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Santos

26 July 2022

Santos Reference: CB20-21

Attention: Denise Leon
Energy, Extractive and SWQ Compliance
Department of Environment and Science
GPO Box 2453
BRISBANE QLD 4001

Dear Denise,

Application to amend Environmental Authority (EA) EPPG00407213

Santos Limited (Santos) on behalf of the joint venture partners Dehli Petroleum Pty Ltd, Vamgas Pty Ltd and Santos Australian Hydrocarbons Pty Ltd has prepared the attached application to amend Environmental Authority (EA) EPPG00407213 in accordance with Section 226 and 227 of the *Environmental Protection Act 1994* (EP Act).

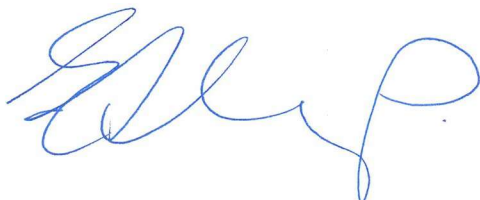
Santos is seeking to amend EA EPPG00407213 to list a new relevant resource tenure, Petroleum Lease (PL) 1087. EA EPPG00407213 currently authorises petroleum activities on PL 80, which is located in the Cooper Basin, South West Queensland (SWQ).

The following information is attached in support of the application:

- Attachment 1 – DES EA Amendment Application Form;
- Attachment 2 – Supporting Information.

The EA amendment application has been prepared as a major amendment. The application fee of \$355.30 has been paid upon lodgement of the application.

Please contact Liz Dunlop on (07) 3838 3668 or liz.dunlop@santos.com should you have any further enquiries. Yours sincerely,



Liz Dunlop

Principal Environmental Advisor
Santos

ATTACHMENT 1 – DES EA Amendment Application Form

Application form

Environmental Protection Act 1994

Application to amend an environmental authority

This approved form is to be used when applying to amend an environmental authority under sections 222 to 227A of the Environmental Protection Act 1994 (EP Act) for an environmentally relevant activity (ERA).

For applications to the Department of Environment and Science, you can apply through Online Services at: <https://business.qld.gov.au/running-business/environment/online-services>.

Note: For applications to the Department of Environment and Science, the only way to pay fees by credit card is by completing the application online using Online Services. For other fee payment options see Question 31.

It is recommended that prior to making an amendment application, you read the information on what to provide with an application. This information is located on the Business Queensland website at www.business.qld.gov.au (use the search term “Environmental licence”). This website includes a diagnostic tool called a “Forms and fees finder” which will help identify fees and supporting information you need to make an application.

You are encouraged to have a pre-lodgement meeting before applying to amend your environmental authority. If you would like to have a pre-lodgement meeting:

- for prescribed ERAs 2, 3 and 4—contact the Department of Agriculture and Fisheries by email at livestockregulator@daf.qld.gov.au or by phone on 13 25 23.
- for any other ERAs —please fill out and lodge the form *Application for pre-lodgement services* (ESR/2015/1664¹), prior to lodging this application form.

If you require assistance in answering any part of this form, or have any questions about your application please contact the relevant department. Contact details are at the end of this form (Section 33).

Privacy statement

The Department of Environment and Science (the Department) is collecting the information on this form in accordance with and as authorised by Chapter 5 of the Environmental Protection Act 1994 (EP Act). Some of the information may be disclosed to the Department of Resources and Queensland Treasury for the purpose of processing this application.

Pursuant to section 540 of the EP Act, the Department is required to maintain a register of certain documents and information authorised under the EP Act. A copy of this document will be kept on the public register. The register is available for inspection by members of the public who are able take extracts, or copies of the documents from the register. Documents that are required to be kept on the register are published in their entirety, unless alteration is required by the EP Act. There is no general discretion allowing the Department to withhold documents or information required to be kept on the public register. For more information on the Department’s public register, search ‘public register’ at www.qld.gov.au. For queries about privacy matters please email privacy@des.qld.gov.au or telephone 13 74 68.

¹ This is the publication number. The publication number can be used as a search term to find the latest version of a publication at www.qld.gov.au.

Application form
Application to amend an environmental authority

Section 1 – Environmental authority number	
Environmental authority number for this application	EA0002115

Section 2 – Applicant details	
<p>Details of the applicant are to be provided in this section. If there is an agent acting on behalf of the environmental authority holder, details of the agent are to be provided. An agent could be a consultant or contactor for the environmental authority holder.</p>	
NAME / COMPANY NAME SANTOS LIMITED, VAMGAS PTY LTD, DELHI PETROLEUM PTY. LTD., SANTOS AUSTRALIAN HYDROCARBONS PTY LTD	TRADING NAME
REGISTERED / RESIDENTIAL ADDRESS 60 Flinders Street ADELAIDE SA 5000	POSTAL ADDRESS (WHERE DIFFERENT) PO BOX 1010 BRISBANE QLD 4001
ABN / ACN 80007550923	CONTACT NAME
EMAIL	TELEPHONE
<input checked="" type="checkbox"/> INDICATE IF YOU WANT TO RECEIVE CORRESPONDENCE VIA EMAIL <input type="checkbox"/> INDICATE IF THIS FORM IS BEING COMPLETED BY AN AGENT FOR THE ENVIRONMENTAL AUTHORITY HOLDER	

Section 3 – Checklist questions	
<p>An application to amend an environmental authority is not appropriate in all circumstances. If you answer Yes to any of the preliminary questions below, you cannot use this application form. If you answer No to all of the preliminary questions, you may continue to use this application form.</p>	
Is the amendment to correct a clerical or formal error?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. This request should be made in writing directly to the administering authority (no fees apply).	
Is the amendment to add an ERA to an amalgamated project authority and the proposed activity does not form part of the single integrated operation conducted under the authority?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. You will need to apply for a new environmental authority.	
Is the amendment to add an ERA to the authority and the addition of the activity would result in the environmental authority applying to activities that were not being carried out as an ERA project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. You will need to apply for a new environmental authority.	
Is the amendment to amalgamate two or more environmental authorities?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. Please use either the form <i>Application to amalgamate two or more environmental authorities into an amalgamated corporate authority</i> (ESR/2015/1734), or <i>Application to amalgamate two or more environmental authorities into an amalgamated project or local government authority</i> (ESR/2015/1735).	
Is the amendment to add an ERA to an amalgamated local government authority and there is not an appropriate degree of integration between the proposed activity and the existing activities on the authority?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. You will need to apply for a new environmental authority.	

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Application to amend an environmental authority

Is the amendment to amend the financial assurance or estimated rehabilitation cost only?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. Please use the form <i>Application to amend or discharge financial assurance held for an environmental authority</i> (ESR/2015/1752) or <i>Application for a decision on the estimated rehabilitation cost</i> (ESR/2018/4426).	
Is the proposed amendment to add a resource activity to an environmental authority for a prescribed ERA project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot add the resource activity to the environmental authority. You will need to apply for a new environmental authority.	
Is the proposed amendment to add a prescribed ERA, other than an ancillary activity, to an environmental authority for a resource project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, you cannot use this form. You can apply using the standard, variation or site-specific application forms.	

Section 4 – Checklist questions for prescribed ERAs	
Is the application to amend an EA for a prescribed ERA?	<input checked="" type="checkbox"/> No – Go to next section
Does the proposed amendment involve changes to the relevant activity that require a new development application to be lodged under the <i>Planning Act 2016</i> and the application for the development application has not been lodged.	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, the development application must be lodged before an environmental authority amendment application can be made. Under EP Act, a development application for a material change of use of premises for an environmentally relevant activity is deemed to be also an application for an environmental authority. In this case, an environmental authority amendment application should not be lodged.	
Is the proposed amendment solely to add or remove vehicles for ERA 57 (Regulated waste transport)?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, you do not need to submit this application form. You can update vehicle details online through Online Services or use the form <i>Details of regulated waste vehicles</i> (ESR/2015/1851).	
Is the amendment for the holder of the environmental authority to transfer all or part of the environmental authority to a person?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, you cannot use this form. Please use the form <i>Request to transfer all or part of an environmental authority (prescribed environmentally relevant activities)</i> (ESR/2015/1718).	
Is the amendment for the surrender of an environmental authority?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, you cannot use this form. Please use the form <i>Application to surrender an environmental authority for a prescribed ERA</i> (ESR/2015/1719).	

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Section 5 – Checklist for resource activities		<input type="checkbox"/> No – Go to next section
Is the application to amend an EA for a resource activity?		
Is the amendment for a partial surrender of an environmental authority for a mining, geothermal or petroleum resource activity?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
If yes, you cannot use this form. Please use the form <i>Application for surrender or partial surrender of an environmental authority (resource activity)</i> (ESR/2015/1751).		
Is the amendment for an EA that has a PRCP Schedule and approval of the amendment application would result in the EA to which the application relates being inconsistent with the relevant PRCP schedule?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
If yes, you cannot use this form. The amendment to the EA must not be inconsistent with the PRCP Schedule otherwise you must apply to amend your PRCP Schedule. Please use the form <i>Application to amend a progressive rehabilitation and closure plan schedule (PRCP schedule) or joint PRCP schedule and environmental authority</i> (ESR/2019/4956).		

Section 6 – Major or minor amendment	
Is the application for a major or minor amendment?	
<p>Your application is a minor amendment (condition conversion) if you want to convert all conditions of your environmental authority to the standard conditions for the environmentally relevant activities to which the environmental authority relates. By selecting this amendment type you are certifying that you have a complete and thorough understanding of, and can comply with, the ERA Standard (eligibility criteria and standard conditions).</p> <p>For applications other than a minor amendment (condition conversion), the administering authority decides if an application is a minor amendment (threshold) or a major amendment and will send you a notice of the decision.</p> <p>If the application is a major amendment, an assessment fee of 30% of the annual fee for your environmental authority is required to be paid. The assessment of your amendment application will not proceed until the assessment fee is paid.</p> <p>No additional assessment fees apply if your application is determined to be a minor amendment.</p> <p>By considering what type of amendment your application is likely to be, you will have a better idea of whether the assessment fee will be payable.</p> <p>For further information see the guideline <i>Major and minor amendments</i> (ESR/2015/1684) and s223 of the EP Act. If you have questions regarding whether your amendment will be a minor or major amendment you are encouraged to arrange a pre-lodgement meeting with the administering authority. Only an indication can be given as to whether the proposed changes are likely to be a minor or major amendment, at a pre-lodgement meeting as this decision can only be made when the actual application is submitted.</p>	
<input checked="" type="checkbox"/> Major amendment <input type="checkbox"/> Minor amendment (threshold) <input type="checkbox"/> Minor amendment (condition conversion) <u>For minor amendment (condition conversion) go to Section 31 (Payment of fees).</u>	
For further information see the guideline on <i>Major and minor amendments</i> (ESR/2015/1684) and s223 of the EP Act. If you have questions regarding whether your amendment will be a minor or major amendment you are encouraged to arrange a pre-lodgement meeting with the administering authority. Only an indication can be given as to whether the proposed changes are likely to be a minor or major amendment, at a pre-lodgement meeting as this decision can only be made when the actual application is submitted.	

Application form
Application to amend an environmental authority

Section 7 – Amendment options	
Complete this section for all applications, tick all that apply	
I would like to amend environmental authority:	<input checked="" type="checkbox"/> Activities – includes changes to threshold <input type="checkbox"/> Conditions – includes conversion to standard conditions and variations <input checked="" type="checkbox"/> Locations – removal/addition or activity locations

Section 8 – Development permits				
Is the activity a prescribed ERA?	<input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below			
Are there any development permits in effect or have any development applications been made under the <i>Planning Act 2016</i> to carry out the proposed amendment?	<input type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below			
Provide a list of applicable development permits or applications below.				
Development permit / application number	Development permit / application name	Assessment manager	Date of application or approval	Expiry date
<input type="checkbox"/> I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.				

Section 9 – Amend activities			
Do you wish to amend activities under the EA, including changes to threshold(s)?			<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below
Section 9.1 - Details of the ERA(s) to be removed.			
Provide a list of all the ERAs that are to be removed from the EA and identify whether the ERA has commenced.			
ERA number	Threshold	Name of ERA	Has the ERA commenced?
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> I HAVE ATTACHED DETAILS OF ADDITIONAL ERA(s) TO BE REMOVED.			
Section 9.1.1 - Rehabilitation conditions			
Does the proposed amendment remove a prescribed ERA from the EA?			<input checked="" type="checkbox"/> No – Continue on below <input type="checkbox"/> Yes – Continue on below
Does your EA contain any rehabilitation conditions that are applicable to the ERA(s) that are requested be removed from the EA?			<input checked="" type="checkbox"/> No – Go to section 9.2 <input type="checkbox"/> Yes – Provide details below
A statement addressing compliance with environmental authority conditions is to be completed by, or on behalf of, the environmental authority holder. Attach a separate document to this application form which states the extent to which:			
1. The ERAs being removed from the environmental authority have complied with each relevant condition of approval; and			
2. The final rehabilitation report is accurate (include the date of the final rehabilitation report).			
PROVIDE DETAILS OF THE DATE, METHOD AND EVIDENCE USED TO VERIFY COMPLIANCE:			
PROVIDE DETAILS OF THE NAME, POSITION AND CONTACT NUMBER OF THE PERSON SIGNING THE STATEMENT:			
DESCRIBE THE QUALIFICATIONS AND EXPERIENCE OF THE PERSON SIGNING THE STATEMENT:			
<input type="checkbox"/> I HAVE ATTACHED THE REQUIRED STATEMENT ADDRESSING COMPLIANCE WITH CONDITIONS.			
For guidance on what a rehabilitation report should contain you may use the final rehabilitation report template available at www.qld.gov.au using the publication number ESR/2015/1616 as a search term. Methods to verify compliance may include a desktop assessment of documentation, an interview with the landowner/holder or a field operator or a site inspection. Evidence used may include photographs, statements and other documents such as maps, plans, approvals, monitoring results etc.			

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Section 9.2 - Details of the ERA(s) to be added.

Provide details of which ERA(s) you wish to add. If the ERA has eligibility criteria and standard conditions², identify whether you can comply with them. Select "N/A" where there are no eligibility criteria and standard conditions for that ERA. If you cannot comply with all of the applicable standard conditions, select "no" and attach details of the standard conditions you cannot comply with.

ERA number	Threshold	Name of ERA	I can comply with the eligibility criteria	I can comply with all the standard conditions
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

- I HAVE ATTACHED DETAILS OF ADDITIONAL ERA(s) TO BE ADDED.
 I HAVE ATTACHED DETAILS OF THE STANDARD CONDITIONS THAT I CANNOT COMPLY WITH.

If you cannot comply with the eligibility criteria as a result of the proposed amendment, then an amendment to the relevant eligibility criteria condition will also be required. The department will only approve an amendment of the eligibility criteria condition if it is a result of factors beyond your control such as residential encroachment, rather than a change to the activity.

² ERAs with eligibility criteria and standard conditions are listed at: www.business.qld.gov.au (use the search term "eligibility criteria").

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Section 10– Amend location(s)		
Will the area where the activity is conducted differ from the area currently designated in the existing environmental authority? (I.e.will the area where the activity is conducted increase or decrease?)		<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below
ERA number and threshold	Location (lot on plan(s), tenure(s) or mobile and temporary)	Add or remove
Non-Scheduled Petroleum Activity Petroleum Lease - PL	PL 1087	Add
<input checked="" type="checkbox"/> I HAVE ATTACHED DETAILS OF ADDITIONAL LOCATIONS FOR THIS SECTION.		
Section 10.1 - Rehabilitation conditions		<input checked="" type="checkbox"/> No – Go to next section
Does your EA contain any rehabilitation conditions that are applicable to the locations that are requested be removed from the EA?		<input type="checkbox"/> Yes – Continue on below
Has a statement addressing compliance with EA rehabilitation conditions been attached as per section 9.1.1?		<input checked="" type="checkbox"/> No – Provide details below
		<input type="checkbox"/> Yes – Go to next section
PROVIDE DETAILS OF THE DATE, METHOD AND EVIDENCE USED TO VERIFY COMPLIANCE:		
PROVIDE DETAILS OF THE NAME, POSITION AND CONTACT NUMBER OF THE PERSON SIGNING THE STATEMENT:		
DESCRIBE THE QUALIFICATIONS AND EXPERIENCE OF THE PERSON SIGNING THE STATEMENT:		
<input type="checkbox"/> I HAVE ATTACHED THE REQUIRED STATEMENT ADDRESSING COMPLIANCE WITH CONDITIONS.		
For guidance on what a rehabilitation report should contain you may use the final rehabilitation report template available at www.qld.gov.au using the publication number ESR/2015/1616 as a search term. Methods to verify compliance may include a desktop assessment of documentation, an interview with the landowner/holder or a field operator or a site inspection. Evidence used may include photographs, statements and other documents such as maps, plans, approvals, monitoring results etc.		

Section 11 – Single integrated operation confirmation	
Will the activities be undertaken as a single integrated operation?	<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below
PROVIDE DETAILS OF THE ERAS THAT WILL BE OPERATED AS A SINGLE INTEGRATED OPERATION AND SUPPORTING INFORMATION SHOWING THEY ARE A SINGLE INTEGRATED OPERATION: There is no change to the way Santos will undertake its activities. This application seeks to change the scale and intensity for the activities authorised. No new ERAs are proposed by the application. Refer to Attachment 2 - Supporting Information	
Single integrated operation occurs when all of the below criteria are met: (a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager; (b) the activities are operationally interrelated; (c) the activities are, or will be, carried out at one or more places; and (d) the places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities.	
Section 12 – Amend conditions	
Do you wish to amend the condition(s) of the environmental authority?	<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below
Provide details of: (a) condition number(s); (b) proposed change; and (c) justification for the change.	
Refer to Attachment 2 - Supporting Information	
<input checked="" type="checkbox"/> I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.	
If the activities were assessed as part of a coordinated project declared under the <i>State Development and Public Works Organisation Act 1971</i> , you are only able to amend Coordinator General conditions if the Coordinator General's evaluation report for the project has lapsed. If you are unsure if the Coordinator General's evaluation report has lapsed, contact the Department of State Development, Infrastructure, Local Government and Planning for more information.	

Section 13 – Describe the proposed amendment

Provide a detailed description of your proposed amendment. Include justification of how your proposed amendment meets the criteria for a major or minor amendment and attach any supporting information to this application. If the amendment is to add or delete a location, tenure or activity, or to change the threshold of an activity, provide details below.

Refer to Attachment 2 - Supporting Information

I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.

Section 14 – Describe the land that will be affected by the proposed amendment

Describe if the activity will be carried out within the existing designated areas of the environmental authority, a new area, or if the activity is mobile or temporary.

Refer to Attachment 2 - Supporting Information

I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.

Section 15 – Compliance with any eligibility criteria	
Are there any eligibility criteria for the activity(s)?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
State whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity.	
Include a declaration (below) that the above statement is correct	
<p style="text-align: center; font-size: small;">(INSERT <u>NAME</u>, <u>POSITION</u> AND <u>COMPANY NAME</u> OF PERSON MAKING THE STATEMENT)</p> <ul style="list-style-type: none"> make the statement by or for the holder of the environmental authority; confirm that, to the best of my knowledge, all information provided as part of this statement, including attachments, is true, correct and complete. I am aware that it is an offence under section 480 and 480A of the <i>Environmental Protection Act 1994</i>, to give the administering authority information that I know is false, misleading or incomplete; confirm that, to the best of my knowledge, this statement, including attachments, does not include false, misleading or incomplete information; confirm that, to the best of my knowledge, I have not knowingly failed to reveal any relevant information or document to the administering authority; confirm that, to the best of my knowledge, all information provided in this statement, including attachments, address the relevant matters and are factually correct; confirm that the opinions expressed in this statement, including attachments, are honestly and reasonably held; and understand that all information supplied as part of this statement, including attachments, can be disclosed publicly in accordance with the <i>Right to Information Act 2009</i> and the <i>Evidence Act 1977</i>. 	
SIGNATURE	DATE
Only a person with appropriate environmental expertise and/or experience in planning and executing site operations should sign this statement. This person may be the environmental authority holder, a full time employee of the environmental authority holder or a consultant to the environmental authority holder.	

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Section 16 – Environmental offsets	
Will the ERA(s) being applied for cause, or be likely to cause, a significant residual impact to a prescribed environmental matter (other than a matter of local environmental significance)?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
<input type="checkbox"/> Yes - Attach supporting information that: <ul style="list-style-type: none"> details the magnitude and duration of the likely significant residual impact on each prescribed environmental matter (other than matters of local environmental significance) for the entire activity; demonstrates that all reasonable measures to avoid and minimise impacts on each of those matters will be undertaken; includes a notice of election, if it has not already been submitted; and if the activity is to be staged, details of how the activity is proposed to be staged. 	
An environmental offset may be required for an ERA where despite all reasonable measures to avoid and minimise impacts on certain environmental matters, there is still likely to be a significant residual impact on one or more of those matters. You must verify the presence, whether temporary or permanent, of those environmental matters. For more information refer to the State Significant Impact Guideline at the Queensland Government website, at: www.qld.gov.au/environment/pollution/management/offsets/index.html .	

Section 17 – Regional interest areas	
Is the activity a resource activity located anywhere within an area of regional interest?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
If yes - Which area of regional interest, has or will require a regional interest development approval (RIDA)? <ul style="list-style-type: none"> <input type="checkbox"/> Priority agricultural areas (PAAs) <input type="checkbox"/> Priority living areas (PLAs) <input type="checkbox"/> Strategic environmental areas (SEAs) <input type="checkbox"/> Strategic cropping area (SCA) <input type="checkbox"/> No RIDA required, I am an exempt activity. 	
If you have applied or been approved for a RIDA, provide the application reference:	
A regional interests development approval (RIDA) is required when a resource activity is proposed in an area of regional interest under the <i>Regional Planning Interests Act 2014</i> . Further information, including application forms, can be found on the Department of State Development, Infrastructure, Local Government and Planning website at www.statedevelopment.qld.gov.au .	

Application form
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Section 18 – Matters of national environmental significance	
Would the carrying out of the proposed ERA, or where relevant the ERA project, be likely to have a significant impact on any matters of national environmental significance?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
Has the proposal been referred to the Federal Government Environment Minister or a delegate for formal assessment and approval?	<input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
If Yes - Has an approval issued under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) required an environmental offset for the same, or substantially the same, impact and the same, or substantially the same, matters of national environmental significance?	<input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
If Yes - Are there any matters of national environmental significance which are assessed under the EPBC Act which are the same, or substantially the same as any matters of national environmental significance, but that were not conditioned in the approval?	<input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
<input type="checkbox"/> I HAVE ATTACHED DETAILS OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE. <input type="checkbox"/> I HAVE ATTACHED A COPY OF THE EPBC ACT APPROVAL.	
There are currently nine matters of national environmental significance (MNES) which have been defined in the <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i> . To determine whether the proposed ERA(s) will have a significant impact on MNES and for referral requirements, please refer to the guidance provided by the Federal Government's Department of Environment on www.australia.gov.au and www.environment.gov.au .	

Section 19 – ANZSIC code			
Is the activity a resource activity?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below		
Provide the ANZSIC code for the resource activity.			
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____ </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores) </td> </tr> </table>		<input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____	<input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores)
<input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____	<input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores)		
The Australian and New Zealand Industrial Classification (ANZSIC) is used by the Australian Bureau of Statistics. It is required to be displayed in the public register.			

