resources estimated herein are those quantities of petroleum that are potentially recoverable from known accumulations but which are not currently considered to be commercially recoverable. Because of the uncertainty of commerciality, the contingent resources estimated herein cannot be classified as reserves. The contingent resources estimates in this report are provided as a means of comparison to other contingent resources and do not provide a means of direct comparison to reserves. The contingent resources estimated in this report have an economic status of Undetermined, since the evaluations of those contingent resources are at a stage such that it is premature to clearly define the ultimate chance of commerciality.

Contingent resources should not be confused with those quantities that are associated with reserves due to the additional risks involved. The quantities that might actually be recovered should these accumulations be developed may differ significantly from the estimates presented herein. There is no certainty that it will be commercially viable to produce any portion of the contingent resources evaluated herein.

Estimates of contingent resources should be regarded only as estimates that may change as further production history and additional information become available. Not only are such contingent resources estimates based on that information which is currently available, but such estimates are also subject to the uncertainties inherent in the application of judgmental factors in interpreting such information.

#### Authority

This report was authorized by Mr. Adrian Cook, CEO, Carnarvon.

Source of Information Information used in the preparation of this report was obtained from Carnarvon. In the preparation of this report we have relied, without independent verification, upon information furnished by Carnarvon with respect to the property interests to be evaluated and various other information that was accepted as represented. A field examination of the properties was not considered necessary for the purposes of this report.

#### **DEFINITION of CONTINGENT RESOURCES**

Estimates of petroleum resources included in this report are classified as contingent resources and have been prepared in accordance with the PRMS approved in March 2007 by the Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, and the Society of Petroleum Evaluation Engineers. Because of the lack of commerciality or sufficient development drilling, the contingent resources estimated herein cannot be classified as reserves. The petroleum resources are classified as follows:

*Contingent Resources* – Those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects, but which are not currently considered to be commercially recoverable due to one or more contingencies.

Based on assumptions regarding future conditions and their impact on ultimate economic viability, projects currently classified as Contingent Resources may be broadly divided into three economic status groups:

Marginal Contingent Resources – Those quantities associated with technically feasible projects that are either currently economic or projected to be economic under reasonably forecasted improvements in commercial conditions but are not committed for development because of one or more contingencies.

Sub-Marginal Contingent Resources – Those quantities associated with discoveries for which analysis indicates that technically feasible development projects would not be economic and/or other contingencies would not be satisfied under current or reasonably forecasted improvements in commercial conditions. These projects nonetheless should be retained in the inventory of discovered resources pending unforeseen major changes in commercial conditions. Undetermined Contingent Resources – Where evaluations are incomplete such that it is premature to clearly define ultimate chance of commerciality, it is acceptable to note that project economic status is "undetermined."

The estimation of resources quantities for an accumulation is subject to both technical and commercial uncertainties and, in general, may be quoted as a range. The range of uncertainty reflects a reasonable range of estimated potentially recoverable quantities. In all cases, the range of uncertainty is dependent on the amount and quality of both technical and commercial data that are available and may change as more data become available.

1C (Low), 2C (Best), and 3C (High) Estimates - Estimates of petroleum resources are expressed using the terms 1C (low) estimate, 2C (best) estimate, and 3C (high) estimate to reflect the range of uncertainty.

For probabilistic estimates of petroleum resources, the low estimate reported herein is the  $P_{90}^*$  quantity derived from probabilistic analysis. This means that there is at least a 90-percent probability that, assuming the accumulation is discovered and developed, the quantities actually recovered will equal or exceed the low estimate. The best (median) estimate is the  $P_{50}^*$  quantity derived from probabilistic analysis. This means that there is at least a 50-percent probability that, assuming the accumulation is discovered and developed, the quantities actually recovered will equal or exceed the best (median) estimate. The high estimate is the  $P_{10}^*$  quantity derived from probabilistic analysis. This means that there is at least a 10-percent probability that, assuming the accumulation is discovered will equal or exceed the high estimate and developed, the quantities at least a 10-percent probability that, assuming the accumulation is discovered will equal or exceed will equal equal

*Low, Best, and High* – Estimates of the gross discovered oil initially in place in this report are expressed using the terms low estimate, best estimate, and high estimate to reflect the range of uncertainty.

#### ESTIMATION of CONTINGENT RESOURCES

Estimates of contingent resources were prepared by the use of appropriate geologic, petroleum engineering, and evaluation principles and techniques that are in accordance with practices generally recognized by the petroleum industry and in accordance with definitions established by the PRMS. The method or combination of methods used in the analysis of each reservoir was tempered by experience with similar reservoirs, stage of development, quality and completeness of basic data, and production history of analog fields.

Contingent resources were evaluated using analysis of an observed range of certain parameters related to the quantity of petroleum present and potentially recoverable in discovered accumulations. Standard probabilistic methods were used in the analysis of the uncertainty associated with these parameters. Probability distributions were estimated from representations of porosity, petroleum saturation, net hydrocarbon thickness, recovery efficiency, fluid properties, and potential productive area for each accumulation. These representations were prepared based on known data, analogy, and other standard estimation methods. Statistical measures describing the probability distributions of these representations were identified and input to a Monte Carlo simulation to produce low estimate (1C), best estimate (2C), and high estimate (3C) of the gross contingent resources attributable to each accumulation.

The contingent resources estimated in this report are associated with certain areas of discovered accumulations. Future development of the reservoir areas associated with contingent resources will depend on economic and market conditions.

The volumetric method was used to estimate the oil initially in place (OIIP) or gas initially in place (GIIP). Structure maps were prepared to delineate each reservoir, and isopach maps were constructed to estimate reservoir volume. Electrical logs, radioactivity logs, core analyses, formation tests and other available data were used to prepare these maps as well as to estimate representative values for porosity and water saturation.

Estimates of ultimate recovery were obtained after applying recovery factors to OIIP or GIIP. These recovery factors were based on consideration of the type of energy inherent in the reservoirs, analyses of the petroleum, the structural positions of the properties, and the production histories of analog fields.

