

**Environmental Authority  
EPPG00407213 – Durham Downs  
(PL80)**

**Response to Notice of  
Information Request –  
Application Reference No:  
APP0053559**

## 1. Introduction

Santos Limited (Santos) lodged an application to amend Environmental Authority (EA) EPPG00407213 with the Department of Environment and Science (DES) on 29 April 2020 (DES reference APP0053559). Santos received a Notice of Information Request on 23 June 2020 (Appendix A). The notice outlines the further information required by DES to assess the application.

Santos provides the following information in response to all of the information requested in the Notice prior to the end of the information response period of **23 December 2020**.

## 2. Information Request and Response

Sections 2.1 to 2.5 provide the elements of the DES Notice of Information Request and the Santos response to the request.

### 2.1. DES Information Request Element (1)

#### Groundwater

*Please provide further information regarding the impacts of the proposed activities on the environmental values associated with groundwater.*

#### *Grounds:*

- *Section 5.5 of the Underground Water Impact Report (UWIR – Santos Cooper Basin Oil and Gas Fields, February 2020) states that there is no current water level information available in the DNRME database and that there are no Santos owned regional groundwater monitoring bores in the study area. Without conducting this monitoring, it is unclear how the model is verified and how Santos can be confident that the impact that their operations are having on this groundwater system are being managed effectively.*

#### **Santos Response**

The response to Element 1 is structured in two parts. Part 1 discusses the modelling philosophy presented in successive iterations of the South West Queensland Underground Water Impact Report (UWIR) and Part 2 provides information relating to the Santos Underground Water Monitoring Strategy described in the Underground Water Impact Report – Santos Cooper Basin Oil and Gas Fields, February 2020 (Feb SWQ UWIR).

#### **Part 1 - Modelling philosophy**

Since 2013, the decision has been taken to use modelling to generate an *“indicative estimate of the magnitude of potential drawdown in the target beds and neighbouring formations in the immediate and long-term scenarios”* as stated in the Feb SWQ UWIR in the EA amendment application.

The model has been developed ‘conservatively’, which means modelling decisions will tend to overestimate the potential drawdown impact. By taking such decisions, a ‘worst case’ prediction of potential impact is generated. The groundwater monitoring strategy, as detailed within the Feb SWQ UWIR, has therefore been developed to be commensurate to the identified risks and impacts. If the results of this ‘worst-case’ model is considered manageable and acceptable (i.e. existing legislation manages the risk of a small number of potential make good agreements across the entirety of

developments in South West Queensland (as the UWIR has consistently found)), it is reasonable to conclude that a more extensive monitoring program or more detailed groundwater model approach are not justified.

- The modelling philosophy for the successive iterations of the UWIR comprises a design that, as described in the UWIR, provides an *“indicative estimate of the magnitude of potential drawdown in the target beds and neighbouring formations in the immediate and long-term scenarios”*.
- This approach is considered reasonable given the need to assess the potential connectivity of a conventional hydrocarbon reservoir. In conventional reservoirs, the naturally occurring hydrocarbons, such as crude oil or natural gas, are trapped by overlying rock formations with lower permeability. Conventional reservoirs only exist because the vertical connectivity is so poor that the oil and gas have accumulated over geological timescales (i.e. millions of years). If there were any vertical connectivity, hydrocarbons would continue to migrate through the system and not be able to accumulate. This is the defining feature of conventional reservoirs.
- Coal seam gas reservoirs differ in that natural gas collects in underground coal seams by bonding to the surface of coal particles. The coal seams are generally filled with water and it is the pressure of the water that keeps the gas as a thin film on the surface of the coal. The technical term for this is 'adsorption'. By adsorption, gas molecules are prevented from migrating out of the system. Gas in the coal may have been produced in-situ or have migrated from deeper geological source rocks, but it is by the process of adsorption that the gas is stored in the coal seam. Coal seam gas reservoirs may be directly overlain and connected to aquifers (such as the Springbok Sandstone in the Surat Basin), but the gas does not migrate upwards and escape from the coal due to adsorption. Gas is released from the coal by pumping water from the coal because the pressure reduction reduces the adsorption potential on the surface of the coal. Water extraction from the coal has the potential to cause drawdown in connected aquifers (such as the Springbook Sandstone).
- The successive iterations of the UWIR presents findings from an analytical and 'steady-state' (as opposed to numerical and 'time-dependent') groundwater model. As presented in the Feb SWQ UWIR, the decision to model the system in this way was based on the following constraints and opportunities:
  - **Depth of extraction:** Santos extracts associated / produced water from depths greater than 2,000m bgl in the Cooper Basin and for more than 90% of Eromanga Basin wells, deeper than 1,000m bgl. It is noted that most private bores in the Eromanga Basin target the upper (Quaternary and Tertiary) formations (upper 300m) where economic hydrocarbons are not present.

- **Stratigraphic settings:** numerous confining beds separate the deeper target hydrocarbon bearing formations and the upper aquifers which are accessed primarily by private users for water supply.
- **Geographic extent:** Santos' SWQ operations cover an area in excess of 8,000km<sup>2</sup> and are classified as remote. The density of all extraction activities (comprising both oil and gas extraction from reservoirs and water extraction from aquifers) is very low.
- **Data availability:** Any modelling is constrained by the availability of data to inform that model. There is a general paucity of data, given the depth of extraction, stratigraphic setting and geographical extent of Santos' SWQ operations, which means it is only possible to model the system at a coarse scale.
- the following model assumptions are incorporated to compensate for a lack of data to inform a more detailed model parameterisation and are commensurate with the modelling philosophy. These assumptions will typically overestimate drawdown in overlying formations such as water bearing aquifers:
  - **Steady-state drawdown calculations:** These assume the drawdown after pumping for effectively an infinite amount of time. It defines the new 'steady-state equilibrium' that will be reached if extraction continues forever. This is in contrast to time-dependent modelling which will model the drawdown at a specific time-step (e.g. at 3 years, or the worst drawdown throughout an operational lifetime of 40 years before pressures are allowed to recover).
  - **Extraction rates higher than observed or predicted:** The modelled extraction rate used to estimate drawdown will exceed the actual extraction rate (refer to Section 7.1.2 of the Feb SWQ UWIR) insofar that:
    - Immediately Affected Area (IAA) predictive modelling assumes water extraction rates maintain at 2019 levels were more elevated than in previous years – but continue in perpetuity.
    - Long Term Affected Area (LTAA) predictive modelling assumes the water production rate increases linearly with the number of additional wells planned in the future (where in fact the number of operational wells is unlikely to increase at the same rate as older wells would be expected to be decommissioned from service) – and continue in perpetuity.
  - **High model permeabilities:** The model assumes high permeabilities for the reservoir production zone, and also the immediately overlying formations/aquitards (i.e. model layers 3-5). The Kh (horizontal permeability) range is  $1 \times 10^{-2}$  to  $1 \times 10^{-3}$  m/d, and Kv (vertical permeability) range is  $1 \times 10^{-4}$  to  $1 \times 10^{-5}$  m/d. For comparison, the 2019 UWIR for the Surat CMA had Kh range of  $1 \times 10^{-2}$  to  $1 \times 10^{-4}$  m/d, and Kv range of  $1 \times 10^{-4}$  to  $1 \times 10^{-5}$  m/d.