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Section 20 – Environmental impact statement (EIS)*	
Is the activity a resource activity?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below
Has an application been made for a decision on whether an EIS would be required for the proposed amendment activity?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
Has a decision been made on the application on whether an EIS would be required for the proposed amendment activity?	<input type="checkbox"/> Yes, a decision was made that an EIS is required – Attach decision. <input type="checkbox"/> Yes, a decision was made that an EIS is not required – Attach decision. <input type="checkbox"/> No, a decision has not yet been made. <input checked="" type="checkbox"/> NA – No application has been made.
<input type="checkbox"/> I HAVE ATTACHED THE DECISION.	
Has an environmental impact statement (EIS) process that includes the proposed amendment been completed?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
If yes – I have assessed the environmental risks of the proposed amendment and consider them to be: <input type="checkbox"/> The same as was assessed in the EIS <input type="checkbox"/> Different to what was assessed in the EIS	
<input type="checkbox"/> I HAVE ATTACHED THE ASSESSMENT OF THE ENVIRONMENTAL RISKS OF THE PROPOSED AMENDMENT.	
<small>* EIS in section 20 question refers to both the EIS process under the <i>Environmental Protection Act 1994</i> and the EIS process under the <i>State Development and Public Works Organisation Act 1971</i>. * For further information about the EIS process is available at www.qld.gov.au, using the search term 'environmental impact statements'.</small>	

Section 21 – Environmental impact statement triggers*	
Is the activity a resource activity?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below
Is the proposed ERA amendment for an increase in the annual extraction of more than 100% or 5 million tonnes per year (whichever is the lesser)? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting between 2–10 million tonnes per year of run of mine (ROM) ore or coal; otherwise select N/A.</small>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Is the proposed ERA amendment for an increase in annual extraction of more than 10% or 10 million tonnes per year (whichever is the lesser)? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting over 10 million tonnes per year of ROM ore or coal; otherwise select N/A.</small>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Is the proposed ERA amendment for an increase in annual extraction of greater than 25%? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting over 20 million tonnes per year of ROM ore or coal extraction; otherwise select N/A.</small>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Is the proposed ERA amendment for a mining activity that will extend into a Category A or B environmentally sensitive area, unless previously authorised by the state? <small>NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.</small>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A

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<p>Is the proposed ERA amendment for a mining activity that would involve a substantial change in mining operations? For example: from underground to open cut, or (for underground mining) a change in operations that currently causes little subsidence but with the proposed ERA amendment, is likely to cause substantial subsidence?</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
<p>Is the proposed ERA amendment for a mining activity and a novel or unproven resource extraction process, technology or activity, is being proposed? <i>NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.</i></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
<p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to have a total disturbance area of greater than 2,000 hectares at any one time during the life of the proposed project? This includes areas occupied by well pads (single or multi-directional), access tracks and roads, water storages, and process plants? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
<p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to involve the construction of a high pressure pipeline over a distance of 300 kilometres or greater? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
<p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to involve the construction of a liquefied natural gas plant? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
<input type="checkbox"/> I HAVE ATTACHED DETAILS OF HOW THE CRITERION IS TRIGGERED INCLUDING DETAILS OF THE IMPACT.	
<p><small>* EIS in section 21 question refers to both the EIS process under the <i>Environmental Protection Act 1994</i> and the EIS process under the <i>State Development and Public Works Organisation Act 1971</i>.</small></p> <p><small>* There are numerous criteria used to make the EIS decision, for further information about the EIS process is available at www.qld.gov.au, using the search term 'environmental impact statements'.</small></p>	

Section 22 – Environmental values								
<p>Attach a document that provides an assessment of the likely impact of the proposed amendment on environmental values (EVs). Note: All fields below are mandatory, therefore a statement is required where there are no likely impacts to an EV.</p>								
<p>Environmental Values</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Water</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Wetlands</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Land use</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Acoustic</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Groundwater</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Land</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Air</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Waste</td> </tr> </table>	<input checked="" type="checkbox"/> Water	<input checked="" type="checkbox"/> Wetlands	<input checked="" type="checkbox"/> Land use	<input checked="" type="checkbox"/> Acoustic	<input checked="" type="checkbox"/> Groundwater	<input checked="" type="checkbox"/> Land	<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Waste
<input checked="" type="checkbox"/> Water	<input checked="" type="checkbox"/> Wetlands	<input checked="" type="checkbox"/> Land use	<input checked="" type="checkbox"/> Acoustic					
<input checked="" type="checkbox"/> Groundwater	<input checked="" type="checkbox"/> Land	<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Waste					
<input checked="" type="checkbox"/> I HAVE ATTACHED A DOCUMENT THAT PROVIDES AN ASSESSMENT OF LIKELY IMPACTS ON EVs.								
<p>Note that the EP Act, s226A(1)(f) states the information required relating to impacts on EVs which include:</p> <ul style="list-style-type: none"> (i) a description of the environmental values likely to be affected by the proposed amendment; and (ii) details of any emissions or releases likely to be generated by the proposed amendment; and (iii) a description of the risk and likely magnitude of impacts on the environmental values; and (iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and (v) if a PRCP schedule does not apply for each relevant activity - details of how the land the subject of the application will be rehabilitated after each relevant activity ceases. 								

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Section 23 – Waste
Attach a document that provides details of the proposed measures for minimising and managing waste generated by any amendment(s) to the relevant activity.
<input checked="" type="checkbox"/> I have attached a document that provides the required information; or <input type="checkbox"/> If waste is to be managed according to an existing waste management plan, provide the name of the plan and the relevant page or section numbers below: _____

Section 24 – Coal seam gas (CSG) activities	
Does the application relate to an environmental authority for a CSG activity that is an ineligible ERA?	<input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
Does the amendment change the way that CSG water is managed?	<input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below
If the amendment will change the way that CSG water is managed the following information must be provided with this application.	
<input type="checkbox"/>	The quantity of CSG water the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity.
<input type="checkbox"/>	The flow rate at which the applicant reasonably expects the water will be generated.
<input type="checkbox"/>	The quality of the water, including changes in the water quality the applicant reasonably expects will happen while each relevant CSG activity is carried out.
<input type="checkbox"/>	The proposed management of water including, for example, the use, treatment, storage and disposal of the water.
<input type="checkbox"/>	The measurable criteria ('management criteria') against which the applicant will monitor and assess the effectiveness of the management of the water, including, for example, criteria for each of the following: (i) the quantity and quality of the water used, treated, stored or disposed of; (ii) protection of the environmental values affected by each relevant CSG activity; and (iii) the disposal of waste, including, for example, salt, generated for the management of the water.
<input type="checkbox"/>	The action proposed to be taken if any of the management criteria are not complied with, to ensure that the criteria will be able to be complied with in the future.
<input type="checkbox"/>	If the application includes a CSG evaporation dam, an evaluation of the following must be provided: (i) best practice environmental management for managing CSG water; (ii) alternative ways for managing CSG water; and (iii) whether there is a feasible alternative to a CSG evaporation dam for managing the water. Note if the evaluation shows that there is a feasible alternative option, the CSG evaporation dam cannot form part of the water management for this amendment application.
<input type="checkbox"/> I HAVE ATTACHED A DOCUMENT THAT PROVIDES THE REQUIRED INFORMATION FOR THIS SECTION.	

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Section 25 – Underground water rights	
Is the activity a resource activity?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below
Is the activity proposed to be undertaken on a mineral development licence (MDL), mining lease (ML) or petroleum lease (PL)?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below
Does the proposed amendment involve changes to the exercise of underground water rights?	<input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below
<input checked="" type="checkbox"/> I have attached a document that details:	
<ul style="list-style-type: none"> a) The areas in which underground water rights are proposed to be exercised; b) For each aquifer affected, or likely to be affected, by the exercise of underground water rights: <ul style="list-style-type: none"> a. a description of the aquifer; b. an analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers and surface water and c. a description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and d. the predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out. c) The environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values; d) Any impacts on the quality of groundwater that will, or may happen because of the exercise of underground water rights during or after the period in which resource activities are carried out; and e) Strategies for avoiding, mitigating or managing the predicted impacts on the environmental values of the impacts on the quality of groundwater. 	
For more information about exercising underground water rights or the associated requirements refer to the guideline <i>Requirements for site-specific and amendment applications - underground water rights</i> (ESR/2016/3275)	

Section 26 – Financial assurance / estimated rehabilitation cost	
Do you currently have financial assurance or scheme assurance held for the approved environmental authority?	<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below
<input type="checkbox"/> I will not need to change the financial assurance or scheme assurance in relation to this amendment.	
<input type="checkbox"/> I will be changing the financial assurance and have attached the form <i>Application to amend or discharge financial assurance held for an environmental authority</i> (ESR/2015/1752).	
<input checked="" type="checkbox"/> I will be applying for a new estimated rehabilitation cost decision if this amendment application is approved.	

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Section 27 – Environmental protection orders or site management plan	
Is this land currently subject to an environmental protection order (EPO) or a site management plan (SMP)?	<input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes (EPO) - provide details below <input type="checkbox"/> Yes (SMP) - provide details below
PROVIDE THE REFERENCE NUMBER AND BRIEF DETAILS INCLUDING: DESCRIPTION OF LAND; LOT AND PLAN NUMBERS; AND LOCAL GOVERNMENT AREA.	

Section 28 – Environmental management register	
Is any part of the land currently recorded in, or has previously been removed from, the environmental management register?	<input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below
<input type="checkbox"/> The land is currently in the environmental management register. <input type="checkbox"/> The land has been removed from the environmental management register. <u>You must attach evidence (e.g. Notice) advising that the details have been removed.</u>	

Section 29 - Website address		
Is the application for a mining activity on a mining lease, or a geothermal, petroleum, or greenhouse gas storage activity?	<input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below	
Provide the website address for the application notice and application documents.	https://www.santos.com/about-us/corporate-governance/public-notices/	
Provide details of the contact person if technical assistance is required.	NAME	TELEPHONE
	EMAIL	

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Section 30 – Site contact	
Would you like to nominate a site contact?	<input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below
SITE CONTACT NAME	POSITION
EMAIL	TELEPHONE
<input type="checkbox"/> INDICATE IF YOU WANT THE SITE CONTACT TO RECEIVE CORRESPONDENCE VIA EMAIL	
A site contact is an alternative contact nominated by the legal entity which holds, or will in future hold, a relevant authority issued by the department. The department may direct correspondence relating to actual or potential compliance matters to the site contact.	

Section 31 – Payment of fees	
Application fee:	\$ 355
Cheque or money order payments	
<input type="checkbox"/> Payment by cheque or money order made payable to the Department of Environment and Science (attached).	
<input type="checkbox"/> Payment by cheque or money order made payable to the Department of Agriculture and Fisheries (attached).	
Credit card payments	
<input type="checkbox"/> For credit card payments for applications to the Department of Environment and Science please lodge the application using Online Services at https://business.qld.gov.au/running-business/environment/online-services .	
<input type="checkbox"/> For credit card payments for applications relating to the Department of Agriculture and Fisheries please contact me (the applicant) for secure payment; Phone number: Insert phone no.	
<p>An application fee is payable at the time the application is made. Information on the fee can be located in the information sheet <i>Fees for permits for environmentally relevant activities (ERAs)</i> (ESR/2015/1721). Where the proposed amendment is determined by the administering authority to be a major amendment, an assessment fee of 30% of the annual fee for the authority at the time of application, is also payable. The assessment fee is payable once notification of the assessment level decision is issued. The assessment fee must be paid before the assessment of the amendment application can proceed.</p> <p>The supplementary annual fee is payable where the amendment is approved and results in the aggregate environmental score (and hence the annual fee) for the EA increasing. The supplementary annual fee is a pro-rata adjustment to the annual fee for the period from when the amended EA takes effect to the next anniversary day for the EA. This is payable within 20 business days after the approval date. The supplementary annual fee can be calculated using the <i>Fee calculator</i> (ESR/2015/1731).</p>	

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Section 32 – Declaration

Note: If you have not told the truth in this application you may be prosecuted.

I declare that:


- I am the holder of the environmental authority, or authorised signatory for the holder of the environmental authority.
- If the proposed amendment is made, the relevant activities will continue to comply with the ERA Standard (eligibility criteria and standard conditions) for all eligible ERAs, or where they cannot comply, I have indicated otherwise in my application and provided the required supporting information.
- If the proposed amendment is a minor amendment (condition conversion), I can comply with the ERA Standard (eligibility criteria and standard conditions) for each of the ERAs authorised by the environmental authority.
- The information provided is true and correct to the best of my knowledge. I understand that it is an offence under section 480 and 480A of *the Environmental Protection Act 1994* to give the administering authority or an authorised person a document containing information that I know is false, misleading or incomplete in a material particular.

I understand that I am responsible for managing the environmental impacts of these activities, and that approval of this application is not an endorsement by the administering authority of the effectiveness of management practices proposed or implemented.


Where an agreement is in place between all holders of the environmental authority, one holder can sign on behalf of the other joint holders. Please tick the checkbox below.

I HAVE AUTHORITY TO SIGN THIS FORM ON BEHALF OF ALL THE JOINT HOLDERS OF THE ENVIRONMENTAL AUTHORITY.

Applicant's signature

APPLICANT'S NAME Richard Nolan	POSITION HSER Manager - Onshore	COMPANY / ORGANISATION Santos Limited Vamgas Pty Ltd Santos Australian Hydrocarbons Pty Ltd
APPLICANT'S SIGNATURE 		DATE 26 July 2022

Joint holder(s) signature if applicable

NAME, POSITION AND COMPANY NAME Reneke van Soest General Manager SA Delhi Petroleum Pty Ltd	SIGNATURE 	DATE 20 July 2022
NAME, POSITION AND COMPANY NAME	SIGNATURE	DATE
NAME, POSITION AND COMPANY NAME	SIGNATURE	DATE

OR I HAVE ATTACHED A DOCUMENT THAT PROVIDES THE REQUIRED INFORMATION FOR ALL JOINT HOLDERS.

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Where the environmental authority holder is a company, this form must be signed by an authorised person for that company. Where there is more than one holder of the environmental authority, this declaration is to be signed by all holders, unless there is an agreement between all holders that one can sign on behalf of the other(s).

Section 33 - Submission

Please submit your completed application to:

For ERA 2, ERA 3 or ERA 4:

Post: Senior Environmental Scientist
Animal Industries
Department of Agriculture and Fisheries
PO Box 102
TOOWOOMBA QLD 4350

Enquiries Phone: (07) 4688 1374
Fax: (07) 4529 4192
Email: livestockregulator@daf.qld.gov.au

For a mining ERA where the proposed amendment impacts upon the resource tenure:

Enquiries Mining Registrar
Department of Resources
The Department of Resources has a list of office locations for mining registrars on its website
www.resources.qld.gov.au/.

For all other ERAs:

Post: Permit and Licence Management
Department of Environment and Science
GPO Box 2454
BRISBANE QLD 4001

Enquiries Website: www.business.qld.gov.au
Email: palm@des.qld.gov.au
Phone: 13 QGOV (13 74 68)

The latest version of this publication and other publications referenced in this document can be found at www.qld.gov.au using the relevant publication number (ESR/2015/1733 for this form) or title as a search term.

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Section 34 - Definitions to terms used in this form	
<i>(Where there is inconsistency between the definition of terms used here and the terms used in the EP Act, the terms in the EP Act apply)</i>	
Condition conversion	For an environmental authority, means an amendment replacing all the conditions of the authority with the standard conditions for the environmentally relevant activity which the authority relates. The relevant eligibility criteria and standard conditions must be able to be met.
Eligibility criteria	For an environmentally relevant activity, means eligibility criteria that are in effect for the activity under – (a) An ERA standard; or (b) A code of environmental compliance; or (c) A regulation in respect of a mining activity.
Environmentally relevant activity (ERA)	A resource activity or a prescribed ERA.
ERA project	A prescribed ERA project or a resource project.
ERA standard	For an environmentally relevant activity, means the eligibility criteria and/ or the standard conditions set by the administering authority.
Major amendment	For an environmental authority, means an amendment that is not a minor amendment.
Material change of use of premises for an ERA	A category of assessable development requiring a development permit under the <i>Planning Act 2016</i> . Refer Schedule 10, Division 2, Item 8 of the Planning Regulation 2017.
Minor amendment	For an environmental authority, means an amendment that is – (a) a condition conversion; or (b) a minor amendment (threshold).
Minor amendment (threshold)	For an environmental authority, means an amendment that the administering authority is satisfied— (a) is not a change to a condition identified in the authority as a standard condition, other than— (i) a change that is a condition conversion; or (ii) a change that is not a condition conversion but that replaces a standard condition of the authority with a standard condition for the environmentally relevant activity to which the authority relates; and (b) does not significantly increase the level of environmental harm caused by the relevant activity; and

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	<p>(c) does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority; and</p> <p>(d) does not significantly increase the scale or intensity of the relevant activity; and</p> <p>(e) does not relate to a new relevant resource tenure for the authority that is—</p> <ul style="list-style-type: none"> (i) a new mining lease; or (ii) a new petroleum lease; or (iii) a new geothermal lease under the Geothermal Energy Act; or (iv) a new GHG injection and storage lease under the GHG storage Act; and <p>(f) involves an addition to the surface area for the relevant activity of no more than 10% of the existing area; and</p> <p>(g) for an environmental authority for a petroleum activity—</p> <ul style="list-style-type: none"> (i) if the amendment involves constructing a new pipeline—the new pipeline does not exceed 150km; and (ii) if the amendment involves extending an existing pipeline—the extension does not exceed 10% of the existing length of the pipeline; and <p>(h) if the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit—the amendment application under section 224 seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit.</p>
<p>Mobile and temporary ERA</p>	<p>A prescribed ERA, other than an activity that is dredging material, extracting rock or other material, or the incinerating of waste:</p> <p>(a) carried out at various locations using transportable plant or equipment, including a vehicle</p> <p>(b) that does not result in the building of any permanent structures or any physical change of the landform at the locations (other than minor alterations solely necessary for access and setup including, for example, access ways, footings and temporary storage areas)</p> <p>(c) carried out at any one of the locations:</p> <ul style="list-style-type: none"> (i) for less than 28 days in a calendar year, or (ii) for 28 or more days in a calendar year only if the activity is necessarily associated with, and is exclusively used in, the construction or demolition phase of a project.
<p>Prescribed ERA</p>	<p>An environmentally relevant activity that is not a resource activity and is prescribed under section 19 of the EP Act.</p>
<p>Prescribed ERA project</p>	<p>All prescribed ERAs carried out, or proposed to be carried out, as a single integrated operation.</p>

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Registered suitable operator	A person who, or a corporation which, under section 318I of the EP Act has been assessed as being suitable to carry out an ERA and has been listed on the suitable operator register.
Resource activity	An activity that is any of the following: (a) a geothermal activity (b) a greenhouse gas (GHG) storage activity (c) a mining activity (d) a petroleum activity.
Resource project	Resource activities carried out, or proposed to be carried out, under 1 or more resource tenures, in any combination, as a single integrated operation.
Single integrated operation	Occurs when all of the below criteria are met: (a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager; (b) the activities are operationally interrelated; (c) the activities are, or will be, carried out at one or more places; and (d) the places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities.
Underground water rights	Means any of the following: (a) underground water rights within the meaning of the <i>Mineral Resources Act 1989</i> ; (b) underground water rights within the meaning of the <i>Petroleum and Gas (Production and Safety) Act 2004</i> ; (c) underground water rights within the meaning of the <i>Petroleum Act 1923</i> , section 87(3).

ATTACHMENT 2 – Supporting Information

Attachment 2

**Supporting Information for an
EA Amendment Application
EPPG00407213**

Petroleum Lease (PL) 1087

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Appendices

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Appendix C: Technical Memorandum – Updating Groundwater Impact Estimation – Santos Cooper Basin Oil and Gas Fields, South-West Queensland

Appendix D: Santos Risk Assessment Process

Appendix E: Stimulation Risk Assessment - Santos Southwest Queensland Tenements (SRA)

Abbreviations and Units

Acronym	Description
ATP	Authority to Prospect
BIM	Block Identification Map
BPEM	Best Practice Environmental Management
CSG	Coal Seam Gas
DEHP	Department of Environment and Heritage Protection, Queensland (now DES)
DES	Department of Environment and Science, Queensland
EA	Environmental Authority
EO Act	<i>Environmental Offsets Act 2014</i>
EP Act	<i>Environmental Protection Act 1994</i>
EP Reg	<i>Environmental Protection Regulation 2019</i>
EPP	<i>Environmental Protection Policy</i>
ERA	Environmentally Relevant Activities
ESA	Environmentally Sensitive Area
GAB	Great Artesian Basin
GES	General Ecological Significance
ha	Hectares
HES	High Ecological Significance
km	Kilometre
LC	Least Concern
m	Metres
MSES	Matters of State Environmental Significance
N/A	Not Applicable
NCA	<i>Nature Conservation Act 1992</i>
NCAP	No Concern at Present
PL	Petroleum Lease
PPL	Petroleum Pipeline Licence
RE	Regional Ecosystem
RoW	Right of Way
SEA	Strategic Environmental Area
SMC	Streamlined Model Conditions
SMP	Site Management Plan
SMS	Santos Management System
SWQ	South West Queensland
UWIR	Underground Water Impact Report

1.0 Introduction

Santos Limited (Santos) on behalf of the joint venture partners Dehli Petroleum Pty Ltd, Vamgas Pty Ltd and Santos Australian Hydrocarbons Pty Ltd, is seeking to amend Environmental Authority (EA) EPPG00407213 to list a new relevant resource tenure, Petroleum Lease (PL) 1087.

EA EPPG00407213 currently authorises petroleum activities on PL 80, which is located in the Cooper Basin, South West Queensland (SWQ) (refer to Figure 1). PL 1087 is located immediately adjacent to PL 80, and both tenures are located approximately 40 kilometres (km) north of the Santos Ballera Gas Facility (refer to Figure 1). PL 1087 will replace 27 sub-blocks of ATP 1189 (refer to **Figure 3**). Gas produced from PL 1087, once granted, will be transported to the Santos Ballera Gas Facility for processing via existing and new pipeline infrastructure. Further, this application also seeks to change the scale and intensity of activities authorised by EA EPPG00407213 to allow sufficient capacity for future development on PL 1087.

The holder of an EA may, at any time pursuant to Section 224 of the *Environmental Protection Act 1994* (EP Act), make an application to the assessing authority seeking an amendment to an EA. In accordance with Section 223 of the EP Act, this amendment application is considered a major amendment as it relates to the inclusion of a new relevant resource tenure (PL 1087) (refer Section 6.0 for further information).

Santos has prepared this document in accordance with Section 226 and Section 227 of the EP Act and considered the Department of Environment and Heritage Protection (DEHP) Guideline – ‘*Application requirements for petroleum activities*’ (DEHP, 2013).

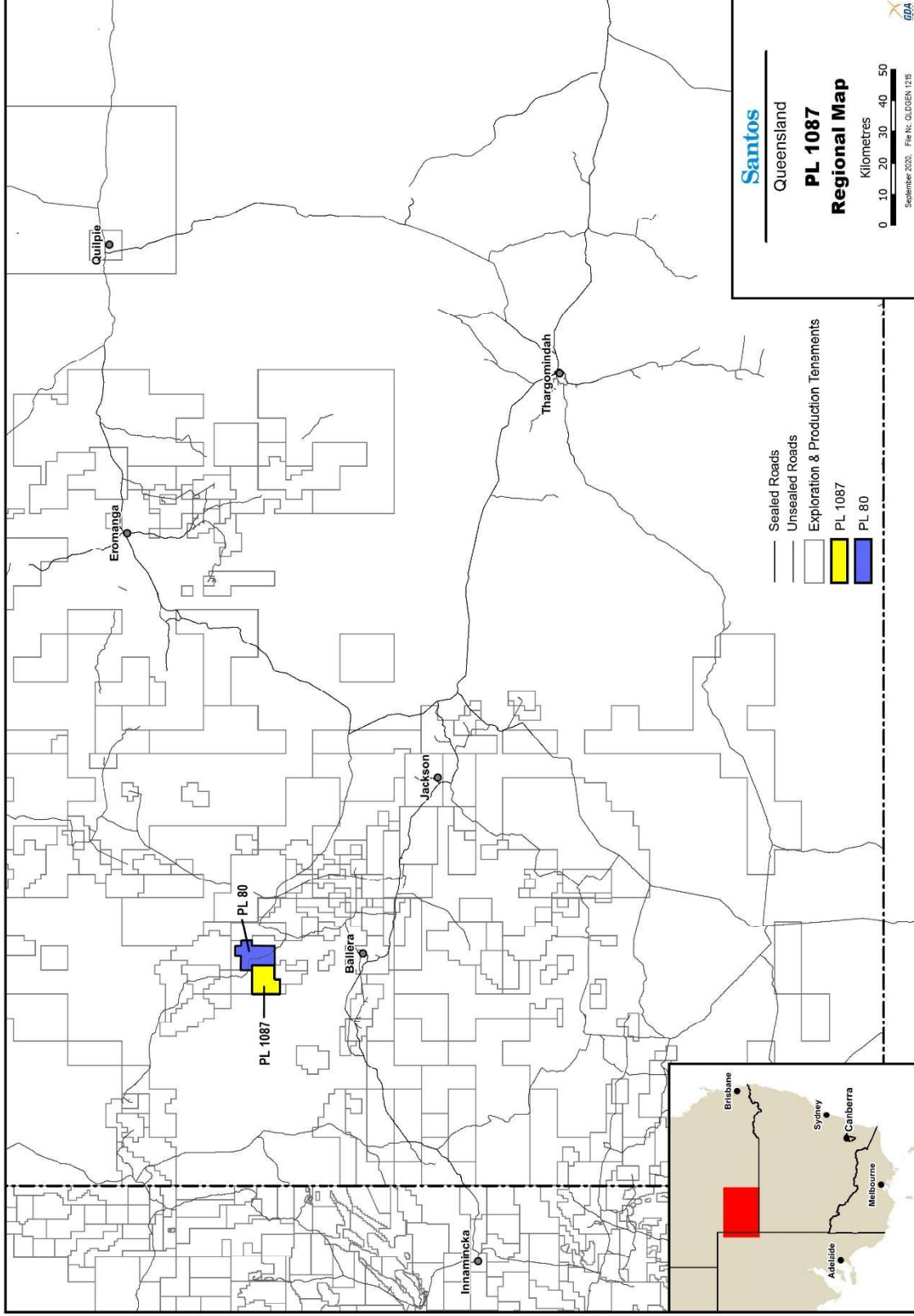


Figure 1: PL 1087 - Regional Location Map

2.0 Application Description

Santos has submitted a Petroleum Lease (PL) application (PL 1087) over an area of existing Santos tenure, Authority to Prospect (ATP) 1189. Petroleum activities currently carried out in ATP 1189 are authorised by EA EPPG03518215. Due to varying joint venture arrangements, PL 1087 cannot be added to EA EPPG03518215. Instead, Santos proposes to add PL 1087 to EA EPPG00407213 as a relevant resource tenure. Further, this application also seeks to increase the scale and intensity of activities authorised by EA EPPG00407213 to allow sufficient capacity for future development on PL 1087.

