Application form
Environmental authority

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).

This application can be completed online via Connect for all ERAs except for ERAs 2, 3 and 4. For more information and to register to use Connect go to www.qld.gov.au/environmentconnect.

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 Connect.

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 (formerly the Queensland Government’s Business and Industry Portal) 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.

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.

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.
- for any other ERA—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 Departments of Environment and Science (DES) and Agriculture and Fisheries (DAF) are collecting the information on this form to process your amendment application for an environmental authority. This collection is authorised under Chapter 5 of the Environmental Protection Act 1994. Some information may be given to the Department of Natural Resources, Mines and Energy (DNRME) for the purposes of processing this application. Your personal information will only be accessed by authorised employees within these departments and will not be disclosed to any other parties unless authorised or required by law. 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.
### Section 1 – Environmental authority number

| Environmental authority number for this application | EPPG00787513 |

### Section 2 – Applicant details

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.

<table>
<thead>
<tr>
<th>NAME / COMPANY NAME</th>
<th>TRADING NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia Pacific LNG Pty Ltd</td>
<td>Australia Pacific LNG Pty Ltd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REGISTERED / RESIDENTIAL ADDRESS</th>
<th>POSTAL ADDRESS (WHERE DIFFERENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 4 139 Coronation Drive MILTON QLD 4064 Australia</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABN / ACN</th>
<th>CONTACT NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 646 331</td>
<td>Dan Kahle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMAIL</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:EnvApprovals@upstream.originenergy.com.au">EnvApprovals@upstream.originenergy.com.au</a></td>
<td>0401399317</td>
</tr>
</tbody>
</table>

☐ INDICATE IF YOU WANT TO RECEIVE CORRESPONDENCE VIA EMAIL

☐ INDICATE IF THIS FORM IS BEING COMPLETED BY AN AGENT FOR THE ENVIRONMENTAL AUTHORITY HOLDER

### Section 3 – Checklist questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the amendment to correct a clerical or formal error?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. This request should be made in writing directly to the administering authority (no fees apply).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. You will need to apply for a new environmental authority.</td>
<td></td>
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</tr>
<tr>
<td>Is the amendment to remove or amend a condition requiring compliance with the eligibility criteria, and is a result of changes to the activity?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. Please make a site-specific application for a new environmental authority. Note: If the required amendment to the eligibility criteria condition is a result of factors beyond your control such as residential encroachment, rather than a change to the activity, you can use this form. The amendment will be a major amendment.</td>
<td></td>
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<tr>
<td>Is the amendment to amalgamate two or more environmental authorities?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. Please use either the form Application to amalgamate two or more environmental authorities into an amalgamated corporate authority (ESR/2015/1734), or Application to amalgamate two or more environmental authorities into an amalgamated project or local government authority (ESR/2015/1735).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. You will need to apply for a new environmental authority.</td>
<td></td>
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<tr>
<td>Is the amendment to amend financial assurance only?</td>
<td>☐ Yes</td>
<td>☑ No</td>
</tr>
<tr>
<td>If yes, you cannot use this form. Please use the form Application to amend or discharge financial assurance held for an environmental authority (ESR/2015/1752).</td>
<td></td>
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</tr>
</tbody>
</table>
Is the proposed amendment to add a resource activity to an environmental authority for a prescribed ERA project?

| □ Yes | □ No |

If yes, you cannot add the resource activity to the environmental authority. You will need to apply for a new environmental authority.

| □ Yes | □ No |

Is the proposed amendment to add a prescribed ERA, other than an ancillary activity, to an environmental authority for a resource project?

| □ Yes | □ 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?

| □ Yes | □ No |

| □ Yes | □ No |

Does the proposed amendment involve changes to the relevant activity that require a new development application to be lodged under the Planning Act 2016 and the application for the development application has not been lodged.

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.

| □ Yes | □ No |

Is the proposed amendment solely to add or remove vehicles for ERA 57 (Regulated waste transport) within the approved threshold?

| □ Yes | □ No |

If yes, you do not need to submit this application form. You can update vehicle details online through Connect or use the form Details of regulated waste vehicles (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?

| □ Yes | □ No |

If yes, you cannot use this form. Please use the form Request to transfer all or part of an environmental authority (prescribed environmentally relevant activities) (ESR/2015/1718).

Section 5 – Checklist for resource activities

Is the application to amend an EA for a resource activity?

| □ Yes | □ No |

| □ Yes | □ No |

Is the amendment for a partial surrender of an environmental authority for a mining, geothermal or petroleum resource activity?

| □ Yes | □ No |

If yes, you cannot use this form. Please use the form Application to surrender an environmental authority for a prescribed ERA (ESR/2015/1719) or Application for surrender or partial surrender of an environmental authority (resource activity) (ESR/2015/1751).

Section 6 – Major or Minor Amendment

Is the application for a major or minor amendment?

□ Major amendment

☑ Minor amendment (threshold)

Minor amendment (condition conversion) - you wish to convert all conditions of your EA to the standard conditions for the ERAs to which the EA 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).

For minor amendment (condition conversion) go to Section 31 (Payment of fees).

For further information see the guideline on Major and minor amendments (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.
## Section 7 – Amendment Options
Complete this section for all applications, tick all that apply

**I would like to amend environmental authority:**
- [ ] Activities – includes changes to threshold
- [x] Conditions – includes conversion to standard conditions and variations
- [ ] Locations – removal/addition or activity locations

## Section 8 – Development Permits

<table>
<thead>
<tr>
<th>Development Permit / Application Number</th>
<th>Development Permit / Application Name</th>
<th>Assessment Manager</th>
<th>Date of application or approval</th>
<th>Expiry Date</th>
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<tbody>
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</table>

- [ ] No – Go to next section
- [x] Yes – Provide details below

**Is the activity a prescribed ERA?**
- [ ] No – Go to next section
- [x] Yes – Provide details below

**Are there any development permits in effect or have any development applications been made under the Planning Act 2016 to carry out the proposed amendment?**
- [ ] No – Go to next section
- [x] Yes – Provide details below

**Provide a list of applicable development permits or applications below.**

- [ ] 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)?

- Yes – Provide details below
- No – Go to next section

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.

<table>
<thead>
<tr>
<th>ERA number</th>
<th>Threshold</th>
<th>Name of ERA</th>
<th>Has the ERA commenced?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>Yes ☐ No ☐</td>
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<td></td>
<td>Yes ☐ No ☐</td>
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<td>Yes ☐ No ☐</td>
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<td>Yes ☐ No ☐</td>
</tr>
</tbody>
</table>

☐ 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?

- Yes – Provide details below
- No – Go to section 9.2

Does your EA contain any rehabilitation conditions that are applicable to the ERA(s) that are requested be removed from the EA?

- Yes – Provide details below
- No – Go to section 9.2

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:

☐ 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 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 conditions, 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.

<table>
<thead>
<tr>
<th>ERA number</th>
<th>Threshold</th>
<th>Name of ERA</th>
<th>I can comply with the eligibility criteria</th>
<th>I can comply with all the standard conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>Yes</td>
<td>N/A</td>
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<td></td>
<td>Yes</td>
<td>Yes</td>
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<td></td>
<td>N/A</td>
<td></td>
<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
<td></td>
<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
<td></td>
<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
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<td></td>
<td>N/A</td>
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<td>Yes</td>
<td>No</td>
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<td></td>
<td>N/A</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

☐ 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.

### Section 10 – Single Integrated Operation Confirmation

Will the activities be undertaken as a single integrated operation?

☒ Yes ☐ No

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.

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2 ERAs with eligibility criteria and standard conditions are listed at: [www.business.qld.gov.au](http://www.business.qld.gov.au) (use the search term "eligibility criteria").
### Section 11 – Amend Conditions

Do you wish to amend the condition(s) of the environmental authority?  
☐ No – Go to next section  
☒ Yes – Provide details below

Provide details of: (a) condition number(s); (b) proposed change; and (c) justification for the change.

Refer to supportin information report

☐ I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.

If the activities were assessed as part of a coordinated project declared under the *State Development and Public Works Organisation Act 1971*, 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 for more information.

### Section 12– Amend location(s)

Will the activity be conducted outside of the area currently designated in the existing environmental authority?  
☐ No – Go to next section  
☒ Yes – Provide details below

<table>
<thead>
<tr>
<th>ERA number and threshold</th>
<th>Location (Lot on Plan(s), Tenure(s) or Mobile and Temporary)</th>
<th>Add or remove</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

☐ I HAVE ATTACHED DETAILS OF ADDITIONAL LOCATIONS FOR THIS SECTION.
### 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 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 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)?

☐ No - Go to next section
☐ 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

I

(INSERT NAME, POSITION AND COMPANY NAME OF PERSON MAKING THE STATEMENT)

- 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 of the Environmental Protection Act 1994, 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 Right to Information Act 2009 and the Evidence Act 1977.

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.
### Section 16 – Environmental Offsets

<table>
<thead>
<tr>
<th>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)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ No - Go to next section</td>
</tr>
</tbody>
</table>

☐ Yes - Attach supporting information that:

- 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](http://www.qld.gov.au/environment/pollution/management/offsets/index.html).

### Section 17 – Regional Interest Areas

<table>
<thead>
<tr>
<th>Is the activity a resource activity located anywhere within an area of regional interest?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ No - Go to next section</td>
</tr>
</tbody>
</table>

If yes - Which area of regional interest, has or will require a regional interest development approval (RIDA)?

- Priority agricultural areas (PAAs)
- Priority living areas (PLAs)
- Strategic environmental areas (SEAs)
- Strategic cropping area (SCA)
- ☑ 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 *Regional Planning Interests Act 2014*. Further information, including application forms, can be found on the Department of State Development, Manufacturing, Infrastructure and Planning website at [www.dsdmp.qld.gov.au](http://www.dsdmp.qld.gov.au).
**Section 18 – Matters of National Environmental Significance**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>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?</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Has the proposal been referred to the Federal Government Environment Minister or a delegate for formal assessment and approval?</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>If Yes - Has an approval issued under the <em>Environmental Protection and Biodiversity Conservation Act 1999</em> (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?</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>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?</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>I HAVE ATTACHED DETAILS OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE.</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>I HAVE ATTACHED A COPY OF THE EPBC ACT APPROVAL.</td>
<td>☑</td>
<td>☐</td>
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</tbody>
</table>

There are currently nine matters of national environmental significance (MNES) which have been defined in the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth). 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**

<table>
<thead>
<tr>
<th>ANZSIC Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1101</td>
<td>Black coal mining</td>
</tr>
<tr>
<td>1102</td>
<td>Brown Coal Mining</td>
</tr>
<tr>
<td>1311</td>
<td>Iron ore mining</td>
</tr>
<tr>
<td>1312</td>
<td>Bauxite mining</td>
</tr>
<tr>
<td>1317</td>
<td>Silver-lead-zinc ore mining</td>
</tr>
<tr>
<td>☑ 1200</td>
<td>Oil and gas extraction</td>
</tr>
<tr>
<td>☑ 1313</td>
<td>Copper ore mining</td>
</tr>
<tr>
<td>☑ 1314</td>
<td>Gold ore mining</td>
</tr>
<tr>
<td>☑ 1315</td>
<td>Mineral sand mining</td>
</tr>
<tr>
<td>☑ 1316</td>
<td>Nickel ore mining</td>
</tr>
<tr>
<td>☑ 1319</td>
<td>Metal ore mining (other metallic mineral ores)</td>
</tr>
<tr>
<td>☑ Other</td>
<td>(provide details): _____</td>
</tr>
</tbody>
</table>

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.
### Section 20 – Environmental Impact Statement

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the activity a resource activity?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has an environmental impact statement (EIS) process that includes the proposed amendment been completed?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If yes – I have assessed the environmental risks of the proposed amendment and consider them to be:

- The same as was assessed in the EIS
- Different to what was assessed in the EIS

I HAVE ATTACHED THE ASSESSMENT OF THE ENVIRONMENTAL RISKS OF THE PROPOSED AMENDMENT.

For further information refer to the guideline: Triggers for Environmental Impact Statements under the Environmental Protection Act 1994 for mining, petroleum and gas activities. This guideline is available at [www.qld.gov.au](http://www.qld.gov.au), using the search term ‘triggers for environmental impact statements’.

### Section 21 – Environmental Impact Statement Triggers

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the activity a resource activity?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)?

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.