Data available from wells drilled on the evaluated properties through April 1, 2015, are included herein. The development and economic status included herein represents the status applicable on April 1, 2015.

Carnarvon has represented that it holds a 20-percent working interest in exploration licenses WA-435-P in the Bedout Sub-Basin in Australia. This license block contains the known accumulations evaluated in this report. The estimates of the contingent resources summarized herein were not limited by the length of a production license that may be granted to Carnarvon.

The potentially recoverable quantities estimated herein are classified as contingent resources due to a lack of a finalized development and marketing plan. The economic status of these quantities classified as contingent resources is Undetermined, since the evaluations of those contingent resources are at a stage such that it is premature to clearly define the ultimate chance of commerciality.

Because of the lack of plans to develop the oil and/or gas quantities in these areas and the uncertain economic viability of such developments, the contingent resources estimated herein cannot be considered reserves. If the required commitment and approval were in place to exploit the oil and/or gas reservoirs and the development were economic, certain of these contingent resources could be reclassified as reserves.

Estimates of oil contingent resources are expressed herein in thousands of barrels ( $10^3$ bbl). In this estimate, 1 barrel equals 42 United States gallons.

#### SUMMARY and CONCLUSIONS

The estimated gross contingent resources attributable to the reservoirs evaluated in this report, as of April 1, 2015, based on standard probabilistic methods, are summarized as follows, expressed in thousands of barrels  $(10^3 bbl)$  of oil:

	1C	<b>2</b> C	_3C
Gross Contingent Oil Resources, 10 <sup>3</sup> bbl	13,262	31,376	77,657

Notes:

- 1. Application of any risk factor to contingent resources quantities does not equate contingent resources with reserves.
- 2. There is no certainty that it will be commercially viable to produce any portion of the contingent resources evaluated herein.
- 3. All of the contingent resources estimate in this report have a status of Undetermined, since the evaluations of those contingent resources are at a stage such that it is premature to clearly define the ultimate chance of commerciality.

Submitted,

Detalyer and Mac Nurghton

DeGOLYER and MacNAUGHTON Texas Registered Engineering Firm F-716

SIGNED: April 2, 2015



John W. Hornbrook, P.E. Senior Vice President DeGolyer and MacNaughton



## TABLE 1 PORTFOLIO SUMMARY as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD. in the BEDOUT SUB-BASIN AUSTRALIA

Accumulation	Country	Basin	License Block	Working Interest (decimal)
Phoenix	Australia	Bedout Sub-Basin	WA-435-P	0.200
Phoenix South	Australia	Bedout Sub-Basin	WA-435-P	0.200



#### TABLE 2 ESTIMATE of the GROSS CONTINGENT RESOURCES as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD in the BEDOUT SUB-BASIN AUSTRALIA

		Country Basin	-	Gross Oil Contingent Resources Summary			
Accumulation Co	Country		License Block	1C (10 <sup>3</sup> bbl)	2C (10 <sup>3</sup> bbl)	3C (10 <sup>3</sup> bbl)	
Phoenix Phoenix South	Australia Australia	Bedout Sub-Basin Bedout Sub-Basin	WA-435-P WA-435-P	3,002 6,264	9,381 18,874	28,474 55,835	
Statistical Aggregate				13,262	31,376	77,657	
Arithmetic Summation				9,265	28,255	84,309	

Notes:

1. Application of any risk factor to contingent resources quantities does not equate contingent resources with reserves.

2. There is no certainty that it will be commercially viable to produce any portion of the contingent resources evaluated.

3. Arithmetic summation of probabilistic estimates produces invalid results except for the mean estimate.

Arithmetic summation of probabilistic estimates is presented in this table in compliance with PRMS guidelines.

4. Summations may vary from those shown here due to rounding.

5. Contingent resources have an economic status of "Undetermined".



#### TABLE 3 ESTIMATE of the GROSS DISCOVERED OIL INITIALLY in PLACE as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD in the BEDOUT SUB-BASIN AUSTRALIA

	Gross Disco			Gross Discover	ed Oil Initially in Pl	ace Summary
Accumulation	Country	Basin	License Block	Low Estimate (10 <sup>3</sup> bbl)	Best Estimate (10 <sup>3</sup> bbl)	High Estimate (10 <sup>3</sup> bbl)
Phoenix	Australia	Bedout Sub-Basin	WA-435-P	19.476	54,972	152,370
Phoenix South	Australia	Bedout Sub-Basin	WA-435-P	40,299	111,909	296,293
Statistical Aggregate				68,949	169,819	418,263
Arithmetic Summation				59,775	166,880	448,663

Notes:

1. Application of any risk factor to contingent resources quantities does not equate contingent resources with reserves.

2. There is no certainty that it will be commercially viable to produce any portion of the contingent resources evaluated.

3. Arithmetic summation of probabilistic estimates produces invalid results except for the mean estimate.

Arithmetic summation of probabilistic estimates is presented in this table in compliance with PRMS guidelines.

4. Summations may vary from those shown here due to rounding.

5. Contingent resources have an economic status of "Undetermined".

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#### REPORT

as of APRIL 1, 2015 on the PROSPECTIVE RESOURCES attributable to VARIOUS PROSPECTS owned by CARNARVON PETROLEUM LTD. in the BEDOUT SUB-BASIN AUSTRALIA

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Table2 - Estimate of the Gross Prospective Oil ResourcesTable3 - Estimate of the Gross Prospective Solution Gas Resources

#### DEGOLYER AND MACNAUGHTON

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# REPORT as of APRIL 1, 2015 on the PROSPECTIVE RESOURCES attributable to VARIOUS PROSPECTS owned by CARNARVON PETROLEUM LTD. in the BEDOUT SUB-BASIN AUSTRALIA

### FOREWORD

Scope of Investigation This report presents estimates, as of April 1, 2015, of the prospective petroleum resources of various prospects located in the Bedout Sub-Basin in Australia. This report is being prepared on behalf of Carnarvon Petroleum Ltd. (Carnarvon). Carnarvon has represented that it currently owns a 20-percent working interest in these prospects under the terms of the exploration and production licenses issued (Table 1).