2.1 Existing Activities

Existing petroleum activities carried out in ATP 1189, within the area of PL 1087, authorised by EA EPPG03518215 include:

- 6 conventional gas wells (including well stimulation);
 - consisting of 4 operational conventional gas wells and 2 plugged and abandoned wells.
- associated pipelines, access tracks, borrow pits and temporary camps;
- seismic surveys and ancillary infrastructure.

Anna North 1 was successfully drilled in 2018 to develop and appraise gas resources in PL 1087. The success of Anna North 1 led to the construction of the Anna North 1 Gas Flowline in 2019. The flowline is authorised by Petroleum Pipeline Licence (PPL) 2044. The flowline connects to existing gathering infrastructure located in PL 80. The success of Anna North 1 also led to the drilling of an additional 3 exploratory gas wells (Anna North 2, Anna North 3 and Anna North 4) in early 2021 to further explore, evaluate and test for petroleum production in PL 1087.

Please note, the above description is current at the time of application. Santos will continue to undertake authorised exploration and appraisal activities on ATP 1189 within the PL 1087 area of land (as currently authorised by ATP 1189 and EA EPPG03518215) until such time this EA amendment application is decided by DES and PL 1087 is granted.

2.2 Proposed Activities

Santos proposes to continue undertaking conventional petroleum exploration and appraisal activities for petroleum resources in PL 1087, but will also commence production of petroleum product. Production will commence from the existing conventional gas wells, however, there is potential for production to occur from up to 5 additional wells and associated infrastructure should further exploration be successful.

It is conservatively assumed stimulation is proposed for all existing and proposed wells. Proposed gas wells will target formations in the Cooper Basin. Associated activities proposed to be undertaken in PL 1087 may include construction and/or operation of the following:

- well leases and equipment laydown areas;
- drilling and completions, including well stimulation (of all existing and proposed wells);
- gathering lines/pipelines;
- produced petroleum product storage and truck load-out facilities;
- access tracks and borrow pits;
- temporary camps and sewage treatment plants and irrigation (<21 EP);

- seismic surveys;
- communication systems; and
- other incidental petroleum activities.

These and other incidental activities are described in Section 2.3.

No new production facilities or ponds would be required to support proposed new wells. All produced fluids generated from PL 1087 would continue to be sent via PL 80 to existing approved facilities located off-tenure, via existing (e.g. Anna North 1 Gas Flowline – PPL 2044) and new infield gathering infrastructure. From PL 80, produced gas is transported to Ballera via the Durham Downs to Karmona East Gas Tinline (PPL 46) and Karmona to Ballera Gas Trunkline (PPL 36).

The proposed activities to be carried out in PL 1087 will largely be consistent with those authorised on ATP 1189 and EA EPPG00407213 – the only key difference will be the enablement of petroleum production (i.e. the sale of petroleum) through the change in tenure type. The authorised and incidental activities under ATP and PL are defined in Chapter 2, Part 1, Division 1, and Chapter 2, Part 2, Division 2 of the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act). The authorised and incidental activities are substantially the same if authorised under an ATP or PL; with the key difference being that petroleum production is only authorised under a PL. The relevant excerpts of the P&G Act are compared in Table 1, emphasising Section 109(1)(c).

Table 1: Authorised and Incidental Activities under ATPs and PLs (P&G Act)

ATP Authorised Activities	PL Authorised Activities
Chapter 2 Petroleum tenures and related matters	Chapter 2 Petroleum tenures and related matters
Part 1 Authorities to prospect	Part 2 Petroleum leases
Division 1 Key authorised activities	Division 1 Key authorised activities
32 Exploration and testing	109 Exploration, production and storage activities
(1) The authority to prospect holder may carry out any of the following activities in the area of the authority-	(1) The lease holder may carry out the following activities in the area of the lease-
(a) exploring for petroleum;	(a) exploring for petroleum;
(b) testing for petroleum production;	(b) subject to sections 150A and 150C- (i) testing for petroleum production; and (ii) evaluating the feasibility of petroleum production; and (iii) testing natural underground reservoirs for storage of petroleum or a prescribed storage gas;
(c) evaluating the feasibility of petroleum production;	(c) petroleum production;
(d) evaluating or testing natural underground reservoirs for the storage of petroleum or a prescribed storage gas;	(d) evaluating, developing and using natural underground reservoirs for petroleum storage or to store prescribed storage gases, including, for example, to store petroleum of prescribed storage gases for others;
(e) plugging and abandoning, or otherwise remediating, a bore or well the holder reasonably believes is a legacy borehole and rehabilitating the surrounding are in	(e) Plugging and abandoning, or otherwise remediating, a bore or well the lease holder reasonably believes is a legacy borehole and rehabilitating the surrounding area in

<i>compliance with the requirements prescribed under a regulation.</i>	<i>compliance with the requirements prescribed under a regulation.</i>
(2) <i>However, the holder must not carry out any of the following-</i>	(2) <i>However, the holder must not carry out any of the following-</i>
(a) <i>extraction or production of a gasification or retorting product from coal or oil shale by a chemical or thermal process;</i>	(a) <i>extraction or production of a gasification or retorting product from coal or oil shale by a chemical or thermal process;</i>
(b) <i>exploration for coal or oil shale to carry out extraction or production mentioned in paragraph (a);</i>	(b) <i>exploration for coal or oil shale to carry out extraction or production mentioned in paragraph (a);</i>
(c) <i>GHG stream storage.</i>	(c) <i>GHG stream storage.</i>
(3) <i>The carrying out of activities mentioned in subsection (1), other than by exploring for petroleum, is subject to sections 71A and 71B.</i>	(3) <i>The rights under subsection (1) may be exercised only by or for the holder.</i>
(4) <i>The rights under subsection (1) may be exercised only by or for the holder.</i>	(4) <i>The right to store petroleum or prescribed storage gases for others is subject to part 6.</i>
33 Incidental activities	112 Incidental activities
(1) <i>The authority to prospect holder may carry out an activity (an incidental activity) in the area of the authority if carrying out the activity is reasonably necessary for, or incidental to, an authorised activity under section 32(1) for the authority or another authority to prospect.</i>	(1) <i>The lease holder may carry out an activity (an incidental activity) in the area of the lease if carrying out the activity is reasonably necessary for, or incidental to-</i> (a) <i>Another authorised activity for the lease; or</i> (b) <i>An authorised activity for another petroleum lease or an authority to prospect.</i>
Examples of incidental activities- 1. <i>constructing or operating plant or works, including, for example, communication systems, pipelines associated with petroleum testing, powerlines, roads, separation plants, evaporation or storage ponds, tanks and water pipelines</i> 2. <i>constructing or using temporary structures or structures of an industrial or technical nature, including, for example, mobile and temporary camps</i> 3. <i>removing vegetation for, or for the safety of, exploration or testing under section 32(1)</i>	Examples of incidental activities- 1. <i>constructing or operating plant or works, including, for example, communication systems, compressors, powerlines, pumping stations, reservoirs, roads, evaporation or storage ponds and tanks</i> 2. <i>constructing or using temporary structures or structure of an industrial or technical nature, including, for example, mobile and temporary camps</i> 3. <i>removing vegetation for, or for the safety of, exploration or testing under section 150A(1) or 150C(1)</i>
(2) <i>However, neither of the following activities is an incidental activity-</i>	(2) <i>However, constructing or using a structure, other than a temporary structure, for office or residential accommodation is not an incidental activity.</i>
(a) <i>constructing or using a structure, other than a temporary structure, for office or residential accommodation;</i>	
(b) <i>the processing of gaseous petroleum, other than gaseous petroleum produced as an unavoidable result of ATP production testing.</i>	
(3) <i>In this section-</i>	
<i>gaseous petroleum</i> means petroleum in a gaseous state.	
<i>processing</i> , of gaseous petroleum, means treating the petroleum to be suitable for transport.	

2.3 Description of Proposed Activities

The following sections describe petroleum infrastructure and activities proposed on PL 1087.

2.3.1 Seismic Surveying Activities

Seismic acquisition is the method of investigating subsurface geological structures and is undertaken to identify locations to conduct drilling activities. During exploration, seismic surveys are the most common geological field assessment method and they are often the first field activity undertaken. Seismic data is collected by recording acoustic (sound) waves that are reflected from geological interfaces at depths of up to several thousands of metres below the surface. Seismic line preparation in the Cooper Basin and Eromanga Basin is undertaken to cause minimal ground, soil and vegetation disturbance. Seismic line preparation generally involves 'walking' a bulldozer with its front blade in the up position along seismic lines to gently flatten terrain and vegetation. Seismic lines are regularly 'offset' and 'weaved' around obstacles to:

- a) avoid the need to disturb terrain and long-lived perennial vegetation or other sensitivities such as watercourses; and
- b) reduce the 'linearity' and visual impact of seismic lines.

No seismic line preparation is undertaken in Gibber land systems i.e. seismic lines are simply driven by light vehicles and Vibroseis trucks. In rough or highly vegetated terrain, seismic lines may require light preparation by earthmoving or vegetation slashing machinery to enable safe and efficient vehicle and equipment access. In flat terrain with limited vegetation cover, seismic line preparation is generally not required. Seismic lines generally consist of lightly prepared 3-5 metre (m) wide lines.

Post-survey rehabilitation of seismic survey lines generally consists of utilising a grader to remove and respread any windrows created during line preparation (but this is often not required as minimal line preparation is typically undertaken). Seismic lines are checked for any remaining survey pegs or rubbish. Minor areas of compacted soil (if they occur) may be ripped (~0.5 m depth and ~1 m tine spacing).

Santos undertakes seismic surveys in accordance with best practice environmental management principles, which have been derived from the Statement of Environmental Objectives (SEO) for Seismic Operations in the Cooper Basin and Eromanga Basin (DSD, 2014; Santos, 2018).

2.3.2 Well Lease Establishment

For each proposed well, well leases up to 1.5 ha (1.65 ha if well requires stimulation) would be established to accommodate drilling and ancillary equipment including a derrick, power generators, pipe handling equipment, tanks, drilling sumps, flares, and office areas. Well lease establishment would involve:

- surveying and pegging the pad boundary;
- constructing a diversion bund if required due to slope or proximity to watercourses;
- clearing (usually sparse, shrubby) vegetation that is unable to be avoided;
- removing and stockpiling topsoil;
- levelling the pad by cutting and filling using material from borrow pit if required;
- excavating and capping the rig hardstand;
- capping and compacting the lease footprint;
- excavating sump pit if required;

- installing fencing and gates;
- installing cellar and conductor on well centre;
- installing pads for ancillary equipment and infrastructure (such a tanks and flowlines); and
- setting up drill rig and associated equipment.

2.3.3 Well Drilling Activities and Associated Infrastructure

2.3.3.1 Drilling

Wells would be constructed in accordance with the *Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland* (DNRME, 2019).

Drilling fluid would be continuously circulated down the drill pipe and back to the surface equipment to manage subsurface pressure (if required), cool the drilling bit and carry back formation cuttings. A drilling sump with an operating volume of approximately 630 (kilolitre) kL would be used to store drilling fluids and cuttings. Following the completion of drilling, the rig would be rigged down and transported from site. Drilling fluids will be water based, and not oil or synthetic based in accordance with EA EPPG00407213 condition K1 - *Oil based or synthetic based drilling muds must not be used in the carrying out of the petroleum activity(ies)*. Management practices for waste drilling fluids, cuttings and the design of drilling sumps would be undertaken to ensure compliance with relevant EPPG00407213 EA conditions.

2.3.3.2 Hydraulic Fracturing

Hydraulic fracturing involves pumping a fluid under pressure into the reservoir to open up and connect fractures within the reservoir rock, thereby increasing the opportunity for the resource to move within the reservoir rock and flow toward the well. The hydraulic stimulation process, including well design, for both conventional oil and gas development is provided in Section 3, Vol. 1 of the Stimulation Risk Assessment - Santos Southwest Queensland Tenements (SRA) (Refer to Appendix E of this application).

Further, a proppant (typically sand) within the fluids pumped into the well is used to hold the fractures open after the activity ceases. Approximately 99.5% of the material pumped into the well during hydraulic fracturing operations is water and sand. Minor quantities of additives make up the remaining 0.5% of the fluid. The purpose of these additives is to:

- enhance fracture initiation;
- help lubricate the flow of proppant (i.e. sand) into the fractures;
- prevent microbial or chemical reactions following introduction of the fluids; and
- prevent formation of scale deposits that may affect the well or pumps.

After the fracture process is completed, fluids that return to surface when the pressure is released are captured in tanks or lined pits for reuse, recycling or transported to a licenced water management facility.

Chemicals that may be used in the stimulation process by Santos in SWQ are detailed in Section 3, Volume Two of the SRA. Toxicity information is described in Volume Two and detailed Human Health Hazard Summaries and Ecological Information Sheets (Profiles) are provided in Appendix C to Appendix E of Volume Two of the SRA. Relevant safety data and chemical information sheets are provided in Appendices C and F of Vol. 2 and 3 of the SRA, respectively (Refer to Appendix E of this application).

All existing and proposed wells located in PL 1087 have the potential to be hydraulically fractured in the future. When the well is brought on-line, produced water (which contains entrained degraded fracturing additives), is pumped from the well, allowing the petroleum resource to move through the well to the

surface. The use of specific chemicals such as benzene, toluene, ethyl-benzene and xylene in hydraulic fracturing fluids has been banned in Queensland (above prescribed levels). The use of other chemicals is subject to a risk assessment process as described in Section 5.5.

2.3.4 Gathering Lines

A right-of-way (RoW) for pipeline routes is lightly graded, if required, to allow access for vehicles required for above ground pipeline construction. Pipeline sections are transported and temporarily stored along the proposed pipeline route prior to joining together the tubing connections of each pipe section. Above ground pipelines are raised approximately 150 mm above ground level on prefabricated supports located along the proposed pipeline route. Below ground pipelines are constructed using a standard construction methodology including:

- clearing and grading;
- trenching and padding;
- pipe stringing, laying and welding;
- backfilling and ROW re-instatement; and
- rehabilitation.

An average RoW width of 19 m is typically required to allow for safe pipeline installation. The RoW must provide sufficient area to locate topsoil banks on either side of the RoW, safe access for pipe truck and side boom tractor/excavator movement, the pipeline trench, and a trench spoil bank (if buried). RoW widths will be restricted to the smallest extent practicable through watercourses. The RoW will then be reinstated to the condition and surface profiles existing at the commencement of activities to ensure natural surface water flows in the area are maintained. Any wheel and equipment ruts created along the pipeline route during installation will be filled in and levelled by grading equipment. Topsoil and seed stock removed during installation will be re-spread over the RoW, and any windrows will be removed.

A maximum 3 m wide corridor located within the rehabilitated RoW will be used to provide access for pipeline inspections via light vehicles from time to time. No formed roads are required or are maintained within the RoW.

Given the nature of the climate within PL 1087 (average rainfall is low and evaporation rates are high), re-instatement and rehabilitation activities are focused on promoting the natural re-establishment of vegetation of similar species composition and density to the surrounding undisturbed land.

2.3.5 Access Tracks

Access tracks are required to provide drilling equipment access to conventional petroleum well sites and for ongoing operational access. Existing access tracks will be utilised as much as possible to minimise the length of new access tracks required. A typical access track would be up to 14 m wide to accommodate a 6 m wide track with table drains either side of the roadway. The roadway would be lightly graded and capped with clay or similar locally available borrow pit material. Access tracks are constructed to allow the natural passage of surface waters, to minimise any changes to the natural surface hydrology.

2.3.6 Borrow Pits

Borrow pits provide a source of construction material to provide a stable and supportive surface for well leases and access tracks where required. Borrow pits vary in dimension, depending on the quality and quantity of material available. Borrow pits are sited preferentially in flat areas with limited vegetation, outside of drainage features, with tree removal and woody vegetation avoided as much as possible. The

borrow pits will be restored by ripping the floor and sides of the borrow pit to a depth of up to 500 millimetres (mm) generally along the contour. Stockpiled topsoil and vegetation would then be re-spread to a uniform depth over the entire area from which it was removed. The borrow pit is then re-contoured to be blend in with adjacent undisturbed land.

2.3.7 Other Incidental Petroleum Activities

Other activities necessary to facilitate petroleum extraction and production include:

- temporary laydown areas;
- fencing;
- power and communication lines/towers;
- storage tanks;
- mobile and temporary camps, that may involve sewage treatment works that are no release works or are less than 21 EP;
- geophysical, geotechnical, geological, topographic, cadastral and ecological surveys;
- installation of environmental monitoring equipment; and
- activities necessary to achieve compliance with conditions of the EA (i.e. sediment and erosion control, rehabilitation works).

2.4 Proposed Changes to EA EPPG00407213

To facilitate future development of petroleum resources on PL 1087 this application seeks to:

- Authorise PL 1087 on EA EPPG00407213 as a relevant resource tenure, and
- Include 11 additional wells (comprised of existing and proposed wells) (including stimulation) in *Schedule A, Table 1 – Scale of Activities*.

Proposed changes to EA EPPG00407213 are specified below (changes identified in red):

EA EPPG00407213

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Non-Scheduled Petroleum Activity Petroleum Lease - PL	PL80, PL1087

SCHEDULE A – GENERAL

(A1) This environmental authority authorises the carrying out of the following resource activities:

- the petroleum activities listed in **Schedule A, Table 1 – Scale of Activities** to the extent they are carried out in accordance with the activity's corresponding scale;
- petroleum activities, including but not limited to:
 - linear infrastructure;
 - borrow pits / extracting, other than by dredging; and
 - compressor stations; and
 - sewage treatment – operating sewage treatment works, other than no release works; and
 - seismic surveys.
- the specified relevant activities prescribed by this Environmental Authority at the locations specified on the cover pages of this environmental authority;
- incidental activities that are not otherwise specified relevant activities.

Table 1 – Scale of Activities

Infrastructure	Total Scale
Wells	33 44
Stimulation	33-wells 44 wells

Note: proposed changes to Schedule A, Table 1 – Scale of Activities of EA EPPG00407213 show total proposed wells for both PL 80 (33 wells) and 1087 (11 wells).

3.0 Site Description, Land Use and Climate

3.1 Site Description and Land Use

PL 1087 is located approximately 40 km north of the Santos Ballera Gas Facility (refer to Figure 1). PL 1087 will replace 27 sub-blocks of ATP 1189 as detailed in Table 2 and displayed on Figure 2.

PL 1087 encompasses approximately 8,235 ha of land located on the Durham Downs Pastoral Station (Lot 1 on Plan SP133822).

Durham Downs Pastoral Station is a pastoral lease that operates as a cattle station with a capacity of up to 21,500 head of cattle. The primary land uses for PL 1087 and the surrounding area are cattle grazing and petroleum activities.

Table 2: Sub-Block Identification – PL 1087

BIM	Block	Sub-Blocks
Cooper Creek	2637	V, W, X, Y, Z
Cooper Creek	2638	V
Cooper Creek	2709	A, B, C, D, E, F, G, H, J, K, L, M, N, O, P, Q, R, S
Cooper Creek	2710	A, F, L

PL 1087 is recorded on the DES Environmental Management Register (EMR) for Petroleum Product or Oil Storage and Chemical Storage (Lot 1 on Plan SP133822), but this is triggered by petroleum production activities undertaken in other Santos tenures located on Durham Downs. PL 1087 is not recorded on the Contaminated Land Register (CLR).

3.2 Climate

PL 1087 is situated in south-west Queensland, an arid region of Australia, where the average rainfall is low and evaporation rates are high. The seasons are generally characterised by hot dry summers and cold dry winters. Temperatures exhibit large seasonal and diurnal fluctuations. In summer, average daily maximum temperatures exceed 36°C and the average minimum is 23°C. Average daily temperatures in winter range from approximately 6°C to 22°C (BOM, 2022).

Rainfall variability is amongst the highest in Australia, while average annual totals are amongst the lowest. There is no distinct seasonal rainfall pattern, but the majority of rainfall occurs during the warmer months from October to March. Summer rainfall is generally associated with thunderstorm activity driven by monsoonal and tropical cyclone weather systems moving inland from northern and north-eastern Australia (BOM, 2020). Winter rainfall can occur from the formation of low-pressure systems pushing cool moist air northwards from the Great Australian Bight into central Australia (GABCC, 1998). Average annual rainfall in the region ranges from 164 mm at Moomba Airport to 290 mm at Windorah (BOM, 2020). However, changes in the irregular atmospheric circulation phenomenon known as the El Niño–Southern Oscillation (ENSO) can significantly influence weather patterns in central Australia. Changes in ENSO can lead to exceptionally dry or wet years with annual rainfall ranging from less than 100 mm during a dry event (termed an ‘El Niño’) to as high as 660-730 mm (at Moomba Airport and Windorah in 2010, respectively) during a wet event (termed a ‘La Niña’) (BOM, 2022).

There are on average 18 to 28 rainfall days (≥ 1 mm) per year in the region. Larger rainfall events of between 10 to 25 mm or more, occur on average 3 to 8 days per year, respectively. Larger rainfall events predominantly occur during the warmer months from October to March (BOM, 2022). Average seasonal

evaporation rates range from 550 mm in summer to 150 mm in winter. Average annual evaporation is extremely high, ranging from 3,000 to 3,800 mm (Marree Soil Conservation Board, 2004). The most common wind direction throughout the year is from the south-east. Light winds (<20 kph) are most common between May to July, while the greatest frequencies of strong winds (41-61 kph) occur between September to January.

4.0 Relevant Environmental Values

Desktop and field-based methods were used to assess relevant environmental values in PL 1087.

Desktop assessment involved a review of environmental databases, maps, literature and digital datasets. Field based methods included an ecological survey of the tenure undertaken by ELA. The ELA ecological assessment report (ELA, 2022) is attached as Appendix A.

Relevant environmental values for PL 1087 include:

- land resources;
- flora and regional ecosystems;
- environmentally sensitive areas;
- fauna;
- surface waters and wetlands;
- groundwater;
- air quality, noise and vibration; and
- Matters of State Environmental Significance.

Sections 4.1 to 4.9 discuss relevant environmental values present within PL 1087. The risks and potential impacts to these environmental values as a result of the proposed activities, and mitigation measures for potential impacts, are discussed in Section 5.0.

The proposed amendment will not result in any changes to how waste is managed while carrying out authorised petroleum activities, or rehabilitation objectives (i.e. these environmental values will be managed in accordance with existing management practices and relevant EA EPPG00407213 conditions). The management of waste and rehabilitation are therefore not considered further.

4.1 Land Resources

PL 1087 is located in the Channel Country bioregion and Sturt Stony Desert subregion. PL 1087 is predominantly identified as Cainozoic duricrusts (land zone 7) and fine grained sedimentary rocks (land zone 9), with smaller areas of recent Quaternary alluvial systems (land zone 3) (refer to Appendix A).