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)? 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.

Is the proposed ERA amendment for an increase in annual extraction of greater than 25%?

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.

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?

NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.

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?

Is the proposed ERA amendment for a mining activity and a novel or unproven resource extraction process, technology or activity, is being proposed?

NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.

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?

NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.
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?  
**NOTE:** Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

Is the proposed ERA amendment for a petroleum and gas activity that is likely to involve the construction of a liquefied natural gas plant?  
**NOTE:** Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

☐ I HAVE ATTACHED DETAILS OF HOW THE CRITERION IS TRIGGERED INCLUDING DETAILS OF THE IMPACT.

### Section 22 – Environmental values

Attach a document that provides an assessment of the likely impact of each relevant activity on environmental values (EVs). Note: All fields below are mandatory, therefore a statement is required where there are no likely impacts to an EV.

<table>
<thead>
<tr>
<th>Environmental Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
</tr>
<tr>
<td>Wetlands</td>
</tr>
<tr>
<td>Land Use</td>
</tr>
<tr>
<td>Acoustic</td>
</tr>
<tr>
<td>Groundwater</td>
</tr>
<tr>
<td>Land</td>
</tr>
<tr>
<td>Air</td>
</tr>
<tr>
<td>Waste</td>
</tr>
</tbody>
</table>

☐ I HAVE ATTACHED A DOCUMENT THAT PROVIDES AN ASSESSMENT OF LIKELY IMPACTS ON EVs.

Note that the EP Act, s226(1)(k) states the information required relating to impacts on EVs which include:

1. a description of the environmental values likely to be affected by the proposed amendment; and
2. details of any emissions or releases likely to be generated by the proposed amendment; and
3. a description of the risk and likely magnitude of impacts on the environmental values; and
4. details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and
5. details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.

### 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.

☐ I have attached a document that provides the required information; or

☐ 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?

<table>
<thead>
<tr>
<th>No - Go to next section</th>
<th>Yes - Provide details below</th>
</tr>
</thead>
</table>

Does the amendment change the way that CSG water is managed?

<table>
<thead>
<tr>
<th>No - Go to next section</th>
<th>Yes - Provide details below</th>
</tr>
</thead>
</table>

If the amendment will change the way that CSG water is managed the following information must be provided with this application.

☐ The quantity of CSG water the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity.

☐ The flow rate at which the applicant reasonably expects the water will be generated.
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.

The proposed management of water including, for example, the use, treatment, storage and disposal of the water.

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.

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.

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.

Section 25 – Underground water rights

Is the activity a resource activity?  □ No - Go to next section  ● Yes - Provide details below

Is the activity proposed to be undertaken on a mineral development licence (MDL), mining lease (ML) or petroleum lease (PL)?  □ No - Go to next section  ● Yes - Provide details below

Does the proposed amendment involve changes to the exercise of underground water rights?  □ No - Go to next section  ● Yes - Provide details below

I have attached a document that details:

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:
   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 Requirements for site-specific and amendment applications - underground water rights (ESR/2016/3275)
Section 26 – Financial Assurance

Do you currently have financial assurance held as part of the approved environmental authority?  
☐ No – Go to next section  
☒ Yes – Provide details below

☒ I will not need to change the financial assurance in relation to this amendment.
☐ I will be changing the financial assurance and have attached the form *Application to amend or discharge financial assurance held for an environmental authority (ESR/2015/1752)*.
☐ I will be changing the financial assurance and will be amending or replacing my Plan of Operations.

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)?  
☐ No – Go to next section  
☒ Yes (EPO) - provide details below  
☐ 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?  
☒ No – Go to next section  
☐ Yes – Provide details below

☐ The land is currently in the environmental management register.
☐ The land has been removed from the environmental management register.
   You must attach evidence (e.g. Notice) advising that the details have been removed.
### Section 29 - Website address

Is the application for a mining activity on a mining lease, or a geothermal, petroleum, or greenhouse gas storage activity?
- ☐ No – Go to next section
- ☑ Yes – Provide details below

| Provide the website address for the application notice and application documents. | N/A |
| Provide details of the contact person if technical assistance is required. | NAME | TELEPHONE |
| | N/A | N/A |
| | EMAIL | TELEPHONE |
| | N/A | N/A |

### Section 30 – Site contact

Would you like to nominate a site contact?
- ☐ No – Go to next section
- ☑ Yes – Provide details below

| SITE CONTACT NAME | POSITION |
| EMAIL | TELEPHONE |

☐ 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: $327.60

**Cheque or money order payments**
- ☐ Payment by cheque or money order made payable to the Department of Environment and Science (attached).
- ☐ Payment by cheque or money order made payable to the Department of Agriculture and Fisheries (attached).

**Credit card payments**
- ☐ For credit card payments for applications relating to mining activities please lodge the application using MyMinesOnline.

An application fee is payable at the time the application is made. Information on the fee can be located in the information sheet Fees for permits for environmentally relevant activities (ERAs) (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.

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 Fee calculator (ESR/2015/1731).
Application form  
Application to amend an environmental authority

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 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

<table>
<thead>
<tr>
<th>APPLICANT’S NAME</th>
<th>POSITION</th>
<th>COMPANY / ORGANISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICOLE BUCHWASCHI</td>
<td>APPROVALS MAN</td>
<td>Australa Pacific LNG Pty Ltd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICANT’S SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9/11/18</td>
</tr>
</tbody>
</table>

Joint holder(s) signature if applicable

<table>
<thead>
<tr>
<th>NAME, POSITION AND COMPANY NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tim Petersen Chief Operating Officer Orient (Denison Gas)</td>
<td>[Signature]</td>
<td>2/11/18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME, POSITION AND COMPANY NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
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<tbody>
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</table>

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<th>SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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 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.
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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**

<table>
<thead>
<tr>
<th>APPLICANT'S NAME</th>
<th>POSITION</th>
<th>COMPANY / ORGANISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Australia Pacific LNG Pty Ltd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICANT'S SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Joint holder(s) signature if applicable</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NAME, POSITION AND COMPANY NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tim Petersen Chief Operating Officer Orient (Denison Gas)</td>
<td>[Signature]</td>
<td>2/11/18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME, POSITION AND COMPANY NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME, POSITION AND COMPANY NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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:**

<table>
<thead>
<tr>
<th>For ERA 2, ERA 3 or ERA 4:</th>
<th></th>
</tr>
</thead>
</table>
| **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 |

<table>
<thead>
<tr>
<th>For a mining ERA where the proposed amendment impacts upon the resource tenure:</th>
<th></th>
</tr>
</thead>
</table>
| **Enquiries:** | Mining Registrar  
Department of Natural Resources, Mines and Energy  
DNRM have a list of office locations for mining registrars on their website  

<table>
<thead>
<tr>
<th>For all other ERAs:</th>
<th></th>
</tr>
</thead>
</table>
| **Post:** | Permit and Licence Management  
Department of Environment and Science  
GPO Box 2454  
BRISBANE QLD 4001 |
| **Courier or hand delivery:** | Permit and Licence Management  
Level 3, 400 George Street  
BRISBANE QLD 4000  
Business hours: 8:30am–4:30pm |
| **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.
**Section 34 - Definitions to terms used in this form**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Condition conversion</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
| **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 Planning Act 2016. 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 |
(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

(d) does not significantly increase the scale or intensity of the relevant activity; and

(e) does not relate to a new relevant resource tenure for the authority that is—
   (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

(f) involves an addition to the surface area for the relevant activity of no more than 10% of the existing area; and

(g) for an environmental authority for a petroleum activity—
   (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

(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.

| Mobile and temporary ERA | A prescribed ERA, other than an activity that is dredging material, extracting rock or other material, or the incinerating of waste:
|                         | (a) carried out at various locations using transportable plant or equipment, including a vehicle
|                         | (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)
|                         | (c) carried out at any 1 of the locations:
|                         |   (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.

| Prescribed ERA | An environmentally relevant activity that is not a resource activity and is prescribed under section 19 of the EP Act.

<p>| Prescribed ERA project | All prescribed ERAs carried out, or proposed to be carried out, as a single integrated operation. |</p>
<table>
<thead>
<tr>
<th><strong>Registered suitable operator</strong></th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource activity</strong></td>
<td>An activity that is any of the following:</td>
</tr>
<tr>
<td></td>
<td>(a) a geothermal activity</td>
</tr>
<tr>
<td></td>
<td>(b) a greenhouse gas (GHG) storage activity</td>
</tr>
<tr>
<td></td>
<td>(c) a mining activity</td>
</tr>
<tr>
<td></td>
<td>(d) a petroleum activity.</td>
</tr>
<tr>
<td><strong>Resource project</strong></td>
<td>Resource activities carried out, or proposed to be carried out, under 1 or more resource tenures, in any combination, as a single integrated operation.</td>
</tr>
<tr>
<td><strong>Single integrated operation</strong></td>
<td>Occurs when all of the below criteria are met:</td>
</tr>
<tr>
<td></td>
<td>(a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager;</td>
</tr>
<tr>
<td></td>
<td>(b) the activities are operationally interrelated;</td>
</tr>
<tr>
<td></td>
<td>(c) the activities are, or will be, carried out at one or more places; and</td>
</tr>
<tr>
<td></td>
<td>(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.</td>
</tr>
<tr>
<td><strong>Underground water rights</strong></td>
<td>Means any of the following:</td>
</tr>
<tr>
<td></td>
<td>(a) underground water rights within the meaning of the <em>Mineral Resources Act 1989</em>;</td>
</tr>
<tr>
<td></td>
<td>(b) underground water rights within the meaning of the <em>Petroleum and Gas (Production and Safety) Act 2004</em>;</td>
</tr>
<tr>
<td></td>
<td>(c) underground water rights within the meaning of the <em>Petroleum Act 1923, section 87(3).</em></td>
</tr>
</tbody>
</table>
## Supporting Information Report

### Denison Trough South Environmental Authority

**EPPG00787513 Amendment Application**

Q-3000-15-RP-028

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### Australia Pacific LNG Pty Ltd

Application to adopt streamlined model conditions for stimulation activities

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<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>December 2018</td>
<td>Revised to address additional DES comments</td>
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<tr>
<td>0</td>
<td>November 2018</td>
<td>Revised to address DES comments</td>
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<tr>
<td>A</td>
<td>October 2018</td>
<td>Issued for review</td>
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</tbody>
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Document Conventions

The following terms in this document apply:

- **Will, shall or must** indicate a mandatory course of action;
- **Should** indicates a recommended course of action; and
- **May** or **can** indicate a possible course of action.

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1. Introduction

1.1. Overview

Australia Pacific LNG Pty Limited (Australia Pacific LNG), has prepared this Supporting Information Report to accompany an amendment application under Section 224 of the Environmental Protection Act 1994 (EP Act) to the Department of Environment and Science (DES).

This amendment application relates to the Denison Trough South Environmental Authority (EA) EPPG00787513 and comprises the following documents:

- Completed DES application form.
- Supporting Information Report (this document).

The proposed amendment seeks to adopt streamlined model conditions (SMCs) for hydraulic fracture stimulation activities.

1.2. Abbreviations

The following abbreviations are used throughout this Supporting Information Report.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia Pacific LNG</td>
<td>Australia Pacific LNG Pty Limited</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Environment and Science</td>
</tr>
<tr>
<td>DNRME</td>
<td>Department of Natural Resources, Mines and Energy</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Authority</td>
</tr>
<tr>
<td>EC</td>
<td>Electrical conductivity</td>
</tr>
<tr>
<td>EP Act</td>
<td>Environmental Protection Act 1994 (Qld)</td>
</tr>
<tr>
<td>ERA</td>
<td>Environmentally Relevant Activities</td>
</tr>
<tr>
<td>ESA</td>
<td>Environmentally Sensitive Areas</td>
</tr>
<tr>
<td>HFS</td>
<td>Hydraulic fracture stimulation</td>
</tr>
<tr>
<td>GAB</td>
<td>Great Artesian Basin</td>
</tr>
<tr>
<td>PL</td>
<td>Petroleum Lease</td>
</tr>
</tbody>
</table>
2. **Proposed Amendments**

2.1. **Proposed Conditions - Streamlined Model Conditions**

The proposed amendment to EA EPPG00787513 seeks to adopt streamlined model conditions (SMCs) for hydraulic fracture stimulation (HFS) activities, with minor variations, as shown below in Table 2.