A possibility exists that the prospects will not result in successful discoveries and development, in which case there could be no future revenue. There is no certainty that any portion of the prospective resources estimated herein will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.

Estimates of prospective resources should be regarded only as estimates that may change as additional information becomes available. Not only are such prospective resources estimates based on that information which is currently available, but such estimates are also subject to the uncertainties inherent in the application of judgmental factors in interpreting such information. Prospective resources quantities estimates should not be confused with those quantities that are associated with contingent resources or reserves due to the additional risks involved. The quantities that might actually be recovered, should they be discovered and developed, may differ significantly from the estimates presented herein.

The prospective resources estimates presented in this report have been prepared in accordance with the Petroleum Resources Management System (PRMS) approved in March 2007 by the Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, and the Society of Petroleum Evaluation Engineers. These prospective resources definitions are discussed in detail in the Definition of Prospective Resources section of this report.

The prospective resources estimated in this report are expressed as gross prospective resources. Gross prospective resources are defined as the total estimated petroleum that is potentially recoverable from these accumulations after March 31, 2015. The prospects are located in the Bedout Sub-Basin in Australia.

The prospective resources estimated herein are those quantities of petroleum that are potentially recoverable from accumulations yet to be discovered. Because of the uncertainty of commerciality and the lack of sufficient exploration drilling, the prospective resources estimated herein cannot be classified as contingent resources or reserves. The prospective resources estimates in this report are not provided as a means of comparison to contingent resources or reserves. Table 1 summarizes ownership, potential hydrocarbon phase, and prospect location for the prospect portfolio presented herein. Tables 2 and 3 summarize the prospective resources volumes and probability of geologic success ( $P_g$ ) for the prospect portfolio estimated herein.

Authority

This report was authorized by Mr. Adrian Cook, CEO, Carnarvon.

#### Source of Information

In the preparation of this report we have relied, without independent verification,

upon information furnished by or on behalf of Carnarvon with respect to the property interests to be evaluated, subsurface data as they pertain to the target objectives and prospects, and various other information and technical data that were accepted as represented. Site visits to the prospects evaluated herein were not made by DeGolyer and MacNaughton, as these potential accumulations are undrilled and prospective; therefore, production facilities are not relevant. This report was based on data available as of April 1, 2015.

#### **DEFINITION of PROSPECTIVE RESOURCES**

Estimates of petroleum resources included in this report are classified as prospective resources and have been prepared in accordance with the PRMS approved in March 2007 by the Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, and the Society of Petroleum Evaluation Engineers. Because of the lack of commerciality or sufficient drilling, the prospective resources estimated herein cannot be classified as contingent resources or reserves. The petroleum resources are classified as follows:

*Prospective Resources* – Those quantities of petroleum that are estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects.

The estimation of resources quantities for a prospect is subject to both technical and commercial uncertainties and, in general, may be quoted as a range. The range of uncertainty reflects a reasonable range of estimated potentially recoverable quantities. In all cases, the range of uncertainty is dependent on the amount and quality of both technical and commercial data that are available and may change as more data become available.

*Low, Best, High, and Mean Estimates* – Estimates of petroleum resources in this report are expressed using the terms low estimate, best estimate, high estimate, and mean estimate to reflect the range of uncertainty.

A detailed explanation of the probabilistic terms used herein and identified with an asterisk (\*) is included in the Glossary of Probabilistic Terms bound with this report. For probabilistic estimates of petroleum resources, the low estimate reported herein is the  $P_{90}^*$  quantity derived from probabilistic analysis. This means that there is at least a 90-percent probability that, assuming the prospect is discovered and developed, the quantities actually recovered will equal or exceed the low estimate. The best (median) estimate is the  $P_{50}^*$  quantity derived from probabilistic analysis. This

means that there is at least a 50-percent probability that, assuming the prospect is discovered and developed, the quantities actually recovered will equal or exceed the best (median) estimate. The high estimate is the  $P_{10}$ \* quantity derived from probabilistic analysis. This means that there is at least a 10-percent probability that, assuming the prospect is discovered and developed, the quantities actually recovered will equal or exceed the high estimate. The expected value\* (EV), an outcome of the probabilistic analysis, is the mean estimate.

Uncertainties Related to Prospective Resources – The quantity of petroleum discovered by exploration drilling depends on the number of prospects that are successful as well as the quantity that each success contains. Reliable forecasts of these quantities are, therefore, dependent on accurate predictions of the number of discoveries that are likely to be made if the entire portfolio of prospects is drilled. The accuracy of this forecast depends on the portfolio size, and an accurate assessment of the  $P_g$ .

Probability of Geologic Success – The probability of geologic success  $(P_g)$  is defined as the probability of discovering reservoirs that flow hydrocarbons at a measurable rate. The  $P_g$  is estimated by quantifying with a probability each of the following individual geologic chance factors: trap, source, reservoir, and migration. The product of the probabilities of these four chance factors is  $P_g$ .  $P_g$  is predicated and correlated to the minimum case prospective resources gross recoverable volume(s). Consequently, the  $P_g$  is not linked to economically viable volumes, economic flow rates, or economic field size assumptions.

In this report estimates of prospective resources are presented both before and after adjustment for  $P_g$ . Total prospective resources estimates are based on the probabilistic summation (statistical aggregate) of the quantities for the total inventory of prospects. The statistical aggregate  $P_g$ -adjusted mean estimate, or "aggregated geologic chance-adjusted mean estimate," is a probability-weighted average geologic success case expectation (average) of the hydrocarbon quantities potentially recoverable if all of the prospects in a portfolio were drilled. The  $P_g$ -adjusted mean estimate is a "blended" quantity; it is a product of the statistically aggregated mean volume estimate and the portfolio's probability of geologic success. This statistical measure considers and stochastically quantifies the geological success and geological failure outcomes. Consequently, it represents the average or mean "geologic success case" volume outcome of drilling all of the prospects in the exploration program.