Mapped land systems in PL 1087 are consistent with land zone mapping, including scarps and dissected undulating tops of tablelands and gently undulating rolling plains (refer to Table 3). Mapped soils in PL 1087 consist of firm shallow siliceous loams (Map Code: Fz48) and crusty red duplex soils (Map Code: Nd6) (ASRIS, 2009).

Table 3: Land Systems – PL 1087

Map Code	Land System Description	Agricultural Land Class	Area (%) of PL
R4	Scarps and flat to gently undulating tops of dissected tablelands, mesas and buttes. Slopes range from less than 2% on the tops varying to 20% on scarps and 5% to 8% on lower slopes.	C3 – Pasture land – native pastures, light grazing in accessible areas	51%
F2	Gently undulating to undulating rolling plains. Slopes 1 to 5%.	C2 – Pasture land – native pastures	42%
G3	Gently undulating to undulating plains. Slopes are generally less than 5% but rise to 8% to 12% near associated scarps.	C1 – Pasture land – sown pastures and native pastures on high fertility soils	4%
A3A5	Flat plains, frequently deflated, and usually with low (20 cm) "blow-up" areas. Frequently associated with the edges of dunefields or alluvia.	C2 – Pasture land – native pastures	3%

4.2 Flora and Regional Ecosystems

PL 1087 predominantly consists of grazed remnant vegetation. Vegetation present within PL 1087 has undergone historic disturbance due to grazing from the operation of the existing cattle station. DES mapped vegetation in PL 1087 is typical of the Sturt Stony Desert sub-region, predominantly consisting of open shrubland, with areas of grassland and hermland.

ELA undertook ecological field surveys to ground-truth vegetation / Regional Ecosystems (REs) in PL 1087. As part of ecological surveys, ELA surveyed sixty-eight (68) locations to characterise vegetation across PL 1087. Survey sites were stratified across the landscape and aimed to sample all photo patterns identified during RE mapping ensuring all REs present were identified, and also to ensure variations in vegetation condition were captured (ELA, 2022).

Ecological ground-truthing identified 10 REs within PL 1087. Ground-truthed vegetation was found to be dominated by Wattle (*Acacia* spp.) and Cassia (*Senna* spp.) shrublands and low woodlands (REs 5.7.1/5.7.5/5.7.6/5.7.13 and 5.9.1/5.9.2x1), with smaller areas of Mitchell Grass (*Astrelba* spp.) and Saltbush (*Atriplex* spp.) open grasslands and herblands (REs 5.9.3/5.9.5 and 5.3.21a). Ground-truthed REs entirely comprised Category B regulated vegetation under the *Vegetation Management Act 1999* (VM Act), with a 'least concern' (LC) vegetation management class and 'no concern at present' biodiversity status. Structural class of ground-truthed REs ranged from grassland, sparse to very sparse. Ground-truthed REs are detailed in Table 4 and displayed on Figure 3.

ELA carried out desktop and field-based likelihood of occurrence assessments to identify the potential presence of Matters of State Environmental Significance (MSES) flora species within PL 1087. These assessments considered species distribution, habitat requirements and historical records in proximity to PL 1087, as well as observations and evidence of occurrence, habitat suitability, and on-site environmental conditions identified during the field survey. Refer to Appendix A for further information.

Following desktop assessment and field survey, ELA considered one threatened flora species to have potential to occur in PL 1087; *Indigofera oxyrachis* – although it was not observed during field survey. *I. oxyrachis* is a shrub listed as vulnerable under the *Nature Conservation Act 2014* (NCA). Limited information exists for the species, but ecological database records for the species are located approximately 80 km north-east of PL 1087, on the eastern side of Cooper Creek (ELA, 2022). Queensland herbarium identifies specimens being recorded on stony rises on cracking clay soils and in open areas amongst low gidgee woodland, with *Senna artemisioides* and *Senna phyllodinea* present. It has also been recorded on open scalded creek flats at the base of escarpments, in open mixed woodland

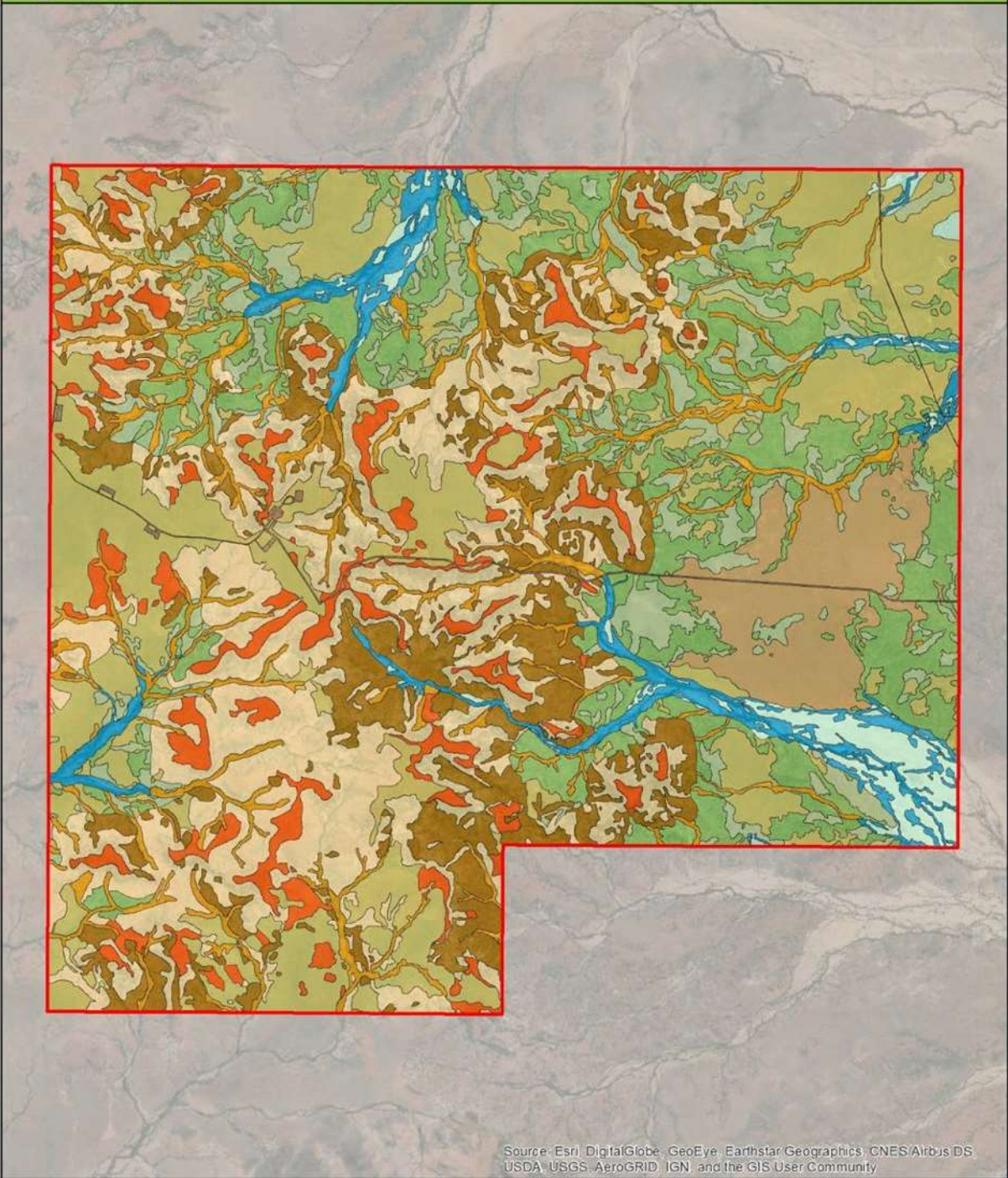
on light clay and sandy creek lines throughout stony patches. These types of habitats are widespread in the region, but the occurrence of *I. oxyrachis* is not. ELA determined that *I. oxyrachis* was therefore unlikely to occur in PL 1087 (refer to Appendix A for further information).

Further, no high-risk areas for protected plants listed under the NCA are mapped to occur in PL 1087.

Table 4: PL 1087 - Ground-Truthed REs (ELA, 2022)

RE	Short Description	VM Act Status	BD Status	Structural Class	Area (ha) in PL	Area (%) of PL
5.3.21a	Variable sparse to open herbland, <i>Senna</i> spp. open shrubland and bare scalded areas on infrequently flooded alluvia of major rivers their distributaries, drainage channels and creeks.	LC	NCAP	Sparse	187.1	2%
5.3.4	<i>Eucalyptus camaldulensis</i> +/- <i>Acacia aneura</i> +/- <i>Acacia cambagei</i> +/- <i>Acacia georginae</i> +/- <i>Acacia cyperophylla</i> var. <i>cyperophylla</i> woodland on drainage lines within ranges.	LC	NCAP	Sparse	290.0	4%
5.7.1	<i>Acacia shirleyi</i> +/- <i>Acacia catenulata</i> +/- <i>Acacia aneura</i> +/- <i>Acacia cyperophylla</i> var. <i>cyperophylla</i> low woodland on scarps and crests of residuals.	LC	NCAP	Sparse	1,844.2	22%
5.7.13	<i>Acacia cyperophylla</i> var. <i>cyperophylla</i> +/- <i>Acacia cambagei</i> or <i>Acacia georginae</i> +/- <i>Atalaya hemiglauca</i> tall shrubland on drainage lines.	LC	NCAP	Sparse	582.5	7%
5.7.5	<i>Acacia sibirica</i> open shrubland +/- <i>Acacia aneura</i> +/- <i>Acacia shirleyi</i> +/- <i>Triodia</i> spp. open shrubland on crests and tops of dissected tablelands and ranges.	LC	NCAP	Very sparse	475.7	6%
5.7.6	<i>Acacia cambagei</i> tall shrubland +/- <i>Triodia</i> spp. +/- <i>Senna</i> spp. on scarp footslopes and eroding pediments.	LC	NCAP	Sparse	929.4	11%
5.9.1	<i>Senna</i> spp., <i>Eremophila</i> spp. +/- <i>Acacia</i> spp. +/- <i>Maireana</i> spp. open shrublands on fresh Cretaceous sediments and Cretaceous or Tertiary limestones.	LC	NCAP	Very sparse	649.5	8%
5.9.2x1	<i>Senna artemisioides</i> subsp. <i>helmsii</i> +/- <i>Senna artemisioides</i> subsp. <i>oligophylla</i> +/- <i>Acacia georginae</i> +/- <i>Acacia</i> spp. open shrubland on Cambrian limestone.	LC	NCAP	Very sparse	1,139.4	14%
5.9.3	<i>Astrelba</i> spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments.	LC	NCAP	Sparse	1,700.7	21%
5.9.5	<i>Atriplex</i> spp. and/or <i>Sclerolaena</i> spp. and/or <i>Salsola australis</i> open herbland on Cretaceous sediments.	LC	NCAP	Sparse	410.5	5%
-	Cleared / Non-remnant	-	-	-	26.3	0.3%

Regional Ecosystems



Source: Esri, DigitalGlobe, GeoEye, Earthstar/Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend			0 0.5 1 2 Kilometres	
 PL1087	 5.7.1	 5.9.1	Datum/Projection: GDA 1994 MGA Zone 54	
Regional Ecosystem	 5.7.13	 5.9.2x1		
 5.3.21	 5.7.5	 5.9.3	eco logical AUSTRALIA www.ecoaus.com.au Prepared by: MS Date: 9/4/20	
 5.3.4	 5.7.6	 5.9.5		

Figure 3: PL 1087 - Ground-Truthed Regional Ecosystems (ELA, 2022)

4.3 Environmentally Sensitive Areas

No Environmentally Sensitive Areas (ESAs) are mapped or identified to be present in PL 1087.

4.4 Fauna

ELA carried out desktop and field-based likelihood of occurrence assessments to identify the potential presence of Matters of State Environmental Significance (MSES) fauna species within PL 1087.

These assessments considered species distribution, habitat requirements and historical records in proximity to PL 1087, as well as observations and evidence of occurrence (remote camera traps, spotlight surveys and opportunistic observations), habitat suitability, and on-site environmental conditions identified during the field survey. No trapping surveys were undertaken which are required to confidently identify some threatened species. However, the combination of surveys undertaken as part of this assessment are considered appropriate for the detection of the target species.

Fauna populations were considered low at the time of survey with only 7 mammals and 17 bird species being observed, or evidence of presence recorded. While good remnant structural and refuge habitat was present in areas, drought and very hot summer conditions experienced during the survey combined with the lack of flowering and seeding plants as well as permanent water sources is likely to have restricted the diversity and abundance of fauna observed. Refer to Appendix A for further information.

Following the desktop and field assessment, five (5) Endangered, Vulnerable or Near Threatened (EVNT) or special least concern fauna species listed under the NCA were considered as having potential to occur within PL 1087. No NC Act listed threatened species were identified to be present during the field survey. Table 5 summarises species listed under the NC Act considered to have potential to occur within PL 1087 (ELA, 2022). Figure 4 displays fauna habitat types based on ground-truthed RE mapping in PL 1087. Refer to Appendix A for further information.

Based on known distributions, species' occurrence records within the region, and preferred habitat requirements, the identified threatened and migratory species are considered to be unlikely or have low potential to occur within PL 1087. This is due to the lack of high-quality suitable habitat within the tenure, or because the tenure is outside the known range of the species.

Vegetation of Cooper Creek (located 13 km east of PL 1087) is likely to represent higher quality habitat for threatened species considered in the likelihood of occurrence assessment (refer to Appendix A and Table 5), due to access to water and/or presence of riparian vegetation.

No Essential Habitat is mapped to be present in PL 1087, and this was confirmed by the ELA field survey of PL 1087 (refer to Appendix A for further information).

Table 5: NC Act / EPBC Act listed species with potential to occur in PL 1087 (adapted from ELA, 2022)

Scientific Name	Common Name	NC Act Status	Habitat / RE Associations	Area (ha) in PL
<i>Apus pacificus</i>	Fork-tailed Swift	Special Least Concern	Not applicable. Potential fly-over species only.	8,240
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	Vulnerable	Gidgee (<i>Acacia cambagei</i>) shrublands: REs 5.7.6 and 5.9.2x1	2,069
<i>Aspidites ramsayi</i>	Woma	Near Threatened	Low woodlands to tall shrublands dominated by <i>Acacia</i> species: REs 5.3.4, 5.7.13	873
			Mulga (<i>Acacia aneura</i>) woodland: REs 5.7.1, 5.7.5	2,320
<i>Falco hypoleucos</i>	Grey Falcon	Vulnerable	Open shrublands dominated by <i>Senna</i> species: RE 5.9.1	650
			Mixed open herblands to open to tussock open grasslands in inland locations: REs 5.3.21a, 5.9.3 and 5.9.5	2,298
			Mulga woodland: REs 5.7.1, 5.7.5	2,320
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable	Low woodlands to tall shrublands dominated by <i>Acacia</i> species: REs 5.3.4, 5.7.13	873

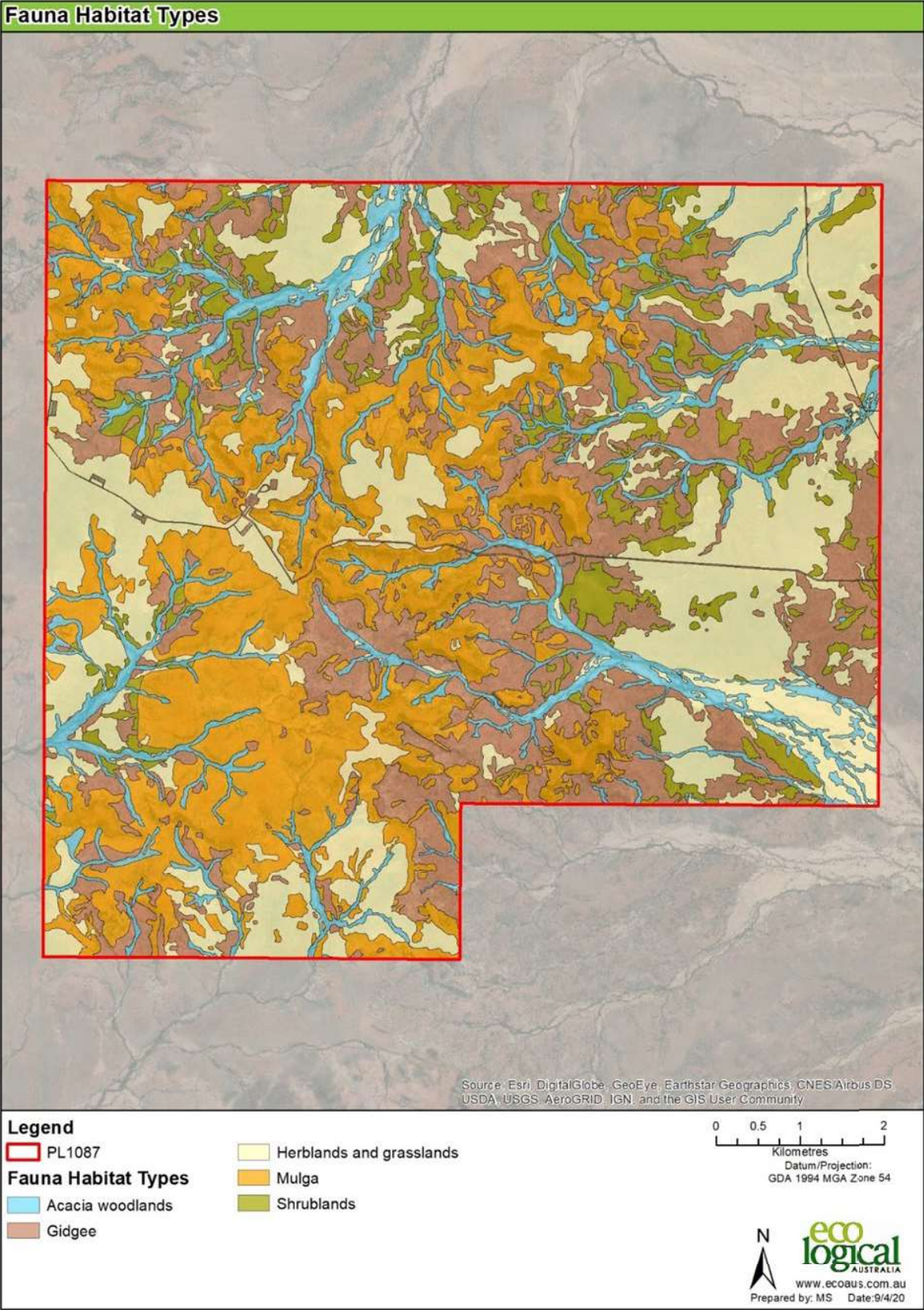


Figure 4: PL 1087 - Fauna Habitat Types (ELA, 2022)

4.5 Surface Water and Wetlands

The environmental values of waters to be enhanced or protected are defined in Section 6 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* for 'water mentioned in schedule 1' and 'other water'. Water within the Cooper Basin is not mentioned in Schedule 1 and so is considered 'other water'. Its environmental values relate to:

- the biological integrity of particular aquatic ecosystems;
- the suitability of water for certain human uses (such as for drinking water, food production, recreation and aesthetic purposes or industrial uses); and
- the cultural and spiritual values of the water.

PL 1087 is located in the Cooper Creek drainage sub-basin, which has a catchment area of 95,800 km². Despite being situated in the Cooper Creek sub-basin, PL 1087 is located approximately 14 km west of the Cooper Creek floodplain. PL 1087 is therefore not located in the Cooper Creek or Channel Country floodplain (refer to Figure 5).

Further, as detailed in Section 4.1, PL 1087 is predominantly characterised as land zones 7 and 9 with smaller areas of land zone 3 i.e. the tenure is located in elevated undulating plains, scarps and dissected tableland land systems with minor areas of alluvium associated with ephemeral drainage features.

Mapped drainage features located in PL 1087 are minor non-perennial drainage features, and the majority of drainage features are mapped to be Stream Order (SO) 1 and 2 with minor sections of SO 3 (refer to Figure 5).

Environmental values for wetlands are defined in Section 7 of the *Environmental Protection (Wetland and Biodiversity) Policy 2019* as the qualities of a wetland that support and maintain the biodiversity of the wetland including:

- the health of the wetland's ecosystems;
- the wetland's natural state and biological integrity;
- the presence of distinct or unique features, endemic plants or animals and their habitats, including threatened wildlife and near threatened wildlife under the NC Act;
- the wetland's natural hydrological cycle; and
- the natural interaction of the wetland with other ecosystems, including other wetlands.

The *map of Queensland wetland environmental values* established by the *Environmental Protection Policy (Water and Wetland Biodiversity) Policy 2019* identifies wetlands of high ecological significance (HES) and general ecological significance (GES) across the State. There are no HES or GES wetlands mapped in PL 1087.

Regulated vegetation - within 100m of a Vegetation Management Wetland and Regulated vegetation – intersecting a watercourse are mapped to be present in PL 1087. Refer to Section 4.9 and Appendix A and for further information.

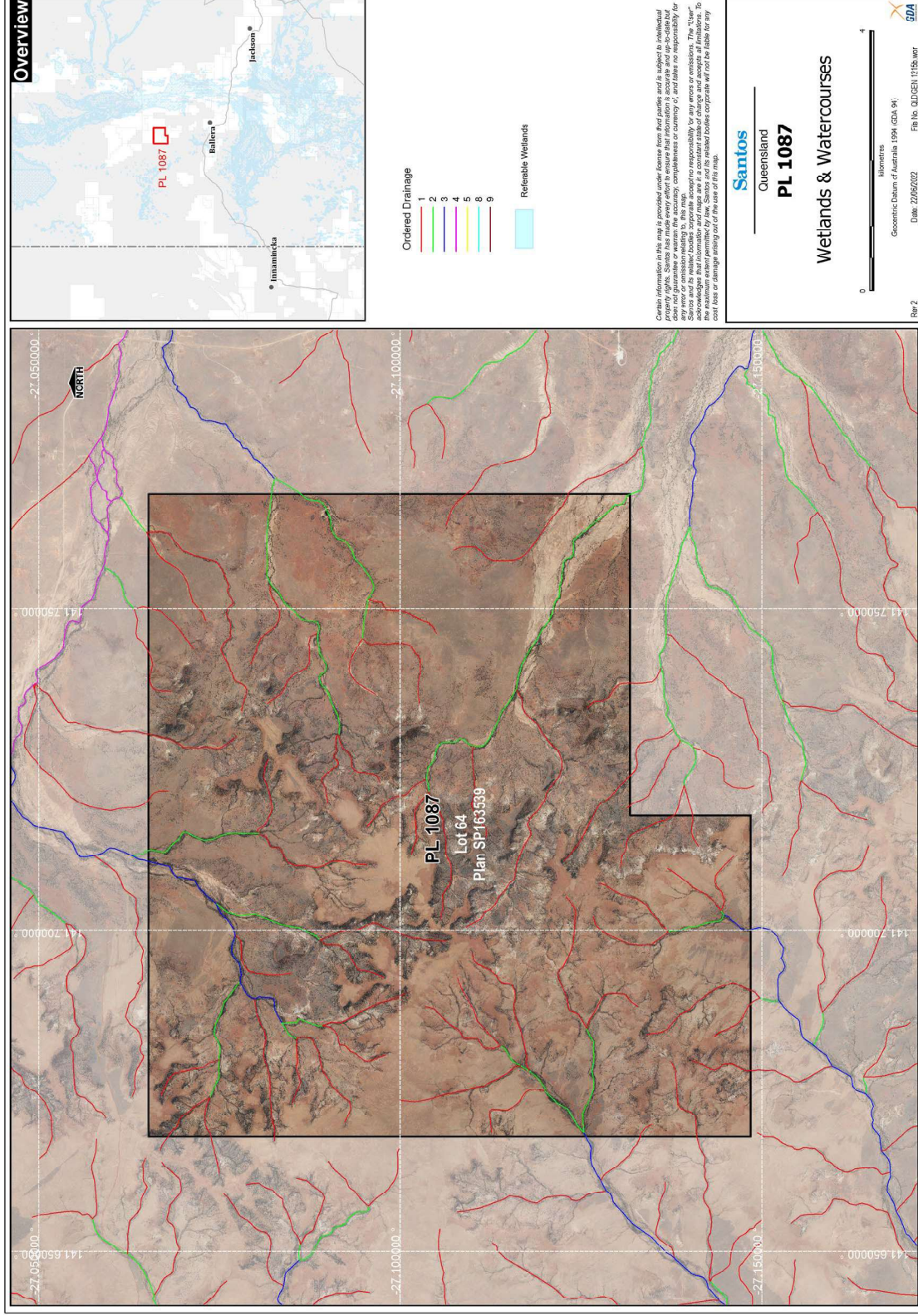


Figure 5: PL 1087 - Mapped Watercourses, Ordered Drainage and Wetlands

4.6 Groundwater

The information in this section is derived from the approved Santos Underground Water Impact Report (UWIR) (Santos, 2020) (refer to Appendix B).