**Table 2: Proposed conditions for incorporation into EPPG00787513**

<table>
<thead>
<tr>
<th>Streamlined Model Condition</th>
<th>Proposed Amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete F1</td>
<td>(F1) Contaminants must not be released to land</td>
</tr>
<tr>
<td>General 12</td>
<td>In addition to the requirements under Chapter 7, Part 1, Division 2 of the Environmental Protection Act 1994, the administering authority must be notified through the Pollution Hotline and in writing, as soon as possible, but within 48 hours of becoming aware of any of the following events:</td>
</tr>
<tr>
<td></td>
<td>(a) any unauthorised significant disturbance to land</td>
</tr>
<tr>
<td></td>
<td>(b) potential or actual loss of structural or hydraulic integrity of a dam</td>
</tr>
<tr>
<td></td>
<td>(c) when the level of the contents of any regulated dam reaches the mandatory reporting level</td>
</tr>
<tr>
<td></td>
<td>(d) when a regulated dam will not have available storage to meet the design storage allowance on 1 November of any year</td>
</tr>
<tr>
<td></td>
<td>(e) potential or actual loss of well integrity</td>
</tr>
<tr>
<td></td>
<td>(f) when the seepage trigger action response procedure required under condition (Water 14(g)) is or should be implemented</td>
</tr>
<tr>
<td></td>
<td>(g) unauthorised releases of any volume of prescribed contaminants to waters</td>
</tr>
<tr>
<td></td>
<td>(h) unauthorised releases of volumes of contaminants, in any mixture, to land greater than:</td>
</tr>
<tr>
<td></td>
<td>i. 200 L of hydrocarbons; or</td>
</tr>
<tr>
<td></td>
<td>ii. 200 L of stimulation additives; or</td>
</tr>
<tr>
<td></td>
<td>iii. 500 L of stimulation fluids; or</td>
</tr>
<tr>
<td></td>
<td>iv. 1000 L of brine; or</td>
</tr>
<tr>
<td></td>
<td>v. 5000 L of untreated coal seam gas water; or</td>
</tr>
<tr>
<td></td>
<td>vi. 5000 L of raw sewage; or</td>
</tr>
<tr>
<td></td>
<td>vii. 10000 L of treated sewage effluent.</td>
</tr>
<tr>
<td></td>
<td>(i) the use of restricted stimulation fluids</td>
</tr>
<tr>
<td></td>
<td>(j) groundwater monitoring results from a landholder’s active groundwater bore monitored under the stimulation impact monitoring program which is a 10% or greater increase from a previous baseline value for that bore and which renders the water unfit for its intended use</td>
</tr>
<tr>
<td></td>
<td>(k) monitoring results where two out of any five consecutive samples do not comply with the relevant limits in the environmental authority.</td>
</tr>
<tr>
<td>Well activities 5</td>
<td>Polycyclic aromatic hydrocarbons or products that contain polycyclic aromatic hydrocarbons must not be used in stimulation fluids in concentrations above the reporting limit.</td>
</tr>
<tr>
<td>Well activities 6</td>
<td>Stimulation activities must not negatively affect water quality, other than within the stimulation impact zone of the target gas producing hydrocarbon bearing formation.</td>
</tr>
<tr>
<td>Well activities 7</td>
<td>Stimulation activities must not cause the connection of the target gas producing hydrocarbon bearing formation and another aquifer.</td>
</tr>
<tr>
<td>Well activities 8</td>
<td>The internal and external mechanical integrity of the well system prior to and during stimulation must be ensured such that there is:</td>
</tr>
<tr>
<td></td>
<td>a) No significant leaking in the casing, tubing or packer; and</td>
</tr>
<tr>
<td>Streamlined Model Condition</td>
<td>Proposed Amendment</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>b)</td>
<td>There is no significant fluid movement into another aquifer through vertical channels adjacent to the well bore hole.</td>
</tr>
<tr>
<td>Well activities 9</td>
<td>Practices and procedures must be in place to detect, as soon as practicable, any fractures that cause the connection of a target gas producing formation and another aquifer.</td>
</tr>
<tr>
<td>Well activities 10</td>
<td>Prior to undertaking stimulation activities, a risk assessment must be developed to ensure that stimulation activities are managed to prevent environmental harm.</td>
</tr>
<tr>
<td>Well activities 11</td>
<td>The stimulation risk assessment must be carried out for every well to be stimulated prior to stimulation being carried out at that well and address issues at a relevant geospatial scale such that changes to features and attributes are adequately described and must include, but not necessarily be limited to:</td>
</tr>
<tr>
<td>a)</td>
<td>A process description of the stimulation activity to be applied, including equipment and a comparison to best international practice</td>
</tr>
<tr>
<td>b)</td>
<td>Provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority</td>
</tr>
<tr>
<td>c)</td>
<td>A geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s)</td>
</tr>
<tr>
<td>d)</td>
<td>Naturally occurring geological faults</td>
</tr>
<tr>
<td>e)</td>
<td>Seismic history of the region (e.g. earth tremors, earthquakes)</td>
</tr>
<tr>
<td>f)</td>
<td>Proximity of overlying and underlying aquifers</td>
</tr>
<tr>
<td>g)</td>
<td>Description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation</td>
</tr>
<tr>
<td>h)</td>
<td>Identification and proximity of landholder active groundwater bores in the area where stimulation activities are to be carried out</td>
</tr>
<tr>
<td>i)</td>
<td>The environmental values of groundwater in the area</td>
</tr>
<tr>
<td>j)</td>
<td>An assessment of the appropriate limits of reporting for all water quality indicators relevant to stimulation monitoring in order to accurately assess the risks to environmental values of groundwater</td>
</tr>
<tr>
<td>k)</td>
<td>Description of overlying and underlying formations in respect to porosity, permeability, hydraulic conductivity, faulting and fracture propensity</td>
</tr>
<tr>
<td>l)</td>
<td>Consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers</td>
</tr>
<tr>
<td>m)</td>
<td>A description of the well mechanical integrity testing program</td>
</tr>
<tr>
<td>n)</td>
<td>Process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling, etc)</td>
</tr>
<tr>
<td>o)</td>
<td>Practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation</td>
</tr>
<tr>
<td>p)</td>
<td>Groundwater transmissivity, flow rate, hydraulic conductivity and direction(s) of flow</td>
</tr>
<tr>
<td>q)</td>
<td>A description of the chemical compounds used in stimulation activities (including estimated total mass, estimated composition, chemical abstract service numbers and properties), their mixtures and the resultant compounds that are formed after stimulation</td>
</tr>
<tr>
<td>r)</td>
<td>A mass balance estimating the concentrations and absolute masses of chemical compounds that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation</td>
</tr>
<tr>
<td>s)</td>
<td>An environmental hazard assessment of the chemicals used including their mixtures and the resultant chemicals that are formed after stimulation including:</td>
</tr>
<tr>
<td>i)</td>
<td>Toxicological and ecotoxicological information of chemical compounds used;</td>
</tr>
<tr>
<td>ii)</td>
<td>Information on the persistence and bioaccumulation potential of the chemical compounds used; and</td>
</tr>
<tr>
<td>iii)</td>
<td>Identification of the chemicals of potential concern in stimulation fluids</td>
</tr>
</tbody>
</table>
Streamlined Model Condition | Proposed Amendment
--- | ---
 | derived from the risk assessment
t) An environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities  
u) Identification and an environmental hazard assessment of using radioactive tracer beads in stimulation activities  
v) An environmental hazard assessment of leaving chemical compounds in stimulation fluids in the target gas producing formation for extended periods subsequent to stimulation  
w) Human health exposure pathways to operators and the general population  
x) Risk characterisation of environmental impacts based on the environmental hazard assessment  
y) Potential impacts to landholder bores as a result of stimulation activities  
z) As assessment of cumulative underground impacts, spatially and temporally of the stimulation activities to be carried out on tenures covered by this environmental authority; and
aa) Potential environmental or health impacts which may result from stimulation activities including, but not limited to, water quality, air quality (including suppression of dust and other airborne contaminants), noise and vibration.

Well activities 12 | Prior to undertaking any stimulation activity, a baseline bore assessment must be undertaken of the water quality of:
a) All landholder’s active groundwater bores (subject to assess being permitted by the landholder) that are spatially located within a two (2) kilometre horizontal radius from the location of the stimulation initiation point within the target gas producing formation; and  
b) All landholder’s active groundwater bores (subject to access being permitted by the landholder) in any aquifer that is within 200m above or below the target gas producing formation and is spatially located within a two (2) kilometre radius from the location of the stimulation initiation point; and  
c) Any other bore that could potentially be adversely impacted by the stimulation activities in accordance with the findings of the risk assessment required by conditions (Well activities 10) and (Well activities 11).

Well activities 13 | Prior to undertaking stimulation activities at a well, there must be sufficient water quality data to accurately represent the water quality in the well to be stimulated. The data must include as a minimum the results of analyses for the parameters in condition (Well activity 14).

Well activities 14 | Baseline bore and well assessments must include relevant analytes and physico-chemical parameters to be monitored in order to establish baseline water quality and must include, but not necessarily be limited to:  
  a) pH  
  b) electrical conductivity (μS/m)  
  c) turbidity (NTU)  
  d) total dissolved solids (mg/L)  
  e) Temperature (°C)  
  f) Dissolved oxygen (mg/L)  
  g) Dissolved gases (methane, chlorine, carbon dioxide, hydrogen sulphide) (mg/L)  
  h) Alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO₃) (mg/L)  
  i) Sodium adsorption ratio (SAR)  
  j) Anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) (mg/L)  
  k) Cations (aluminium, calcium, magnesium, potassium, sodium) (mg/L)  
  l) Dissolved and total metals and metalloids (including but not necessarily being limited to: aluminium, arsenic, barium, borate (boron), cadmium, total chromium, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium,
silver, strontium, tin and zinc) (μg/L)

m) Total petroleum hydrocarbons (μg/L)

n) BTEX (as benzene, toluene, ethylbenzene, ortho-xylene, para- and meta-xylene and total xylene) (μg/L)

o) Polycyclic aromatic hydrocarbons (including but not necessarily being limited to: naphthalene, phenanthrene, benzo[a]pyrene) (μg/L)

p) Sodium hypochlorite (mg/L)

q) Sodium hydroxide (mg/L)

r) Formaldehyde (mg/L)

s) Ethanol (mg/L); and

t) Gross alpha + gross beta or radionuclides by gamma spectrometry (Bq/L)

Well activities 15

A stimulation impact monitoring program must be developed prior to the carrying out of stimulation activities which must be able to detect adverse impacts to water quality from stimulation activities and must consider the findings of the risk assessment required by conditions (well activities 10) and (well activities) 11 that relate to stimulation activities and must include, as a minimum, monitoring of:

a) The stimulation fluids to be used in stimulation activities at sufficient frequency and which sufficiently represents the quantity and quality of the fluids used

b) Flow back waters from stimulation activities at sufficient frequency and which sufficiently represents the quality of that flow back water

c) Flow back waters from stimulation activities at sufficient frequency and accuracy to demonstrate that 150% of the volume used in stimulation activities has been extracted from the stimulated well; and

d) All bores in accordance with condition (well activities 12).

Well activities 16

The stimulation impact monitoring program must provide for monitoring of:

a) Analytes and physico-chemical parameters relevant to baseline bore and well assessments to enable data referencing and comparison including, but not necessarily limited to, the analytes and physico-chemical parameters in condition (well activities 14); and

b) Any other analyte or physico-chemical parameters that will enable detection of adverse water quality impacts and the inter-connection with a non-target aquifer as a result of stimulation activities including chemical compounds that are actually or potentially formed by chemical reactions with each other or coal seam materials during stimulation activities.

Well activities 17

The stimulation impact monitoring program must provide for monitoring of the bores in condition (well activities 15(d)) at the following minimum frequency:

a) Monthly for the first six (6) months subsequent to stimulation activities being undertaken; then

b) Annually for the first five (5) years subsequent to stimulation being undertaken or until analytes and physico-chemical parameters listed in conditions (well activities 14(a) to (well activities 14(t)) inclusive, are not detected in concentrations above baseline bore monitoring data on two (2) consecutive monitoring occasions.

Well activities 18

The results of the stimulation impact monitoring program must be made available to any potentially affected landholder upon request by that landholder.

