



Marcus Ray
Deputy Secretary Planning & Assessment
NSW Department of Planning Industry and Environment

Attention: Steve O'Donaghue

Dear Mr Ray

**Narrabri Gas Project (6456)
Supplementary Response to Submissions**

The Department of Planning Industry & Environment: Water Group has reviewed the supplementary information provided by Santos. We advise that Santos has not sufficiently addressed issues raised in earlier correspondence dated 29 April 2017 and 9 October 2018. These concerns continue to be:

- That the project's current data collection and proposed monitoring network should be improved to provide a better characterisation of the current groundwater system and to support the necessary upgrade of the groundwater model.
- The groundwater model requires regular updating to ensure that impacts are appropriately monitored and managed in accordance with Aquifer Interference Policy (AIP).
- The proposed groundwater monitoring triggers need to be improved as they do not provide enough early warning to allow for appropriate management measures to be implemented.
- The proponent needs to demonstrate that they have sufficient shares of water from relevant water sources.

We believe these issues can be addressed through detailed consent conditions applied post approval.

Please note further explanation is provided in Attachment A and a summary of issues and adequacy of responses in Attachment B.

Please send any further referrals to Department of Primary Industry & Environment: Water Group by email to landuse.enquiries@dpi.nsw.gov.au.

Yours sincerely

A handwritten signature in blue ink that reads 'Jim Bentley'.

Jim Bentley
Chief Executive Officer
DPIE Water
12th August 2019

Attachment A

Detailed advice to DPIE Planning & Assessment about the Santos Supplementary RTS.

1.0 Data collection and monitoring

The project's current data collection and proposed monitoring network should be improved to provide a better description of the current groundwater system and to support the development of a calibrated groundwater model.

1.1 Explanation

It is important that the data collection program is improved to:

- Develop a thorough understanding of the project environment especially the physical properties of the different high value aquifers and aquitards.
- Establish pre-development conditions and a baseline to relate future monitoring results. This will inform the development of the next version of the groundwater model and support monitoring and impact management requirements.

The proposed monitoring network requires improvement as it currently does not characterise temporal and spatial variations of all water sources and aquitards in the project area. The risk of potential water level/pressure drawdown needs to be better managed by monitoring changes in multiple horizontal and vertical groundwater levels. This can be done by installing additional groundwater piezometers ahead of production and/or impact propagation and collecting formation property data during drilling programs of both production bores and monitoring bores.

The Bohena gauging station is no longer in use. Santos will need to assess locations suitable along the creek profile and establish a new station closer to the discharge point.

1.2 Recommendation

That the consent conditions require a comprehensive water monitoring plan developed in consultation with DPIE Water and to the satisfaction of the DPIE Secretary.

2.0 Groundwater modelling

The groundwater model will require refinement supported by improved monitoring and data collection described above to ensure that any impacts are reliably predicted and appropriately managed in accordance with the Aquifer Interference Policy (AIP).

2.1 Explanation

The current uncalibrated groundwater model is a Class 1 model and is not precise in its prediction. This is because Class 1 models have a high level of inaccuracy. This is why it is important that the model is updated periodically using data obtained as the project progresses so that impacts can be predicted and assessed more reliably and mitigation measures adapted. It is important that the upgraded model is based on dewatering levels as a model simulation requirement rather than volumes of extraction as the former is more reliable and is more conservative.

Currently the proponent will not commit to updating the model unless their proposed management response triggers relating to water production and drawdown are exceeded. However the requirement for a periodic model update is a standard requirement for State Significant Development projects.

DPIE Water believes that the proponent can collect the required data after the project is determined. This additional data can be obtained from the drilling and logging of appraisal bores,

test bores and production bores and new monitoring bores. They should be able to upgrade the model within three years to a calibrated groundwater model which has an improved predictive capability consistent with a Class 2 model.

The model should incorporate important characteristics described by the confidence level classification Class 2 (Australian Modelling Guidelines). The improved model must have a higher level of confidence in predicting:

- potential impacts to multiple aquifers currently utilized as water resources
- production volumes
- maximum drawdowns in various aquifers, and
- time taken to achieve predicted drawdown.

Sufficient data, including production and water level data, and hydraulic parameter information should be available by year six to update the model further. This model should give a high level of confidence that predicted impacts to high value aquifers are being identified and managed as described by the classification Class 3 (Australian Modelling Guidelines).