10<sup>-4</sup> to 1 x 10<sup>-7</sup> m/d. This shows the South West Queensland UWIR assumes two orders of magnitude greater horizontal permeability and one order of magnitude greater vertical permeability. Noting that this comparison demonstrates higher vertical permeabilities in formations overlying the conventional reservoirs in SWQ versus the unconventional (coal seam gas) reservoirs of the Surat Basin. Since conventional reservoirs must be overlain by low permeability units, this demonstrates the modelled vertical permeabilities values are extremely conservative.

- **Stratigraphy typical of the shallowest part of basin:** 90% of wells in the Eromanga Basin extract from reservoirs located ~1000m below ground level. However, the model assumes these wells are much shallower, from 620m to 900m below ground level.
- The approved approach to assessing potential groundwater impacts within the successive iterations of the UWIR is commensurate to the lack of risks and impacts due to a lack of receptors and hydraulic connectivity in general. Monitoring of reservoir pressures would provide limited value in validating the model assumptions, since the assumptions are intentionally conservative. If the predicted drawdown do not result in any unacceptable prediction of impact or the management or mitigation of potential impact to other environmental values other than make good of impact to water bore supplies (none of which have yet required any make good measures), then validation of a highly conservative model should not be required, other than to confirm that shallow and useable aquifers remain unaffected by resource development, as proposed.

## **Part 2 - Water monitoring strategy**

Santos has undertaken groundwater monitoring as proposed by successive iterations of the UWIR. The groundwater monitoring validates modelling predictions. This is presented in Section 9 of the Feb SWQ UWIR. Monitoring of reservoir pressures cannot be used to validate the model due to the decision to purposefully select conservative model assumptions to overestimate impacts to overlying aquifers.

- Section 5.5 of the Feb SWQ UWIR refers to monitoring data used to inform the hydrogeological conceptual model as it was first developed in 2012. This section summarises various data sources for water level available at the model inception stage only, it does not outline monitoring data used to validate prediction of impacts.
- Section 9 of the Feb SWQ UWIR presents the past and future Underground Water Monitoring in relation to the findings of the Feb SWQ UWIR, as well as the current monitoring strategy.
- The stated objective of the monitoring strategy described in Section 9 of the Feb SWQ UWIR, and which has been approved by the Department of Environment and Science (DES) since

2013, is the early detection and protection for impact to shallow aquifers and the Hooray Sandstone aquifer within, and adjacent to, the study area.

- This monitoring has been undertaken in accordance with the monitoring strategy articulated in each successive iteration of the UWIR which have been approved by DES. Features of the water monitoring strategy include:
  - Implemented since the first UWIR was approved in 2013 and so currently provides ~7 years of reliable trend data.
  - The program includes monitoring of water depth/pressure and water quality at bores within the IAA.
  - The monitoring strategy comprises monitoring of third-party water supply bores. These are “low-use” stock bores which are adequate for the purpose of monitoring long-term groundwater level trends.
  - Monitoring data is reviewed annually. The data, and the conclusions which can be drawn from the data, is provided to DES each year as part of the UWIR annual report.
- Monitoring to date has shown that groundwater levels in usable aquifers are stable, and that there is no clear depressurisation of the monitored aquifers throughout the monitoring period.
- This is supported by observations made up to 1990 to 2011, as reported in Section 5.5 of the Feb SWQ UWIR, which show that for all except the target reservoir formations, water level trends are generally stable or upward trending.
- Monitoring plans have been revised in subsequent iterations of the UWIR to reflect the practical operability of each monitoring point. Most monitoring points remain operational and provide a good time series of data points since monitoring commenced in 2013.
- Monitoring of reservoirs will not provide data that can be used to validate the model. This is because the model incorporates highly conservative assumptions (see Part 1 above) to demonstrate a general lack of potential for depressurisation impact to overlying formations. Monitored reservoir depressurisation is almost certainly not going to be adequately modelled. For example:
  - by overestimating the water abstraction rate and duration, the monitored depressurisation of the reservoir may be greater than predicted by the model because less water is extracted and over a much shorter duration than assumed by the model.
  - by overestimating the vertical permeability and connectivity with aquifers, the monitored depressurisation of the reservoir may be far less than predicted by the model because there is far less ‘leakage’ from overlying formations than assumed by the model.

## 2.2. DES Information Request Element (2)

### Groundwater

*Please provide further information regarding the impacts of the proposed activities on the environmental values associated with groundwater.*

### Grounds:

- *The application states that “the production of petroleum on PL 80 would not impact groundwater in GAB aquifers because of the hydraulic separation (or lack of connectivity) between the deeper Cooper Basin sediments and the overlying GAB aquifers of the Eromanga Basin. This is demonstrated by the modelling results reported in the Feb SWQ UWIR for other development areas.” However, Figures 45 and 49 of UWIR (Santos Cooper Basin Oil and Gas Fields, February 2020) show the immediately and long term affected areas for Eromanga Basin modelled groundwater drawdown in Layer 5, there are two affected areas with more than 5m drawdown in PL80. Please clarify.*

### **Santos Response**

Figure 45 and 49 referenced in the Information Request are depicted in the original Santos UWIR dated June 2013. The June 2013 UWIR has been superseded by the Feb SWQ UWIR which was submitted as a part of the amendment application (Appendix C of Attachment 2 of the application documents).

As outlined in section 4.7 of Attachment 2 of the amendment application, the petroleum activities within PL 80 target the late Permian Toolachee Formation within the Cooper Basin. The petroleum activities within PL 80 do not propose to target formations of the Eromanga Basin. As such, Figures 46-49 of the Feb SWQ UWIR, which depict drawdown in formations of the Cooper Basin, are the figures relevant to this application.

The Cooper Basin underlies the Great Artesian Basin (GAB), but does not contain aquifers of the GAB. The current model does not show any drawdown from the Cooper Basin sediments transferring up into the shallower formations of the Eromanga Basin. 6-11m of maximum drawdown is modelled in the upper-most layer of the Cooper Basin as depicted in Figures 46 - 49 of the Feb SWQ UWIR.

Some drawdown is predicted in the Eromanga Basin across the model domain, including some drawdown that overlaps PL80. This drawdown is due to development of other tenements which target petroleum and gas reservoirs located within sediments in the Eromanga Basin. Development of PL80 does not propose to target formations of the Eromanga Basin and therefore production of petroleum in PL80 would not impact groundwater or aquifers in the GAB.

## 2.3. DES Information Request element (3)

### Risk assessment of likely impacts of project activities on the environmental values

*Please provide the details of the risk assessment of likely impacts of project activities on the environmental values for both the construction and operation phases. The risk assessment must include the description of the risks and likely magnitude of impacts on the environmental values, mitigation strategies and residual risks.*

*Grounds:*

- *As per section 125 of the Environmental Protection Act 1994, a site specific application requires an assessment of the likely impacts on relevant environmental values. The provided risk assessment does not meet all regulatory requirements.*

## **Santos Response**

Section 4 of Attachment 2 of the amendment application describes the environmental values relevant to the amendment application. Section 4.9 of Attachment 2 of the amendment application describes the risks and likely magnitude of impacts on the environmental values from the proposed activities and the mitigation measures (control strategies) within PL 80 relevant to the proposed activities to minimise environmental harm.

To assess residual environmental risks associated with the proposed activities, a risk assessment for each relevant environmental value (EV) (as identified in Section 4 of Attachment 2 of the amendment application) has been completed (refer to Table 1). The environmental risk assessment is based on risk factors associated with both the initial construction, and ongoing operational phases of the proposed activities.