Table 3 provides the rationale for the proposed minor variations to the two SMCs: Well Activities 6 & 7.

<table>
<thead>
<tr>
<th>Streamlined Model Condition</th>
<th>Proposed Amendment</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Activities 6</td>
<td>Stimulation activities must not negatively affect water</td>
<td>Exiting EA EPPG00787513 authorises</td>
</tr>
</tbody>
</table>
2.2. **Amendment Rationale**

This application seeks to authorise hydraulic fracture stimulation on EA EPPG00787513, conducted in line with the Queensland Government developed Streamlined Model Conditions (ESR/2016/1989).

Hydraulic fracture stimulation (HFS) is a process performed on petroleum wells located within low permeability reservoirs. In order to increase permeability, a stimulation fluid is pumped at high pressure into the target reservoir to create small fractures; allowing the trapped gas to flow to the surface at an increased rate.

The stimulation process consists of pumping fluid under pressure down the well into the target reservoir to create controlled and localised fracturing within the formation. As the pressure is sustained, the fractures propagate radially from the well and within the formation. Once optimal fracture propagation has been achieved, a stimulation fluid, which primarily consists of water and sand (~99% water and sand), is pumped down the well and into the fractures. The aim of the stimulation is to open, connect and create fractures, as well as placing sand in existing and new fractures which in turn, holds the fractures open to provide an enhanced flow path within the formation; improving gas productivity throughout the well’s life.

2.2.1. **HFS Risk Assessment**

Australia Pacific LNG has developed a Hydraulic Fracturing Risk Assessment ([Link: APLNG Project Hydraulic Fracturing Risk Assessment 2017](#)) which addresses aspects of Australia Pacific LNG regulatory approvals for conducting hydraulic fracturing operations within relevant project areas. Adoption of the proposed SMCs for stimulation activities on EA EPPG00787513 would facilitate updating the existing risk assessment to include future stimulation activities in existing and authorised petroleum wells.

Proposed SMC (Well Activities 11) prescribes the minimum requirements for the risk assessment, including details of the proposed stimulation scope of works as follows:

- **A process description of the stimulation activity to be applied, including equipment and a comparison to best international practice**
- **Provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority**

The proposed SMCs (Well Activities 10) and (Well Activities 11) ensures the risk of environmental harm from stimulation activities are identified and appropriate management techniques are proposed to prevent environmental harm. The risk assessment framework includes the minimum acceptable standards to be applied to each well before it is hydraulically fractured so that site-specific risks can be managed from each well during the event. The risk assessment will determine the nature, extent and
impact from the stimulation activity and allow the proper and efficient management of any environmental harm caused by the activity.

2.2.2. Location

The amendment seeks to authorise HFS which will be conducted on well sites that are existing or authorised on the EA, noting that if future well sites cannot comply with the EA conditions a separate EA amendment application will be lodged. As such, the proposed amendment does not change the authorised impacts to land, beyond what is authorised on the EA.

While the number of wells and specific well locations are not yet known, as part of the design of the HFS, modelling is conducted on each target reservoir intersected by the well to determine which reservoir will be hydraulically fractured. Further, SMC (Well Activities 11), which is proposed as part of this application, requires a stimulation risk assessment which will identify the location of wells which will be HFS.
3. **Environmental Values**

The proposed amendment described in Section 2 would be undertaken within the existing resource authorities authorised by EA EPPG00787513, including:

- PL 43;
- PL 44;
- PL 45; and
- PL 218.

The proposed amendment would not impact the following environmental values within the Project Area (PLs 43, 44, 45, and 218):

- surface water;
- wetlands;
- air;
- acoustics;
- biodiversity; and
- heritage.

As such, these values are not discussed further, as part of this amendment application.

3.1. **Groundwater**

3.1.1. **Existing Environment**

3.1.1.1. **Geology**

**Regional**

The Bowen Basin is a north-south elongate basin that initiated as a back-arc rift and transitioned into a foreland basin. The Hunter-Bowen orogeny resulted in regional uplift and erosion in the Late Triassic. The Surat Basin developed as an intracratonic basin unconformably overlying the Bowen Basin. Regional uplift in the mid-Cretaceous resulted in the present day geology with the Surat and Bowen Basins having a regional dip to the south resulting in outcropping formations to the south. Coal seams are present within the Permo-Triassic Bowen Basin and the Jurassic-Cretaceous Surat Basin. While the Surat Basin stratigraphy is intersected in select locations within the project area, the coal seams of the Bowen Basin are the main coal seam gas resource targets within the project area\(^1\).

**Local**

The main structural feature through the project area is the Comet Ridge, located along the eastern margin of the Denison Trough in the southern extent of the Bowen Basin. The Comet Ridge is comprised of mainly Devonian aged rocks and is covered by a relatively thin sequence of gently folded Permian and Triassic rocks which make up the Bowen Basin\(^1\).

The Black Alley Shale and the Bandanna Formation are included in the Late Permian Blackwater Group. CSG gas in the project area will be extracted from the coal seams of the Bandanna Formation, at depths of 250 to 1000 m below ground level (mbgl). The thickness of the Bandanna Formation is variable throughout the Project Area, from approximately 60 to 125 m thick. Up to six coal seams are defined within the Bandanna Formation with an average coal thickness of approximately 6 to 9 m in the Fairview CSG field, generally thinning northward. The Bandanna Formation is unconformably overlain by the oldest formation of the Triassic aged Mimosa Group, the Rewan Formation. The unconformable contact

\(^1\) RPS 2013 *Denison Trough Project Area Environmental Management Plan*
between the Moolayember Formation and the overlying Precipice Sandstone marks the boundary between the Bowen and Surat Basin sequences.

3.1.1.2. Hydrogeology
The Bowen Basin is a sub-basin of the Great Artesian Basin (GAB), one of the largest artesian groundwater basins in the world. The GAB is generally recharged via rainfall on the elevated margins of the basin in what are referred to as the GAB intake beds, with regional groundwater flow predominantly towards the southwest. A number of sandstone aquifers of regional importance are present in the stratigraphic sequence beneath the study area, including the Hutton Sandstone and, to a variable degree, the Precipice Sandstone, which provide groundwater supply for drinking water, stock watering, irrigation and industrial uses. Groundwater bores within the project area are mostly completed within the Hutton Sandstone, Evergreen Formation, and Precipice Sandstone.

Both the Surat (which overlies the Bowen Basin) and the Bowen Basins are multi-layered mainly confined hydrogeological systems comprising alternating layers of water-bearing (permeable) sandstones and non-water-bearing (impermeable) siltstones and mudstones. The sandstone units store and transmit groundwater and are defined as aquifers. These rocks are sufficiently permeable to conduct groundwater and to yield economically significant quantities of groundwater to water bores and springs. Figure 1 provides a general stratigraphic column of the Denison Trough focussing on potential hydrocarbon sources (e.g. the Bandana formation) and surrounding formations below the Bowen Basin demonstrating general hydraulic separation/isolation provided by the Moolayember Formation underlying the sandstone aquifers of the Bowen basin (e.g. Hutton and Precipice Sandstone).

Vertical hydraulic gradients exist between the layered water-bearing formations, which are attributable both to natural and induced processes (groundwater extraction). However, under ambient conditions, the gradients between formations are generally low and the potential for inter-aquifer flow of groundwater is considered to be limited relative to horizontal flow within aquifer layers.

The siltstone and mudstones within these systems are low permeability rocks that do not qualify as aquifers. They hinder groundwater flow or leakage between the aquifer layers, thus they are considered to be aquitards. Within the adjacent GLNG Arcadia and Fairview CSG fields, the thickness of the formations remains relatively uniform throughout their profile. The formations are also laterally continuous and hydraulically connected. The regional groundwater flow regime in the study area is broadly consistent with the southward dip direction of the local geology; however, flow directions appear to vary locally in recharge areas or zones of significant water supply development.

The vertical permeability of the aquitards is generally very low as demonstrated by the vertical hydraulic conductivity ($K_v$) of the Rewan Formation: $\sim 10^{-6}$ m/d.). This signifies that the primary direction of groundwater flow in the area is horizontally through the aquifers, with north-easterly and northerly flow regionally indicated. Figure 1 demonstrates how the Rewan Formation is generally thick and continuous acting as a regional aquitard between hydrocarbon bearing formations and overlying aquifers and controlling vertical hydraulic permeability.

3.1.1.3. Groundwater Recharge, Levels and Flow
The GAB aquifers are recharged by infiltration (rainfall), and leakage from streams into outcropping sandstone formations, mainly on the eastern margins of the GAB along the western slopes of the Great Dividing Range. Regional groundwater flow is from the topographically higher recharge areas around the basin margins towards the lowest parts of the basin in the southwest. Local groundwater flow in the shallow alluvial and volcanic systems are likely more affected by local activities such as surface water drainage features (where groundwater/surface water interaction exist), groundwater pumping and/or recharge occur and geological heterogeneities.
Locally, recharge to shallow aquifers occurs by direct infiltration of rainfall and through seepage from creeks along the outcrops. The groundwater movement within aquifers is relatively slow, and based on hydraulic data it approximates 1 - 5 m/year, as hydraulic conductivities and gradients are low relative to porosities. In general, discharge in the Project Area occurs from controlled and uncontrolled flowing artesian bores or pumping from the different beds. Natural discharge is likely to occur via flows to the north and northwest, potential with interaction with rivers in the upper Dawson catchment and Comet River.

3.1.1.4. Groundwater Quality

Average values for key water quality parameters for groundwater within the project area and surrounding greater Denison Trough is provided in Table 7 suggesting generally decreasing water quality with depth. Relatively fresh water within the Hutton and Precipice formations is underlain by poor to very poor quality water in the underlying formations including the Moolayember Formation and Rewan Group.

Figure 1: Denison Trough (Bowen Basin) stratigraphic column of the project area.
### Table 4: Average Groundwater Quality

<table>
<thead>
<tr>
<th>Formation</th>
<th>Conductivity (µS/cm)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium</td>
<td>1,665</td>
<td>7.8</td>
</tr>
<tr>
<td>Hutton Sandstone</td>
<td>1,934</td>
<td>8.2</td>
</tr>
<tr>
<td>Boxvale sandstone member of the Evergreen Formation</td>
<td>679</td>
<td>8.3</td>
</tr>
<tr>
<td>Evergreen Formation</td>
<td>386</td>
<td>7.4</td>
</tr>
<tr>
<td>Evergreen Formation and Precipice Sandstone</td>
<td>484</td>
<td>7.7</td>
</tr>
<tr>
<td>Precipice Sandstone</td>
<td>453</td>
<td>7.4</td>
</tr>
<tr>
<td>Moolayember Formation</td>
<td>7,500</td>
<td>7.5</td>
</tr>
<tr>
<td>Rewan Group</td>
<td>10,560</td>
<td>7.5</td>
</tr>
<tr>
<td>Rangal Coal Measures</td>
<td>991</td>
<td>7.9</td>
</tr>
<tr>
<td>Blackwater Group</td>
<td>1,313</td>
<td>8.0</td>
</tr>
<tr>
<td>Peawaddy Formation</td>
<td>2,005</td>
<td>7.9</td>
</tr>
<tr>
<td>Ingelara Formation and Aldebaran Sandstone</td>
<td>2,650</td>
<td>8.5</td>
</tr>
<tr>
<td>Aldebaran Sandstone</td>
<td>682</td>
<td>8.2</td>
</tr>
</tbody>
</table>

#### 3.1.1.5. Surat CMA

The current tenures which form part of the Denison Trough South Development area (PLs 43, 44, 45, and 218) are located within the Surat Cumulative Management Area (CMA).

Potential impacts associated with petroleum activities within the CMA are assessed and managed by the Queensland Office of Groundwater Impact Assessment, which is required to submit an Underground Water Impact Report (UWIR) for the CMA. The *Water Act 2000* defines the requirements for a UWIR, which include, but are not limited to:

- The quantity of water historically produced and an estimate of the quantity of water to be produced because of the exercise of underground water rights.
- For each aquifer affected or likely to be affected a description of the aquifer and an analysis of the movement of groundwater between aquifers, including the changes due to the exercising of underground water rights.
- A water monitoring strategy, including:
  - The rationale for the strategy and locations to be monitored; and
  - The parameters to be measured and their measurement frequency.
- A spring impact management strategy, including:
  - An assessment of the hydraulic connection between the spring and underlying aquifer(s);
  - The predicted risk to the spring due to declining water levels at its location, and likely impact on ecosystem and ecological values of the spring due to declining water levels; and
  - Options available and a strategy for preventing or mitigating predicted impacts on the spring.
Springs

The Springs in the vicinity of the Denison Trough Development area are shown in Figure 2. There are springs located in the northern part of the Development Area, which are not predicted to be impacted.