2.2 Recommendation

That the consent conditions require a modelling plan to be developed in consultation with DPIE Water to the satisfaction of the DPIE Secretary

This plan will ensure that data is collected to improve the current model to an improved predictive capability consistent with a Class 2 model by year 3 and consistent with intent of a Class 3 model by year 6.

If by year 6 post determination, insufficient data is available, the requirement and timing of delivery of a model with characteristics described by the confidence level classification Class 3 can be negotiated with DPIE Water.

The aim of the above refinements is to improve reliability in model predictions. DPIE Water will require key criteria in each classification to be met.

The proponent should:

- Regularly update the groundwater model basing it on dewatering levels to quantify induced impact during the project's operation and impacts post production.
- Ensure updated models and associated peer reviews are publicly available.
- Update the predicted impacts at each stage of model re-development and ensure appropriate actions are undertaken such as ensuring adequate licences and make good.
- After each model update, assess predicted impacts against the NSW Aquifer Interference Policy (AIP) and update the monitoring plan and management response triggers. This must be completed to the satisfaction of the consent authority.

3.0 Management Response Triggers

The proposed groundwater monitoring triggers need to be improved so they provide enough early warning to allow for appropriate management measures to be implemented.

3.1 Explanation

Santos propose that:

- The level 1 response trigger would be exceeded if three or more years of cumulative water extraction exceeds cumulative water production defined in the Environmental Impact Statement (EIS).

- The level 2 response trigger would be exceeded if the pressure decline in Triassic age strata exceeds or is likely to exceed the predicted maximum drawdown published in the Environmental Impact Statement (EIS).

These proposed Level 1 and 2 groundwater monitoring triggers:

- do not provide an early warning of the potential of approaching approved limits with sufficient time for mitigating measures to be applied to prevent those limits from being exceeded;
- enable exceedance of an approved limit for three or more years and hence would be facilitating potential non-compliance; and
- do not enable verification against the minimal impact considerations of the NSW Aquifer Interference Policy (AIP).

Hence the groundwater monitoring triggers need to be updated and a response plan developed.

3.2 Recommendation

That the Management Response Triggers are updated in line with the requirements detailed in the DPIE Water advice to DPIE Planning & Assessment (Oct 2018 -OUT18/6607). These triggers must be consistent with the Aquifer Interference Policy (AIP), be specific and give early warning of possible impacts to the water table, at different depths within the geological profile on water pressure as well as water quality and groundwater dependent ecosystems.

4.0 Shares of water

The proponent needs to demonstrate that they have sufficient shares of water from relevant water sources.

4.1 Explanation

The proponent needs to account for the maximum predicted take for each water source prior to production. This provides the proponent and government certainty on the ability to account for the predicted take. The specific entitlement requirements may vary over time based on actual take figures and monitoring results and model updates.

4.2 Recommendation

That the consent conditions require the proponent to demonstrate they have sufficient shares of water from relevant water sources.

Attachment B – Key issues raised and adequacy of responses to DPIE Water correspondence

Ref/Date	Item	Issues raised by DPIE Water	Response from proponent
OUT17/15115 29 April 2017	Response to EIS	<p><i>Groundwater modelling.</i> The Class 1 model will require refinement supported by intensive monitoring and data collection in the first five years of the project in order to meet requirements of NSW's AIP. The model should be updated periodically in order to assess impacts more reliably and adapt mitigation measures to protect water assets.</p> <p><i>Baseline data</i> The baseline data is not detailed enough to inform thresholds or modelling. Deficiencies need to be addressed by providing all available data.</p> <p><i>Groundwater monitoring</i> The groundwater monitoring network is not adequate for detecting early change and monitoring locations need to target main seams. These issues</p>	<p><i>Santos' Response to Submissions (RTS) April 2018</i></p> <p>The concerns raised by DPIE Water were not adequately addressed by the proponent.</p> <p>In response to the majority of issues raised by DPIE Water, the proponent advises that the information provided in the EIS adequately addresses DPIE Water's concerns. The proponent does not propose any change to their approach.</p> <p>For example the proponent advises:</p> <ul style="list-style-type: none"> In line with the approach described in the EIS the model will be revised if either the level 1 or 2 triggers are exceeded. The level 1 response trigger would be exceeded if three or more