In early 2021, Santos engaged Golder Associates Pty Ltd (Golder) to update the existing Cooper Basin and Eromanga Basin groundwater models used in the UWIR with a revised number of proposed oil and gas wells, including additional wells located in PL 1087. The assessment used the same groundwater impact assessment methodology described in the approved UWIR. A Technical Memorandum (Golder, 2021) is provided as Appendix C and summarising the findings of this assessment.

Proposed gas wells in PL 1087 will target the Toolachee Formation (primary target) and Patchawarra Formation (secondary target) within the Cooper Basin. Together with the Epsilon Formation, these three formations make up the main gas reservoirs of the Cooper Basin.

The Cooper Basin is overlain by the Eromanga Basin. The Cooper Basin is for the most part considered to be distinct and separate from the Great Artesian Basin (GAB), whereas the Eromanga Basin is the largest of the three major sedimentary basins comprising the GAB. Both the Cooper and Eromanga Basins are multilayered systems comprising alternating layers of sandstone, shale, mudstone and siltstone formations.

The Toolachee Formation of the Cooper Basin comprises sandstones, siltstones and shale with thin coal seams and some conglomerates. It spreads unconformably over older formations across the whole Cooper Basin and is observed at its thickest in the Patchawarra and Nappamerri Troughs. In QLD, the average thickness ranges from 25 to 50m, with maximum thickness of up to 130 m observed north of the Jackson–Naccowlah–Pepita Trend. The minimum and maximum hydraulic conductivity of the Toolachee Formation is 2.0×10^{-3} m/d and 4.3×10^{-3} m/d, respectively.

The Patchawarra Formation of the Cooper Basin comprises of interbedded variable size sandstone beds with siltstone, shale and coal beds, sandstone and mudrock beds being the dominant type of geology. The Patchawarra Formation is the thickest (up to 680 m in the Nappamerri Trough and up to 550 m in SWQ near the SA border) and in QLD the second most widespread Permian unit after the Toolachee Formation generally extending to the limits of the Cooper Basin. The minimum and maximum hydraulic conductivity of the Patchawarra Formation is 3.3×10^{-4} m/d and 3.5×10^{-3} m/d, respectively.

Groundwater Use in Gas Target Formations

The Toolachee and Patchawarra Formations are not GAB aquifers and are typically not utilised for water supply. Only the upper (shallow) aquifers of the Eromanga Basin sequence are generally used by landholders due to the significant depth of the deeper aquifers (typically associated with petroleum production and located at greater than 2,000 metres). The main aquifers and aquitards in the region are presented in Section 5.2 of the approved Santos UWIR (Santos, 2020). Groundwater in the Santos UWIR study area is used primarily for stock and domestic use sourced primarily from Tertiary and the upper GAB formations in the Eromanga Basin.

Groundwater Dependent Ecosystems

There are no GAB ROP discharge or recharge springs located in PL 1087. The closest GAB springs are located >250 km south-east of PL 1087, as shown on Figure 14 of the Santos UWIR (refer to Appendix B). These springs are too far away to be at risk of hydraulic impact due to the proposed activities on PL 1087.

Further information on groundwater is presented in Section 5.5.

Groundwater Bores

There is one registered groundwater bore (Jensens bore, RN: 50388, owned by Durham Downs Holding) located in PL 1087. Jensens bore was drilled in 1981 and is a sub-artesian bore that accesses shallow groundwater from the Winton formation. The bottom depth of Jensens bore is approximately 445m (Queensland Globe, 2022; DNRME, 2022), compared to the target gas formations within PL 1087, which are located at depths greater than 2,000 metres.

4.7 Air Quality

The air quality environmental values relevant to PL 1087 include environmental values for the air environment provided in Section 6 of the *Environmental Protection (Air) Policy 2019* as follows:

- the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems;
- the qualities of the air environment that are conducive to human health and wellbeing;
- the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and
- the qualities of the air environment that are conducive to protecting agricultural use of the environment.

The existing air quality of PL 1087 is typical of a remote environment influenced by agricultural industries including operation of the surrounding pastoral lease. There are no potential sensitive receptors for air quality within PL 1087. The closest sensitive receptor to PL 1087 is the Durham Downs Pastoral Station homestead, which is located approximately 13.5 km east of the tenure.

There are no ambient air quality monitoring stations (AQMSs) within the vicinity of PL 1087. The closest DES AQMS is located at Moranbah, approximately 950 km north-east of PL 1087. The Moranbah AQMS has been operational since 2011 and was established to measure particles levels (particulate matter (PM₁₀ and PM_{2.5})) from coal mining operations in the community and surrounding area.

The Toowoomba AQMS was the closest station for oxides of nitrogen (NO_x) and carbon monoxide (CO) (located approximately 1,150 km east of PL 1087). The Toowoomba AQMS was operational from 2003 to 2010.

Table 6. Given the urban/agricultural and/or industrial nature of these regions, background air quality data for Toowoomba and Moranbah provides a very conservative estimate of the background air quality for SWQ and PL 1087.

Table 6: Background Air Quality Data relevant to PL 1087

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

¹ PM₁₀ and PM_{2.5} values have been derived from DES monitoring data from 1 August 2019-30 July 2020.

4.8 Noise

The noise environmental values relevant to PL 1087 include environmental values for the acoustic environment provided in Section 6 of the *Environmental Protection (Noise) Policy 2019* as follows:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
 - sleep;
 - study or learn;
 - be involved in recreation, including relaxation and conversation; and
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

The existing noise environment is typical of remote, largely unpopulated area, with low levels of background noise dominated by natural sources (i.e. wind, animals and insects) and intermittent noise from vehicular traffic and grazing activities (i.e. mustering) from the operation of the surrounding pastoral lease. There are no potential sensitive receptors for noise within PL 1087. The closest sensitive receptor to PL 1087 is the Durham Downs Pastoral Station homestead, which is located approximately 13.5 km east of the tenure.

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 are as per the EA EPPG00407213 and the DES 'Guideline - Prescribing noise conditions for environmental authorities for petroleum activities' (DES, 2013) and have been adopted as being representative of the ambient acoustic environment. The deemed background levels are as follows:

- 7:00 am – 6:00 pm 35dBA;
- 6:00 pm – 10:00 pm 30dBA;
- 10:00 pm – 6:00 am 25dBA; and
- 6:00 am – 7:00 am 30dBA.

4.9 Matters of State Environmental Significance

ELA (2022) assessed Matters of State Environmental Significance (MSES), as defined in Schedule 2 of the *Environmental Offsets Regulation 2014* within PL 1087 (refer to Appendix A). Table 7 summarises the MSES identified to be present in PL 1087, these include regulated vegetation, connectivity areas and protected wildlife habitat (low potential habitat).

Table 7: Summary of MSES within PL 1087

Matters of State Environmental Significance	Area (ha) in PL
Regulated vegetation:	
<ul style="list-style-type: none"> Intersecting a watercourse 	1,126
<ul style="list-style-type: none"> Within 100 m of a vegetation management wetland 	404
Connectivity areas	8,235
Protected wildlife habitat for:	
<ul style="list-style-type: none"> Grey Falcon (low potential habitat), NC Act listed vulnerable 	8,210
<ul style="list-style-type: none"> Major Mitchell's Cockatoo (low potential habitat), NC Act listed vulnerable 	5,262
<ul style="list-style-type: none"> Painted Honeyeater (low potential habitat), NC Act listed vulnerable 	873
<ul style="list-style-type: none"> <i>Indigofera oxyrachis</i> (low potential habitat), NC Act listed vulnerable 	5,890

5.0 Potential Impacts and Mitigation Measures

As discussed in Section 2.0, Santos has submitted a PL application (PL 1087) over an area of existing Santos tenure (ATP 1189). Petroleum activities currently carried out in ATP 1189 are authorised by EA EPPG03518215. Due to varying joint venture arrangements, PL 1087 cannot be added to EA EPPG03518215, and Santos proposes to add PL 1087 to EA EPPG00407213 as a relevant resource tenure. Further, this application also seeks to increase the scale and intensity of activities authorised by EA EPPG00407213 to allow sufficient capacity for future development on PL 1087.

Potential impacts to relevant environmental values from proposed activities are therefore considered to be largely analogous to those resulting from existing authorised activities. The risk of new or additional significant impacts to environmental values present in PL 1087 from the proposed amendment is considered to be very low.

Notwithstanding, this section identifies and assesses potential impacts, mitigation measures (control strategies), and environmental risks to relevant environment values resulting from carrying out the proposed activities as required by Section 125 of the EP Act.

To assess environmental risks associated with the proposed activities, a risk assessment for each relevant environmental value (as identified in Section 4.0) has been completed. The environmental risk assessment is based on risk factors associated with both the initial construction and ongoing operational phases of the proposed activities.

The proposed amendment will not result in any changes to how waste is managed while carrying out authorised petroleum activities, or rehabilitation objectives (i.e. these environmental values will be managed in accordance with existing management practices and relevant EA EPPG00407213 conditions). The management, potential impacts and risks associated with waste and rehabilitation are therefore not explicitly addressed in the following sections. However, Table 8 contains standard Santos mitigation measures (control strategies) for the management of waste and rehabilitation with regard to a range of potential risks and impacts to relevant environmental values associated with carrying out authorised activities.

Risk assessments for a proposed activity identify a wide range of risks and potential impacts to relevant environmental values 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 environmental value. Following identification of appropriate mitigation measures (control strategies), the residual (mitigated) risk posed to each environmental value 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. Further detail on risk assessment process is provided in Appendix D. The results of the risk assessment are summarised in Table 8.

Impacts to MSES in context of the *Environmental Offset Act 2014* (EO Act) are discussed in Section 6.2.

5.1 Land Resources

The proposed activities will result in direct and indirect impacts to land resources (as described in Section 4.1), primarily as a result of:

- infrastructure construction (earthworks activities);
- vehicle and plant movements;
- minor spills or leaks of fuels, chemicals or other produced fluids;
- production operations;
- loss of containment;
- storage and disposal of general waste, chemical and process wastes;
- fire (ignition sources resulting from activities); and
- bushfire and flood (natural events).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to land resources resulting from the proposed activities may include:

- reduction in visual amenity;
- soil erosion, topsoil loss, inversion and compaction;
- disturbance to land use and suitability changes;
- reduction in agricultural productivity; and
- contamination of soil.

The area of direct disturbance within PL 1087 would be up to approximately 64 ha for the proposed activities including 5 additional wells and associated infrastructure (i.e. flowlines, access tracks and borrow pits) should further exploration be successful. This is a conservative upper disturbance estimate only, as future well locations (and associated infrastructure) are not known at the time of application. Santos has an understanding of the prospective areas for gas within PL 1087 based on the findings of previous seismic surveys and drilling results. However, Santos does not yet know the precise location of the majority of proposed wells and associated infrastructure to be located within PL 1087. As such, the assessment of impacts within this application takes a precautionary approach and simulates a conservative disturbance scenario.

Disturbance would occur progressively over a 10-to-20-year period and include the development of areas, such as flowline alignments, which are subject to temporary disturbance only. The bulk of these areas (approximately 24 ha) would be reinstated and permitted to naturally revegetate immediately following completion of construction activities, thereby reducing the overall development footprint. The remaining disturbance areas would be rehabilitated following the cessation of petroleum activities.

Fire is identified as a potential risk associated with both natural events and ignition sources resulting from petroleum activities potentially causing bushfires. Although unlikely, bushfires have the potential to occur when undertaking a range of industrial and agricultural activities in natural environments e.g. vehicle exhausts interacting with dry grass can cause bushfires. Bushfires can cause impacts to infrastructure, agricultural productivity, vegetation/habitat and fauna. Santos implements a range of management strategies to mitigate the risk of causing fire as outlined in outlined in Table 8. These events are unlikely to occur as a result of undertaking the proposed activities, and have been mitigated, and risk assessed as such.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate the residual risk to land resources as a result of the proposed activities is classified as 'low'. Furthermore, any short-term reduction in the agricultural availability of the pasture land would be offset by commercial agreements between the proponents and the property owner.

5.2 Flora, Regional Ecosystems and Environmentally Sensitive Areas

The proposed activities will result in direct and indirect impacts to flora and REs (native remnant vegetation) and potentially to ESAs (if they were subsequently identified to be present in PL 1087) (as described in Sections 4.2 and 4.3), primarily as a result of:

- 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; and
- fire (ignition sources resulting from activities).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to flora and REs (native remnant vegetation) and potentially to ESAs resulting from the proposed activities may include:

- loss of ecosystem functioning;
- loss of species population, further endangerment and loss in species diversity; and
- introduction and/or spread of weeds, pests and pathogens.

The proposed petroleum activities would directly impact up to 64 ha of remnant native vegetation comprising 'least concern' RE under the VM Act.

This is a conservative upper disturbance estimate only, as future well locations (and associated infrastructure) are not known at the time of application. Santos has an understanding of the prospective areas for gas within PL 1087 based on the findings of previous seismic surveys and drilling results. However, Santos does not yet know the precise location of the majority of proposed wells and associated infrastructure to be located within PL 1087. As such, the assessment of impacts within this application takes a precautionary approach and simulates a conservative disturbance scenario.

Disturbance would occur progressively over a 10-to-20-year period and include the development of areas, such as flowline alignments, which are subject to temporary disturbance only. The bulk of these areas (approximately 24 ha) would be reinstated and permitted to naturally revegetate immediately following completion of construction activities, thereby reducing the overall development footprint. The remaining disturbance areas would be rehabilitated following the cessation of petroleum activities.

The proposed RE disturbance represents a very minor portion of the total area the REs occupy in the broader bioregion, and the greater Cooper Basin.

Santos will maximise avoidance of ground-truthed REs 5.3.21 and 5.3.4 as far as reasonably practicable as these areas are associated with mapped Regulated vegetation. Santos will also maximise avoidance of steep terrain including cliff lines, particularly those with cave features, which provide important breeding, roosting, foraging and sheltering habitat for a range of common species in a hostile landscape.

As stated in Section 4.3, no ESAs are mapped or have been identified to be present within PL 1087; however, future surveys or changes in ESA definitions may result in ESAs being identified in the tenure. If this were to occur, conditions contained in EA EPPG00407213 and implementation of management strategies outlined in Table 8 would mitigate potential impacts to ESAs.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to flora, REs (native remnant vegetation) and ESAs as a result of the proposed activities are classified as 'low'.

5.3 Fauna

The proposed activities will result in direct and indirect impacts to fauna and/or fauna habitat (as described in Section 4.4), primarily as a result of:

- 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; and
- seismic source.

Santos aims to minimise the disturbance and risk posed to fauna associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to fauna resulting from the proposed activities may include:

- loss of ecosystem functioning
- loss of species population, further endangerment and loss in species diversity
- disturbance, injury or loss of fauna and livestock; and
- introduction and/or spread of weeds, pest plants, animals and pathogens.

The proposed petroleum activities would directly impact up to 64 ha of lower value fauna habitat in the form of remnant native vegetation comprising 'least concern' RE under the VM Act.

Disturbance would occur progressively over a 10-to-20-year period and include the development of areas, such as flowline alignments, which are subject to temporary disturbance only. The bulk of these areas (approximately 24 ha) would be reinstated and permitted to naturally revegetate immediately following completion of construction activities, thereby reducing the overall development footprint. The remaining disturbance areas would be rehabilitated following the cessation of petroleum activities.

The proposed upper disturbance limit of 64 ha is a conservative estimate only, as future well locations (and associated infrastructure) are not known at the time of application. Santos has an understanding of the prospective areas for gas within PL 1087 based on the findings of previous seismic surveys and drilling results. However, Santos does not yet know the precise location of the majority of proposed wells and associated infrastructure to be located within PL 1087. As such, the assessment of impacts within this application takes a precautionary approach and simulates a conservative disturbance scenario.

Further, following the desktop and field assessments, five Endangered, Vulnerable or Near Threatened (EVNT) or special least concern fauna species listed under the NC Act are considered as having potential to occur within PL 1087 (refer to Section 4.4 and Appendix A).

These include NC Act Vulnerable listed birds Grey Falcon, Major Mitchell Cockatoo and Painted Honeyeater, NC Act Near Threatened listed reptile Woma, and Special Least Concern bird Fork-tailed Swift. No threatened fauna species were identified during field surveys.

Based on known distributions, the species' occurrence within the region and preferred habitat requirements, threatened and migratory species are considered to be unlikely or have a low potential to occur, due to the lack of high-quality suitable habitat within the study area, or because the study area is outside the known range of the species. Furthermore, vegetation of Cooper Creek (13 km east of the study area) and its immediate tributaries with pooling water/drought refuge is likely to represent higher quality habitat for the identified listed species, due to permanent access to water and/or presence of significant riparian vegetation (refer to Appendix A for further information).

Further, the proposed upper disturbance limit of 64 ha is negligible in the context of the total area of low potential habitat available for the identified listed species in PL 1087 as follows:

- Grey Falcon: up to 0.8% of 8,210 ha of low potential habitat in PL 1087;
- Major Mitchell's Cockatoo: up to 1.2% of 5,262 ha of low potential habitat in PL 1087;
- Painted Honeyeater: up to 7.4% of 873 ha of low potential habitat in PL 1087; and
- Woma: up to 1.2% of 5,262 ha of low potential habitat in PL 1087.

Note: the Fork-tailed Swift is listed as migratory under the EPBC Act. It is a non-breeding migratory aerial only species, known to occur in all states and territories in Australia and is likely to fly over PL 1087 on occasion. It is unlikely that this species will be impacted by the proposed activities / disturbance.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to fauna and/or fauna habitat as a result of the proposed activities are classified as 'low'.

5.4 Surface Water and Wetlands

The proposed activities may result in direct and indirect impacts to surface water (as described in Section 4.5), primarily as a result of:

- infrastructure construction (earthworks activities);
- vehicle and plant movements;
- storage and disposal of general waste, chemical and process wastes;
- well control or well head equipment failure;
- minor spills or leaks of fuels, chemicals or other produced fluids;
- production operations;
- loss of containment; and
- flood (natural event).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to surface water resulting from the proposed activities may include:

- disturbance to natural drainage patterns;

- degradation of water quality from sediment releases, spills or leaks of fuels and chemicals;
- impacts to aquatic flora and fauna from sediment releases, spills or leaks of fuels and chemicals; and
- contamination of surface water.

As detailed in Section 4.5, PL 1087 is not located in the Cooper Creek or Channel Country floodplain. Mapped drainage features located in PL 1087 are minor non-perennial drainage features, and the majority of drainage features are mapped to be SO 1 and 2 with minor sections of SO 3 (refer to Figure 5). No HES or GES wetlands are mapped in PL 1087 (refer to Figure 5).

Regulated vegetation (within 100m of a Vegetation Management Wetland) and Regulated vegetation (intersecting a watercourse) are mapped to be present in PL 1087. The Regulated vegetation (within 100m of a Vegetation Management Wetland) is associated with a SO 1 and 2 drainage feature and ground-truthed REs 5.3.21 (Variable sparse to open hermland) and 5.3.4 (Eucalyptus and Acacia woodlands on drainage lines) located in the south-eastern section of the tenure. As discussed in Section 5.2, Santos will maximise avoidance of ground-truthed REs 5.3.21 and 5.3.4.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to surface water as a result of the proposed activities are classified as 'low'.

5.5 Groundwater

The proposed activities may result in direct and indirect impacts to groundwater (as described in Section 4.6) primarily as a result of:

- drilling and hydraulic stimulation/fracturing activities;
- production operations;
- well control or well head equipment failure;
- well casing or cement failure (well integrity failure);
- minor spills or leaks of fuels, chemicals or other produced fluids;
- loss of containment;
- storage and disposal of general waste, chemical and process wastes; and
- vehicle and plant movements.

These risk sources may result in the following potential impacts:

- contamination of groundwater resources;
- crossflow, aquifer contamination or reduction in pressure in aquifers;
- reduction in groundwater quantity and/or availability for other users; and
- impacts to groundwater dependant ecosystems.

As discussed in Section 4.6, the proposed activities would co-produce groundwater as a by-product of gas extraction from the Toolachee Formation (primary target) and Patchawarra Formation (secondary target) within the Cooper Basin.

[Santos South West Queensland Underground Water Impact Report \(UWIR\):](#)

As discussed in Section 4.6, the UWIR (Santos, 2020) assesses cumulative drawdown impacts from oil and gas extraction from the Cooper and Eromanga basins across SWQ.

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 UWIR.

UWIR Modelling Philosophy:

The modelling philosophy for the successive iterations of the UWIR comprises a design that provides an indicative estimate of the magnitude of potential drawdown in the target beds and neighbouring formations in the immediate and long-term scenarios as described in the UWIR.

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. The geology of the Eromanga and Cooper Basins, including hydrocarbon trapping mechanisms and environmental values, is discussed in detail in Section 4 of the UWIR.

Successive iterations of the UWIR present findings from an analytical and ‘steady-state’ (as opposed to numerical and ‘time-dependent’) groundwater model. As presented in the 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. Most private bores in the Eromanga Basin target the upper (Quaternary and Tertiary) formations (upper 300 m) 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’ South West Queensland operations cover an area in excess of 8,000 km² 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’ South West Queensland 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 (i.e. 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 UWIR) insofar that:
 - For the purposes of Immediately Affected Area (IAA) predictive modelling of both the Eromanga and Coopers Basins, Santos has used extraction data from the last year of historical data (2019) to represent future extraction rates. These values are considered to be representative over the next three years. This was considered conservative as the actual extraction is likely to decline over this period.
 - 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 1×10^{-2} to 1×10^{-3} m/d, and Kv (vertical permeability) range is 1×10^{-4} to 1×10^{-5} m/d. For comparison, the UWIR for the Surat CMA had Kh range of 1×10^{-2} to 1×10^{-4} m/d, and Kv range of 1×10^{-4} to 1×10^{-7} m/d. This shows the SWQ 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 ~1000 m below ground level. However, the model assumes these wells are much shallower, from 620 m to 900 m 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.

In 2021, Santos engaged Golder to update the existing Cooper and Eromanga Basin groundwater models used in the UWIR with a revised number of proposed oil and gas wells, including additional gas wells in PL 1087. The assessment used the same groundwater impact assessment methodology described in the approved UWIR (Santos, 2020). A Technical Memorandum (Golder, 2021) is attached as Appendix C and provides a summary of the findings of this assessment.

The number of existing wells has not changed, thus the predicted IAA is not updated from that reported in the UWIR. The number of long-term oil and gas wells were updated based on an updated configuration of proposed wells. This results in an updated assessment of the LTAA relative to the UWIR. Extraction rates (extraction rate per well) are taken from the UWIR. All other aspects of the modelling remain the same as they were reported in the UWIR. The updated Eromanga and Cooper Basin models produced revised drawdown predictions. The outcomes of the revised modelling demonstrated no significant

change in LTAA results since the UWIR. Refer to the Technical Memorandum for further information (attached as Appendix C).

Underground Water Monitoring

Section 9 of the UWIR presents the past and future Underground Water Monitoring in relation to the findings of the UWIR, as well as the current monitoring strategy.

The stated objective of the monitoring strategy described in Section 9, and which has been approved by the 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 currently provides ~7 years of reliable trend data.
- monitoring of water depth/pressure and water quality at bores within the IAA.
- 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; and
- 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 there is no clear depressurisation of the monitored aquifers throughout the monitoring period.

This is supported by observations recorded from 1990 to 2011, as reported in Section 5.5 of the 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 the reservoirs is not proposed as it will not provide data that can be used to validate the model. This is because the model incorporates highly conservative assumptions (refer to UWIR Modelling Philosophy 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.

Santos SWQ UWIR Modelling – PL 1087:

- The modelling predicts the IAA (after 3 years) and LTAA (after 20 years) from groundwater extraction from existing and planned wells. The IAA model used extraction rates from the last historical extraction year (2019) to represent future extraction rates.