![Figure 2: Location of Springs in the Surat CMA (OGIA, 2016)](image)

Landholder Bores

Active landholder bores are present within the Denison Trough Development Area (Figure 3). The data is based on Australia Pacific LNG bore baseline information and is accurate at the date of the latest baseline data from individual properties within the tenures.

In accordance with the proposed SMC (Well Activities 11), a Stimulation Risk Assessment will be conducted prior to stimulation occurring on the tenures, which will identify the landholder active groundwater bores in the area where stimulation activities are to be carried out.
3.1.2. Potential Impacts to Environmental Values

Based on an assessment of the existing environment, potential environmental values of groundwater that may be affected by the proposed amendment include:

- Changes in groundwater quality as a result of inter-aquifer leakage
- Changes in groundwater in other aquifers beyond the stimulation impact zone due to aquifer interconnectivity
- Contamination of groundwater from stimulation fluids
- Aquatic ecosystems
- Groundwater drawdown affecting landholder bores. Existing uses in the area includes:
  - Aquaculture and human consumption of aquatic food;

Figure 3: Active Landholder Bores on Denison Trough South tenures
- Agricultural;
- Recreation;
- Drinking water;
- Industrial; and
- Cultural and spiritual values.

There are no springs or surface water bodies that may be impacted by conducting HFS within the Denison Trough Development Area.

Further, the environmental values of groundwater within hydrocarbon bearing formations are very limited due to poor water quality, depth, and hydraulic isolation as demonstrated in Section 3.1.
### 3.1.3. Emissions or releases

There are no expected impacts to groundwater associated with the proposed activities.

The following unmitigated emissions and releases to groundwater are possible from the proposed activities:

- Contamination of groundwater from stimulation fluids.

### 3.1.4. Risk and Magnitude of Impacts

Overall, the risk and magnitude of impacts have been assessed as low as a result of the management measures outlined in section 3.1.5, and based on the low magnitude, extent and duration of the potential impact.

The proposed amendment to authorise HFS would not result in a significant risk or potential impact on environmental values of the project area or surrounds given the following:

- The natural significant vertical hydraulic separation / isolation between hydrocarbon bearing formations and overlying and underlying sandstone aquifers as described in Section 3.1.1.
- Implementation of best practice well construction standards prior to hydraulic fracturing, as described in Section 3.1.5.
- A comprehensive site-specific risk assessment, as described in Section 2.2.1, would be prepared for the project area and implemented for proposed hydraulic fracturing to avoid impacts to groundwater environmental values.
- Adoption of standard/model conditions subject to previous environmental/risk assessment by DES.
- Following the hydraulic stimulation, long-term (e.g. 20-30 years) operation of the petroleum well would result in full recovery of fluids used during hydraulic fracturing.

### 3.1.5. Environmental Management Measures

Prior to undertaking stimulation activities, a risk assessment would be developed to ensure that stimulation activities are managed to prevent environmental harm. Australia Pacific LNG Pty Ltd has prepared hydraulic fracturing risk assessments for other project areas, including for the APLNG Project (APLNG Hydraulic Fracture Stimulation Risk Assessment). This risk assessment would be updated, or a stand-alone risk assessment prepared, for proposed hydraulic fracturing with the project area, and include the following:

- A process description of the stimulation activity to be applied, including equipment and a comparison to best international practice.
- Provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority.
- A geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s).
- Naturally occurring geological faults.
- Seismic history of the region (e.g. earth tremors, earthquakes).
- Proximity of overlying and underlying aquifers.
- Description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation.
- Identification and proximity of landholder active groundwater bores in the area where stimulation activities are to be carried out.
- The environmental values of groundwater in the area.
• An assessment of the appropriate limits of reporting for all water quality indicators relevant to stimulation monitoring in order to accurately assess the risks to environmental values of groundwater.

• Description of overlying and underlying formations in respect to porosity, permeability, hydraulic conductivity, faulting and fracture propensity.

• Consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers.

• A description of the well mechanical integrity testing program.

• Process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling, etc).

• Practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation.

• Groundwater transmissivity, flow rate, hydraulic conductivity and direction(s) of flow.

• A description of the chemical compounds used in stimulation activities (including estimated total mass, estimated composition, chemical abstract service numbers and properties), their mixtures and the resultant compounds that are formed after stimulation.

• A mass balance estimating the concentrations and absolute masses of chemical compounds that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation.

• An environmental hazard assessment of the chemicals used including their mixtures and the resultant chemicals that are formed after stimulation including:
  – Toxicological and ecotoxicological information of chemical compounds used;
  – Information on the persistence and bioaccumulation potential of the chemical compounds used; and
  – Identification of the chemicals of potential concern in stimulation fluids derived from the risk assessment.

• An environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities.

• Identification and an environmental hazard assessment of using radioactive tracer beads in stimulation activities.

• An environmental hazard assessment of leaving chemical compounds in stimulation fluids in the target gas producing formation for extended periods subsequent to stimulation.

• Human health exposure pathways to operators and the general population.

• Risk characterisation of environmental impacts based on the environmental hazard assessment.

• Potential impacts to landholder bores as a result of stimulation activities.

• As assessment of cumulative underground impacts, spatially and temporally of the stimulation activities to be carried out on tenures covered by this environmental authority; and

Potential environmental or health impacts which may result from stimulation activities including, but not limited to Best practice well construction standards and well integrity verification would be undertaken prior to stimulation where hydraulic fracturing is proposed, including compliance with the DNRME Code of Practice for constructing and abandoning coal seam gas wells and associated bores in Queensland. These requirements relevant to proposed hydraulic fracturing, include:

Well Design
• All CSG wells must be designed to ensure the safe and environmentally sound production of gas by preventing any cross-flow contamination between hydrocarbon bearing formations and aquifers, and ensuring that gas is contained within the well and associated pipework and equipment without leakage.

• consider casing setting depths that take into account aquifer and production zone locations, and the requirements for well control.

• provide for installation of pressure control equipment (PCE) based on risk assessment, e.g. BOP equipment to API Standard 53.

• use appropriate casing weight and grade, and casing running procedures.

• use appropriate well design and construction materials.

• use appropriate casing centralisation.

• use engineered cement slurry and effective cement placement techniques.

• ensure all fluids produced from the well travel directly from the production zone to the surface without cross contamination.

Casing

• Casing, casing connections, wellheads, and valves used in CSG wells must be designed to withstand the loads and pressures that may act on them throughout the entire well life cycle. This includes casing running and cementing, any treatment pressures, production pressures, any potential corrosive conditions, and other factors pertinent to local experience and operational conditions.

• For CSG wells all surface and production casing in pressure containing applications must meet the relevant requirements of the P&G Regulation, Schedule 1, ‘Mandatory and preferred standards for safety requirements’.

• In all CSG wells, a conductor pipe does not need to meet the above requirements.

• Barriers shall be installed to prevent surface pollutants from entering the well, and prevent wellbore fluids and gas from escaping to the surface environment.

• When designing casing strings and casing connections for CSG wells, CSG operators must design each well’s casing string using appropriate design safety factors. For example, typical design safety factors used in the hydrocarbon industry at large are 1.1 for burst, 1.0 for collapse, 1.3 for static tension and 1.25 for tri-axial analysis. The design safety factors used by a CSG operator need to be appropriate for the anticipated well life, service conditions and local experience.

• To verify casing integrity during the well construction process, casing must be pressure tested prior to drilling out for the next hole section (in the case of surface or intermediate casing), and prior to completion operations commencing (in the case of production casing). The test pressure must be greater than the anticipated formation pressure possible at the surface, but must not exceed the burst pressure rating of the casing with the design safety factor applied.

• Minimum casing setting depth should be sufficient to meet the isolation requirements of groundwater aquifers and provide an acceptable kick tolerance for the next hole-section to be drilled. The kick tolerance criteria shall be selected by the operator and will be dependent upon knowledge of the local pore pressure and fracture gradient profiles, and of the likely kick conditions in the well.
  - If it is intended to convert a CSG well to a water supply bore, the surface casing shall not be set shallower than 60 m true vertical depth.
  - When the surface casing is set shallower than 60 m true vertical depth (TVD), the intermediate or production casing must be cemented to surface.

• Steel casing connections must be made up to ensure an aligned, round, secure, and leak proof joint
  - Only threaded casing connections are permitted in construction of CSG wells.
Cementing

- To prevent interconnection between zones of differing pressure and water quality:
  - All surface casing must be cemented from shoe to surface
  - For cementing production and intermediate casing, operators must design to ensure cement is either brought to surface or designed to an appropriate safety overlap distance of at least 50 m back inside the previous casing shoe. However, where operators choose not to bring cement to surface, they should consider that after abandonment, two adjacent cement barriers across all aquifers will be required.
  - Where cement is not returned to surface, wire-line logging or pressure testing must be performed and recorded, to verify isolation of the casing / casing annulus has occurred, after the cement has reached a compressive strength of 500 psi. at surface conditions.
  - Testing pressures shall take into account collapse pressure of the inner casing string and fracture gradient at the outer casing shoe
  - Production casing cement must be designed so that the base of the cement is no more than 30 m TVD above the prognosed depth of the shallowest production zone. If, once final pressure tests and/or wire-line evaluation are complete, achievement of the cementing objectives cannot be reliably demonstrated then written notification must be sent to The Chief Inspector, Petroleum and Gas

- Cement constituents and properties must be suitable for the intended conditions of use and used in compliance with the relevant material safety data sheets (MSDS) requirements.

- Appropriate cement laboratory testing procedures must be carried out in advance of the well being drilled to ensure the resulting slurry meets the requirements of the well design. The testing, as a minimum, must include compressive strength development with time. In the case where a number of similar wells are drilled in an area with constant cement materials and mix water properties, then a representative lab test may suffice.

- Wait on cement setting time.
  - Wait on cement time prior to slacking off or removing blowout preventers (BOPs) must be based on the cement achieving a minimum of 100 psi (0.7 MPa) compressive strength at the temperature of any potential flow zone in the annulus just cemented. Alternatively, operators may use a mechanical barrier that is compliant with API 65 - Part 2 and tested to verify a pressure seal prior to removing BOPs.
  - Wait on cement time prior to drill out must equate to the laboratory testing time for cement surrounding the casing shoe to have achieved a minimum compressive strength of 500 psi (3.5 MPa).

- Operators must ensure all zones (both hydrocarbon and groundwater aquifers) are isolated with cement with a minimum ultimate compressive strength of 500 psi (3.5 MPa).

- Operators must determine and document in their well procedures a minimum required ultimate compressive strength for cement slurries to be used across zones which may be hydraulically fracture stimulated. For example, requirements for ultimate compressive strength of 1400 psi (10 MPa) to 2000 psi (14 MPa) are often used in the hydrocarbon industry for cement across zones requiring fracture stimulation treatment.

- Operators must ensure that the required compressive strength slurry for fracture stimulation also be placed at least 150m above the shallowest target coal to be hydraulically fractured. Refer: API Guidance Document HF-1.

- During all cement jobs where the casing to be cemented is installed to the surface, cement returns to surface must be continuously monitored and recorded to confirm the effectiveness of the cement placement. Pressures during the cement job and in particular immediately prior to plug bump must be similarly recorded as a potential indicator of height of cement column and downhole problems.
• Free water content of the cement is specified as less than 2% using the free water test outlined in API RP 10B-2.

• Casing centralisation simulation must be undertaken for the casing centralisation plan to achieve a minimum of 70% standoff across the total cementing depth
  - 70% standoff is equal to 23mm for 9-5/8” casing in 12-1/4” hole; 13mm for 7” casing in 8-1/2” hole; 21mm for 5-1/2” casing in 7-7/8” hole.

• Centralisation calculations for a vertical well must include a deviation of three degrees from vertical at casing depth, unless otherwise proven. Where the actual deviation exceeds three degrees, the actual deviation data must be used. Refer to API 10D-2.