Risk assessments for a proposed activity identify a wide range of risks and potential impacts to relevant EVs as a result of carrying out proposed activities. This should not be interpreted to assume that all identified potential impacts will occur as a result of carrying out activities. Once initial unmitigated risks and potential impacts are identified as part of a risk assessment, appropriate control strategies are identified and implemented. Appropriately implemented control strategies will typically mitigate the likelihood of a potential impact occurring, and/or reduce the severity/consequences of the potential impact.

The risk assessment identifies initial (unmitigated) risks associated with the proposed activities for each relevant EV. Following identification of appropriate mitigation measures (control strategies), the residual (mitigated) risk posed to each EV has also been determined.

The risk assessment has been undertaken in accordance with the Santos Management System (SMS) Risk Management Standard. The SMS Risk Management Standard is based on accepted principles and applicable Australian standards. The risk assessment process involves:

- identifying the potential hazards or threats posed by the activities;
- categorising the potential consequences and their likelihood of occurring; and
- using a risk matrix (refer to Figure 1) to characterise the level of risk.

The results of the risk assessment are summarised in Table 1.



# Santos Risk Matrix

Consequence	Safety	Negligible Harm + No bodily damage or minimal harm or impairment (hours to days)	Minor Harm + Short term impairment (days to weeks)	Moderate Harm + Temporary disablement or medium term impairment (weeks to months)	Severe Harm + Long term/life altering disablement or impairment	Single Fatality OR Critical Life Threatening Injuries	Multiple Fatalities	
	Environment	+ No impact to Environmental Value (EV).	+ Small-scale impact to EV(s) of conservation significance + Potential surface or groundwater impact.	+ Moderate-scale impact to EV(s) of conservation significance + Localised surface or groundwater impact.	+ Large-scale impact to EV(s) of conservation significance + Moderate-scale surface water impact; + Localised impact to groundwater with potential or known beneficial use.	+ Extensive population or community scale impact to EV(s) of conservation significance + Extensive impact to other EV(s).	+ Irreversible impact to EV(s).	
	Community & Reputation	+ No actual or potential community criticism + Details remain within Santos sites and/or offices	+ Minor level local community criticism (< week) + No reputation impact	+ Local community criticism (> week) or one-day community protest + Local company reputation impacted	+ State-level community criticism or protest over multiple days/locations + State-based company reputation impacted + Very short-term share price impact (< week)	+ National community criticism or large scale protest + Company reputation and approvals impacted + Shareholder intervention or short-term share price impact (< month)	+ Sustained national community criticism or widespread protest + Industry reputation and approvals impacted + Changes at executive/board level or long-term share price impact (> month)	
	Financial (As)	< \$30k	\$30k to \$300k	\$300k to \$3m	\$3m to \$30m	\$30m to \$300m	> \$300m	
	Workforce	+ Will require some staff attention over several days. + No actual or potential impact to culture	+ Will require several days local management time. + Minor impact to employee engagement and limited staff turnover	+ Will require head office staff and take several weeks of site management time. + Moderate impact to employee engagement and staff turnover above industry average with some key roles	+ Will require several weeks of senior management time + Impact to employee engagement (< 6 months), moderate turnover of key roles and no succession	+ Will require several months of senior management time + Impact to employee engagement (< 18 months), high staff turnover and attraction issues	+ Will require more than a year of senior management involvement and operations severely disrupted + Impact to employee engagement (> 18 months), significant key role turnover and attraction issues	
	Compliance	+ Non-conformance with legislation, instruments (e.g. tenure licence) or contract + No regulatory or punitive action	+ Minor breach of legislation, instruments or contract + Notification/report to, request for information by, and/or administrative/warning notice from the regulator + LOCI Tier 3 or non-hydrocarbon releases notifiable to the regulator	+ Limited number of minor breaches of legislation, instruments or contract + Statutory notice from the regulator + LOCI Tier 2 or non-hydrocarbon releases immediately reportable to the regulator	+ Systemic minor breaches (or one moderate breach) of legislation, instruments or contract + Company charged with an offence with minor penalty/fine + LOCI Tier 1 or cumulative regulator notification of non-hydrocarbon releases	+ Systemic moderate breaches (OR single material breach) of legislation, instruments or contract + Company charged with an offence with moderate penalty/fine	+ Material breaches of legislation, instruments or contract + Company or officers charged with an offence with material penalty/fine, or loss of tenure/operatorship	
			I	II	III	IV	V	VI
Likelihood	ALMOST CERTAIN (< 4 monthly) Occurs in almost all circumstances OR could occur <i>within days</i> to weeks	f	Low	Medium	High	Very High	Very High	Very High
	LIKELY (4 monthly - 1 yearly) Occurs in most circumstances OR could occur <i>within weeks to months</i>	e	Low	Medium	High	High	Very High	Very High
	OCCASIONAL (1 - 3 yearly) Has occurred before in Santos OR could occur <i>within months to years</i>	d	Low	Low	Medium	High	High	Very High
	POSSIBLE (3 - 10 yearly) Has occurred before in the industry OR could occur <i>within the next few years</i>	c	Very Low	Low	Low	Medium	High	Very High
	UNLIKELY (10 - 30 yearly) Has occurred elsewhere OR could occur <i>within decades</i>	b	Very Low	Very Low	Low	Low	Medium	High
	REMOTE (30 - 100 yearly) Requires exceptional circumstances and is unlikely even in the long term OR only occurs as a "one in 100 year event"	a	Very Low	Very Low	Very Low	Low	Medium	Medium

### Operational Risk Assessment Requirements

Risk Level	Action	Governance Mechanism	Authority for Continued Tolerance of Risk	Control Development and Timeframe	Control Ownership
Very High	+ Following verification of the risk at 'Very High' activity must stop + Activity cannot recommence until controls are implemented to reduce risk to 'High' or lower + For incidents, a dedicated multi-disciplinary incident investigation team will be formed + Level 3 Manager or Excom member will be included in the investigation team	+ Controls will be governed at the Operations Committee meeting or equivalent forum + Sponsorship of incident investigation by EVP or Level 2 Manager	+ CEO	+ Intolerable Risk Level + Develop and implement controls urgently to reduce risk to 'High' or lower as soon as practicable	+ Level 2 Manager (e.g. Executive Vice President)
High	+ Assess risk to determine if it is reduced So Far As is Reasonably Practicable (SFAIRP) + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new controls + For incidents, a dedicated multi-disciplinary incident investigation team will be formed	+ Controls will be governed at Divisional level meeting or equivalent forum + Sponsorship of incident investigation by Level 3 Manager	+ EVP or Level 2 Manager	+ Action to reduce risk level to 'Medium' or below	+ Level 3 Manager (e.g. General Manager)
Medium	+ Assess risk to determine if SFAIRP + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new controls + Incidents are assessed using Mining the Diamond and investigated relative to the incident potential	+ Controls will be governed at Area level meeting or equivalent forum + Sponsorship of incident investigation at Level 4 Manager	+ General Manager or Level 3 Manager	+ Manage and monitor risk efficiently in accordance with business management plans	+ Level 4 Manager (e.g. Asset or Functional Manager)
Low	+ Assess risk to determine if SFAIRP + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new controls + Incidents are assessed using Mining the Diamond and investigated relative to the incident potential	+ Controls will be governed at site level meeting or equivalent forum + Sponsorship for incident investigation at Level 5 Manager	+ Level 4 Manager	+ Manage and monitor risk efficiently in accordance with business management plans	+ Level 5 Manager (e.g. Area Manager, Team Leader, Superintendent or equivalent)
Very Low	+ Risk to be managed as stipulated by the related work processes	+ Governed if required	+ Level 5 Manager	+ Manage and monitor risk efficiently in accordance with business management plans	+ Any individual contributor