Application of  $P_g$  to estimate the  $P_g$ -adjusted prospective resources quantities does not equate prospective resources with reserves or contingent resources.  $P_g$ -adjusted prospective resources quantities cannot be compared directly to or aggregated with either reserves or contingent resources. Estimates of  $P_g$  are interpretive and are dependent on the quality and quantity of data currently made available. Future data acquisition, such as additional drilling or seismic acquisition, can have a significant effect on  $P_g$  estimation. These additional data are not confined to the study area, but also include data from similar geologic settings or technological advancements that could affect the estimation of  $P_g$ .

Predictability versus Portfolio Size - The accuracy of forecasts of the number of discoveries that are likely to be made is constrained by the number of prospects in the exploration portfolio. The size of the portfolio and  $P_g$  together are helpful in gauging the limits on the reliability of these forecasts. A high Pg, which indicates a high chance of discovering measurable petroleum, may not require a large portfolio to ensure that at least one discovery will be made (assuming the Pg does not change during drilling of some of the prospects). By contrast, a low P<sub>g</sub>, which indicates a low chance of discovering measurable petroleum, could require a large number of prospects to ensure a high confidence level of making even a single discovery. The relationship between portfolio size,  $P_{g}$ , and the probability of a fully unsuccessful drilling program that results in a series of wells not encountering measurable hydrocarbons is referred to herein as the predictability versus portfolio size (PPS) relationship\*. It is critical to be aware of PPS, because an unsuccessful drilling program, which results in a series of wells that do not encounter measurable hydrocarbons, can adversely affect any exploration effort, resulting in a negative present worth.

For a large prospect portfolio, the  $P_g$ -adjusted mean statistical aggregate estimate of the prospective resources quantity should be a reasonable estimate of the recoverable petroleum quantities found if all prospects are drilled. When the number of prospects in the portfolio is small and the  $P_g$  is low, the recoverable petroleum actually found may be considerably smaller than the statistical aggregate  $P_g$ -adjusted mean estimate would indicate. It follows that the probability that all of the prospects will be unsuccessful is smaller when a large inventory of prospects exist.

*Prospect Technical Evaluation Stage* – A prospect can often be subcategorized based on its current stage of technical evaluation. The different stages of technical evaluation relate to the amount of geologic, geophysical, engineering, and petrophysical data as well as the quality of available data.

*Prospect* – A prospect is a potential accumulation that is sufficiently well defined to be a viable drilling target. For a prospect, sufficient data and analyses exist to identify and quantify the technical uncertainties, to determine reasonable ranges of geologic chance factors and engineering and petrophysical parameters, and to estimate prospective resources.

Lead – A lead is less well defined and requires additional data and/or evaluation to be classified as a prospect. An example would be a poorly defined closure mapped using sparse regional seismic data in a basin containing favorable source and reservoir(s). A lead may or may not be elevated to prospect status depending on the results of additional technical work. A lead must have a  $P_g$  equal to or less than 0.05 to reflect the inherent technical uncertainty.

Play – A project associated with a prospective trend of potential prospects, but which requires more data acquisition and/or evaluation in order to define specific leads or prospects.

#### ESTIMATION of PROSPECTIVE RESOURCES

Estimates of prospective resources were prepared by the use of standard geological and engineering methods generally accepted by the petroleum industry. The method or combination of methods used in the analysis of the reservoirs was tempered by experience with similar reservoirs, stage of development, and quality and completeness of basic data.

The probabilistic analysis of the prospective resources in this study considered the uncertainty in the amount of petroleum that may be discovered and the  $P_g$ . The uncertainty analysis addresses the range of possibilities for any given volumetric parameter. Minimum, maximum, low, best, high, and mean estimates of prospective resources were estimated to address this uncertainty. The  $P_g$  analysis addresses the probability that the identified prospect will contain petroleum that flows at a measurable rate.

Standard probabilistic methods were used in the uncertainty analysis. Probability distributions were estimated from representations of porosity, hydrocarbon saturation, net hydrocarbon thickness, geometric correction factor<sup>\*</sup>, recovery efficiency, fluid properties, and potential productive area for each prospect. These representations were prepared based on known data, analogy, and other standard estimation methods including experience. Statistical measures describing the probability distributions of these representations were identified and input to a Monte Carlo simulation to produce low estimate (P<sub>90</sub>), best estimate (P<sub>50</sub>), high estimate (P<sub>10</sub>), and mean estimate prospective resources for each prospect.

Estimates of recovery efficiency presented in this report are based on analog data and global experience and reflect the potential range in recovery for the potential reservoirs considered in each prospect. Recovery efficiency estimates do not incorporate development or economic input and are subject to change upon selection of specific development options and costs, economic parameters, and product price scenarios.

Nonassociated gas is gas at initial reservoir conditions with no crude oil present in the reservoir. Gas-cap gas is gas at initial reservoir conditions and is in communication with an underlying oil zone. Solution gas is gas dissolved in crude oil at initial reservoir conditions. In known accumulations, solution gas and gas-cap gas are sometimes produced together and, as a whole, referred to as associated gas. Hydrocarbon phase determination is based on the phase chance of occurrence per the present interpretation of the petroleum system. Therefore, prospective resources volumes in this report are identified herein as oil and solution gas.

Assumed recovery of the potential prospective oil resources estimated herein would be by normal separation in the field. Estimates of prospective oil resources are expressed herein in thousands of barrels (10<sup>3</sup>bbl). In this estimate, 1 barrel equals 42 United States gallons.

In this report, gas quantities are expressed in English units at a temperature base of 60 degrees Fahrenheit (°F) and at a pressure base of 14.7 pounds per square inch absolute (psia).

In this report, four potential accumulations are referred to as prospects to reflect the current stage of technical evaluation.

Volumetrics, Quantitative Risk

Assessment, and the Application of P<sub>g</sub>

Minimum, low, modal, best, mean, high, and maximum representations of potential productive area were interpreted from maps, available seismic data,

and/or analogy. Representations for the petrophysical parameters (porosity, hydrocarbon saturation, and net hydrocarbon thickness) and engineering parameters (recovery efficiency and fluid properties) were also estimated based on available well data, regional data, analog field data, and global experience.