• Operators must review centraliser selection and application in the API Technical Report 10TR4 Selection of Centralisers for Primary Cementing Operations.

• It is mandatory that wiper plugs be used for production casing and they are recommended for surface casing to enable plug bump and pressure test of the casing before cement cures.

• Water quality, air quality (including suppression of dust and other airborne contaminants), noise and vibration.

While the proposed amendment would generate additional waste during the initial flowback of petroleum wells following hydraulic fracturing. This additional waste would be managed in accordance with existing waste management measures would continue to be implemented for the proposed amendment, including the following:

• Handling and temporary storage of regulated waste to prevent any loss.

• Separation of regulated and general waste.

• Removal of all regulated waste from the project area to a facility licenced to receive the waste under the EP Act.

3.2. Land

The Denison Trough South Development Area (PL43, PL44, PL45 and PL218) is predominately cleared landscape, which has been developed for cattle grazing and agricultural use, with some land areas designated for cropping land. The landscape is undulating low hills, and some watercourses present.

Significant land clearing has occurred in the past and vegetation present is largely non-remnant and highly modified. Some areas of regional ecosystems remain, predominantly in shadelines and small patches.

The Denison Trough South development includes existing infrastructure including gas processing facilities, wells flowlines, dams and ancillary equipment over the development area.

3.2.1. Existing Environment

3.2.1.1. Environmentally Sensitive Areas

DES mapping identified the following environmentally sensitive areas within the Denison Trough South Development Area:

• National Park - Carnarvon National Park (Category A)

• ‘Endangered’ REs (Category B)

• State Forest - Howe and Forrest State Forests (Category C)

• ‘Of Concern’ REs (Category C).
Australia Pacific LNG conduct detailed pre-clearance surveys prior to significant disturbance to verify Queensland Government RE mapped, confirm the terrestrial ecological values and identify any potential endangered, vulnerable or near threatened species listed under the Nature Conservation Act 1992.

3.2.1.2. Matters of State Environmental Significance

The Matters of State Environmental Significance (MSES) that are relevant to the Denison Trough South Development Area include the following listed in Schedule 2 of the Environmental Offsets Regulation 2014:

- Protected Areas (National Park)
- Regulated Vegetation (Prescribed REs that are Endangered and Of Concern)
- Regulated Vegetation (An area of Essential Habitat on the Essential Habitat map for wildlife prescribed as ‘endangered wildlife’ or ‘vulnerable wildlife’ under the NC Act)
- Regulated Vegetation (A prescribed RE to the extent the ecosystem is located within a defined distance from the defining banks of a relevant watercourse)
- Protected Wildlife Habitat (Protected Plants Flora Survey Trigger Map)
- Threatened Wildlife (threatened wildlife under the NC Act or special least concern animals under the Nature Conservation (Wildlife) Regulation 2006)
- Watercourses (High Ecological Value Waters).

3.2.1.3. Dominant ecosystems, topographic features and soils

Due to the large geographical distribution of the Denison Trough South Development Area, it intersects a number of biogeographical subregions of the Brigalow Belt South Bioregion, including the Carnarvon Ranges and Southern Downs.

The Brigalow Belt South Bioregion is complex and mainly characterised by brigalow (Acacia harpophylla) open forests. It has approximately 2.2 percent of the bioregion conserved in protected areas. Townships and rural settlements are dispersed throughout this landscape, which provide visual variety to the landscape, with a mosaic of agricultural crops and pastures throughout the region.

Remnant vegetation is common across much of the Denison Trough South Development Area with vegetation consisting of forests of Cypress Pine, Box and Ironbark covering the sandy soils. Open Brigalow and Box woodland occur on the clay soils with native and introduced grasses prevailing. The majority of the Denison Trough South Development Area has been identified as ‘Not of Concern’ RE with the southern aspect being cleared land reflecting the current land use.

The soils within the development area include rudosols, sodosols and vertosols, which are typical for the region.

3.2.1.4. Watercourses, Wetlands and Floodplains

The Denison Trough South Development Area is located in the Dawson River Catchment and the Maranoa River Catchment, within the greater Fitzroy Basin. The development area spans the headwaters of the Maranoa and Dawson River Basins and has a number of floodplains areas associated with higher stream order watercourses.

3.2.2. Potential Impacts to Environmental Values

The amendment seeks to authorise HFS which will be located within well sites that are existing or authorised on the EA. As such, the proposed amendment does not change the authorised impacts to land, beyond what is authorised on the EA.

Based on an assessment of the existing environment, potential impacts to the environmental values of land include:
• unplanned releases from onsite chemical storage required during the hydraulic fracture stimulation and drilling processes.

3.2.3. Emissions or releases
There are no expected impacts to land associated with the proposed activities.

The following unmitigated emissions and releases to land are possible from the proposed activities:
• unplanned releases from onsite chemical storage required during the hydraulic fracture stimulation and drilling processes.

3.2.4. Risk and Magnitude of Impacts
Overall, the risk and magnitude of impacts have been assessed as low as a result of the management measures outlined in section 3.2.5, and based on the low magnitude, extent and duration of the potential impact.

3.2.5. Environmental Management Measures
The amendment seeks to authorise HFS within the currently operational Denison Trough South Development Area. Existing management measures are in place within the development area to ensure impacts to environmental values are minimised.

• Any chemicals will be stored and handled within the development area, in accordance with the relevant legislative requirements and Australian Standards including the provisions of:
  - AS 3780:2008 - The storage and handling of corrosive substances.
  - AS 1940:2004 - The storage and handling of flammable and combustible liquids.
  - AS 3822:2007 - Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers.

• Infrastructure will be sited in accordance with the conditions of EA EPPG00787513 and in consultation with the landholder to minimise disturbance to the agricultural land.

4. Rehabilitation
The proposed amendment would not result in the authorisation of additional significant disturbance to land or change existing rehabilitation requirements. Notwithstanding, all significantly disturbed land will be rehabilitated and monitored in accordance with the existing conditions of EA EPPG00787513.

A Denison Trough Rehabilitation Plan (CDN/ID 12743080) has been developed by a suitably qualified person and implemented to address the relevant approval conditions of the EA (Appendix A).

5. Statutory Requirements

5.1. Environmental Protection Act 1994
Section 226, 227 and 227AA of the EP Act sets out the requirements for making an application to amend an EA. Table 5 lists these requirements and where they are addressed in the application material.

<table>
<thead>
<tr>
<th>Application requirement</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>s.226(1)(a) Made to the administering authority;</td>
<td>Refer to cover letter</td>
</tr>
<tr>
<td>s.226(1)(b) Made in the approved form;</td>
<td>Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(c) Accompanied by the prescribed fee;</td>
<td>Refer to the approved form</td>
</tr>
<tr>
<td>Application requirement</td>
<td>Relevance to amendment application</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>s.226(1)(d) Describe the proposed amendment;</td>
<td>Refer to Section 2 of this Supporting Information Report</td>
</tr>
<tr>
<td>s.226(1)(e) Describe the land that will be affected by the proposed amendment;</td>
<td>Refer to Section 3.2 of this Supporting Information Report</td>
</tr>
<tr>
<td>s.226(1)(f) Describe any development permits in effect under the Sustainable Planning Act 2009 for the carrying out of the relevant activity for the authority;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(g) State whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(h) 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;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(i) State whether the application seeks to change a condition identified in the authority as a standard condition;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(j) 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;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(k) Include an assessment of the likely impact of the proposed amendment on the environmental values, including:</td>
<td>Refer to Section 3 of this Supporting Information Report</td>
</tr>
<tr>
<td>(i) a description of the environmental values likely to be affected by the proposed amendment;</td>
<td></td>
</tr>
<tr>
<td>(ii) details of any emissions or releases likely to be generated by the proposed amendment;</td>
<td></td>
</tr>
<tr>
<td>(iii) a description of the risk and likely magnitude of impacts on the environmental values;</td>
<td></td>
</tr>
<tr>
<td>(iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and</td>
<td></td>
</tr>
<tr>
<td>(v) details of how the land the subject of the application will be rehabilitated after each relevant activity ceases;</td>
<td>Refer to Section 4 of this Supporting Information Report</td>
</tr>
<tr>
<td>s.226(1)(l) Include a description of the proposed measures for minimising and managing waste generated by any amendments to the relevant activity;</td>
<td>Refer to Section 3.1.5 and 3.2.5 of this Supporting Information Report</td>
</tr>
<tr>
<td>s.226(1)(m) Include details of any site management plan or environmental protection order that relates to the land the subject of the application;</td>
<td>N/A - Refer to the approved form</td>
</tr>
<tr>
<td>s.226(1)(n) Include any other document relating to the application prescribed under a regulation;</td>
<td>N/A - No other relevant documents have been prescribed</td>
</tr>
</tbody>
</table>

s.227 Where the proposed amendment would result in changes to the management of CSG water the matters in section 126(1) must also be addressed

126(1)(a) the quantity of CSG water the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity | N/A - No changes are proposed to the existing management of CSG water. |

126(1)(b) the flow rate at which the applicant reasonably expects the water will be generated | N/A - No changes are proposed to the existing management of CSG water. |

126(1)(c) the quality of the water, including changes in the water quality the applicant reasonably expects will happen while each relevant CSG activity is
### Application requirement

<table>
<thead>
<tr>
<th>Application requirement</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>carried out</td>
<td>CSG water.</td>
</tr>
<tr>
<td>126(1)(d) the proposed management of the water including, for example, the use, treatment, storage or disposal of the water</td>
<td>N/A - No changes are proposed to the existing management of CSG water.</td>
</tr>
<tr>
<td>126(1)(e) the measurable criteria (the management criteria) against which the applicant will monitor and assess the effectiveness of the management of the water,</td>
<td>N/A - No changes are proposed to the existing management of CSG water.</td>
</tr>
<tr>
<td>126(1)(f) the action proposed to be taken if any of the management criteria are not complied with, to ensure the criteria will be able to be complied with in the future</td>
<td>N/A - No changes are proposed to the existing management of CSG water.</td>
</tr>
</tbody>
</table>

### S227AA Where the proposed amendment involves changes to the exercise of underground water rights the matters mentioned in s126A(2) must also be addressed:

| 227AA(1)(a) The application relates to a site-specific environmental authority for: | N/A - the proposed amendment does not involve a change in the exercise of underground water rights |
| i) A resource project that includes a resource tenure that is a mineral development license, mining lease or petroleum lease; or | |
| ii) A resource activity for which the relevant tenure is a mineral development license, mining lease or petroleum activity; and | |
| 227AA(1)(b) The proposed amendment involves changes to the exercise of underground water rights. | |

| 227AA(2) The application must also state the matters mentioned in section 126A(2) | |
| 126(A)(2)(a) any proposed exercise of underground water rights during the period in which resource activities will be carried out under the relevant tenure | |
| 126(A)(2)(b) the areas in which underground water rights are proposed to be exercised; | |
| 126(A)(2)(c) for each aquifer affected, or likely to be affected, by the exercise of underground water rights - | |
| (i) a description of the aquifer; | |
| (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 | |
| (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; | |
| (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 | |
| 126(A)(2)(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 | |
| 126(A)(2)(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 | |
| 126(A)(2)(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). | |

Table 6 provides the assessment considerations of s223 of the EP Act in making an assessment level decision for the application.

**Table 6: Assessment Level Decision**
Exploration and New Ventures – Integrated Gas

Section 223 of EP Act | Minor Amendment Criteria | Relevance to amendment application
--- | --- | ---
(a) | Is not a change to a condition identified in the authority as a standard condition; | There are no standard conditions included in this EA.
(b) | Does not significantly increase the level of environmental harm caused by the relevant activity; | The amendment will not significantly increase the level of environmental harm authorised under the EA as the amendment seeks the adoption of standard conditions. Further, Section 3 of this report demonstrate how the amendment would not result in environmental harm given the hydrogeology of the project area with significant hydraulic isolation, proposed best practice management / mitigation measures.
(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; | The proposed amendment would not change any rehabilitation objectives stated in the EA.
(d) | Does not significantly increase the scale or intensity of the relevant activity; | The proposed amendment would not increase the scale or intensity of the relevant activity; petroleum exploration and production.
(e) | Does not relate to a new relevant resource tenure for the authority that is (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 | The proposed amendment does not relate to a new relevant resource tenure for the EA.
(f) | Involves an addition to the surface area for the relevant activity of no more than 10% of the existing area | The proposed amendment does not involve an addition to the surface area for the relevant activity. HFS will occur on well sites that are currently approved on the EA.
(g) | For an environmental authority for a petroleum activity— (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 | The proposed amendment does not involve constructing a new pipeline or 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.