- The LTAA used these historical extraction rates (2019) and added the extraction from 866 petroleum wells in the Cooper Basin (212 existing wells, 654 new wells) and 678 petroleum wells in the Eromanga Basin (252 existing wells, 426 new wells) –
 - o the modelling considered extraction from up to 9 proposed gas wells within PL 1087 (refer to Golder, 2021 attached as Appendix C).
 - o Note: as discussed in Section 2.0, this application considers the potential for gas production to occur from up to 9 operational wells in total within PL 1087 (comprised of 4 existing and 5 proposed production and exploration wells), should further exploration be successful.
- The ‘affected area’ was defined as those areas with two metres of drawdown in the shallow alluvial aquifers or more than five metres of drawdown in the deeper consolidated aquifers.
- The modelling identified development of up to 9 gas wells within PL 1087 is predicted to result in an insignificant change to the predicted impact to groundwater resources.
 - o the maximum estimated drawdown in the IAA due to cumulative extraction from the Cooper Basin is less than 10 m in the Toolachee to Patchawarra Formations. Refer to Table 4 and Figure 8 of Appendix C.
 - o the maximum estimated drawdown for the LTAA due to cumulative extraction from the Cooper Basin is less 52 m in the Toolachee to Patchawarra Formations. Refer to Table 4 and Figure 8 of Appendix C.
- As discussed in Section 4.6, there are no GAB ROP discharge or recharge springs within or near PL 1087. The closest GAB springs are located more than >250 km from PL 1087. These springs are too far away to be at risk of hydraulic impact due to the proposed activities on PL 1087. Potential impacts to groundwater environmental values due to exercising underground water rights are further discussed in Section 6.1.3.
- As discussed in Section 4.6, there is one registered groundwater bore (Jensens Bore, RN: 50388, owned by Durham Downs Holding) located in PL 1087. Jensens Bore was drilled in 1981 and is a sub-artesian bore that accesses shallow groundwater from the Winton formation. Bore bottom depth is approximately 445m (Queensland Globe, 2022; DNRME, 2022), compared to the target gas formations, which are located at depths greater than 2,000m. As detailed in Appendix C (Refer to Table 4 and Figure 8), the maximum estimated drawdown in the IAA due to extraction from the Eromanga Basin in the Tertiary and Quaternary strata (including the Glendower and Winton Formations) is predicted to be less than 2 m. The maximum estimated long term drawdown in the same units is predicted to be less than 4 m. Santos will ensure that water quality baseline monitoring and stimulation impact monitoring is conducted in accordance with EA conditions, approved UWIR and the Queensland *Water Act 2000* (Water Act). This will ensure that any impacts to this bore are detected early and action taken if required, by agreement with the affected bore owner (i.e. remediation of the bore or make good arrangements).
- The SWQ UWIR modelling results are conservative and worst-case. The actual drawdown is expected to be less than predicted based on the intermittent and time-limited operation of extraction wells, and the conservative assessment of flow rate assigned to each well in the model.

Potential impacts to groundwater environmental values due to exercising underground water rights are discussed further in Section 6.1.3.

Hydraulic Fracturing Activities:

Hydraulic stimulation is employed to improve production efficiency of petroleum wells. This is achieved by increasing the conductivity within the reservoir and by increasing the fracture permeability, which in turn increases the efficient for oil and/or gas to flow to the well. Conventional gas in SWQ (and PL 1087) is produced from sandstone reservoirs within the Toolachee and Patchawarra Formations of the Cooper Basin. The gas within these formations is stored as free gas within the pore spaces of the reservoirs, with much of the porosity as primary intergranular porosity. These sandstone reservoirs often have low permeability, and stimulation is necessary to achieve economic gas flowrates and production volumes.

There are key differences between coal seam gas and conventional oil and gas operations, both in the geographic and geological setting of the resource and the methodology for assessing the resource, that have substantial bearing on the risk profile presented by hydraulic fracturing activities. These include:

- Santos' conventional oil and gas operations in South West Queensland are located in an arid, sparsely populated area of central Australia. Whilst groundwater is an important water supply source to support rural land uses, the extent of groundwater supply development is limited;
- In Santos' SWQ operations, the hydrocarbon reservoirs generally occur in anticlines capped with thick, laterally-extensive low permeability formations that isolate the reservoirs from overlying water-bearing formations; and
- The oil and gas reservoirs in SWQ are very deep, of the order of 1,500 m to 3,000 m below ground level, which provides hundred to thousands of metres vertical separation between the formations in which fracturing activities have occurred or are proposed to occur and the shallow groundwater resources.

Santos hydraulic fracturing activities in SWQ are designed, tested, undertaken, monitored and reported in accordance with the *Code of Practice - For the construction and abandonment of petroleum wells and associated bores in Queensland* (Queensland Government, December 2019) (the Code) including relevant legislative requirements identified in the *Queensland Petroleum and Gas (General Provisions) Regulation 2017*. Further, the hydraulic stimulation process, including well design, for both conventional oil and gas development in South-West Queensland, including PL 1087, has been prepared by Golder Associates, and is provided in Section 3, Vol. 1 of the *Stimulation Risk Assessment - Santos Southwest Queensland Tenements* (SRA) (attached as Appendix E). By undertaking hydraulic fracturing activities in accordance with the abovementioned Code and SRA, Santos ensures that the risk of environmental harm to groundwater formations is negligible.

The SRA has been written as a single overarching risk assessment that covers all relevant matters for Santos' operations in SWQ. The SRA has been written to address the regulatory requirements and relevant EA conditions (i.e. conditions in Schedule K of EA EPPG00407213). The SRA has 2 volumes:

- Volume One of the SRA discusses the environmental and geological settings within which Santos' stimulation activities take place, and the general techniques for the drilling, completion and stimulation of wells. The report also discusses why stimulation is essential in SWQ and outlines Santos's current forward programme for fracture-stimulations (noting that this is frequently reviewed and subject to change); and
- Volume Two relates specifically to the stimulation fluids proposed to be used by Santos' service providers on both conventional oil and gas wells in SWQ. The report considers the ecological and human health toxicity of the chemical constituents in the stimulation fluids and includes an exposure pathway assessment and risk characterisations based on a review of complete exposure pathways and controls to mitigate exposure.

Chemicals that may be used in the stimulation process / fracturing fluids by Santos in SWQ are detailed in Section 3 of Volume Two of the SRA. Toxicity information is described in Volume Two and detailed Human Health Hazard Summaries and Ecological Information Sheets (Profiles) are provided in

Appendix C to Appendix E of Volume Two of the SRA. Relevant safety data and chemical information sheets are provided in Appendices C and F of Vol. 2 and 3 of the SRA, respectively. Chemicals not included in the SRA will be risk assessed prior to their use. This adaptive management is in line with that provided for by the streamlined model conditions (and conditions in Schedule K of EA EPPG00407213).

The additional wells planned as part of the proposed amendment application target the Toolachee to Patchawarra formations within the Cooper Basin, from which gas is currently extracted and stimulation activities have occurred. As any hydraulic impacts from extraction in the Cooper Basin are confined (e.g. hydraulic impacts would not propagate above the top of the Tinchoo and Arraburry Formations), there would be no impact to the shallower Eromanga Basin which hosts aquifers providing regional groundwater supply.

The Queensland Government's Gasfields Commission publishes data on well integrity. They have concluded that when such national and international codes are used then the likelihood, and therefore risk, of well integrity failure resulting in underground leakage is assessed to be low to near zero (Queensland Gasfield Commission, 2015).

In summary, the combination of remote project location, limited water supply development, best practice operational procedures and controls and vertical separation of the petroleum reservoir from any primary groundwater supply aquifers results in a low risk profile to groundwater from petroleum activities.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to groundwater as a result of the proposed activities are classified as 'low'.

5.6 Air Quality

The proposed activities may result in impacts to air quality primarily as a result of:

- infrastructure construction;
- vehicle and plant movements;
- seismic source;
- minor air emissions generated from vehicles and equipment; and
- air emissions vented from testing and production activities.

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to air quality values resulting from the proposed activities may include:

- air pollution and localised reduction in air quality;
- minor localised nuisances caused by dust and light; and
- minor localised disturbance to fauna and livestock.

These potential air quality impacts from the petroleum activities within PL 1087 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 consist of minor dust and exhaust emissions (NO_x, CO, volatile organic compounds and PM₁₀) from operating vehicles, plant, machinery and wellhead equipment (i.e. pumps).

These relatively minor dust and exhaust emissions would be localised and highly unlikely to significantly impact the air quality environmental values of PL 1087 provided that the mitigation measures listed in Table 8 are carried out. These emissions would be unlikely to cause nuisance to the nearest sensitive receptors, Durham Downs Pastoral Station homestead, which is located approximately 13.5 km east of the tenure. Many of the sources will also be temporary, occurring only through the construction period, or by workovers or intermittent site visits during operation.

An air quality impact assessment has not been undertaken for this development given the small number of new emission sources, the remote nature of the location, the lack of other industry/pollutant sources in the region and the absence of sensitive receptors.

Further, 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.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to air quality values as a result of the proposed activities are classified as 'low'.

5.7 Noise

The proposed activities may result in impacts to acoustic/noise values (as described in Section 4.8), primarily as a result of:

- infrastructure construction;
- vehicle and plant movements;
- seismic source; and
- noise generated during drilling and hydraulic stimulation/fracturing activities and production operations.

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to acoustic values resulting from the proposed activities may include:

- nuisance caused by vibration and noise generation; and
- disturbance to fauna and livestock.

Potential noise emissions from the proposed petroleum activities within PL 1087 would be consistent with those associated with the existing petroleum activities and pastoral activities.

Santos manages noise generating activities in accordance with the 'management hierarchy for noise' set out in the *Environmental Protection (Noise) Policy 2019* (EPP Noise). Noise generated by the proposed activities will be generally consistent with 'typical sound power levels for petroleum activities' as described in Table 1 of the DES Guideline – *Noise Assessment - Prescribing noise conditions for environmental authorities for petroleum activities* (DES, 2013).

Noise generated by the proposed activities is expected to be generally consistent with that generated by existing agricultural activities undertaken in the region. Furthermore, noise generated by the proposed activities is highly unlikely to cause nuisance to the nearest sensitive receptors, Durham Downs Pastoral Station homestead, which is located approximately 13.5 km east of the tenure.

Therefore, nuisance impacts from noise generation by the proposed activities at the nearest sensitive receptor are highly unlikely. Noise levels associated with the proposed activities may result in minor

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.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 8. The results of the risk assessment indicate that residual risks to acoustic/noise values as a result of the proposed activities are classified as 'low'.

5.8 Matters of State Environmental Significance

The proposed activities will potentially result in direct and indirect impacts to MSES (as described in Section 4.9). Desktop and field based ecological assessments conducted by ELA (2022) within PL 1087 concluded that after the application of avoidance, minimisation and mitigation measures (as outlined throughout this application, in relevant sections of the risk assessment, and in Appendix A), the proposed activities are unlikely to have a significant residual impact on MSES occurring within PL 1087. The risk of a Significant Residual Impact to MSES is assessed in Section 6.2.

Table 8: Environmental Risk Assessment

Identification				Unmitigated Risk			Residual Risk		
Risk Event/ Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Seismic surveys and construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities Well drilling and hydraulic fracturing	Land Resources	Reduction in visual amenity Soil erosion, topsoil loss, inversion and compaction Disturbance to land use and suitability changes Reduction in agricultural productivity Contamination of soil	Infrastructure construction (earthworks activities) Vehicle and plant movements Minor spills or leaks of fuels, chemicals or other produced fluids Production operations Loss of containment Storage and disposal of general waste, chemical and process wastes Risks posed by fire (ignition sources resulting from activities), and bushfire and flood (natural events)	III	d	Medium	III	c	Low
				<p>General</p> <ul style="list-style-type: none"> Compliance with relevant EA conditions and all relevant internal and external approvals in place before work undertaken. All disturbance undertaken in accordance with Santos standards. Appropriate emergency response plans in place. Restricted access to site/s. Industry standards and good industry practices are followed. <p>Land Resources</p> <ul style="list-style-type: none"> Surface disturbance restricted to the minimum area required to safely carry out activities. Consider alternate routes, locations and construction methods during planning and scouting phases to minimise environmental impacts. Where practicable, use existing routes/disturbed ground, and co-locate access tracks and gathering lines to reduce the total disturbance area. Existing unrestored borrow pits are used in preference to establishing new pits. 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. Topsoil stockpiles separated from subsoil and maintained to preserve the seedbank (where practicable). Erosion and sediment control measures in place where appropriate. Infrastructure and seismic lines located to minimise impacts to drainage patterns, soil and vegetation, and avoid significant cut and fill. Vehicle and plant movements <ul style="list-style-type: none"> No unauthorised off-site driving. Access track maintenance (and watering) carried out as required to reduce dust generation. Active promotion of appropriate road use behaviours, and the setting of appropriate speed limits for Santos personnel and contractors. Work is scheduled to fit in with stock locations and the mustering schedule. Fire/Flood <ul style="list-style-type: none"> Activity planning will consider seasonal conditions and the risk of bushfire and flood. Work programs in riparian/water crossing areas scheduled to take into account seasonal conditions and rainfall/flood likelihood. Emergency response procedures should contain a fire and flood response procedure. Personnel are informed on the fire danger season and associated restrictions. Ignition sources are controlled via permit to work. Measures undertaken to reduce potential impacts of fire and flooding where appropriate (i.e. 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). Construction activity not undertaken during or immediately prior to flooding. Fuel, oil and chemical storage and handling <ul style="list-style-type: none"> 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. Spill leak and drip trays provided to address minor drips and spills resulting from re-fuelling operations. Spill response equipment and materials kept on site and in operational vehicles (where appropriate). In the event of expected flooding, non-essential items/facilities such as chemicals, fuel and oil storages and waste receptacles removed from areas at risk of inundation (where appropriate/safe to do so). Contaminated areas will be fenced if a threat is posed to stock or wildlife. Maintain a register of incidents and implement corrective actions based on outcome of investigations. Vehicles and equipment are operated and maintained in accordance with specifications to minimise the potential for a spill or leak (i.e. oil leak or hydraulic hose failure). Production operations <ul style="list-style-type: none"> Plant and equipment designed, constructed and operated in accordance with Santos Engineering Standards and relevant Australian/International standards. Infrastructure design process to address location and non-location specific threats (i.e. pipeline corrosion) and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures implemented. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification i.e. hydrotest. 			<p>Control Strategies</p>		

Identification					Unmitigated Risk		Residual Risk	
Risk Event/ Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk	Consequence	Likelihood
Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and	Flora, Regional Ecosystems and ESAs	Loss of ecosystem functioning Loss of species population, further endangerment and loss in species diversity	Infrastructure construction (earthworks activities) Vehicle and plant movements Minor spills or leaks of fuels, chemicals or other	Consequence	Low	High	II	b
				Likelihood				
<ul style="list-style-type: none"> <u>Loss of containment</u> <ul style="list-style-type: none"> Regular monitoring of control systems (i.e. emergency shutdown valves) to ensure that protection levels are adequate. Emergency spill response equipment on site. Loss of containment is managed via appropriate Santos incident management system, and implementation of corrective actions is based on incident investigation. Emergency response training for emergency response personnel. <u>Waste</u> <ul style="list-style-type: none"> Waste managed in accordance with the waste and resource management hierarchy, defined in Section 9 of the Waste Reduction and Recycling Act 2011. Where practicable, Santos would implement the waste and resource management hierarchy, and reduce risks to environmental values from waste storage and disposal by: <ul style="list-style-type: none"> designing activities to incorporate less resource-intensive materials and more efficient processes. designing contracts which encourage waste avoidance and set waste reduction targets. identifying and separating waste streams for re-use, recycling, treatment or disposal. storing waste in appropriate receptacles or designated areas prior to their re-use or collection for recycling, treatment or disposal. ensuring wastes are removed by transporters which are appropriately licensed or authorised to transport that particular waste type. ensuring all wastes removed from the site are recycled, treated or disposed of at an appropriately licensed waste facility. reviewing and auditing waste management practice to confirm legal compliance and identify opportunities for improvement. Treated sewage effluent (<21 EP) will be released to land provided it: <ul style="list-style-type: none"> is a signed contaminant release area(s). does not contain any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm; does not result in pooling or run-off or aerosols or spray drift or vegetation die-off. minimises deep drainage below the root zone of any vegetation; and does not adversely affect the quality of shallow aquifers. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. 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. Hydraulic fracturing flowback fluid contained in lined pits or tanks and removed from site for authorised reuse or disposal upon completion of operations. In the event of expected flooding, waste will be removed from areas at risk of inundation (where appropriate/safe to do so). Waste materials and non-essential infrastructure removed from operational areas as soon as reasonably practicable following petroleum activities. 					<p>Rehabilitation</p> <ul style="list-style-type: none"> Gathering line/pipeline ROW are immediately re-instated following gathering line/pipeline installation. 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 (i.e. a flood event) prevents this timeframe being met). Areas potentially exposed to contamination will be assessed and remediated where required. Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions (as specified in the EA). <p>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):</p> <ul style="list-style-type: none"> ripping of areas of compacted soil (except on sensitive soils/environments). respreading of stockpiled topsoil, vegetation and seed stock (where available) to facilitate natural revegetation; and restoration of natural landform contours. 			
<p>General</p> <ul style="list-style-type: none"> 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. Refer to general control strategies listed under the land resources environmental values. <p>Flora, Regional Ecosystems and ESAs</p> <ul style="list-style-type: none"> Maximise avoidance of regulated vegetation (i.e. intersecting a watercourse and associated buffers). Maximise use of pre-disturbed areas (where practicable). Where practicable, clearing of mature trees avoided. Where practicable, branches lopped rather than removing whole trees or shrubs. 					<p>III</p>	<p>Low</p>	<p>c</p>	

Identification				Unmitigated Risk		Residual Risk	
Risk Event/ Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk	
incidental activities		Introduction and/or spread of weeds, pest plants, animals and pathogens	produced fluids Storage and disposal of general waste, chemical and process wastes Loss of containment Fire (ignition sources resulting from activities)				
							Control Strategies
							<ul style="list-style-type: none"> Ensure activities are located and undertaken in compliance with EA conditions (Schedule F). Introduction and/or spread of weeds, pest plants, animals and pathogens <ul style="list-style-type: none"> Hygiene protocols implemented as appropriate to minimise the introduction, spread and persistence of weeds, pest plants, animals and pathogens. Access to and from the site via designated access tracks only. Vehicle and equipment wash-down when operations have been undertaken in areas of known weed infestations. Monitor for presence of weeds within the construction and operational areas, and where necessary implement control measures. Ensure that imported material is from an area or source considered to be pest plant/disease free. Maximise avoidance of areas that may represent potential habitat for threatened flora as far as reasonably practicable. Should clearing of threatened flora be required, approval under the EPBC Act and/or NC Act may be required. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Loss of containment' and 'Fire' under the Land Resources EV.
Seismic surveys 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 Seismic source	III	c	Low	<p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under flora and regional ecosystems and land resources environmental values. <p>Fauna and Livestock</p> <ul style="list-style-type: none"> Maximise avoidance of areas that may represent important habitat for threatened fauna as far as reasonably practicable. Hollow logs (located on ground) within disturbance areas retained and shifted to adjacent undisturbed areas. Seismic energy sources are not operated within the distance defined by Santos standards of landholder infrastructure. Measures implemented to reduce risks to fauna from entrapment and injury in pipes and excavations, including: <ul style="list-style-type: none"> Facilities (i.e. borrow pits, well cellars) are designed and constructed as far as practicable to minimise impacts to fauna. Borrow pits are not established in locations which pose an unacceptable hazard to livestock. Sumps, mud pits and other pits holding fluid are fenced as appropriate to minimise fauna (medium to large) and livestock access. Pipes capped to prevent fauna entrapment during construction or after abandonment. Minimising the period trenches remain open to as short as reasonably practicable. Regular inspections of open trenches and prior to backfilling. Provision of escape ramps and refuge material for fauna that do enter trenches. <p>Threatened Fauna</p> <ul style="list-style-type: none"> Where threatened species nests are identified to be present, disturbance should be avoided. If disturbance cannot be avoided, clearing of the nest and a surrounding area should be postponed until after the relevant breeding season and/or incubation period. Clearing must not occur while any nests are active, with adults, eggs or nestlings. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Loss of containment' and 'Fire' under the land resources environmental value.
Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities Well drilling and hydraulic fracturing	Surface Water	Disturbance to natural drainage patterns Degradation of water quality from sediment releases, spills or leaks of fuels and chemicals Impacts to aquatic flora and fauna from sediment releases, spills or leaks of	Infrastructure construction (earthworks activities) Vehicle and plant movements Storage and disposal of general waste, chemical and process wastes Well control or equipment failure	III	c	Low	<p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the land resources environmental value. <p>Surface Water</p> <ul style="list-style-type: none"> Well leases constructed on high ground wherever practicable. Preferentially select dry crossing sites for linear infrastructure with minimal earthworks requirements. Pre-existing areas of disturbance used to place infrastructure or seismic lines wherever practicable. Culverts and floodways installed where required to maintain natural water flows, drainage and surface runoff. Areas subject to inundation are assessed for conduciveness to support vehicles prior to access. Erosion and sediment controls installed, where necessary. Infrastructure and seismic lines located, prepared and constructed to maintain pre-existing surface water flows. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Production operations', 'Loss of containment' and 'Flood' under the land resources environmental value. Refer to control strategies for 'Drilling operations' under the groundwater environmental value.

Identification				Unmitigated Risk		Residual Risk	
Risk Event/ Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk	Risk
		fuels and chemicals Contamination of surface water	Minor spills or leaks of fuels, chemicals or other produced fluids Production operations Loss of containment Flood (natural event).				
Construction and operation of wells, gathering lines and incidental activities Well drilling and hydraulic fracturing	Groundwater	Contamination of groundwater resources Crossflow, aquifer contamination or reduction in pressure in aquifers Reduction in groundwater quantity and/or availability for other users Impacts to groundwater dependant ecosystems	Drilling and hydraulic stimulation / fracturing activities Production operations Well control or well head equipment failure Well casing or cement failure (well integrity failure) Minor spills or leaks of fuels, chemicals or other produced fluids Loss of containment Storage and disposal of general waste, chemical and process wastes Vehicle and plant movements	IV	c	Medium	IV a
				<p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the land resources environmental value. Well drilling, completion and hydraulic fracturing operations conducted in accordance with the Code of Practice for the Construction and Abandonment of Petroleum Wells and Associated Bores in Queensland (version 2 December 2019). <p>Groundwater</p> <ul style="list-style-type: none"> Drilling operations <ul style="list-style-type: none"> Formation evaluation program and drilling program in place. Well design to leading practice. Blowout preventers (BOP) used once surface casing is installed. Regular BOP drills, testing, certification, and maintenance. Drilling fluids will be water based, and not oil or synthetic based. Implementation of control measures and monitoring as documented in the Santos SWQ Underground Water Impact Report (UWMR) (refer to Appendix B). <p>Hydraulic fracturing operations</p> <ul style="list-style-type: none"> During the hydraulic fracturing process, Santos implements the following: <ul style="list-style-type: none"> Pressure tests of well casing and cement are conducted prior to hydraulic fracturing to confirm well integrity. 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. 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. 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 stimulation impact zone. 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. Implementation of control measures described in Sections 5.5 and 6.1.3. Implementation of control measures and monitoring as documented in the Santos South West Queensland Underground Water Impact Report (UWMR) (Appendix B) and Santos Stimulation Risk Assessment (SRA) (Appendix E). Implementation of the Santos Stimulation Impact Monitoring Program (SIMP). <p>Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Production operations' and 'Loss of containment' under the land resources environmental value.</p>			
Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and	Air Quality and Noise	Air pollution and localised reduction in air quality Nuisances caused by dust, light, vibration and noise generation	Infrastructure construction Vehicle and plant movements Seismic source Minor air emissions generated	II	c	Low	II b
			<p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the land resources environmental value. Emergency shutdown systems in place. Fit for purpose equipment. Conduct regular testing, inspections and maintenance of site equipment. <p>Air Quality and Noise</p> <ul style="list-style-type: none"> Identification of sensitive receptors during planning: <ul style="list-style-type: none"> Nearest sensitive receptors are located approximately 13.5 km east of the tenure (Durham Downs Pastoral Station homestead) (refer to Sections 5.6 and 5.7). 				