Figure 1. Santos Risk Matrix

Identification				Unmitigated Risk			Control Strategies	Residual Risk		
Risk Event / Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk		Consequence	Likelihood	Risk
<p>Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities</p> <p>Well drilling and hydraulic fracturing</p>	Land Resources	<p>Reduction in visual amenity</p> <p>Soil erosion, topsoil loss, inversion and compaction</p> <p>Disturbance to land use and suitability changes</p> <p>Reduction in agricultural productivity</p> <p>Contamination of soil</p>	<p>Infrastructure construction (earthworks activities)</p> <p>Vehicle and plant movements</p> <p>Minor spills or leaks of fuels, chemicals or other produced fluids</p> <p>Production operations</p> <p>Loss of containment</p> <p>Storage and disposal of general waste, chemical and process wastes</p> <p>Risks posed by fire (ignition sources resulting from activities); and</p> <p>Bushfire and flood (natural events)</p>	II	d	Medium	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Compliance with relevant Environmental Authority conditions, and all relevant internal and external approvals in place before work undertaken.</li> <li>All disturbance undertaken in accordance with Santos standards.</li> <li>Appropriate emergency response plans in place.</li> <li>Restricted access to site/s.</li> <li>Industry standards and good industry practices are followed.</li> </ul> <p><b>Land Resources</b></p> <ul style="list-style-type: none"> <li>Surface disturbance restricted to the minimum area required to safely carry out activities.</li> <li>Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts.</li> <li>Where practicable, use existing routes / disturbed ground, and co-locate and access tracks and flowlines to reduce the total disturbance area.</li> <li>Existing unrestored borrow pits are used in preference to establishing new pits.</li> <li>Impacts to sensitive areas are mitigated through implementation of appropriate construction and maintenance practices as detailed in the scope of works, approval documents and company procedures.</li> <li>Topsoil stockpiles separated from subsoil and maintained to preserve the seedbank (where practicable).</li> <li>Erosion and sediment control measures in place where appropriate.</li> <li>Infrastructure located to minimise impacts to drainage patterns, soil and vegetation, and avoid significant cut and fill.</li> <li><u>Vehicle and plant movements</u> <ul style="list-style-type: none"> <li>No unauthorised off-site driving.</li> <li>Access track maintenance (and watering) carried out as required to reduce dust generation.</li> <li>Active promotion of appropriate road use behaviours, and the setting of appropriate speed limits for Santos personnel and contractors.</li> <li>Work is scheduled to fit in with stock locations and the mustering schedule.</li> </ul> </li> <li><u>Fire / Flood</u> <ul style="list-style-type: none"> <li>Activity planning will consider seasonal conditions and risk of bushfire and flood.</li> <li>Work programs in water crossing areas scheduled to take into account seasonal conditions and rainfall.</li> <li>Emergency response procedures should contain a fire and flood response procedure.</li> <li>Personnel are informed on the fire danger season and associated restrictions.</li> <li>Ignition sources are controlled via permit to work.</li> <li>Measures undertaken to reduce potential impacts of fire and flooding where appropriate (e.g. installation of fire breaks, bunds, removal of fuels/chemicals and sump contents (where appropriate / safe to do so) prior to arrival of fire or flood event).</li> </ul> </li> <li><u>Fuel, oil and chemical storage and handling</u> <ul style="list-style-type: none"> <li>Fuel, oil and chemical storage and handling undertaken in accordance with Australian standards and guidelines (i.e. in bunded areas) and in small volumes wherever practicable.</li> <li>Spill leak and drip trays provided to address minor drips and spills resulting from re-fuelling operations.</li> <li>Spill response equipment and materials kept on site and in operational vehicles (where appropriate).</li> <li>Contaminated areas will be fenced if threat is posed to stock or wildlife.</li> <li>Maintain a register of incidents and implement corrective actions based on outcome of investigations.</li> <li>Vehicles and equipment are operated and maintained in accordance with specifications to minimise the potential for a spill or leak (e.g. oil leak or hydraulic hose failure).</li> </ul> </li> </ul>	III	c	Low

				IV	c	Medium	<ul style="list-style-type: none"> <li>• <u>Production operations</u> <ul style="list-style-type: none"> <li>- Plant and equipment designed, constructed and operated in accordance with Santos Engineering Standards and relevant Australian/International standards.</li> <li>- Infrastructure design process to address location and non-location specific threats (e.g. pipeline corrosion) and develop adequate controls to mitigate environmental and public/third party safety risk.</li> <li>- Safety, testing, maintenance and inspection procedures implemented.</li> <li>- Prestart-up checklist prior to commissioning and decommissioning activities.</li> <li>- Pipeline construction integrity verification e.g. hydrotest.</li> </ul> </li> <li>• <u>Loss of containment</u> <ul style="list-style-type: none"> <li>- Regular monitoring of control systems (e.g. emergency shutdown valves) to ensure that protection levels are adequate.</li> <li>- Emergency spill response equipment on site.</li> <li>- Loss of containment is managed via appropriate Santos incident management system, and implementation of corrective actions is based on incident investigation.</li> <li>- Emergency response training for emergency response personnel.</li> </ul> </li> <li>• <u>Waste</u> <ul style="list-style-type: none"> <li>- Waste managed in accordance with the Waste Management Hierarchy, defined in Schedule 1 of the <i>Environment Protection (Waste Management) Policy 2000</i>.</li> <li>- Where practicable, Santos would implement the waste management hierarchy, and reduce risks to environmental values from waste storage and disposal, by: <ul style="list-style-type: none"> <li>o designing activities to incorporate less resource-intensive materials and more efficient processes.</li> <li>o designing contracts which encourage waste avoidance and set waste reduction targets.</li> <li>o identifying and separating waste streams for re-use, recycling, treatment or disposal.</li> <li>o storing waste in appropriate receptacles or designated areas prior to their re-use or collection for recycling, treatment or disposal.</li> <li>o ensuring wastes are removed by transporters which are appropriately licensed or authorised to transport that particular waste type.</li> <li>o ensuring all wastes removed from the site are recycled, treated or disposed of at an appropriately licensed waste facility.</li> <li>o reviewing and auditing waste management practice to confirm legal compliance and identify opportunities for improvement.</li> </ul> </li> <li>- Treated sewage effluent (&lt;21 EP) will be released to land provided it: <ul style="list-style-type: none"> <li>o is a signed contaminant release area(s);</li> <li>o does not contain any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm;</li> <li>o does not result in pooling or run-off or aerosols or spray drift or vegetation die-off;</li> <li>o minimises deep drainage below the root zone of any vegetation; and</li> <li>o does not adversely affect the quality of shallow aquifers.</li> </ul> </li> <li>- Covered bins are provided for the collection and storage of wastes.</li> <li>- Rubbish loads are covered during transport to a licensed waste facility.</li> <li>- On site disposal of residual drilling material undertaken in accordance with mix bury cover method, or alternative method and quality criteria as certified by a suitably qualified third party.</li> <li>- Hydraulic fracturing flowback fluid contained in lined pits or tanks, and removed from site for authorised reuse or disposal upon completion of operations.</li> <li>- Waste materials and non-essential infrastructure removed from operational areas as soon as reasonably practicable following petroleum activities.</li> </ul> </li> <li>• <u>Rehabilitation</u> <ul style="list-style-type: none"> <li>- Gathering line / pipeline ROW are immediately re-instated following gathering line / pipeline installation.</li> <li>- Rehabilitation of significantly disturbed areas will commence within 12-months of no longer being required (unless an exceptional circumstance in the area to be rehabilitated (e.g. a flood event) prevents this timeframe being met).</li> <li>- Areas potentially exposed to contamination will be assessed and remediated where required.</li> <li>- Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions specified for the proposed EA.</li> <li>- Rehabilitation aims to reshape and stabilise disturbed areas to provide appropriate site conditions to facilitate natural revegetation processes, and will include the following activities (where appropriate): <ul style="list-style-type: none"> <li>o ripping of areas of compacted soil (except on sensitive soils / environments).</li> <li>o respreading of stockpiled topsoil, vegetation and seed stock (where available) to facilitate natural revegetation; and</li> <li>o restoration of natural landform contours.</li> </ul> </li> </ul> </li> </ul>	III	c	Low
--	--	--	--	----	---	--------	---	-----	---	-----

Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities	Flora and Regional Ecosystems	Loss of ecosystem functioning Loss of species population, further endangerment and loss in species diversity Introduction and / or spread of weeds, pest plants, animals and pathogens	Infrastructure construction (earthworks activities) Vehicle and plant movements Minor spills or leaks of fuels, chemicals or other produced fluids Storage and disposal of general waste, chemical and process wastes Loss of containment Fire (ignition sources resulting from activities)	III	c	Low	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Assess proposed disturbance locations for the potential presence of high value flora and regional ecosystems before commencement of construction, and implement appropriate avoidance or mitigation measures.</li> <li>Refer to the control strategies listed under the Land Resources EV (refer to section 4.9.2 of Attachment 2 of the amendment application).</li> </ul> <p><b>Flora, Regional Ecosystems and ESAs</b></p> <ul style="list-style-type: none"> <li>Maximise use of pre-disturbed areas (where practicable).</li> <li>Where practicable, clearing of mature trees avoided.</li> <li>Where practicable, branches will be lopped rather than the removal of whole trees or shrubs.</li> <li><u>Introduction and / or spread of weeds, pest plants, animals and pathogens:</u> <ul style="list-style-type: none"> <li>Hygiene protocols implemented as appropriate to minimise the introduction, spread and persistence of weeds, pest plants, animals and pathogens</li> <li>Access to and from the site via designated access tracks only.</li> <li>Vehicle and equipment wash-down when operations have been undertaken in areas of known weed infestations.</li> <li>Monitor for presence of weeds within the construction area, and where necessary implement control measures.</li> <li>Ensure that imported material is from an area or source considered to be pest plant/disease free.</li> </ul> </li> <li>Refer to Control Strategies listed under Biodiversity including MSES EV (refer to section 4.9.1 of Attachment 2 of the amendment application).</li> </ul>	II	c	Low
Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities	Fauna	Loss of ecosystem functioning Loss of species population, further endangerment and loss in species diversity Disturbance, injury or loss of fauna and livestock Introduction and / or spread of weeds, pest plants, animals and pathogens	Infrastructure construction (earthworks activities) Entrapment in voids and pipelines Vehicle and plant movements Fire (ignition sources resulting from activities) Storage and disposal of general waste, chemical and process wastes Loss of containment	III	c	Low	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Refer to Control Strategies listed under Biodiversity including MSES and Land Resources EVs (refer to sections 4.9.1 and 4.9.2 of Attachment 2 of the amendment application).</li> </ul> <p><b>Fauna and Livestock</b></p> <ul style="list-style-type: none"> <li>Hollow logs (located on ground) within disturbance areas retained and shifted to adjacent undisturbed areas.</li> <li>Measures implemented to reduce risks to fauna from entrapment in pipes and excavations, including: <ul style="list-style-type: none"> <li>Facilities (e.g. borrow pits, well cellars) are designed and constructed as far as practicable to minimise impacts to fauna.</li> <li>Borrow pits are not established in locations which pose an unacceptable hazard to livestock.</li> <li>Sumps, mud pits and other pits holding fluid are fenced as appropriate to minimise fauna (medium to large) and livestock access.</li> <li>Pipes capped to prevent fauna entrapment during construction or after abandonment.</li> <li>Minimising the period trenches remain open to as short as reasonably practicable.</li> <li>Regular inspections of open trenches and prior to backfilling,</li> <li>Provision of escape ramps and refuge material for fauna that do enter trenches.</li> </ul> </li> <li>Refer to Control Strategies listed under Biodiversity including MSES EV (refer to section 4.9.1 of Attachment 2 of the amendment application).</li> </ul>	II	c	Low

<p>Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities</p> <p>Well drilling and hydraulic fracturing</p>	<p>Surface Water</p>	<p>Disturbance to natural drainage patterns</p> <p>Degradation of water quality from sediment releases, spills or leaks of fuels and chemicals</p> <p>Impacts to aquatic flora and fauna from sediment releases, spills or leaks of fuels and chemicals</p> <p>Contamination of surface water</p>	<p>Infrastructure construction (earthworks activities)</p> <p>Vehicle and plant movements</p> <p>Storage and disposal of general waste, chemical and process wastes</p> <p>Well control or well head equipment failure</p> <p>Minor spills or leaks of fuels, chemicals or other produced fluids</p> <p>Production operations</p> <p>Loss of containment</p>	<p>IV</p>	<p>c</p>	<p>Medium</p>	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Refer to general control strategies listed under the Land Resources EV (refer to section 4.9.2 of Attachment 2 of the amendment application).</li> </ul> <p><b>Surface Water</b></p> <ul style="list-style-type: none"> <li>Activities to be located away from watercourses where practicable.</li> <li>Preferentially select dry crossing sites for linear infrastructure with minimal earthworks requirements.</li> <li>Pre-existing areas of disturbance used to place infrastructure wherever practicable.</li> <li>Culverts and floodways installed where required to maintain natural water flows, drainage and surface runoff.</li> <li>Areas subject to inundation are assessed for conduciveness to support vehicles prior to access.</li> <li>Erosion and sediment controls installed where necessary.</li> <li>Infrastructure located, prepared and constructed to maintain pre-existing surface water flows.</li> <li>Refer to the control strategies listed under the Surface Waters and Wetlands EV (refer to section 4.9.5 of Attachment 2 of the amendment application).</li> </ul>	<p>IV</p>	<p>b</p>	<p>Low</p>
<p>Construction and operation of wells, gathering lines and incidental activities</p> <p>Well drilling and hydraulic fracturing</p>	<p>Groundwater</p>	<p>Contamination of groundwater resources</p> <p>Crossflow, aquifer contamination or reduction in pressure in aquifers</p> <p>Reduction in groundwater quantity and/or availability for other users</p> <p>Impacts to groundwater dependant ecosystems</p>	<p>Drilling and hydraulic stimulation / fracturing activities</p> <p>Production operations</p> <p>Well control or well head equipment failure</p> <p>Well casing or cement failure (well integrity failure)</p> <p>Minor spills or leaks of fuels, chemicals or other produced fluids</p> <p>Loss of containment</p> <p>Storage and disposal of general waste, chemical and process wastes</p> <p>Vehicle and plant movements</p>	<p>IV</p>	<p>c</p>	<p>Medium</p>	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Refer to general control strategies listed under the Land Resources EV (refer to section 4.9.2 of Attachment 2 of the amendment application).</li> <li>Well drilling operations undertaken in accordance with the Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland (DNRME, 2019).</li> <li>Hydraulic fracturing processes undertaken in accordance with the Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland (DNRME, 2019).</li> </ul> <p><b>Groundwater</b></p> <ul style="list-style-type: none"> <li><b>Drilling operations</b> <ul style="list-style-type: none"> <li>Formation evaluation program and drilling program in place.</li> <li>Well design to leading practice.</li> <li>Blowout preventers (BOP) used once surface casing is installed.</li> <li>Regular BOP drills, testing, certification, and maintenance.</li> <li>Implementation of control measures and monitoring as documented in the Santos SWQ Underground Water Impact Report (Feb SWQ UWIR) (Appendix C of Attachment 2 of the amendment application).</li> </ul> </li> <li><b>Hydraulic fracturing operations</b> <ul style="list-style-type: none"> <li>During the hydraulic fracturing process, Santos implements the following:                             <ul style="list-style-type: none"> <li>Pressure tests of well casing and cement are conducted prior to hydraulic fracturing to confirm well integrity.</li> <li>Fluids utilised in hydraulic fracturing are subjected to a risk assessment prior to use. The material will not contain restricted fluids, including BTEX or the use of polycyclic aromatic hydrocarbons in concentrations above the reporting limit.</li> <li>Hydraulic stimulation procedures utilised by Santos and its contractors follow a design philosophy predicated on international best practice. This includes practices for ensuring mechanical well integrity and surveillance.</li> <li>Operational procedures monitor fracture design to stay within the target formation, thereby preventing interconnectivity between the target formation and an aquifer and minimising the potential for migration of stimulation fluids beyond the simulation impact zone.</li> <li>Hydraulic fracturing fluids and flowback are stored to prevent seepage to shallow groundwater. Fluids will be removed at the cessation of the hydraulic fracturing activity to an appropriate facility for reuse or disposal.</li> <li>Implementation of control measures described in Section 4.9.4 of Attachment 2 of the amendment application.</li> <li>Implementation of control measures and monitoring as documented in the Feb SWQ UWIR (Appendix C of Attachment 2 of the amendment application) and the SWQ Hydraulic Fracture Risk Assessment (HFRA) (Appendix D of Attachment 2 of the amendment application).</li> <li>Implementation of the Santos Stimulation Impact Monitoring Program (SIMP).</li> </ul> </li> <li>Refer to the control strategies listed under the Groundwater EV (refer to section 4.9.4 of Attachment 2 of the amendment application).</li> </ul> </li> </ul>	<p>IV</p>	<p>a</p>	<p>Low</p>