The distributions for the variables were derived from (1) scenario-based interpretations, (2) the geologic, geophysical, petrophysical, and engineering data available, (3) local, regional, and global knowledge, and (4) field and case studies in the literature. The parameters used to model the recoverable quantities were potential productive area, net hydrocarbon thickness, geometric correction factor, porosity, hydrocarbon saturation, formation volume factor, and recovery efficiency. Minimum, mean, and maximum representations were used to statistically model and shape the input  $P_{90}$ ,  $P_{50}$ , and  $P_{10}$  parameters. Potential productive area and net hydrocarbon thickness were modeled using truncated lognormal distributions. Truncated normal distributions were used to model geometric correction factor, formation volume factor, recovery

efficiency, porosity, and hydrocarbon saturation. Latin hypercube sampling was used to better represent the tails of the distributions.

Each individual volumetric parameter was investigated using a probabilistic approach with attention to variability. Deterministic data were used to anchor and shape the various distributions. The net rock volume parameters had the greatest range of variability, and therefore had the greatest impact on the uncertainty of the simulation. The volumetric parameter variability was based on the structural and stratigraphic uncertainties due to the depositional environment and quality of the seismic data. Analog field data were statistically incorporated to derive uncertainty limits and constraints on the net hydrocarbon saturation pore volume. Uncertainty associated with the depth conversion, seismic interpretation, gross sand thickness mapping, and net hydrocarbon thickness assumptions were also derived from studies of analogous reservoirs, multiple interpretative scenarios, and sensitivity analyses.

A  $P_g$  analysis was applied to estimate the quantities that may actually result from drilling these prospects. In the  $P_g$ analysis, the  $P_g$  estimates were made for each prospect from the product of the probabilities of the four geologic chance factors: trap, reservoir, migration, and source. The  $P_g$  is predicated and correlated to the minimum case prospective resources gross recoverable volume(s). The  $P_g$  is not linked to economically viable volumes, economic flow rates, or economic field size assumptions.

Estimates of gross prospective resources and the  $P_g$  estimates, as of April 1, 2015, evaluated herein are shown in Tables 2 and 3. The  $P_g$ -adjusted mean estimate of the prospective resources was then made by the probabilistic product of  $P_g$  and the resources distributions for the prospect. These results were then stochastically summed (zero dependency) to produce the statistical aggregate  $P_g$ -adjusted mean estimate prospective resources. The range in probability of the mean occurrence  $(P_{MEAN})^*$  for the prospective resources volumes were estimated as defined in the glossary of this report. The range in  $P_{MEAN}$  for the statistical aggregate  $P_g$ -adjusted mean oil estimate is 0.13 to 0.19.

 $\label{eq:product} Application of the P_g factor to estimate the P_g-adjusted prospective resources quantities does not equate prospective resources with reserves or contingent resources. The P_g-adjusted estimates of prospective resources quantities cannot be compared directly to or aggregated$ 

with either reserves or contingent resources. Estimates of  $P_g$  are interpretive and are dependent on the quality and quantity of data currently available. Future data acquisition, such as additional drilling or seismic acquisition, can have a significant effect on  $P_g$  estimation. These additional data are not confined to the area of study, but also include data from similar geologic settings or from technological advancements that could affect the estimation of  $P_g$  or impact the interpretation of the petroleum system.

Estimates of prospective resources and related distributions herein are the results of probabilistic estimation. These estimates are expressed as a distribution rather than a single value. Probabilistic outcomes involve thousands of iterations using distributions. Deterministic estimations utilizing non-stochastic mathematical operations (addition, subtraction, multiplication, and division) performed on the prospective resources distributions estimated herein produce results that are not comparable.

There is no certainty that any portion of the prospective resources estimated herein will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.

#### SUMMARY and CONCLUSIONS

Prospective resources in four prospects have been evaluated in the Bedout Sub-Basin in Australia. The prospective resources estimates presented below are based on a statistical aggregation method. Estimates of the gross prospective oil and solution gas resources, as of April 1, 2015, are summarized as follows, expressed in English units in thousands of barrels  $(10^3 \text{ bbl})$  and millions of cubic feet  $(10^6 \text{ ft}^3)$ :

	Low Estimate	Best Estimate	High Estimate	Mean Estimate
Gross Prospective Oil Resources, 10 <sup>3</sup> bbl Gross Prospective Solution Gas	35,256	73,058	154,318	89,202
Resources, $10^6$ ft <sup>3</sup>	$32,\!541$	60,525	121,628	71,361

Notes:

- 1. Low, best, high, and mean estimates in this table are P<sub>90</sub>, P<sub>50</sub>, P<sub>10</sub>, and mean, respectively.
- 2. Pg has not been applied to the volumes in this table.
- 3. Application of any geological and economic chance factor does not equate prospective resources to contingent resources or reserves.
- 4. Recovery efficiency is applied to prospective resources in this table.
- 5. The prospective resources presented above are based on the statistical aggregation method.
- 6. There is no certainty that any portion of the prospective resources estimated herein will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.

The gross statistical aggregate  $P_g$ -adjusted mean estimate prospective oil and solution gas resources, as of April 1, 2015, are summarized as follows, expressed in English units in  $10^3$ bbl and  $10^6$ ft<sup>3</sup>:

	Mean Estimate
Gross Pg-Adjusted Prospective Oil Resources, 10 <sup>3</sup> bbl	36,504
Gross $P_{g}$ -Adjusted Prospective Solution Gas Resources, $10^{6} { m ft}^{3}$	29,203
Notes:	

- 1. Application of any geological and economic chance factor does not equate prospective resources to contingent resources or reserves.
- 2. Recovery efficiency is applied to prospective resources in this table.
- 3. The prospective resources presented above are based on the statistical aggregation method.
- 4.  $P_g$  is predicated and correlated to the minimum case prospective resources gross recoverable volume(s). The  $P_g$  is not linked to economically viable volumes, economic flow rates, or economic field size assumptions.
- 5. The range in probability of occurrence for the statistical aggregate  $P_g$ -adjusted mean oil estimate is 0.13 to 0.19.
- 6. There is no certainty that any portion of the prospective resources estimated herein will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.