Identification				Unmitigated Risk		Residual Risk			
Risk Event/ Activity	Relevant EV	Potential Impact	Risk Source	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
incidental activities Well drilling and hydraulic fracturing		Disturbance to fauna and livestock	from vehicles and equipment Air emissions vented from testing and production activities Noise generated during drilling and hydraulic stimulation / fracturing activities and production operations						
Control Strategies				<ul style="list-style-type: none"> Landholders consulted as required where activities may affect sensitive receptors and/or agricultural operations. Systems in place for logging stakeholder/landholder complaints to ensure issues are recorded and addressed as appropriate. Noise managed in accordance with 'management hierarchy for noise' set out in the Environmental Protection (Noise) Policy 2019. Vehicles, engines and equipment operated and maintained in accordance with manufacturer specifications and planned maintenance systems. Use of attenuation/suppression devices where required i.e. silencing equipment on mobile plant. Majority of vehicle movements will be limited to daylight hours. Dust suppression measures carried out where required i.e. road watering. Preference to flare rather than vent and venting only in extreme circumstances. Seismic energy sources are not operated within the distance defined by Santos standards of any pipeline, infrastructure/utilities, installations or buildings. Refer to control strategies for 'Vehicle and plant movements' under the Land Resources EV. 					

6.0 Legislative Considerations

6.1 Environmental Protection Act 1994 (EP Act)

6.1.1 General Requirements for an EA Amendment Application (s226 EP Act)

Section 226 and Section 226A of the EP Act specify the requirements for an EA amendment application. Table 9 summarises the EP Act requirements assessed against this EA amendment application.

Table 9: Requirements EA Amendment Application (s226 and s226A EP Act)

Section of the EP Act	Relevance to Amendment Application
s226(1)(a) be made to the administering authority; and	The EA amendment application has been lodged with DES, who is the administering authority for the EP Act.
s226(1)(b) be made in the approved form; and	The application was made using the approved form.
s226(1)(c) be accompanied by the fee prescribed under a regulation; and	The prescribed fee was paid at lodgement of the EA amendment application.
s226(1)(d) describe the proposed amendment; and	Refer to Section 2.0.
s226(1)(e) describe the land that will be affected by the proposed amendment; and	Refer to Section 4.0.
s226(1)(f) include any other document relating to the application prescribed under a regulation.	Refer to information provided throughout this supporting report.
s226A(1)(a) describe any development permits in effect under the Planning Act for the carrying out of the relevant activity for the authority; and	Not applicable - no development permits are in effect under the <i>Planning Act 2016</i> for the activities that are the subject to the EA amendment application.
s226A(1)(b) state whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity; and	Not applicable - there are currently no eligibility criteria relevant to the activities proposed by the EA amendment application.
s226A(1)(c) if the application states that each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity— include a declaration that the statement is correct; and	Not applicable - there are currently no eligibility criteria relevant to the activities proposed by the EA amendment application.
s226A(1)(d) state whether the application seeks to change a condition identified in the authority as a standard condition; and	Not applicable - EA EPPG00407213 does not contain any standard conditions.
s226A(1)(e) if the application relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit—state whether the applicant seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit; and	Not applicable - the EA amendment application does not relate to a new resource tenure that is an exploration permit or a GHG permit.
s226A(1)(f) include an assessment of the likely impact of the proposed amendment on the environmental values, including—	Refer to Section 5.0.

Section of the EP Act	Relevance to Amendment Application
(i) a description of the environmental values likely to be affected by the proposed amendment; and	Refer to Section 4.0.
(ii) details of any emissions or releases likely to be generated by the proposed amendment; and	Refer to Section 5.0.
(iii) a description of the risk and likely magnitude of impacts on the environmental values; and	Refer to Section 5.0.
(iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and	Petroleum activities will be conducted in compliance with EA EPPG00407213 conditions and implementation of the environmental management practices/control measures outlined in Section 5.0 to minimise adverse impacts on the environmental values.
(v) details of how the land the subject of the application will be rehabilitated after each relevant activity ceases; and	The proposed amendment would not result in a change to the existing rehabilitation requirements. Notwithstanding, all significantly disturbed land will be rehabilitated and managed in accordance with the conditions of EA EPPG00407213.
s226A(1)(g) include a description of the proposed measures for minimising and managing waste generated by any amendments to the relevant activity; and	The proposed amendment would not result in a change to the existing waste management requirements. Waste management practices would continue to be implemented in accordance with the conditions of EA EPPG00407213.
s226A(1)(h) include details of any site management plan or environmental protection order that relates to the land the subject of the application.	Not applicable - there is no relevant site management plan or current environmental protection orders (EPOs) relating to land located within PL 1087.

6.1.2 CSG Activities Requirements for an EA Amendment Application (s227 EP Act)

Section 227 of the EP Act, specifies the requirements for an amendment application for CSG activities where the application:

- a) relates to an EA for a CSG activity; and
- b) the proposed amendment would result in changes to the management of CSG water; and
- c) the CSG activity is an ineligible ERA.

The proposed amendment does not relate to CSG activities. This section of the EP Act is not relevant.

6.1.3 Underground Water Rights - EA Amendment Applications (s227AA EP Act)

Section 227AA of the EP Act specifies the requirements for an EA amendment application where the application involves changes to the exercise of underground water rights for a petroleum lease. Section 227AA(2) of the EP Act requires the EA amendment application to state the matters mentioned in Section 126A(2) of the EP Act. These requirements are addressed in Table 10.

Table 10: Underground Water Rights (s227AA)

Section 227AA EP Act	Relevance to Amendment Application
(a) any proposed exercise of underground water rights during the period in which	As discussed in Section 5.5, the proposed activities would co-produce groundwater as a by-product of gas extraction from the Toolachee Formation (primary target) and

Section 227AA EP Act	Relevance to Amendment Application
resource activities will be carried out under the relevant tenure	Patchawarra Formation (secondary formation) within the Cooper Basin. While these deep formations are not considered useful aquifers, drawdown impacts from the extraction is predicted to propagate to the Arraburry and Tinchoo formations which are included in the Queensland GAB Regulation (Great Artesian Basin Resource Operations Plan (GAB ROP) and Water resources (GAB) Plan 2006. The proposed activities therefore would involve the exercise of underground water rights.
(b) the areas in which underground water rights are proposed to be exercised	The proposed amendment would result in the exercise of existing underground water rights within PL 1087.
(c) for each aquifer affected, or likely to be affected, by the exercise of underground water rights (i) a description of the aquifer	Refer to Sections 4.6 and 5.5 of this report. Groundwater extraction from the proposed activities would occur within the Toolachee to Patchawarra formations. These formations are not considered sandstone aquifers of the GAB. Drawdown from this extraction would potentially extend to the Tinchoo Formation and Arraburry Formation but is not predicted to extend into the sandstone aquifers of the overlying Eromanga Basin. This is due to the hydraulic separation of these basins and the relatively low extraction rates associated with conventional gas.
(ii) an analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers and surface water; and	<p>Refer to Figures 16-18 in the SWQ UWIR (attached as Appendix B). These figures display groundwater level and flow directions that could be established by all available groundwater level data.</p> <p>In general, groundwater flow in the GAB is towards the low-lying areas of Central Australia. From the eastern margin of the basin, groundwater flows are predominantly to the west, south and southwest. From the Western Australian recharge beds, flow is generally towards the east.</p> <p>Groundwater flow in each of the following formations (GAB aquifers) is briefly described below:</p> <p>Quaternary and Tertiary Alluvium</p> <p>Groundwater flow generally follows the topographical profile of the study area, with the only limitations imposed by the fluvial nature of the sediments. A hydrogeological map of the area (presented as Figure 16 in the SWQ UWIR) indicates that the hydraulic gradient is small.</p> <p>Winton Formation</p> <p>Based on the information available, the groundwater flow direction is broadly from the north-east to the south-west.</p> <p>Cadna-Owie Formation</p> <p>Insufficient water level information is available to describe water flows and water levels and therefore a hydrogeological map has not been generated.</p> <p>Hooray Sandstone</p> <p>It is noted that a number of bores within the Hooray Sandstone may be artesian. Groundwater bores are concentrated in the south-eastern region of the study area however, water level and salinity data is limited for the majority of the bores in the study area (i.e. within Santos tenements). Based on the information that is available, the</p>

Section 227AA EP Act	Relevance to Amendment Application
	<p>groundwater flow direction is generally towards the south-east and the water salinity is fresh to slightly brackish.</p> <p>Westbourne Formation, Adori Sandstone and Birkhead Formation</p> <p>There is no data available to characterise groundwater flow in these formations within the study area.</p> <p>Hutton Sandstone</p> <p>The groundwater flow is expected to be to the south-west i.e. consistent with the flow of the major GAB units as described in the literature (there is insufficient water level data in the Hutton Sandstone to characterise groundwater flow direction further).</p> <p>Poolowanna Formation</p> <p>As per the Hutton Sandstone, groundwater flow is expected to be to the south-west, which is consistent with the flow of the major GAB units as described in the literature.</p> <p>Preferential flow paths</p> <p>There is a very negligible risk of vertical preferential flow paths that may bypass the lack of vertical connectivity throughout the system because:</p> <ul style="list-style-type: none"> • The absence of connecting geological structures such as faults and other connecting features (such as unconformable contact zones) that would permit vertical migration. This statement seems particularly pertinent because there is an accumulation of petroleum at the location of the project. If there was any vertical connectivity, the petroleum product (which is less dense than water) could not have accumulated within the reservoir at all. • The implementation of production well construction to industry standards in order to manage the risk of gas migration into overlying formations due to inadequate seal between formations in poorly constructed wells. <p>Springs</p> <p>As discussed in Section 4.6, there are no GAB ROP discharge or recharge springs within or near PL 1087. The closest GAB springs are located more than >250 km from PL 1087. These springs are too far away to be at risk of hydraulic impact due to the proposed activities on PL 1087. Potential impacts to groundwater environmental values due to exercising underground water rights are further discussed in Section 6.1.3. Spring locations are presented in Section 4.3.8 of the SWQ UWIR (attached as Appendix B).</p>
<p>(iii) a description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and</p>	<p>The groundwater model prepared for the UWIR (refer to Appendix B) and Technical Memorandum (refer to Appendix C) specifically contemplate the development of PL 1087.</p> <p>The predictive modelling used to assess groundwater impacts is described in Section 7 of the UWIR. Revised drawdown maps are provided in the Technical Memorandum attached as Appendix C.</p>

Section 227AA EP Act	Relevance to Amendment Application
	<p>As discussed in Section 5.5, the impact of extraction from the Cooper Basin strata does not affect areas beyond the assumed extraction well locations at the top of the Cooper Basin stratigraphy. These impacts can therefore be discounted from the analysis of the overlying Eromanga Basin.</p> <p>The modelling predicts the IAA (after 3 years) and LTAA (after 20 years) from groundwater extraction from existing and planned wells. The IAA model used extraction rates from the last historical extraction year (2019) to represent future extraction rates.</p> <p>The LTAA used these historical extraction rates (2019) and added the extraction from 866 petroleum wells in the Cooper Basin (212 existing wells, 654 new wells) and 678 petroleum wells in the Eromanga Basin (252 existing wells, 426 new wells) –</p> <p>The modelling considered extraction from up to 9 proposed gas wells within PL 1087 (refer to Golder, 2021 attached as Appendix C).</p> <p>The ‘affected area’ was defined as those areas with two m of drawdown in the shallow alluvial aquifers or more than five m of drawdown in the deeper consolidated aquifers.</p> <p>The modelling identified development of up to 9 gas wells within PL 1087 is predicted to result in an insignificant change to the predicted impact to groundwater resources.</p> <ul style="list-style-type: none"> o the maximum estimated drawdown in the IAA due to cumulative extraction from the Cooper Basin is less than 10 m in the Toolachee to Patchawarra Formations. Refer to Table 4 and Figure 8 of Appendix C. o the maximum estimated drawdown for the LTAA due to cumulative extraction from the Cooper Basin is less 52 m in the Toolachee to Patchawarra Formations. Refer to Table 4 and Figure 8 of Appendix C. <p>The SWQ UWIR modelling results are conservative and worst-case. The actual drawdown is expected to be less than predicted based on the intermittent and time-limited operation of extraction wells, and the conservative assessment of flow rate assigned to each well in the model.</p>
<p>(iv) the predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out;</p>	<p>The long-term/conservative modelled extraction rates for petroleum wells targeting the Cooper Basin modelled for the UWIR was 4.01 m3/day/well.</p> <p>The volume of water predicted to be extracted by existing wells (4) and proposed wells (5) within PL 1087 (9 wells in total) is up to 36.09 m3/day.</p>
<p>(d) the environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values;</p>	<p>The calculated impact in the Cooper Basin is described generally in Section 5.5.</p> <p>Impact to Water Bores</p> <p>As discussed in Section 5.5, there is one registered groundwater bore (Jensens Bore, RN: 50388, owned by Durham Downs Holding) located in PL 1087. Jensens Bore was drilled in 1981 and is a sub-artesian bore that accesses shallow groundwater from the Winton formation.</p>

Section 227AA EP Act	Relevance to Amendment Application
	<p>Bore bottom depth is approximately 445m (Queensland Globe, 2022; DNRME, 2022).</p> <p>As detailed in Appendix C (Refer to Table 4 and Figure 8), the maximum estimated drawdown in the IAA due to extraction from the Eromanga Basin in the Tertiary and Quaternary strata (including the Glendower and Winton Formations) is predicted to be less than 2 m. The maximum estimated long term drawdown in the same units is predicted to be less than 4 m. Santos will ensure that water quality baseline monitoring and stimulation impact monitoring is conducted in accordance with EA conditions, approved UWIR and the <i>Queensland Water Act 2000</i> (Water Act). This will ensure that any impacts to this bore are detected early and action taken if required, by agreement with the affected bore owner (i.e. remediation of the bore or make good arrangements).</p> <p>Impact to Springs</p> <p>There is no predicted impact to springs predicted due to the proposed amendment. The nearest springs are located ~250 km away.</p> <p>Impact to Other Surface Waters</p> <p>There is no impact to the shallowest aquifers that have the potential to interact with surface waters. Accordingly, there are no expected impacts to surface water bodies that may be dependent on groundwater-surface water interactions.</p> <p>Impact to Formation Integrity and Surface Subsidence</p> <p>The risk of subsidence impacts to groundwater due to reservoir depressurisation on PL 1087 is very low because:</p> <ul style="list-style-type: none"> the target formations are sandstone, which is not considered easily compressible (as opposed to more compressible formations like coal seams); and the target formations are more than 1500m below ground level, and at such a depth would require significant stresses to make it deform.
<p>(e) any impacts on the quality of groundwater that will, or may, happen because of the exercise of underground water rights during or after the period in which resource activities are carried out;</p>	<p>There are no expected impacts on groundwater quality due to:</p> <ul style="list-style-type: none"> a pre-existing vertical gradient exists, whereby the deeper formations tend to be under greater a hydraulic pressure than overlying formation. The difference in pressure is greater than 150m throughout the full stratigraphic sequence; the change to the hydraulic pressures induced by development on PL 1087 will not be sufficient to reverse change the general direction of migration that drives water from deeper formation up into shallower formations; and deeper formations have generally poorer quality water than shallower formations. A reduction in the vertical upward gradient will therefore not induce more saline water from deeper formations to migrate into shallower formations. <p>The following sections presents the basis of these assertions. While the SWQ UWIR does not assess impacts</p>

Section 227AA EP Act	Relevance to Amendment Application
	<p>to groundwater quality directly, it does provide baseline aquifer information to support a qualitative assessment.</p> <p>Impact On Baseline Hydraulic Gradient</p> <p>The vertical upward gradient throughout the stratigraphic sequence will not be impacted by development.</p> <p>Baseline Groundwater Quality</p> <ul style="list-style-type: none"> • Quaternary and Tertiary Alluvium - the salinity of the aquifer is brackish, with electrical conductivity (EC) values ranging from 3,000 to 7,000µS/cm or 2,000 to 4,700mg/L Total Dissolved Solids (TDS). • Winton Formation - The water quality in the Winton Formation is brackish (to saline) with ECs ranging from 900 to 13,000µS/cm or 600 to 9,000mg/L TDS. • Cadna-Owie Formation - The limited data available in the DoR groundwater database indicate fresh to slightly brackish water quality with the Wyandra Sandstone. • Hooray Sandstone - The water quality in the Hooray Sandstone is generally fresh to slightly brackish. EC values range from 675 to 3,930µS/cm or 450 to 2,700mg/L TDS. A number of Hooray water supply bores have salinity values measured over a 40-year period, the latest of which compare well with historical values. • Westbourne Formation, Adori Sandstone and Birkhead Formation - Salinity data are not available for the Westbourne, Adori and Birkhead Formations. • Hutton Sandstone - Salinity data are not available for the Hutton Sandstone is not known. • Poolowanna Formation – Salinity data are not available for the Poolowanna Formation.
<p>(f) strategies for avoiding, mitigating or managing the predicted impacts on the environmental values stated for paragraph (d) or the impacts on the quality of groundwater mentioned in paragraph (e).</p>	<p>The proposed activities within PL 1087 are unlikely to result in a significant impact to groundwater values as demonstrated in the SWQ UWIR (refer to Appendix B), Golder Technical Memorandum (refer to Appendix C) and as described above.</p> <p>The monitoring strategy proposed by the SWQ UWIR will be implemented in accordance with the requirements under the Queensland <i>Water Act 2000</i> commensurate to the risk of groundwater impact that is predicted by the SWQ UWIR. This monitoring may be periodically reviewed and adapted in accordance with the requirements under the Queensland <i>Water Act 2000</i>.</p>

6.1.4 Assessment Level Decision for Amendment Application (s228 EP Act)

Within 10 business days after receiving an EA amendment application, the administering authority must decide on the assessment level decision for the EA amendment application. The assessment level decision will determine whether the EA amendment application is a major or minor amendment. Section 223 of the EP Act provides the minor amendment (threshold) assessment. Table 11 provides information to support the assessment of this EA amendment application as a major amendment.

Table 11: Minor Amendment (Threshold) Assessment (s223 EP Act)

Minor amendment (threshold), for an environmental authority, means an amendment that the administering authority is satisfied -		Relevance to Amendment Application
(a) is not a change to a condition identified in the authority as a standard condition, other than-	✓	EA EPPG00407213 does not identify any standard conditions.
(a)(i) a change that is a condition conversion; or	✓	
(a)(ii) a change that is not a condition conversion but that replaces a standard condition of the authority with a standard condition for the environmentally relevant activity to which the authority relates; and	✓	
(b) does not significantly increase the level of environmental harm caused by the relevant activity; and	✓	<p>The petroleum activities associated with the proposed amendment are not new and are consistent with the activities authorised in EA EPPG00407213.</p> <p>As described in Section 2.0, this EA amendment seeks to list a replacement resource tenure and authorise existing and proposed new wells and associated infrastructure in PL 1087. All activities other than 'production', are already authorised by the existing EA EPPG03518215 for the underlying ATP 1189.</p> <p>As described in Section 2.0 and Section 5.0, there will be no significant increase to the level of environmental harm as a result of the proposed amendment.</p>
(c) does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority; and	✓	The proposed amendment does not seek to change any rehabilitation objectives or conditions.
(d) does not significantly increase the scale or intensity of the relevant activity; and	✗	<p>The amendment would increase the scale of the relevant activity on PL 1087 from 6 wells to 11 wells.</p> <p>Note: of the existing 6 wells on PL 1087, only 4 wells are operational, and 2 wells are plugged and abandoned.</p>

(e) does not relate to a new relevant resource tenure for the authority that is – (e)(i) a new mining lease; or (e)(ii) a new petroleum lease; or (e)(iii) a new geothermal lease under the Geothermal Energy Act; or (e)(iv) a new GHG injection and storage lease under the GHG storage Act; and	×	The proposed amendment relates to a new petroleum lease PL 1087.
(f) involves an addition to the surface area for the relevant activity of no more than 10% of the existing area; and	×	Additional surface area will be required (up to 64 ha) for the 5 proposed new wells and associated infrastructure within PL 1087. This is greater than a 10 % increase of the existing authorised disturbance area.
(g) for an environmental authority for a petroleum activity –	✓	The proposed amendment does not involve constructing a new pipeline more than 150 km in length.
(g)(i) if the amendment involves constructing a new pipeline – the new pipeline does not exceed 150km; and	✓	The proposed amendment does not involve constructing a new pipeline more than 150 km in length.
(g)(ii) if the amendment involves extending an existing pipeline- the extension does not exceed 10 % of the existing length of the pipeline; and	✓	The proposed amendment does not involve extending an existing pipeline.
(h) if the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit - the amendment application under section 224 seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority to the extent it relates to the permit.	✓	The proposed amendment does not relate to a new relevant resource tenure that is an exploration permit or GHG permit.

6.1.5 The Standard Criteria (EP Act)

The standard criteria (as defined by Schedule 4 of the EP Act) are required to be considered by the administering authority for both a major and minor amendment applications. Table 12 provides an assessment of the proposed amendment against the standard criteria.

Table 12: Standard Criteria (EP Act)

Schedule 4 EP Act	Relevance to the EA Amendment Application
(a) the following principles of environmental policy as set out in the Intergovernmental Agreement on the Environment – (i) the precautionary principle; (ii) intergenerational equity; (iii) conservation of biological diversity and ecological integrity; and	The precautionary principle was considered for the application. It is considered that the proposed activities will use ‘proven’ technology and sufficient scientific data exists that a reverse onus does not exist. The principle of intergenerational equity was considered for the application. It is considered that the proposed activities would not impact the use of environmental values by future generations. The principles of conservation of biological diversity and ecological integrity were considered for the application. The proposed application would not result in significant impacts to biological diversity or ecological integrity.

Schedule 4 EP Act	Relevance to the EA Amendment Application
(a)(iii) conservation of biological diversity and ecological integrity; and	The principles of conservation of biological diversity and ecological integrity were considered for the application. The EA amendment application would not result in significant impacts to biological diversity or ecological integrity.
(b) any Commonwealth or State government plans, standards, agreements or requirements about environmental protection or ecologically sustainable development	<p>The proposed activities will be undertaken in accordance with the applicable requirements of the following:</p> <ul style="list-style-type: none"> • EP Act; • EPBC Act; • NC Act; • <i>Petroleum and Gas (Production and Safety) Act 2004</i> (P&G Act); • <i>Regional Planning Interests Act 2014</i> (RPI Act); and • <i>Vegetation Management Act 1999</i> (VM Act). <p>The relevance of these Acts to this application is referenced throughout the supporting information.</p>
(c) any relevant environmental impact study, assessment or report	N/A – an EIS has not previously been prepared for the EA amendment application.
(d) the character, resilience and values of the receiving environment	Refer to Sections 4.0 and 5.0
(e) all submissions made by the application and submitters	The EA amendment application should not be subject to public notification as there is not likely to be a substantial increase in the risk of environmental harm under the amended EA, nor a substantial change in the contaminants permitted to be released to the environment.
<p>(f) the best practice environmental management (BPEM) for activities under any relevant instrument, or proposed instrument, as follows-</p> <ul style="list-style-type: none"> (i) an environmental authority; (ii) a transitional environmental program; (iii) an environmental protection order; (iv) a disposal permit; (v) a development approval; and 	BPEM of the proposed activities would be achieved through compliance with existing conditions of EA (EPPG00407213) and implementation of management measures as described in Section 5.0 of this document.
(g) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out under the instrument; and	Santos will continue to provide adequate funds, equipment and staff time to comply with the conditions of EA EPPG00407213.
(h) the public interest; and	The proposed amendment is in the public interest, as it will facilitate the production of petroleum to meet the needs of customers in Queensland and other Australian states/territories. Petroleum produced by Santos will also generate taxes and royalties to the Queensland State Government, which provide an ongoing source of revenue to support government services provided to the public.

Schedule 4 EP Act	Relevance to the EA Amendment Application
	Furthermore, in Australia and Queensland, oil and gas plays an important role in domestic energy security and diversification, supporting intermittent renewable energy sources.
(i) any relevant site management plan (SMP); and	There are no SMPs applicable to the EA amendment application.
(j) any relevant integrated environmental management system (IEMS) or proposed IEMS; and	The Santos Management System (SMS) will be implemented for the proposed petroleum activities.
(k) any other matters prescribed under a regulation.	The Environmental Protection Regulation 2019 prescribes an environmental objective assessment relating to an environmental management decision as an additional matter for the standard criteria. Sections 2.0 to 5.0 of this supporting information report addresses the matters raised in the environmental objective assessment.

6.1.6 Prescribed Matters for Particular Resource Activities (s28 EP Reg)

Section 226 of the EP Act specifies the general requirements for an EA amendment application. This includes item (1)(f) which specifies any other documents relating to the application prescribed under a regulation. Section 28 of the EP Reg describes the prescribed documents for an EA application for a CSG activity.

This amendment does not involve the management of CSG water.