<p>Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities</p> <p>Well drilling and hydraulic fracturing</p>	<p>Air Quality and Noise</p>	<p>Air pollution and localised reduction in air quality</p> <p>Nuisances caused by dust, light, vibration and noise generation</p> <p>Disturbance to fauna and livestock</p>	<p>Infrastructure construction</p> <p>Vehicle and plant movements</p> <p>Seismic source</p> <p>Fire (ignition sources resulting from activities)</p> <p>Minor air emissions generated from vehicles and equipment</p> <p>Air emissions vented from testing and production activities</p> <p>Noise generated during drilling and hydraulic stimulation / fracturing activities and production operations</p>	<p>III</p>	<p>c</p>	<p>Low</p>	<p><b>General</b></p> <ul style="list-style-type: none"> <li>• Refer to general control strategies listed under the Land Resources EV (refer to section 4.9.2 of Attachment 2 of the amendment Application).</li> <li>• Emergency shutdown systems in place.</li> <li>• Fit for purpose equipment.</li> <li>• Conduct regular testing, inspections and maintenance of site equipment.</li> </ul> <p><b>Air Quality and Noise</b></p> <ul style="list-style-type: none"> <li>• Identification of sensitive receptors during planning <ul style="list-style-type: none"> <li>- Nearest sensitive receptor is located approximately 6 km south east of the boundary of PL 80.</li> </ul> </li> <li>• Landholders consulted as required where activities may affect sensitive receptors and/or agricultural operations.</li> <li>• Systems in place for logging stakeholder / landholder complaints to ensure issues are recorded and addressed as appropriate.</li> <li>• Noise managed in accordance with 'management hierarchy for noise' set out in the <i>Environmental Protection (Noise) Policy 2019</i>.</li> <li>• Vehicles, engines and equipment operated and maintained in accordance with manufacturer specifications and planned maintenance systems.</li> <li>• Use of attenuation / suppression devices where required e.g. silencing equipment on mobile plant</li> <li>• Majority of vehicle movements will be limited to daylight hours.</li> <li>• Dust suppression measures carried out where required e.g. road watering.</li> <li>• Preference to flare rather than vent, and venting only in extreme circumstances.</li> <li>• Refer to control strategies under the Air and Noise EV.</li> </ul>	<p>II</p>	<p>c</p>	<p>Low</p>
---	------------------------------	--	---	------------	----------	------------	---	-----------	----------	------------

Table 1. Risk assessment relevant to PL 80 development

## 2.4. DES Information Request element (4)

### Noise assessment

Please provide more information to ensure the acoustic environmental value will not be impacted by the proposed activities. This should have regard to the predicted noise generated by the project activities during construction and operation phases and the consequent impacts on the sensitive receptors (both ecological and human) and the proposed management measures and the remaining risk.

### Grounds:

- The application doesn't provide adequate noise assessment for the project activities for both construction and operation phases.

### Santos Response

The existing noise environment of PL 80 is typical of a remote, largely unpopulated area, with low levels of background noise dominated by natural sources (e.g. wind, animals and insects) and intermittent noise from vehicular traffic and grazing activities (e.g. mustering) from the operation of the surrounding pastoral lease. There are no sensitive receptors within PL 80. The nearest sensitive receptor is Durham Downs Station located approximately 6km south-east from the boundary of PL 80.

Background noise monitoring has not been undertaken for this development given the remote nature of the location and the absence of sensitive receptors and other noise generating industries / activities. In the absence of background noise monitoring, the deemed background levels nominated in the EA EPPG00407213 and the DES guideline - *Prescribing noise conditions for environmental authorities for petroleum activities* (ESR/2016/1935) have been adopted as being representative of the ambient acoustic environment. The deemed background levels are as follows:

- 7:00 am – 6:00 pm      35db(A)
- 6:00 pm – 10:00 pm    30db(A)
- 10:00 pm – 6:00 am    25db(a)
- 6:00 am – 7:00 am      30dB(A)

Potential noise emissions from the proposed petroleum activities within PL 80 would be consistent with those associated with the existing petroleum activities. Noise emissions are likely to be generated during construction, drilling, operations and rehabilitation activities from the operation of vehicles, plant, machinery, drilling and well completion activities and wellhead equipment like pumps.

Table 2 provides the sound power level of the noise generating activities associated with the construction and operation of petroleum wells sourced from the DES guideline - *Prescribing noise conditions for environmental authorities for petroleum activities* (ESR/2016/1935). These activities are applicable to the existing and proposed activities on PL 80. The occurrence of these activities varies, with some activities such as drilling and stimulation activities being once-off activities compared to the ongoing maintenance and operation of petroleum wells which produce reoccurring emissions for the duration of the petroleum activity. These types of noise emissions are not new and are consistent with those authorised by the existing EA. The construction of the additional petroleum activities proposed

by the application are likely to be undertaken in a staged manner with individual wells and their associated infrastructure constructed one at a time rather than all at once, therefore the cumulative noise emissions from the proposed activities are likely to be minimised.