The arithmetic summation method was used to aggregate resources quantities above the field, property, or project level. The prospective resources quantities aggregated by the arithmetic summation method for the conventional and unconventional prospects evaluated in this report are presented in the prospective resources tables bound with this report.

Submitted,

Detalyer and Max Naughter

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SIGNED: April 2, 2015



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#### GLOSSARY of PROBABILISTIC TERMS

- Accumulation The term accumulation is used to identify an individual body of moveable petroleum. A known accumulation (one determined to contain reserves or contingent resources) must have been penetrated by a well. The well must have clearly demonstrated the existence of moveable petroleum by flow to the surface or at least some recovery of a sample of petroleum through the well. However, log and/or core data from the well may establish an accumulation, provided there is a good analogy to a nearby and geologically comparable known accumulation.
- Arithmetic Summation The process of adding a set of numbers that represent estimates of resources quantities at the reservoir, prospect, or portfolio level and estimates of  $PPW_{10}$  at the prospect or portfolio level. Statistical aggregation yields different results.
- Best (Median) Estimate The best (median) estimate is the  $P_{50}$  quantity.  $P_{50}$  means that there is a 50-percent chance that an estimated quantity, such as a prospective resources volume or associated quantity, will be equaled or exceeded.
- *Expected Value* The expected value (EV) is the probability-weighted average of the parameter being estimated, where probability values from the probability distribution are used as the weighting factors. Parameter values (abscissa) and probabilities (ordinate) are the Cartesian pairs (e.g., gross recoverable volumes and  $P_{90}$  which define the probability distribution. These parameters are probability-weighted and summed to yield the resulting expected value. The equation for computing the expected value is as follows:

$$EV = \sum_{i=1}^{n} (P_i) (V_i)$$
(1)

where:  $P_i$  = probability from probability distribution, ordinate

- $V_i$  = parameter value, abscissa
- i = a specific value in an ordered sequence of values
- n = the total number of samples

The expected value is the algebraic sum of all of the products obtained by multiplying the parameter quantity and its associated probability of occurrence. The expected value is sometimes called the mean estimate or the statistical mean. In a probabilistic analysis, the expected value is the only quantity that can be treated arithmetically (by addition, subtraction, multiplication, or division). All other quantities, such as median,  $P_{50}$ , mode,  $P_{90}$ , and  $P_{10}$ , require probabilistic techniques for scaling or aggregation.

The probability associated with the statistical mean depends on the variance of the distribution from which the mean is calculated. The mean estimate is the statistical mean (the probability-weighted average), which typically has a probability in the  $P_{45}$  to  $P_{15}$  range. Therefore, if a successful discovery occurs, the probability of the accumulation containing the statistical mean volume or greater is usually between  $P_{45}$  and  $P_{15}$ .

The expected value is the preferred quantity to use in probabilistic estimates of prospective resources. The  $P_{90}$  and  $P_{10}$  quantities are used for the low and high estimates, respectively, of prospective resources. Aggregation or scaling of  $P_{90}$ ,  $P_{50}$ , and  $P_{10}$  quantities should be done probabilistically, not arithmetically.

- *High Estimate* The high estimate is the  $P_{10}$  quantity.  $P_{10}$  means there is a 10-percent chance that an estimated quantity, such as a prospective resources volume or associated quantity, will be equaled or exceeded.
- Low Estimate The low estimate is the  $P_{90}$  quantity.  $P_{90}$  means there is a 90-percent chance that an estimated quantity, such as a prospective resources volume or associated quantity, will be equaled or exceeded.
- Mean Estimate In accordance with petroleum industry standards, the mean estimate is the probability-weighted average (expected value), which typically has a probability in the  $P_{45}$  to  $P_{15}$  range, depending on the variance of prospective resources volume or associated quantity. Therefore, the probability of a prospect or accumulation containing the probability-weighted average volume or greater is usually between 45 and 15 percent. The mean estimate is the preferred probabilistic estimate of resources volumes.
- *Median* Median is the  $P_{50}$  quantity, where the  $P_{50}$  means there is a 50-percent chance that a given variable (such as prospective resources, porosity, or water saturation) is equaled or exceeded. The median of a data set is a number such that half the measurements are below the median and half are above.

The median is the best estimate in probabilistic estimations of prospective resources, as required by the PRMS guidelines.

*Migration Chance Factor* – Migration chance factor ( $P_{migration}$ ) is defined as the probability that a trap either predates or is coincident with petroleum migration and that there exists vertical and/or lateral migration pathways linking the source to the trap.

*Mode* – The mode is the quantity that occurs with the greatest frequency in the data set and therefore is the quantity that has the greatest probability of occurrence. However, the mode may not be uniquely defined, as is the case in multimodal distributions.

 $P_{g}$ -adjusted Mean Estimate, statistical aggregate – The statistical aggregate  $P_{g}$ -adjusted mean estimate, or "aggregated geologic chance-adjusted mean estimate," is a probability-weighted average geologic success case expectation (average) of the hydrocarbon quantities potentially discovered if all of the prospects in a portfolio were drilled. The  $P_{g}$ -adjusted mean estimate is a "blended" quantity; it is a product of the statistically aggregated mean volume estimate and the portfolio's probability of geologic success. This statistical measure considers and stochastically quantifies the geological success and geological failure outcomes. Consequently, it represents the average or mean "geologic success case" volume outcome of a drilling all of the prospects in the exploration program. The  $P_{g}$ -adjusted mean volume estimate for a single prospect is calculated as follows:

 $P_g$ -adjusted mean estimate =  $P_g \times$  mean estimate (2) (mean geological success case volumes)

The probability of the statistical aggregate  $P_g$ -adjusted mean estimate is estimated by the product of the portfolio  $P_g$  and the probability of the mean volume occurrence for the entire prospect portfolio. The equation is as follows:

 $Statistical aggregate P_g-adjusted mean estimate, probability of \qquad (3) \\ occurrence = Portfolio P_g \times mean volume probability estimate for the portfolio$ 

 $P_n$  Nomenclature – This report uses the convention of denoting probability with a subscript representing the greater than cumulative probability distribution. As such, the notation  $P_n$  indicates the probability that there is an n-percent chance that a specific input or output quantity will be equaled or exceeded. For example,  $P_{90}$  means that there is a 90-percent chance that a variable (such as prospective resources, porosity, or water saturation) is equaled or exceeded. *Play* – A project associated with a prospective trend of potential prospects, but which requires more data acquisition and/or evaluation in order to define specific leads or prospects.