6.2 Environmental Offsets Act 2014

In accordance with Section 207(1)(c) of the EP Act, the administering authority may impose an environmental offset condition on an EA. However, Section 14(1) of the EO Act states that an offset condition may only be imposed on an EA if the proposed activity will or is likely to have a significant residual impact on the prescribed environmental matter, and all reasonable on-site mitigation measures for the prescribed activity have been, or will be, undertaken.

As discussed in Section 5.8, the proposed activities are unlikely to result in significant residual impacts to prescribed environmental matters (MSES) provided the proposed measures to avoid, minimise and mitigate potential impacts are carried out (as outlined in the following sections and in Section 5.0 and Table 8). Table 13 summarises the relevant MSES present in PL 1087.

Table 13: Prescribed Environmental Matter Assessment

Schedule 2 Environmental Offsets Regulation 2014	Relevance to PL 1087	
2. Regulated vegetation	✓	Regulated vegetation is mapped within PL 1087, including: <ul style="list-style-type: none"> 1,126 ha intersecting a watercourse; and 404 ha within 100 m of a vegetation management wetland.

Schedule 2 Environmental Offsets Regulation 2014	Relevance to PL 1087	
3. Connectivity areas	✘	<p>While connectivity areas are present, the proposed resource activity does not relate to a fixed footprint and therefore cannot be assessed using the Landscape Fragmentation and Connectivity Tool.</p> <p>However, the current extent of remnant vegetation in PL 1087 largely represents the pre-clearing extent. Therefore, impacts are unlikely to trigger for significance under the Landscape Fragmentation and Connectivity Tool irrespective of infrastructure locations.</p> <p>Using the Queensland Environmental Offsets Policy, Significant Residual Impact Guideline, a development impact on connectivity areas is determined to be significant if either of the following tests are true:</p> <p>Test 1 — change in core remnant ecosystem extent at the local scale is greater than the threshold. The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale. PL 1060 is mapped as 100% remnant vegetation (regional scale extent of core remnant ecosystem > 90%), therefore change threshold for local core scale remnant ecosystem is 50%. Future disturbance will not result in a reduction of more than 50% of the core remnant ecosystem extent around any disturbance. Test 1 would be false irrespective of infrastructure locations.</p> <p>Test 2 — Loss or fragmentation of core remnant ecosystem at the site scale. Any core area that is greater than or equal to 1 hectare is lost or reduced to patch fragments (core to non-core). If the number of core areas that are greater than or equal to one hectare in area is greater pre-impact than post-impact that part of the significant impact test is true. PL 1060 is mapped as 100% remnant vegetation; the connectivity tool sees this as one patch. The number of core areas that are greater than or equal to one hectare in area will not be greater pre-impact than post-impact. The proposed disturbances will not result in the removal of the one existing core patch. Test 2 would also be false.</p>
4. Wetlands and watercourses	✘	There are no HES wetlands of HES present in PL 1087.
5. Designated precinct in a strategic environmental area	✘	PL 1087 is not located in a strategic environment area.
6. Protected wildlife habitat	✓	<p>The prescribed activity:</p> <ul style="list-style-type: none"> • will not be undertaken in an area identified as essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife; • will not be undertaken in an area that is shown as a high risk area on the flora survey trigger map; and • may be undertaken in an area of low potential habitat (i.e. foraging, roosting, nesting or breeding habitat) for an animal that is vulnerable or endangered. <ul style="list-style-type: none"> ○ Grey Falcon (low potential habitat) ○ Major Mitchell's Cockatoo (low potential habitat) ○ Painted Honeyeater (low potential habitat); and ○ <i>Indigofera oxyrachis</i> (low potential habitat).
7. Protected areas	✘	There are no protected areas present in PL 1087.

Schedule 2 Environmental Offsets Regulation 2014	Relevance to PL 1087	
8. Highly protected zones of State marine parks	x	There are no State marine parks present in PL 1087.
9. Fish habitat areas	x	There are no <i>Fisheries Act 1994</i> declared fish habitat areas present in PL 1087.
10. Waterway providing for fish passage	x	<p>The <i>Queensland Environmental Offsets Policy Significant Residual Impact Guideline</i> (DEHP, 2014) provides the criteria for determining significant impacts on a waterway providing for fish passage. Based on these criteria, the proposed activities would not have a significant residual impact on this prescribed environmental matter due to:</p> <ul style="list-style-type: none"> (a) The highly ephemeral streams within PL 1087 only provide potential for fish passage during periods of high rainfall causing streamflow. (b) Construction within watercourses would not occur during periods of streamflow, avoiding potential fish mortality or injury. Accordingly, construction of infrastructure within watercourses would not: <ul style="list-style-type: none"> i. reduce the extent, frequency, or duration of fish passage; ii. result in a substantial change to the hydrological regime of the watercourse; or iii. lead to significant changes in water quality parameters within the watercourse.
11. Marine plants	x	There are no areas containing marine plants present in PL 1087.
12. Legally secured offset areas	x	Legally secured offset areas (offset register areas and vegetation offsets through a Property Map of Assessable Vegetation) are not present in PL 1087.

As per Section 8 of the EO Act, a significant residual impact is generally an adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that:

- a) remains, or will or is likely to remain, (whether temporarily or permanently) despite on-site avoidance and mitigation measures for the prescribed activity; and
- b) is, or will or is likely to be, significant.

The *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP, 2014) has been developed to assist in deciding whether or not a prescribed activity will, or is likely to have, a significant residual impact on a MSES. The criteria contained in the guideline provides direction for identifying when an impact on a prescribed environmental matter that is MSES, may be ‘significant’. Table 14 considers these criteria for each of the relevant prescribed matters present in PL 1087.

Impacts have been assessed for activities associated with development of 5 additional wells and associated infrastructure. The precise location of infrastructure is subject to the progressive development of the tenure over a 10 - 20 year timeframe.

An upper disturbance limit of 64 ha for MSES has been utilised for this assessment. This is a conservative upper disturbance estimate only, as future well locations (and associated infrastructure) are not known at the time of application i.e. potential disturbance associated with the proposed 5 additional wells has been conservatively over-estimated, and will likely be less. As such, the assessment of impacts within this report (as undertaken by ELA, 2022 – refer to Appendix A) takes a precautionary approach and simulates a conservative disturbance scenario.

Table 14: Significant Residual Impact Summary Table

Prescribed Environmental Matters		Significant Residual Impact Criteria
2. Regulated vegetation	x	<p>Table 1 of the <i>Significant Residual Impact Guideline</i> (DEHP 2014) details the significant residual impact test criteria for regulated vegetation.</p> <p>Where disturbance to regulated vegetation exceeds the clearing limits for appropriate criteria set out in Table 1, a significant residual impact to Regulated vegetation will occur.</p> <p>The regulated vegetation present in the study area is that located within a defined distance of a relevant watercourse or drainage feature and those REs that intersect a mapped wetland. This includes a number of REs, all of which are in the 'sparse' to 'very sparse' structure category.</p> <p>A portion of regulated vegetation intersecting a watercourse and regulated vegetation within 100m of a vegetation management wetland may be directly impacted through the clearing of vegetation for infrastructure for the proposed development.</p> <p>Infrastructure will be located outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable.</p> <p>Where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits.</p> <p>Infrastructure will be located outside Vegetation Management Wetlands, and greater than 50 m from the defining bank, where practicable.</p> <p>Where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits.</p> <p>Therefore, No SRI to this MSES will occur.</p>
6. Protected wildlife habitat	x	<p>As discussed in Sections 4.4 and 4.9, following desktop and field assessment, ELA (2022) conservatively assessed PL 1087 to contain low potential MSES protected wildlife habitat for:</p> <ul style="list-style-type: none"> • Grey Falcon (low potential habitat) • Major Mitchell's Cockatoo (low potential habitat) • Painted Honeyeater (low potential habitat); and • <i>Indigofera oxyrachis</i> (low potential habitat). <p>Based on known distributions, species' occurrence records within the region, and preferred habitat requirements, the identified species are considered by ELA (2022) to be unlikely or have low potential to occur within PL 1087, due to the lack of high-quality suitable habitat within the tenure, or because the tenure is outside the known range of the species.</p> <p>When considered against the significant impact criteria below, ELA determined that the removal of up to 64 ha of low potential habitat for Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and <i>Indigofera oxyrachis</i> did not present a significant residual impact.</p> <p>Refer to Appendix A and Section 6.2.1 for further detail.</p> <p>Therefore, SRI to this MSES is unlikely.</p>

6.2.1 Protected Wildlife Habitat

For endangered and vulnerable wildlife habitat (including essential habitat), an action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:

- lead to a long-term decrease in the size of a local population; or
- reduce the extent of occurrence of the species; or
- fragment an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- introduce disease that may cause the population to decline, or
- interfere with the recovery of the species; or
- cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

For special least concern (non-migratory) animal wildlife habitat, an action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:

- a long-term decrease in the size of a local population; or
- a reduced extent of occurrence of the species; or
- fragmentation of an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.

As discussed in Sections 4.9, ELA (2022) determined that PL 1087 contains low potential habitat for the following species subject to MSES protected wildlife habitat:

- Grey Falcon (low potential habitat), NC Act listed vulnerable
- Major Mitchell's Cockatoo (low potential habitat), NC Act listed vulnerable
- Painted Honeyeater (low potential habitat), NC Act listed vulnerable; and
- *Indigofera oxyrachis* (low potential habitat), NC Act listed vulnerable.

ELA (2021) assessed the potential impacts of removing up to 64 ha of low potential habitat for Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Indigofera oxyrachis* against the significant residual impact criteria and determined that a significant residual impact to these species was unlikely because:

- There is no current evidence of the presence of the species within PL 1087 and the presence of suitable habitat has been inferred from detailed RE mapping and associated habitat preferences for each species.
- The area subject to disturbance is not considered to be an ecologically significant location i.e. the clearing of 64 ha of habitat would not cause disruption to an ecologically significant location for the species.
- The upper disturbance limit of 64 ha is negligible in the context of the total area of potential habitat available within PL 1087 for protected wildlife species – as follows:

- o For Grey Falcon this is up to 0.8% of 8,210 ha of available habitat in PL 1087;
 - o For Major Mitchell's Cockatoo this is up to 1.2% of 5,262 ha of available habitat in PL 1087;
 - o For Painted Honeyeater this is up to 7.4% of 873 ha of available habitat in PL 1087; and
 - o For *Indigofera oxyrachis* this is up to 1.1% of 5,890 ha of available habitat in PL 1087.
- A large component of the total disturbance area will be temporary, with many areas (e.g. pipeline RoWs) being progressively rehabilitated and allowed to regenerate consistent with surrounding areas at the completion of construction activities.
 - Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions specified in EA EPPG00407213.
 - The Grey Falcon and Major Mitchell's Cockatoo are wide ranging mobile species that may undertake movements in response to changes in the suitability of habitat. This suggests that if present within the study area, any individuals affected by the relatively small increase in disturbance footprint should be able to relocate to nearby areas of suitable habitat that remain undisturbed.
 - o Further, the Painted Honeyeater is nomadic and moves in response to flowering mistletoe. The species potential presence within the study area are likely only limited to those events.
 - Considering the linear nature of the proposed development impacts and mitigation measures to be implemented, potential impacts to important or breeding habitat (such as hollow-bearing trees) or large areas of foraging habitat (mistletoe) is considered unlikely or will otherwise be avoided where practicable.
 - The disturbance will predominantly (>80%) occur in largely treeless grasslands, herblands / forblands and shrublands, and will not result in significant fragmentation or isolation of populations, nor is the proposed development likely to result in the introduction of invasive species or diseases.
 - The disturbance will occur in a progressive nature, such that the total of 64 ha impact will not occur at the one time, but rather spread across a number of years.
 - The habitat of the study area operates under a boom / bust cycle, which drives diversity and faunal activity (e.g., species respond to rains and multiple good seasons). The proposed, progressive nature of the impacts, particularly with the implementation of mitigation measures, will not alter this natural cycle of boom / bust seasons; and
 - The proposed development will not interfere with any relevant recovery strategies.

Detailed summaries of the ELA significant residual impact criteria for each relevant species are provided in Sections 6.2.1.1 to 6.2.1.4 and Appendix A.

6.2.1.1 Grey Falcon (*Falco hypoleucos*) – potential impacts and significance assessment

The project will result in direct impacts of up to 64 ha of vegetation considered to be potential foraging habitat for Grey Falcon. No breeding places were identified within the study area during the field surveys, however, given the species persistence in the region (observed approx. 30 km south from the study area during August 2021), breeding may occur within the study area and surrounds. Foraging habitat within the study area includes a range of treed and tree-less habitat, with potential breeding habitat limited to areas along watercourses where taller trees occur, and nesting sites may exist.

In consideration of the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to Grey Falcon are unlikely to be significant (refer to Table 15).

Table 15: Significant Residual Impact Assessment for the Grey Falcon

Criteria	Response to Criteria
Lead to a long-term decrease in the size of a local population	<p>The Grey Falcon occurs in arid and semi-arid Australia and occurs at low densities within this inland environment. It is a wide ranging, mobile species.</p> <p>Grey Falcon habitat within the study area is considered to represent mostly potential foraging habitat, with potential breeding habitat limited to taller trees along watercourses (such as Acacia woodlands habitat type). Given the lack of species observations within the study area, and the majority of the study area comprising only foraging habitat, it is unlikely an important population of Grey Falcon occurs in the study area.</p> <p>The project will directly impact up to 64 ha of foraging habitat. Direct impacts of the proposed development are unlikely to inhibit breeding or movement of the Grey Falcon and is unlikely to lead to a long-term decrease in the size of an important population or size of a local population.</p>
Reduce the extent of occurrence of the species	<p>The extent of occurrence (EOO) is estimated at 6.1 million km², and the area of occupancy (AOO) estimated at 6,000 km² (Garnett et al. 2011). Direct impacts up to 64 ha of potential habitat will not inhibit breeding or movement of the species, and therefore is unlikely to reduce the AOO or EOO of the species.</p>
Fragment an existing population	<p>Direct impacts up to 64 ha of potential foraging habitat is likely to be predominantly linear in nature (e.g. access tracks, pipeline right of ways) and minor areas of clearing for well pads.</p> <p>An important population of the species is unlikely to occur (as per the above). This species is highly mobile and wide ranging, therefore, the proposed development is unlikely to fragment an existing population into two or more populations.</p>
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	<p>No habitat critical to the survival of the species is defined for Grey Falcon. Whilst potential habitat for the species may be present in the form of potential foraging and breeding habitat, the habitat present in the study area is typical of that in the surrounding landscape and is unlikely to be necessary for the long-term maintenance of the species, or to maintain genetic diversity or for the reintroduction of populations. As such, habitat within the study area is unlikely to be habitat critical to the survival of the Grey Falcon. The proposed development will directly impact up to 64 ha of potential foraging habitat, which is a small amount of habitat available within the study area and surrounding region. In consideration of these facts, the proposed development is not considered to adversely affect habitat critical to the survival of the species.</p> <p>Further, the proposed development will directly impact up to 64 ha of potential foraging habitat, which is a small amount of habitat available within the study area and surrounding region. An important population or ecologically significant locations for Grey Falcon is unlikely to occur. Therefore, the proposed development is unlikely to disrupt to the breeding cycle of an important population or disrupt an ecological significant location.</p> <p>To minimise potential impacts to individuals, mitigations outlined in Section 5.0 are recommended.</p>

<p>Result in genetically distinct populations forming as a result of habitat isolation</p>	<p>The proposed development will directly impact up to 64 ha of potential foraging habitat only. Whilst the area of potential habitat will decrease within the study area, the extent is negligible considering the wide ranging and mobile nature of the species. Appropriate management practises will be implemented during the proposed development to reduce the risk of habitat degradation of surrounding areas. The proposed development is unlikely to impact habitat to the extent that the species is likely to decline or be isolated given the nature of the proposed impact and the species' mobile nature.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p>Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species.</p> <p>Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.</p>
<p>Introduce disease that may cause the species to decline</p>	<p>It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (<i>Phytophthora cinnamomi</i>).</p>
<p>Interfere with the recovery of the species</p>	<p>There is no Recovery Plan for this species. Considering the wide ranging and mobile nature of the species and that the habitat impacted is negligible in regard to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.</p>

6.2.1.2 Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) – potential impacts and significance assessment

The proposed development will result in direct impacts up to 64 ha of vegetation considered to be potential habitat for Major Mitchell's Cockatoo. The species inhabits a wide range of treed and treeless inland habitats, however these areas are always within a close distance to water. Foraging habitat within the study area consists of both these habitats (especially saltbush and Acacia habitats), with potential breeding habitat limited to trees capable of hosting tree hollows in which they nest.

In consideration of the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to Major Mitchell's Cockatoo are unlikely to be significant (refer to Table 16).

Table 16: Significant Residual Impact Assessment for Major Mitchell's Cockatoo

Criteria	Response to Criteria
Lead to a long-term decrease in the size of a local population	<p>No observations of the species were made in the study area, however, several species records occur within the region, including a relatively recent record (2014) within 25 km of the study area.</p> <p>The proposed development will directly impact up to 64 ha of potential habitat. This is a wide ranging and mobile species recorded across much of inland Australia.</p> <p>Direct impacts of the proposed development are unlikely to inhibit breeding or movement of the Major Mitchell's Cockatoo and is unlikely to lead to a long-term decrease in the size of a local population.</p>
Reduce the extent of occurrence of the species	<p>The species is wide ranging and mobile, recorded across much of inland Australia. Direct impacts up to 64 ha of potential habitat is relatively small and is unlikely to inhibit breeding or movement of the species, and therefore is unlikely to reduce the EOO of the species.</p>
Fragment an existing population	<p>Direct impacts up to 64 ha of potential habitat is likely to be predominantly linear in nature (e.g. access tracks, pipeline right of ways) and minor areas of clearing for well pads.</p> <p>This species is highly mobile and wide ranging, therefore, the proposed development is unlikely to fragment an existing population into two or more populations.</p>
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	<p>The proposed development will directly impact up to 64 ha of potential habitat. Potential foraging habitat within the study area is widespread, whilst potential breeding habitat is limited to watercourses that are more likely to host taller trees capable of forming hollow bearing trees in which individuals may nest. Appropriate mitigation measures will be implemented to minimise potential disruptions to individuals. Therefore, the proposed development is unlikely to ecological significant locations given these measures and the varsity of similar habitat in the landscape.</p>
Result in genetically distinct populations forming as a result of habitat isolation	<p>The proposed development will directly impact up to 64 ha of potential habitat. Whilst the area of habitat will decrease within the study area, the extent is negligible considering the wide ranging and mobile nature of the species. Impacts from habitat fragmentation to the species would be minimal. Appropriate management practises will be implemented during the proposed development to reduce the risk of habitat degradation of surrounding areas. The proposed development is unlikely to impact habitat to the extent that distinct populations would form as a result of habitat isolation.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p>Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species.</p> <p>Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.</p>

Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (<i>Phytophthora cinnamomi</i>).
Interfere with the recovery of the species	There is a Recovery Plan for this species. Considering the wide ranging and mobile nature of the species, and that the habitat impacted is negligible in regards to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.

6.2.1.3 Painted Honeyeater (*Grantiella picta*) – potential impacts and significance assessment

The project will result in direct impacts of up to 64 ha of vegetation considered to be potential habitat for Painted Honeyeater. Potential habitat present is limited to creek lines and nearby Acacia dominated woodlands that may host mistletoe. The closest known record is approximately 25 km south-east (ALA, 2021) of the study area.

In consideration of the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to Major Mitchell's Cockatoo are unlikely to be significant (refer to Table 17).

Table 17: Significant Residual Impact Assessment for Painted Honeyeater

Criteria	Response to Criteria
Lead to a long-term decrease in the size of a local population	The species is a mistletoe specialist and relies on this food source in the landscape. It is a widespread, nomadic species responding to flowering mistletoe events, thus its presence in the study area only being occasional. The species is often only observed singly or in pairs or small flocks. Given the infrequency of mistletoe observed in the study area, it is unlikely an important population of Painted Honeyeater inhabits the study area. Further, given the relatively small impact area (up to 64 ha) and the context of the species being widespread with records concentrated around areas likely to contain mistletoe host trees (i.e. Coolabah within the Cooper Creek floodplain), it is unlikely the proposed development will lead to a long-term decrease in the size of a population at a local or regional level.
Reduce the extent of occurrence of the species	Given the above, it is unlikely an important population of Painted Honeyeater occurs in the study area. Further, the EOO is estimated to be 2 800 000 km ² and the AOO is estimated to be 1 000 km ² (Garnett et al., 2011), therefore, the relatively small impacts of up to 64 ha is unlikely to reduce either of these.
Fragment an existing population	An important population of Painted Honeyeater is unlikely to occur within the study area given the sparsity of mistletoe observed on which the species relies. It is therefore unlikely project impacts of up to 64 ha of potential species habitat would fragment an existing population of this wide-ranging and mobile species.
Result in genetically distinct populations forming as a result of habitat isolation	The species is mobile and wide ranging. Habitat throughout the study area is sparse and limited to infrequent areas hosting mistletoe. Given the small impacts proposed, and these mostly being of a linear nature, it is unlikely impacts would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, nor would it result in a genetically distinct population forming as result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species. Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (<i>Phytophthora cinnamomi</i>).
Interfere with the recovery of the species	There is no Recovery Plan for this species. Considering the wide ranging and mobile nature of the species and that the habitat impacted is negligible in regard to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.
Cause disruption to ecologically significant locations (breeding, feeding, nesting,	The species is mobile and wide ranging. Habitat throughout the study area is sparse and limited to infrequent areas hosting mistletoe. Given the small impacts proposed, and these mostly being of a linear nature, it is unlikely impacts would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, nor would it result in a genetically distinct

migration or resting sites) of a species.

population forming as result of habitat isolation. The species is a mistletoe specialist and almost entirely relies on this food source for survival. Given the scarcity of mistletoe observed in the study area, it is unlikely that habitat critical to the survival of the species occurs in the study area. Therefore, it is unlikely that the project would adversely affect habitat critical to the survival of the species given its absence of this form of habitat in the study area.

6.2.1.4 *Indigofera oxyrachis* – potential impacts and impact assessment

The proposed development will result in direct impacts up to 64 ha of vegetation considered to be potential habitat for the plant. Closest known records of *I. oxyrachis* are 50 to 60 km to the north east of the study area, however, occur in similar environments to those within the study area. Queensland herbarium identifies specimens being recorded on stony rises on cracking clay soils and in open areas amongst low gidgee woodland, with *Senna artemisioides* and *Senna phyllodinea* present. It has also been recorded on open scalded creek flats at the base of escarpments, in open mixed woodland on light clay and sandy creek lines throughout stony patches. These types of habitats are widespread in the region, but the occurrence of *I. oxyrachis* is not.

In consideration of the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to *I. oxyrachis* are unlikely to be significant (refer to Table 18).

Table 18: Significant Residual Impact Assessment for *Indigofera oxyrachis*

Criteria	Response to Criteria
Lead to a long-term decrease in the size of a local population	No populations of the species were observed and impacts of potential habitat should the species occur in the study area would be minor. Given this, it is unlikely the project would lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	Known populations of the species extend from Idalia National Park to Cooper Creek. These areas are east of the study area, though potential habitat and potential occurrence of the species extends west within the surrounding the study area. Given no populations were observed, and the species known EOO and potential EOO exists surrounding the region, it is unlikely small impacts of potential species habitat would impact the species EOO. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible.
Fragment an existing population	No existing populations are known to occur within the study area, rather potential occurrence of the species due to presence of species habitat. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would fragment an existing population.
Result in genetically distinct populations forming as a result of habitat isolation	Species habitat is known to occur east of Cooper Creek, with potential species habitat occurring west and extending into the study area. No populations were observed. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would result in genetically distinct populations forming as result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented to minimise the risk of introduction or spread of weed species. It is unlikely the proposed development would increase the risk of harm from invasive species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (<i>Phytophthora cinnamomi</i>).
Interfere with the recovery of the species	There is a Recovery Plan for this species. No populations of the species were observed and impacts of potential habitat should the species occur in the study area would be minor. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would interfere with the recovery of the species.
Cause disruption to ecologically significant	<i>Indigofera</i> reproduces through pollination of flowers. Mitigation measures should be implemented in which if the species is detected, avoidance

locations (breeding, feeding, nesting, migration or resting sites) of a species.

measures should occur, where possible. It is unlikely that project impacts would cause a disruption to the ecologically significant locations, should they be identified. Pollination mechanisms within the region would still be occurring.

7.0 Appendices