**Table 2. Typical sound power levels of petroleum activity noise sources**

Noise source	Overall sound power level (L) <sub>WA</sub>	Metric	Occurrence
<i>Well construction (existing authorised activity and proposed)</i>			
Drill Rig (mud pump)	100 – 105 dB(A)	L <sub>Aeq</sub>	Once – off
Impacts of Drill Rods / Casings	100 – 110 dB(A)	L <sub>AMAX</sub>	Once – off
Cavitation / Air Release	115 – 120 dB(A)	L <sub>AMAX</sub>	Once – off
Engine Brakes	110 – 115 dB(A)	L <sub>AMAX</sub>	Reoccurring
Reversing Beeper	100 -105 dB(A)	L <sub>AMAX</sub>	Reoccurring
<i>Well Maintenance / Workover (existing authorised activity and proposed)</i>			
Drill Rig (air compressor)	95 – 100 dB(A)	L <sub>Aeq</sub>	Reoccurring
Cavitation / Air Release	115 – 120 dB(A)	L <sub>AMAX</sub>	Reoccurring
Engine Brakes	110 – 115 dB(A)	L <sub>AMAX</sub>	Reoccurring
Reversing Beeper	100 -105 dB(A)	L <sub>AMAX</sub>	Reoccurring
<i>Well Operation (existing authorised activity and proposed)</i>			
Generator (500kVA)	100 – 110 dB(A)	L <sub>Aeq</sub>	Continuous
Engine Brakes	110 – 115 dB(A)	L <sub>AMAX</sub>	Reoccurring
Reversing Beeper	100 -105 dB(A)	L <sub>AMAX</sub>	Reoccurring
<i>Stimulation (existing authorised activity and proposed)</i>			
Stimulation Activity (fracking) (combined sources)	110 – 120 dB9A)	L <sub>Aeq</sub>	Once – off
Drill Rig (hydraulic pack)	95 – 100 dB(A)	L <sub>Aeq</sub>	Reoccurring
Engine Brakes	110 – 115 dB(A)	L <sub>AMAX</sub>	Reoccurring
Reversing Beeper	100 -105 dB(A)	L <sub>AMAX</sub>	Reoccurring

Noise levels associated with the proposed activities may result in localised impacts (disturbance) to fauna and livestock located in the immediate area surrounding operational sites (i.e. the immediate 100-200 m buffer around a well lease) however, these impacts are largely expected to be short-term and are not expected to result in significant ongoing impacts to local fauna populations, or impact use of the area by livestock. As outlined in section 4.3 of Attachment 2 of the amendment application:

- Two threatened fauna species (two birds (Grey Falcon and Major Mitchell's Cockatoo) listed under the NC Act are considered as having low potential to occur within the study area. No threatened fauna species were identified during field surveys and only the migratory Fork-tailed Swift, listed under the EPBC Act (and as special least concern under the NC Act), is considered as having a potential to occur within the study area; and



- Based on known distributions, the species' occurrence within the region and preferred habitat requirements, threatened and migratory species are considered unlikely or a low potential to occur, due to the lack of high quality suitable habitat within the study area, or the study area is outside the known range of the species.

Santos manages noise generating activities in accordance with the noise management hierarchy of avoid, minimise and manage as set out in the *Environmental Protection (Noise) Policy 2019*. Santos will continue to minimise noise emissions through:

- Compliance with the existing conditions of the EA, particularly conditions (A19), (A22) and Schedule G - Acoustic;
- Orientation of equipment on the well pad to minimise the resultant noise level at sensitive receptors;
- Ensuring the operation and maintenance of plant and equipment are in good working order;
- The minimisation of the amount of time vehicles and machinery are left to idle;
- Staff induction and training in the appropriate operation of plant and equipment; and
- The substitution of noise generating equipment (e.g. pumps and generators) with equipment with lesser noise emissions and attenuation devices where there is likely to be an impact on a sensitive receptor.

To minimise nuisance complaints from petroleum activities Santos engages with relevant landholders and negotiates alternative arrangements where necessary. Santos implements a complaints management procedure with the aim of closing out valid complaints to the satisfaction of both parties.

DES has applied the Streamlined Modelled Conditions (SMC) for Petroleum Activities, Protection of Acoustic Values conditions to the environmental authority. The SMC conditions are considered by DES to reflect best practice noise emissions and are approved standard conditions. Santos will comply with the existing noise conditions (Schedule G) for the existing and proposed development.

Given the lack of sensitive receptors within PL 80, the implementation of the mitigation and management measures listed above and the application of the SMCs to the environmental authority, the noise emissions from the proposed development is unlikely to cause nuisance to the nearest sensitive receptor, Durham Downs Station; is not expected to result in significant ongoing impacts to local fauna populations; or impact the use of the area by livestock. The proposed emissions are not new and are consistent with those authorised by the existing EA.

## **2.5. DES Information Request element (5)**

### *Air Assessment*

*Please provide more information to ensure the air environmental value will not be impacted by the proposed activities. This should have regard to the predicted emissions by the project activities during the construction and operation phases and the consequent impacts on the sensitive receptors (both ecological and human) and the proposed management measures and any remaining risk.*

**Grounds:**

- *The application doesn't provide adequate air assessment for the project activities for both construction and operation phases.*

**Santos Response**

The existing air quality of PL 80 is typical of a remote environment influenced by the existing petroleum activities and agricultural industries including the operation of the surrounding pastoral lease. There are no sensitive receptors within PL 80. The nearest sensitive receptor is Durham Downs Station located approximately 6km south-east from the boundary of PL 80.

Potential air quality impacts from the proposed petroleum activities within PL 80 would be consistent with those associated with the existing petroleum activities and pastoral activities. The primary air pollutants generated during construction, drilling and operations would be dust and exhaust emissions (NO<sub>x</sub>, CO, volatile organic compounds and PM<sub>10</sub>) from operating vehicles, plant, machinery and wellhead equipment like pumps. These relatively minor dust and exhaust emissions would remain local to the source and are unlikely to effect the air quality environmental values of PL 80 provided that the mitigation measures listed below are carried out. Many of the sources will also be temporary, occurring only through the construction period, or by workovers or intermittent site visits during operation.

There is no ambient air quality monitoring stations (AQMSs) within the vicinity of PL 80. The closest DES AQMS is located at Moranbah, approximately 490km north-east of PL 80. This monitoring station has been operational since 2011 and was established to measure particles levels (particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>)) from coal mining operations in the community and surrounding area. The Toowoomba AQMS was the closest station for oxides of nitrogen (NO<sub>x</sub>) and carbon monoxide (CO). This station was operational from 2003 to 2010. Table 3 provides a very conservative estimate of the background air quality in South West Queensland.

**Table 3. Background Air Quality Data relevant to PL 80**

Parameter	Source	Value (ug/m <sup>3</sup> )	Objective (ug/m <sup>3</sup> )	Averaging Period
Carbon monoxide (CO)	Toowoomba	1.9mg/m <sup>3</sup>	11,000	8 hour rolling average
Nitrogen dioxide(NO <sub>2</sub> )	Toowoomba	82.8µg/m <sup>3</sup>	250	Maximum 1 hour average
		10.5µg/m <sup>3</sup>	62	Annual average
PM <sub>10</sub>	Moranbah (Utah Drive)	29.1	50	24 hours
PM <sub>2.5</sub>	Moranbah (Utah Drive)	4.1	25	24 hours
		7.2	6	Annual

Note – PM<sub>10</sub> and PM<sub>2.5</sub> values have been derived from DES monitoring data for the period 1 August 2019 to 30 July 2020.