*Predictability versus Portfolio Size* – The number of prospects in a prospect portfolio influences the reliability of the forecast of drilling results. The relationship between predictability versus portfolio size (PPS) is also known in the petroleum industry literature as "Gambler's Ruin." The relationship of probability to portfolio size is described by the binomial probability equation given as follows:

$$P_{x^{n}} = (C_{x^{n}})(p)^{x}(1-p)^{n-x}$$
(4)

where:  $P_{x^n}$  = the probability of x successes in n trials

- $C_{x^n}$  = the number of mutually exclusive ways that x successes can be arranged in  $n\ trials$
- $p = the probability of success for a given trial (for petroleum exploration, this is <math>P_g$ )
- x = the number of successes (e.g., the number of discoveries)
- n = the number of trials (e.g., the number of wells to be drilled)

Note: For the case of n successive dry holes,  $C_{x^n}$  and p each equals 1, so the probability of failure is the quantity (1-p) raised to the number of trials.

- Probability of Geologic Success The probability of geologic success  $(P_g)$  is defined as the probability of discovering reservoirs that flow hydrocarbons at a measurable rate. The  $P_g$  is estimated by quantifying with a probability each of the following individual geologic chance factors: trap, source, reservoir, and migration. The product of the probabilities of these four chance factors is  $P_g$ .  $P_g$  is predicated and correlated to the minimum case prospective resources gross recoverable volume(s). Consequently, the  $P_g$  is not linked to economically viable volumes, economic flow rates, or economic field size assumptions.
- Probability of the Mean Occurrence The probability of the mean occurrence  $P_{MEAN}$  is defined as the probability of occurrence of the mean quantity as defined by the distribution(s) in the Monte Carlo simulation. The probability associated with the mean is dependent on the variance of the distribution, and type of distribution from which the mean is estimated. Typically, the range in probability of occurrence for the statistical mean estimate is 0.45 to 0.15 for lognormal

(positively skewed) distributions. The statistical mean has a probability of occurrence of 0.50 for normal (symmetric) distributions.

item *Prospect* – A prospect is a potential accumulation that is sufficiently well defined to be a viable drilling target. For a prospect, sufficient data and analyses exist to identify and quantify the technical uncertainties, to determine reasonable ranges of geologic chance factors and engineering and petrophysical parameters, and to estimate prospective resources. In addition, a viable drilling target requires that 70 percent of the median potential production area be located within the block or license area of interest.

- *Prospective Resources* Those quantities of petroleum that are estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects.
- *Raw Natural Gas* Raw natural gas is the total gas produced from the reservoir prior to processing or separation and includes all nonhydrocarbon components as well as any gas equivalent of condensate.
- Reservoir Chance Factor The reservoir chance factor  $(P_{reservoir})$  is defined as the probability associated with the presence of porous and permeable reservoir quality rock.
- Source Chance Factor The source chance factor ( $P_{source}$ ) is defined as the probability associated with the presence of a hydrocarbon source rock rich enough, of sufficient volume, and in the proper spatial position to charge the prospective area or areas.
- Standard Deviation Standard deviation (SD) is a measure of distribution spread. It is the positive square root of the variance. The variance is the summation of the squared distance from the mean of all possible values. Since the units of standard deviation are the same as those of the sample set, it is the most practical measure of population spread.

$$\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum\limits_{i=1}^{n} (x_i - \mu)^2}{n - 1}}$$
 (5)

where:  $\sigma$  = standard deviation  $\sigma^2$  = variance n = sample size  $x_i$  = value in data set  $\mu$  = sample set mean

- Statistical Aggregation The process of probabilistically aggregating distributions that represent estimates of resources quantities at the reservoir, prospect, or portfolio level and estimates of  $PPW_{10}$  at the prospect or portfolio level. Arithmetic summation yields different results, except for the mean estimate.
- *Trap Chance Factor* The trap chance factor ( $P_{trap}$ ) is defined as the probability associated with the presence of a structural closure and/or a stratigraphic trapping configuration with competent vertical and lateral seals, and the lack of any post migration seal integrity events or breaches.
- *Variance* The variance  $(\sigma^2)$  is a measure of how much the distribution is spread from the mean. The variance sums up the squared distance from the mean of all possible values of x. The variance has units that are the squared units of x. The use of these units limits the intuitive value of variance.

$$\sigma^2 = \frac{\sum\limits_{i=1}^{n} \left( \mathbf{x}_i - \boldsymbol{\mu} \right)}{n-1} \tag{6}$$

where:  $\sigma^2$  = variance

n = sample size

 $x_i$  = value in data set

 $\mu$  = sample set mean

Working Interest – Working interest prospective resources are that portion of the gross prospective resources to be potentially produced from the properties attributable to the interests owned by "Company" before deduction of any associated royalty burdens, net profits payable or government profit share. Working interest is a percentage of ownership in an oil and gas lease granting its owner the right to explore, drill and produce oil and gas from a tract of property. Working interest owners are obligated to pay a corresponding percentage of the cost of leasing, drilling, producing and operating a well or unit. The working interest also entitles its owner to share in production revenues with other working interest owners, based on the percentage of working interest owned.