Table 7: Standard Criteria

<table>
<thead>
<tr>
<th>Application requirement</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) the following principles of environmental policy as set out in the Intergovernmental</td>
<td>The proposed amendment was contemplated within the context of intergenerational equity and sustainable development, including the conservation of biological and ecological diversity; the</td>
</tr>
</tbody>
</table>
### Amendment Application

<table>
<thead>
<tr>
<th>Application requirement</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
</table>
| Agreement on the Environment -  
   (i) the precautionary principle;  
   (ii) intergenerational equity;  
   (iii) conservation of biological diversity and ecological integrity; and | proposed amendment would not significantly or permanently impact environmental values as demonstrated in Section 3. The proposed amendment was contemplated within the context of the precautionary principle and the activities proposed as part of the amendment do not pose a threat of serious or irreversible environmental harm, and there is a sufficient level of scientific certainty regarding the level of potential environmental harm. Best practice environmental management (BPEM) of the proposed activity will be achieved through implementation of environmental management measures described in this report. |
| (b) any Commonwealth or State government plans, standards, agreements or requirements about environmental protection or ecologically sustainable development | The proposed activities will be undertaken in accordance with other State and Commonwealth permits and approvals, including existing authorisations under the EP Act and the Environment Protection and Biodiversity Conservation Act 2001. |
| (d) any relevant environmental impact study, assessment or report | There are no relevant environmental impact studies, assessments or reports relevant to the amendment application. |
| (e) the character, resilience and values of the receiving environment | The character, resilience and values of the receiving environment are detailed in Section 3. |
| (f) all submissions made by the application and submitters | N/A. |
| (g) Best Practice Environmental Management (BPEM) for activities under any relevant instrument, or proposed instrument, as follows-  
   (i) an environmental authority;  
   (ii) a transitional environmental program;  
   (iii) an environmental protection order;  
   (iv) a disposal permit;  
   (v) a development approval; | Section 3 describes BPEM for the proposed amendment. |
| (g) 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; | The amendment proposes to adopt the BPEM described in Section 3. |
| (h) public interest; | Public interest in the proposed amendment is likely to be minimal given the low risk of potential impacts demonstrated by Section 3, including the proposed adoption of BPEM. Further, HFS will occur on existing or authorised wells on EA EPPG00787513. |
| (i) site management plan (SMP); | There are no known SMPs relevant to the application. |
| (j) integrated environmental management system (IEMS) or proposed IEMS; | N/A. |
| (k) other matters prescribed under a regulation. | Refer to Section 5. |

### 5.2. Environmental Protection Regulation 2008

Section 235 of the EP Act (major amendment) and section 241 of EP Act (minor amendment), both require the administering authority to consider any relevant regulatory requirement in deciding an amendment application. However, in accordance with section 48(2)(b) of the Environmental Protection Regulation 2008 (EP Reg), an amendment application is only considered an environmental management
5.2.1. Environmental Objective Assessment

Section 51 of the EP Reg describes the matters to be considered by the administering authority in making an environmental management decision. For the purposes of this amendment application, sections 51(1)(a) and (b), require the administering authority to:

- carry out an environmental objective assessment against the environmental objective and performance outcomes mentioned in Schedule 5, Part 3, Tables 1 and 2. The objective assessment is also prescribed as an additional matter for the standard criteria (section 53A); and
- Consider the environmental values declared under the EP Reg.

<table>
<thead>
<tr>
<th>Schedule 5, Part 3, Table 1 EP Reg</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Objective</td>
<td></td>
</tr>
<tr>
<td>The activity will be operated in a way that protects the environmental values of air.</td>
<td>The proposed amendment would protect the environmental values of air as it does not include the discharge of air contaminants above the existing authorisations of EPPG00787513.</td>
</tr>
<tr>
<td>Performance Outcomes</td>
<td></td>
</tr>
<tr>
<td>(1) There is no discharge to air of contaminants that may cause an adverse effect on the environment from the operation of the activity.</td>
<td>N/A - The proposed amendment does not include the discharge of air contaminants above the existing authorisations of EPPG00787513.</td>
</tr>
<tr>
<td>(2) All of the following—</td>
<td></td>
</tr>
<tr>
<td>(a) fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the site are prevented or minimised;</td>
<td></td>
</tr>
<tr>
<td>(b) contingency measures will prevent or minimise adverse effects on the environment from unplanned emissions and shut down and start up emissions of contaminants to air;</td>
<td></td>
</tr>
<tr>
<td>(c) releases of contaminants to the atmosphere for dispersion will be managed to prevent or minimise adverse effects on environmental values.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schedule 5, Part 3, Table 1 EP Reg</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Objective</td>
<td></td>
</tr>
<tr>
<td>The activity will be operated in a way that protects environmental values of waters.</td>
<td>The proposed amendment would protect the environmental values of water as it does not include the discharge of contaminants to surface waters above the existing authorisations of EPPG00787513.</td>
</tr>
<tr>
<td>Performance Outcomes</td>
<td></td>
</tr>
<tr>
<td>(1) There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity</td>
<td>N/A - The proposed amendment does not include the discharge of contaminants to surface waters above the existing authorisations of EPPG00787513.</td>
</tr>
<tr>
<td>2 (a) the storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks;</td>
<td></td>
</tr>
</tbody>
</table>
### Schedule 5, Part 3, Table 1 EP Reg

<table>
<thead>
<tr>
<th>Relevant to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water;</td>
</tr>
<tr>
<td>(c) the activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the site without prior treatment;</td>
</tr>
<tr>
<td>(d) the disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values;</td>
</tr>
<tr>
<td>(e) acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered;</td>
</tr>
<tr>
<td>(f) any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland;</td>
</tr>
<tr>
<td>(g) for a petroleum activity, the activity will be managed in a way that is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water and the prioritisation hierarchy for managing saline waste;</td>
</tr>
<tr>
<td>(h) the activity will be managed so that adverse effects on environmental values are prevented or minimised.</td>
</tr>
</tbody>
</table>

### Table 10: Schedule 5, Part 3, Table 1 - Wetlands

<table>
<thead>
<tr>
<th>Environmental Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>The activity will be operated in a way that protects the environmental values of wetlands.</td>
</tr>
<tr>
<td>Performance Outcomes</td>
</tr>
<tr>
<td>1 There will be no potential or actual adverse effect on a wetland as part of carrying out the activity.</td>
</tr>
<tr>
<td>2 The activity will be managed in a way that prevents or minimises adverse effects on wetlands.</td>
</tr>
</tbody>
</table>

### Table 11: Schedule 5, Part 3, Table 1 - Groundwater

<table>
<thead>
<tr>
<th>Environmental Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>The activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems.</td>
</tr>
<tr>
<td>Performance Outcomes</td>
</tr>
<tr>
<td>1 Both of the following apply— (a) there will be no direct or indirect release of contaminants to groundwater and demonstrates the</td>
</tr>
</tbody>
</table>
Schedule 5, Part 3, Table 1 EP Reg | Relevance to amendment application
--- | ---
contaminants to groundwater from the operation of the activity;  
(b) there will be no actual or potential adverse effect on groundwater from the operation of the activity. | continued protection of environmental values of groundwater and any associated surface ecological systems.

2 The activity will be managed to prevent or minimise adverse effects on groundwater or any associated surface ecological systems.

Note— Some activities involving direct releases to groundwater are prohibited under section 56 of this regulation.

| Environmental Objective | Relevance to amendment application
--- | ---
The activity will be operated in a way that protects the environmental values of the acoustic environment. | The proposed amendment would protect the environmental values of the acoustic environment as it does not include the generation of noise emissions above the existing authorisations of EPPG00787513.

Performance Outcomes

1 Sound from the activity is not audible at a sensitive receptor. | The proposed amendment does not include the generation of noise emissions above the existing authorisations of EPPG00787513.

2 The release of sound to the environment from the activity is managed so that adverse effects on environmental values including health and wellbeing and sensitive ecosystems are prevented or minimised.

| Environmental Objective | Relevance to amendment application
--- | ---
Any waste generated, transported or received as part of carrying out the activity is managed in a way that protects all environmental values. | Waste would continue to be managed in accordance with existing waste management measures including removal of all regulated waste from the site by a person who holds a current authority to transport such waste under the provisions of the EP Act and sent to a facility licensed to accept such waste.

Performance Outcomes

1 Both of the following apply—  
(a) waste generated, transported or received is managed in accordance with the waste and resource management hierarchy in the Waste Reduction and Recycling Act 2011;  
(b) if waste is disposed of, it is disposed of in a way that prevents or minimises adverse effects on environmental values. | Waste would continue to be managed in accordance with existing waste management measures including removal of all regulated waste from the site by a person who holds a current authority to transport such waste under the provisions of the EP Act and sent to a facility licensed to accept such waste. Beneficial uses of waste would continue to be pursued where it meets the quality criteria for reuse under the Waste Reduction and Recycling Act 2011.

The amendment application does not seek authorisation for the storage of waste above the existing authorisations of EPPG00787513.
### Schedule 5, Part 3, Table 1 EP Reg

**Environmental Objective**

The activity is operated in a way that protects the environmental values of land including soils, subsoils, landforms and associated flora and fauna.

Section 3 demonstrates the continued protection of environmental values for the proposed amendment.

**Performance Outcomes**

1. There is no actual or potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity.

   The amendment does not propose disturbance to land, beyond what is authorised on the EA, or adverse effect to environmental values of land as demonstrated in Section 3.

2. All of the following—
   
   (a) activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimise adverse effects on the environmental values of land;
   
   (b) areas disturbed will be rehabilitated or restored to achieve sites that are—
   
   (i) safe to humans and wildlife; and
   
   (ii) non-polluting; and
   
   (iii) stable; and
   
   (iv) able to sustain an appropriate land use after rehabilitation or restoration;

   (c) the activity will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants;

   (d) the application of water or waste to the land is sustainable and is managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils.

### Schedule 5, Part 3, Table 2 EP Reg

**Environmental Objective**

The choice of the site, at which the activity is to be carried out, minimises serious environmental harm on areas of high conservation value and special significance and sensitive land uses at adjacent places.

The amendment proposes to undertake the activity at existing locations or locations currently approved under EA EPPG00757513. Section 3 demonstrate the continued protection of environmental values including consideration of the significant hydraulic separation between the proposed activity and significant environmental values, and proposed implementation of BPEM.

**Performance Outcomes**

1. Both of the following apply—
   
   (a) areas of high conservation value and special significance likely to be affected by the proposal are identified and evaluated and any adverse effects on the areas are minimised, including any edge effects on the areas;

   (b) the activity does not have an adverse effect beyond the site.

2. Both of the following apply—
   
   (a) areas of high conservation value and special
Table 16: Schedule 5, Part 3, Table 2 - Location on Site

<table>
<thead>
<tr>
<th>Schedule 5, Part 3, Table 2 EP Reg</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Objective</strong></td>
<td></td>
</tr>
<tr>
<td>The location for the activity on a site protects all environmental values relevant to adjacent sensitive uses.</td>
<td>The amendment proposes to undertake the activity at existing locations or locations currently approved under EA EPPG00757513. Section 3 demonstrate the continued protection of environmental values including consideration of the significant hydraulic separation between the proposed activity and significant environmental values, and proposed implementation of BPEM.</td>
</tr>
<tr>
<td><strong>Performance Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>1 The location for the activity means there will be no adverse effect on any environmental values.</td>
<td>The amendment proposes to undertake the activity at existing locations or locations currently approved under EA EPPG00757513. Section 3 demonstrate the continued protection of environmental values including consideration of the significant hydraulic separation between the proposed activity and significant environmental values, and proposed implementation of BPEM.</td>
</tr>
<tr>
<td>2 Both of the following apply— (a) the activity, and components of the activity, are carried out on the site in a way that prevents or minimises adverse effects on the use of surrounding land and allows for effective management of the environmental impacts of the activity; (b) areas used for storing environmentally hazardous materials in bulk are located taking into consideration the likelihood of flooding.</td>
<td></td>
</tr>
</tbody>
</table>

Table 17: Schedule 5, Part 3, Table 2 - Critical Design Requirements

<table>
<thead>
<tr>
<th>Schedule 5, Part 3, Table 2 EP Reg</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Objective</strong></td>
<td></td>
</tr>
<tr>
<td>The design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management.</td>
<td>The amendment application does not include the design or operation of a facility. Notwithstanding, the amendment application proposes the adoption of best practice environmental management.</td>
</tr>
<tr>
<td><strong>Performance Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>1 The activity does not involve the storage, production, treatment or release of hazardous contaminants, or involve a regulated structure.</td>
<td>N/A - The amendment application does not include the design or operation of a facility.</td>
</tr>
<tr>
<td>2 All of the following apply— (a) all storage provided for hazardous contaminants includes secondary containment to prevent or minimise releases to the environment from spillage or leaks; (b) regulated structures comply with the ‘Manual for assessing consequence categories and hydraulic performance of structures’ published by the department; (c) provide containers for the storage of hazardous contaminants that are secured to prevent the removal of</td>
<td></td>
</tr>
</tbody>
</table>

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Exploration and New Ventures - Integrated Gas
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### 5.2.2. Environmental Values for Wetlands

Section 81A of the EP Reg describes the environmental values for wetlands. However, there are no GES or HES wetlands mapped within the project area.