		<p>can be addressed through further development of the groundwater monitoring plan.</p> <p>There is currently insufficient data to develop a calibrated model therefore DPI recommends a groundwater monitoring plan that will enable the development of a calibrated model. This is recommended as a condition of consent.</p> <p>The proponent is asked to reassign government owned monitoring bores to the right geological unit which will result in changes to the baseline assessment.</p> <p><i>Water use and supply</i> The proponent holds licences for 600 ML in the Gunnedah Oxley Basin and does not currently hold adequate licences to account for the predicted take particularly for the Gunnedah Oxley Basin. Predicted peak annual induced flow will occur from year 190. All relevant licences must be obtained prior to the take of</p>	<p>years of cumulative water extraction exceeds cumulative water production defined in the EIS. This would require updating of modelling predictions.</p> <ul style="list-style-type: none"> • The level 2 response trigger would be exceeded if pressure decline in Triassic age strata exceeds or is likely to exceed the predicted maximum drawdown published in the EIS. This would require revision and recalibration of the model. • The proponent is committed to groundwater monitoring and believes the plan described in the EIS is appropriate and founded on the principle of early detection monitoring. The identified monitoring thresholds, trigger levels and management actions for mitigation are appropriate and that it is not necessary to monitor GDEs. This includes
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		<p>water.</p> <p><i>Groundwater Dependent Ecosystem Review</i> Appears to be adequate but proponent is required to ensure consistency with DPIE Water dataset on GDEs and to implement an adequate monitoring program.</p> <p><i>Surface Water Review</i> Appears to be adequate. However DPIE Water lists a number of actions relating to water quality, risk management and includes a requirement for a purpose-built hydrological gauging station in close proximity to the treated water release site on Bohena Creek. Plus upgrade of current BOM gauging site (419905).</p>	<p>management action triggers to update the groundwater model described above.</p> <p>In response to DPIE Water advice the proponent advises that it:</p> <ul style="list-style-type: none"> • Has now updated the water baseline report to include all data. • Has reassigned the majority of bores. • will buy the appropriate licences at the required time. • does not believe an additional gauging station is required for Bohena Creek. The proponent will monitor upstream-downstream of the discharge site and calibrate to the Newell Highway gauging station. They acknowledge that this station has poor sensitivity and that a refined gauge may be needed.
OUT18/6607 9 October 2018	Response to RTS	DPIE Water advises that the	Santos' supplementary response

		<p>following information is required to determine the project:</p> <ul style="list-style-type: none"> • Analysis of baseline data • A groundwater monitoring and management plan including a GDE monitoring plan in consultation with DoI Water • A groundwater modelling plan in consultation with DoI Water • A plan of when and how the proponent plans to acquire water entitlements from relevant water sources • A government stakeholder consultation plan <p>Should the project be approved DPIE Water's advice includes that the proponent:</p> <ul style="list-style-type: none"> • Update the groundwater model to a confidence class level 2 by year 3 • Update the groundwater model to a confidence class level 3 by year 6. This level can be negotiated. • Regularly update the 	<p>- April 2019.</p> <p>The concerns raised by DPIE Water were not adequately addressed by the proponent.</p> <p>In response to the majority of issues raised by DPIE Water, the proponent advises that the information provided in the EIS adequately addresses DPIE Water's concerns. The proponent does not propose any change to their approach.</p> <p>For example the proponent advises that:</p> <ul style="list-style-type: none"> • the existing groundwater management program described in the EIS is adequate and will also address risk to GDEs. • They will prepare a groundwater modelling plan but any reviews of the model will be in accordance with the five steps described in the current Groundwater Impact Assessment and Water Monitoring Plan in the EIS.
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		<p>model during the project's operation to quantify induced impact</p> <ul style="list-style-type: none"> • Update the groundwater impact assessment at each stage of the model including an assessment against the AIP. • Install additional monitoring bores and make operational • Apply tiered management response triggers • Update the groundwater modelling plan and the management response triggers • Update the GDE impact assessment • Investigate upgrading the Bohena creek gauging station or consider an alternative site. • Acquire sufficient water licences to account for the maximum predicted take 	<ul style="list-style-type: none"> • The existing Management Response Triggers in the EIS are appropriate and mimic those proposed by Water. <p>The proponent also advise that:</p> <ul style="list-style-type: none"> • they will work with the regulator to determine specific monitoring locations. However the current monitoring locations already proposed by Santos are more effective. Any increase in monitoring locations should be informed by reviews of the groundwater model. • The Bohena gauging station is at the ideal location so will discuss upgrading this station with DPIE Water. • water access licences will be required for the water take. The proponent intends to acquire an allocation only when and if water is required.
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