

# **Origin Response to Request for Information from the NT Hydraulic Fracturing Inquiry:**

- i) Petroleum Resource Information**
- ii) Petroleum Industrial Water Use Information**
- iii) Land Access and Disturbance**

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## 1 Petroleum Resource Information

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### Questions 1 to 3.

1. Up to date published estimates of potential shale and tight gas resources in the Northern Territory held by Origin.
2. Professional advice from Origin as to estimates of which (if any) of the resources have the potential to be developed, the factors influencing this, and in what timeframe.
3. Ranges of indicative gas volumes that could be developed and levels of confidence for these resources.

### Response:

Please find attached (Attachment 1) Origin's Amungee NW-1H Discovery Evaluation Report (Report). The Report, which is required by the NT Petroleum Act, was submitted to the NT DPIR in February, 2017, and provides a substantial amount of detail regarding our estimates of Contingent Resource and of Gas in Place (GIP) within the Velkerri Formation B Shale Pool. Some material in this document is confidential as it has not been previously released to the market and is considered commercial in confidence.

Although we haven't published estimates of resources within other intervals in the Beetaloo Basin, we have done work on other intervals including the C Shale of the Velkerri Formation and the Kyalla Formation. Attached (Attachment 2) is a short summary of the potential for resources within these other formations - all the material within Attachment 2 is confidential as it has not been released to market and ASX rules prevent disclosure in its current form. In summary, what we have said publicly is that the potential of the Kyalla Formation has not been fully addressed in the exploration campaigns of 2015-16; however, there are sufficient gas composition data to confirm that any production from the Kyalla Formation would be considered 'liquids rich' (condensate to gas ratios of >~30 bbls/mmscf). Liquids production, and the potential to utilise surface infrastructure to develop both the Kyalla and Velkerri formations, would greatly improve project economics. It is likely that if the Kyalla Formation play is successful that it would supersede the Velkerri Formation play as a priority and that it would provide substantially better economic returns (and consequently royalties and taxes).

The Report does provide some commentary on "Question 2 - do any of the resources have the potential to be developed?", however, this was not the intent of the Report. It is clear that the B Shale has the potential to be developed; however, we cannot be as equivocal regarding the Kyalla Formation. For both plays, there are substantially more data required to prove whether a development would be economic. The key pieces of information relate to well performance and cost performance, a multi-well pilot (perhaps multiple multi-well pilots) is required to acquire these data. Specifically, for the B Shale Play, we need results to show line of sight to:

- Estimated Ultimate Recovery (EUR) per well of 5-15 BCF
- Well costs (including fracture stimulation) of \$12-15m

There is a trade-off, of course, between EUR and cost such that if EUR improves then higher costs could be sustained and vice versa. It is reasonable, based on analogues from QLD CSG and North American shale plays that these results can be achieved; but there can be no certainty without data and bona fide results.

If gas can be economically developed, the volume available for development would likely be greater than the sum of any domestic and export supply gaps, but of course would be limited to the available pipeline egress out of the Basin. That is, the volumetric materiality (i.e. OGIP >>10 TCF) is now largely proven; however, the question of what portion (if any) of that volume is economic remains unanswerable at this point.

#### **Question 4.**

All digital information relating to the boundaries of all potential shale and tight gas resources identified by Origin in the Northern Territory.

#### **Response:**

A shape file for the pool boundary reported in the Discovery Evaluation Report is attached (Attachment 3).

#### **Question 5.**

All information relating to the geology and geochemistry of these prospective resources.

#### **Response:**

All geological information has been provided to the DPIR and much of it is summarised in Attachment 1 and Attachment 2. Please advise if there are any specific relevant data that you would like to discuss with Origin.

## **2 Petroleum Industrial Water Use Information**

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#### **Questions 1 to 7.**

1. Estimates of water requirements for the life cycle of the industry, broken down into development stages i.e. exploration, drilling, production etc. (assumptions on likely development scenarios to be included).
2. Likely source of water for potential developments in the Northern Territory.
3. Estimates of volumes of waste water to be produced by potential development for the life cycle of the industry, broken down into development stages i.e. exploration, drilling, production etc. (assumptions on likely development scenarios to be included).
4. Likely economical recycle rates for wastewater reuse.

5. Best estimates of likely discharges (controlled and uncontrolled) into the environment from a potential development detailing frequency, number quantity and quality.
6. List of the likely chemicals in waste waters and their individual and combined toxicity.
7. Details of storage, treatment and transport requirements by Origin for waste waters.

Questions 1 to 3 are covered in our recent submission in response to the Background and Issues Paper (Submission).

Question 4 cannot be forecast with any certainty. Across North America, the best analogue, recycling rates are impacted by a number of factors (primarily regulations and availability of alternative disposal options).

Question 5 is addressed in our Submission; in summary there are currently no plans for discharges into the environment.

Question 6 is addressed in our Submission. However, further detail regarding combined toxicity is being specifically addressed through a detailed, third-party risk assessment by AECOM using a rigorous methodology applied across our Queensland operations. This assessment will use water test results from flow back fluids, in addition to data from the chemicals used in the hydraulic fracturing process, to undertake quantitative human health and ecological risk assessments. We anticipate the report on this risk assessment to be available in the coming weeks, and we will share the report with the Inquiry Panel at that time.

Question 7 is addressed in our Submission.

### **3 Land Access and Disturbance**

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1. Describe the typical access infrastructure (roads, culverts, fencing, pipeline easements etc.) required throughout the operational phase of any potential development. Include in this description, typical site selection process, policy on the utilisation of existing infrastructure, construction standards, maintenance requirements, runoff management, and security.

A summary of land access requirements and disturbance areas is included in our Submission. If more detailed design and construction information is required, we are able to share technical specifications of roads and lease pads we have constructed in the Beetaloo.



Appendix to of our Submission (Community Guide to CSG Activities) does provide relatively detailed descriptions of the types of surface activities that are associated with different phases of activity. Although this material is most relevant to the specific requirements of

## 4 Attachments

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Below is a listing of attachments referenced in this document:

1. Attachment 1 - Discovery Evaluation Report
2. Attachment 2 - Potential of other stratigraphic intervals in the Beetaloo Basin (submitted separately as CONFIDENTIAL)
3. Attachment 3 - Shape file of pool boundary for the Velkerri Formation B Shale