## TABLE 1 PROSPECT PORTFOLIO SUMMARY as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD. in VARIOUS PROSPECTS BEDOUT SUB-BASIN AUSTRALIA

				Working Interest	Potential Hydrocarbon
Prospect	Country	Area/Basin	License/Block	(decimal)	Phase
Roc	Australia	Bedout Sub-Basin	WA-437-P	0.200	Oil
Bewdy	Australia	Bedout Sub-Basin	WA-437-P	0.200	Oil
Bottler	Australia	Bedout Sub-Basin	WA-437-P	0.200	Oil
Phoenix 2 Updip	Australia	Bedout Sub-basin	WA-435-P	0.200	Oil



#### TABLE 2 ESTIMATE of the GROSS PROSPECTIVE OIL RESOURCES as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD. in VARIOUS OIL PROSPECTS BEDOUT SUB-BASIN AUSTRALIA

				Gross Prospective Oil Resources Summary						
							Probability			
				Low	Best	High	Mean	of Geologic	P <sub>g</sub> -Adjusted	
Prospect	Country	Area/Basin	License/Block	Estimate (10 <sup>3</sup> bbl)	Estimate (10 <sup>3</sup> bbl)	Estimate (10 <sup>3</sup> bbl)	Estimate (10 <sup>3</sup> bbl)	Success, P <sub>g</sub> (decimal)	Mean Estimate (10 <sup>3</sup> bbl)	
Roc	Australia	Bedout Sub-Basin	WA-437-P	12,313	41,528	133,249	61,138	0.420	25,678	
Bewdy	Australia	Bedout Sub-Basin	WA-437-P	2,862	8,848	25,540	12,327	0.420	5,177	
Bottler	Australia	Bedout Sub-Basin	WA-437-P	2,060	6,563	19,720	9,330	0.420	3,919	
Phoenix 2 Updip	Australia	Bedout Sub-basin	WA-435-P	1,303	4,271	14,206	6,406	0.270	1,730	
Statistical Aggregate				35,256	73,058	154,318	89,202	0.409	36,504	
Arithmetic Summation				18,537	61,210	192,715	89,202	0.409	36,504	

#### Notes:

- 1. Low, best, high, and mean estimates follow the PRMS guidelines for prospective resources.
- 2. Low, best, high, and mean estimates in this table are  $P_{90}$ ,  $P_{50}$ ,  $P_{10}$ , and mean respectively.
- 3.  $P_q$  is defined as the probability of discovering reservoirs which flow petroleum at a measurable rate.
- 4. Pg has been rounded for presentation purposes. Multiplication using this presented Pg may yield
  - imprecise results. Dividing the P<sub>a</sub>-adjusted mean estimate by the mean estimate yields the precise P<sub>a</sub>.
- 5. Application of any geological and economic chance factor does not equate prospective resources to contingent resources or reserves.
- 6. Recovery efficiency is applied to prospective resources in this table.
- 7. Arithmetic summation of probabilistic estimates produces invalid results except for the mean estimate.
  - Arithmetic summation of probabilistic estimates is presented in this table in compliance with PRMS guidelines.
- 8. Summations may vary from those shown here due to rounding.
- 9. There is no certainty that any portion of the prospective resources estimated herein will be discovered.
  - If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.
- 10. The range in  $P_{mean}$  for the statistical aggregate  $P_{q}$ -adjusted mean estimate is 0.13 to 0.19.



#### TABLE 3 ESTIMATE of the GROSS PROSPECTIVE SOLUTION GAS RESOURCES as of APRIL 1, 2015 for CARNARVON PETROLEUM LTD. in VARIOUS OIL PROSPECTS BEDOUT SUB-BASIN AUSTRALIA

				Gross Prospective Solution Gas Resources Summary					
Prospect	Country	Area/Basin	License/Block	Low Estimate (10 <sup>6</sup> ft <sup>3</sup> )	Best Estimate (10 <sup>6</sup> ft <sup>3</sup> )	High Estimate (10 <sup>6</sup> ft <sup>3</sup> )	Mean Estimate (10 <sup>6</sup> ft <sup>3</sup> )	Probability of Geologic Success, P <sub>g</sub> (decimal)	P <sub>g</sub> -Adjusted Mean Estimate (10 <sup>6</sup> ft <sup>3</sup> )
Roc Bewdy	Australia Australia	Bedout Sub-Basin Bedout Sub-Basin	WA-437-P WA-437-P	9,252 2,148	32,206 7,087	109,498 20,191	48,911 9,861	0.420 0.420	20,543 4,142
Bottler Phoenix 2 Updip	Australia Australia	Bedout Sub-Basin Bedout Sub-basin	WA-437-P WA-435-P	1,601 1,018	5,223 3,432	15,889 11,036	7,464 5,125	0.420 0.270	3,135 1,384
Statistical Aggregate				32,541	60,525	121,628	71,361	0.409	29,203
Arithmetic Summation				14,019	47,948	156,615	71,361	0.409	29,203

#### Notes:

- 1. Low, best, high, and mean estimates follow the PRMS guidelines for prospective resources.
- 2. Low, best, high, and mean estimates in this table are P <sub>90</sub>, P<sub>50</sub>, P<sub>10</sub>, and mean respectively.
- 3. P<sub>g</sub> is defined as the probability of discovering reservoirs which flow petroleum at a measurable rate.
- P<sub>g</sub> has been rounded for presentation purposes. Multiplication using this presented P<sub>g</sub> may yield imprecise results. Dividing the P<sub>g</sub>-adjusted mean estimate by the mean estimate yields the precise P<sub>g</sub>.
- 5. Application of any geological and economic chance factor does not equate prospective resources to contingent resources or reserves.
- 6. Recovery efficiency is applied to prospective resources in this table.
- 7. Arithmetic summation of probabilistic estimates produces invalid results except for the mean estimate.
  - Arithmetic summation of probabilistic estimates is presented in this table in compliance with PRMS guidelines.
- 8. Summations may vary from those shown here due to rounding.
- 9. There is no certainty that any portion of the prospective resources estimated herein will be discovered.

If discovered, there is no certainty that it will be commercially viable to produce any portion of the prospective resources evaluated.