An air quality impact assessment has not been undertaken for this development given the small number of new emission sources from the proposed EA amendment, the remote nature of the location, the lack of other industry / pollutant sources in the region and the absence of sensitive receptors. The application seeks authority to construct, drill and operate petroleum wells and associated supporting infrastructure. It does not propose the use of fuel burning or combustion equipment that has the potential to emit more / different pollutants on a continuous basis. The existing fuel burning equipment on PL 80 is not capable of burning more than 500kg of fuel in an hour and as such does not meet the definition of an environmentally relevant activity as prescribed by the *Environmental Protection Regulation 2019*.

Santos manages air emissions in accordance with the management hierarchy for air emissions of avoid, recycle, minimise and manage as set out in the *Environmental Protection (Air) Policy 2019*. Santos will continue to minimise air emissions through:

- Compliance with the existing conditions of the EA, particularly conditions (A19), (A22), (H1) and Schedule J – Rehabilitation;
- Emissions from vehicles, plants and equipment will be managed through regular maintenance to ensure all machinery is in good working order and does not generate excessive exhaust emissions (requirement of condition A19);
- The amount of time vehicles and machinery are left to idle is minimised to reduce fugitive emissions;
- Designing and operating flares and vents in accordance with petroleum legislation and Australian standards;
- Employing dust suppression measures as required by prevailing conditions;
- Staff induction and training in the appropriate operation of plant and equipment;
- Compliance with the Department of Natural Resources, Mines and Energy (DNRME) *Code of Practice for leak management, detection and reporting for petroleum operating plant* with regards to fugitive emissions from the petroleum activities; and
- Progressive rehabilitation of significantly disturbed land as practicable after areas are no longer required for operations.

To minimise nuisance complaints from petroleum activities Santos engages with relevant landholders and negotiates alternative arrangements where necessary. Santos implements a complaints management procedure with the aim of closing out valid complaints to the satisfaction of both parties.

DES has applied the SMC for Petroleum Activities, Protection of Air Values condition (Air 1) to the environmental authority (condition H1) for the venting of waste gas from the petroleum activities and the environmental nuisance condition (condition A22). Based on the above, Santos believes these conditions remain appropriate to manage the proposed activities.

Given the lack of sensitive receptors within PL 80, the implementation of the mitigation and management measures listed above and the application of the SMCs to the environmental authority

the emissions from the proposed development is unlikely to cause nuisance to the nearest sensitive receptor, Durham Downs Station; is not expected to result in significant ongoing impacts to local fauna populations; or impact the use of the area by livestock. The proposed emissions are not new and are consistent with those authorised by the existing EA.

## Appendix A – Notice of Information Request

# Notice

## *Environmental Protection Act 1994*

### Information request

*This information request is issued by the administering authority under section 140 of the Environmental Protection Act 1994 to request further information needed to assess an amendment application for a site-specific environmental authority.*

To: Santos Limited  
60 Flinders Street ADELAIDE SA 5000  
  
ATTN: Elizabeth Dunlop  
elizabeth.dunlop@santos.com

Reference: EPPG00407213 (Connect Reference: APP0053559)

### **Further information is required to assess an amendment application for a site-specific environmental authority**

#### **1. Application details**

The amendment application for a site-specific environmental authority was received by the administering authority on 29 April 2020.

The application reference number is: **APP0053559**

Land description: PL80

#### **2. Information request**

The administering authority has considered the abovementioned application and is writing to inform you that further information is required to assess the application (an information request).

The information requested is provided below:

#### **Groundwater**

Please provide further information regarding the impacts of the proposed activities on the environmental values associated with groundwater.

**Grounds:**

- Section 5.5 of the Underground Water Impact Report (UWIR – Santos Cooper Basin Oil and Gas Fields, February 2020) states that there is no current water level information available in the DNRME database and that there are no Santos owned regional groundwater monitoring bores in the study area. Without conducting this monitoring, it is unclear how the model is verified and how Santos can be confident that the impact that their operations are having on this groundwater system are being managed effectively.
- The application states that:” the production of petroleum on PL 80 would not impact groundwater in GAB aquifers because of the hydraulic separation (or lack of connectivity) between the deeper Cooper Basin sediments and the overlying GAB aquifers of the Eromanga Basin. This is demonstrated by the modelling results reported in the Feb SWQ UWIR for other development areas.” However, Figures 45 and 49 of UWIR (Santos Cooper Basin Oil and Gas Fields, February 2020) show the immediately and long term affected areas for Eromanga Basin modelled groundwater drawdown in Layer 5, there are two affected areas with more than 5m drawdown in PL80. Please clarify.

**Risk assessment of likely impacts of project activities on the environmental values**

Please provide the details of the risk assessment of likely impacts of project activities on the environmental values for both the construction and operation phases. The risk assessment must include the description of the risks and likely magnitude of impacts on the environmental values, mitigation strategies and residual risks.

**Grounds:** As per section 125 of the Environmental Protection Act 1994, a site specific application requires an assessment of the likely impacts on relevant environmental values. The provided risk assessment does not meet all regulatory requirements.

**Noise Assessment**

Please provide more information to ensure the acoustic environmental value will not be impacted by the proposed activities. This should have regard to the predicted noise generated by the project activities during construction and operation phases and the consequent impacts on the sensitive receptors (both ecological and human) and the proposed management measures and the remaining risk.

**Grounds:** The application doesn't provide adequate noise assessment for the project activities for both construction and operation phases.

**Air Assessment**

Please provide more information to ensure the air environmental value will not be impacted by the proposed activities. This should have regard to the predicted emissions by the project activities during the construction and operation phases and the consequent impacts on the sensitive receptors (both ecological and human) and the proposed management measures and any remaining risk.

**Grounds:** The application does not provide adequate air assessment for the project activities for both the construction and operation phases.

### 3. Actions

The abovementioned application will lapse unless you respond by giving the administering authority -

- (a) all of the information requested; or
- (b) part of the information requested together with a written notice asking the authority to proceed with the assessment of the application; or
- (c) a written notice –
  - i. stating that you do not intend to supply any of the information requested; and
  - ii. asking the administering authority to proceed with the assessment of the application.

A response to the information requested must be provided by 23 December 2020 (the information response period). If you wish to extend the information response period, a request to extend the period must be made at least 10 business days before the last day of the information response period.

The response to this information request or a request to extend the information response period can be submitted to the administering authority by email to [EnergyandExtractive@des.qld.gov.au](mailto:EnergyandExtractive@des.qld.gov.au).

If the information provided in response to this information request is still not adequate for the administering authority to make a decision, your application may be refused as a result of section 176 of the *Environmental Protection Act 1994*, where the administering authority must have regard to any response given for an information request.

### 4. Review and appeal rights

You may apply to the administering authority for a review of this decision within 10 business days after receiving this notice. Information about your review rights is attached to this notice. This information is guidance only and you may have other legal rights and obligations.

If you require more information, please contact Forough Ghasemi, the Project Manager, on the telephone number listed below.



Signature

23/06/2020

Date

Tristan Roberts  
Department of Environment and Science  
Delegate of the administering authority  
*Environmental Protection Act 1994*

**Enquiries:**  
Forough Ghasemi  
Energy and Extractive Resources Business Centre  
GPO Box 2454, Brisbane QLD 4001  
Phone: 07 33306020  
Email: [EnergyandExtractive@des.qld.gov.au](mailto:EnergyandExtractive@des.qld.gov.au)

### Attachments

Information sheet: Internal review and appeals (ESR/2015/1742)