### 5.2.3. Environmental Protection Policies (EPPs)

Section 51(1)(c) of the EP Reg requires consideration of the management hierarchy, the environmental values, the quality objectives and the management intent of all EPPs. However, as described in Section 3, the proposed amendment seeks only to adopt SMCs associated with groundwater environmental values. These proposed SMCs require the undertaking of a comprehensive hydraulic fracture risk assessment to determine the environmental values of groundwater in the area as the basis for a detailed site-specific risk assessment of the activities.

Section 52 of the EP Reg enables the administering authority to consider imposing conditions about protecting environmental values, and meeting quality objectives, under relevant EPPs, including the Environmental Protection (Water) Policy 2009. The continued protection of these environmental values was considered by the Department of Environment and Science in drafting the SMCs relevant to this amendment application, as documented in the detailed explanatory notes for the Guideline Streamlined model conditions for petroleum activities (ESR/2016/1989).

### 5.2.4. Additional Regulatory Requirements

Chapter 4, Part 3 of the EP Reg includes additional regulatory requirements, which must be considered by the administering authority in making an environmental management decision where the management decision relates to an activity mentioned in either section 58 or 63. However, the amendment application does not relate to an activity mentioned in section 58.

#### Table 18: s63 - Activity involving direct release of waste to groundwater

<table>
<thead>
<tr>
<th>Application requirement</th>
<th>Relevance to amendment application</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of waste directly to groundwater (the receiving groundwater). Example of direct release of waste to groundwater—an activity involving the release of contaminated water to groundwater through a well, deep-well injection or a bore</td>
<td>The amendment does not propose the release of waste directly to groundwater.</td>
</tr>
<tr>
<td>(2) The administering authority must refuse to grant the application if the authority considers—</td>
<td>The proposed amendment relates to an environmental authority for a petroleum activity. Notwithstanding, the proposed activity would be entirely confined within hydrocarbon bearing formations.</td>
</tr>
<tr>
<td>(a) for an application other than an application relating to an environmental authority for a petroleum activity—the waste is not being, or may not be, released entirely within a confined aquifer; or</td>
<td></td>
</tr>
<tr>
<td>(b) the release of the waste is affecting adversely, or may affect adversely, a surface ecological system; or</td>
<td>Section 3 demonstrate the continued protection of environmental values including consideration of the significant hydraulic separation between the proposed activity and significant environmental values, and proposed</td>
</tr>
<tr>
<td>Application requirement</td>
<td>Relevance to amendment application</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>(c) the waste is likely to result in a deterioration in the environmental values of the receiving groundwater.</td>
<td>Section 3 demonstrate the continued protection of environmental values including consideration of the significant hydraulic separation between the proposed activity and significant groundwater environmental values, and proposed implementation of BPEM.</td>
</tr>
<tr>
<td>(3) In this section— confined aquifer means an aquifer that is contained entirely within impermeable strata.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A: Denison Trough Rehabilitation Plan (CDN/ID 12743080)
Integrated Gas

REHABILITATION PLAN
Denison Trough

This Rehabilitation Plan has been prepared to address State Government approvals EPPG00787513 (PL 41, 42, 43, 44, 45, 54, 67, 173 and 218), EPPG00303813 (PL183), EPPG00300013 (PL219) and EPPG00304413 (PL220) conditions for the Australia Pacific LNG Project relating to rehabilitation activities within the Denison Trough, Membrane and Lonesome Gas Fields.

Review record

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<th>Approver</th>
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<td>Andrew Beckman</td>
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Review due: 06/09/2020
Review frequency: 3 years

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THE THREE WHATS

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What could cause it to go wrong?
What can I do to prevent it?
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1. **Introduction**

1.1 **Project Description**

The Denison Trough Development Area stretches from Injune through to Springsure and has been operating since 1990. Gas from the Southern section is processed at Yellowbank Gas Plant, and Rolleston Gas Plant processes the Northern section. The Denison Trough Development Area is an established conventional gas field with the Membrane and Lonesome fields undergoing exploration and appraisal. Authorised petroleum activities to be carried out at under the EAs include the operation of:

- exploration, appraisal and production wells
- gas and water gathering networks
- waste transfer stations and pipeline
- central compressor station
- water treatment facilities
- dams
- laydown and stockpile areas
- access tracks
- workforce accommodation and administration

Within the Denison Trough Development Area, proposed infrastructure associated with the production of coal seam gas from PLs 218, 219, 220, 41, 43, 44 and 67 consists of:

- Exploration and appraisal wells with associated infrastructure for development of the well

2. **Purpose**

This Rehabilitation Plan has been prepared to address rehabilitation activities within the Denison Trough Development Area and Membrane/Lonesome exploration. The rehabilitation plan has considered State Government approval conditions for the relating to rehabilitation activities within the Denison Trough Gas Fields. Specifically, this Plan has been developed to address approval conditions within the relevant Environmental Authorities (EAs).

Reinstatement and rehabilitation of disturbed areas is a regulatory requirement at the State level as part of environmental impact mitigation measures. Rehabilitation efforts will aim to achieve a stable landform with self-sustaining vegetation cover and species that are similar to adjoining undisturbed areas.

2.1 **Document Use**

The function of this document is to identify the range of rehabilitation methods (Section 4) that may be required to successfully undertake shaping and rehabilitation of land to a pre-disturbance land use.

Sections 4 identify the methods to return land to a particular pre-disturbance land use (pasture, cropping, native vegetation), identifying the variety of rehabilitation types and objectives that are necessary to achieve the pre-disturbance land use and function. Section 6 identifies the success criteria to be used to identify if the rehabilitation has achieved the desired outcome and discusses the monitoring efforts that are required to prove that the rehabilitation outcome has been achieved for both the rehabilitation type and the disturbance.
2.2 Definitions, Abbreviations and Documents

2.2.1 Definitions

In this document, the following definitions apply in Table 1:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue site</td>
<td>Specific locality, which is undisturbed or minimally disturbed and is representative of the expected biological integrity of other localities of the ecological community. Also known as a reference site.</td>
</tr>
<tr>
<td>BioCondition</td>
<td>A condition assessment framework for Queensland that provides a measure of how well a terrestrial ecosystem is functioning for biodiversity values.</td>
</tr>
<tr>
<td>Decommissioning</td>
<td>To withdraw something from active service. This typically involves the removal of project infrastructure on the completion of a project.</td>
</tr>
<tr>
<td>Progressive Rehabilitation</td>
<td>The process by which significantly disturbed areas are rehabilitated to their pre-disturbance land use with similar species and density of cover to that of surrounding undisturbed (by development activities) areas, as soon as practicable following the completion of any construction or operational works</td>
</tr>
<tr>
<td>Recovery</td>
<td>The process of protecting, conserving and managing a listed threatened species or a listed threatened ecological community.</td>
</tr>
<tr>
<td>Regeneration</td>
<td>Vegetation that regenerates naturally (i.e. without the assistance of human intervention) from existing seed banks, suckering or coppice growth.</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>Means the process of reshaping and revegetating land to restore it to a stable landform including the remediation of contaminated land.</td>
</tr>
<tr>
<td>Reinstatement</td>
<td>The process of bringing the construction earthen landscape back to a stable profile to the surrounding environment, including the stabilisation of the site. This can include seeding with grasses to stabilise the site.</td>
</tr>
<tr>
<td>Remediation</td>
<td>To take action to repair or mitigate damage that may or will be, or that has been, caused to a MNES or an EVNT listed species Remediation, in reference to contaminated land, means:</td>
</tr>
<tr>
<td></td>
<td>(a) rehabilitate the land; or (b) restore the land; or (c) take other action to prevent or minimise serious environmental harm being caused by the hazardous contaminant contaminating the land</td>
</tr>
<tr>
<td>Revegetation</td>
<td>The use of direct seeding or tubestock to support an area achieving the pre-clearance native vegetation or regional ecosystem</td>
</tr>
</tbody>
</table>

2.2.2 Abbreviations

In this document, the following abbreviations apply in Table 2:

<table>
<thead>
<tr>
<th>Term/Acronym</th>
<th>Definition/Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>APLNG</td>
<td>Australia Pacific LNG</td>
</tr>
<tr>
<td>ATP</td>
<td>Authority to Prospect</td>
</tr>
<tr>
<td>BAAM</td>
<td>Biodiversity Assessment and Mapping Methodology</td>
</tr>
<tr>
<td>CCS</td>
<td>Central Compressor Station</td>
</tr>
<tr>
<td>CSG</td>
<td>Coal seam gas</td>
</tr>
<tr>
<td>DEEDI</td>
<td>Department of Employment, Economic Development and Innovation</td>
</tr>
<tr>
<td>DERM</td>
<td>Department of Environment and Resource Management (currently EHP)</td>
</tr>
<tr>
<td>DOEE</td>
<td>Department of Energy and Environment (formerly DSEWPaC)</td>
</tr>
<tr>
<td>Term/Acronym</td>
<td>Definition/Expansion</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>DSEWPaC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Authority</td>
</tr>
<tr>
<td>EHP</td>
<td>Department of Environment and Heritage Protection (Queensland) (formerly DERM)</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>EMR</td>
<td>Environment Management Register</td>
</tr>
<tr>
<td>EP Act</td>
<td>Environmental Protection Act 1994 (Queensland)</td>
</tr>
<tr>
<td>EPBC Act</td>
<td>Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)</td>
</tr>
<tr>
<td>ESA(s)</td>
<td>Category A, B and C Environmentally Sensitive Areas as mapped by EHP and defined in the Environmental Authority</td>
</tr>
<tr>
<td>ESDAT</td>
<td>Environmental Data Management System</td>
</tr>
<tr>
<td>EVNT</td>
<td>A species listed as endangered, vulnerable or near threatened under the NC Act or threatened species under the EPBC Act.</td>
</tr>
<tr>
<td>FIC</td>
<td>Field Inspection Checklist</td>
</tr>
<tr>
<td>GCL</td>
<td>Geosynthetic clay liner</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GQAL</td>
<td>Good Quality Agricultural Land as defined by Planning Guidelines: the Identification of Good Quality Agricultural Land (Queensland)</td>
</tr>
<tr>
<td>HDPE</td>
<td>High density polyethylene</td>
</tr>
<tr>
<td>HSEMS</td>
<td>Health Safety Environment Management System</td>
</tr>
<tr>
<td>IECA</td>
<td>International Erosion Control Association</td>
</tr>
<tr>
<td>LNG</td>
<td>Liquefied Natural Gas</td>
</tr>
<tr>
<td>MDL</td>
<td>Minimum Disturbance Lease</td>
</tr>
<tr>
<td>MNES</td>
<td>Matters of National Environmental Significance listed under the EPBC Act</td>
</tr>
<tr>
<td>NC Act</td>
<td>Nature Conservation Act 1992 (Queensland)</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resource Management</td>
</tr>
<tr>
<td>PL</td>
<td>Petroleum Lease</td>
</tr>
<tr>
<td>PLA</td>
<td>Petroleum Lease Application</td>
</tr>
<tr>
<td>PoO</td>
<td>Plan of Operations</td>
</tr>
<tr>
<td>PPL</td>
<td>Petroleum Pipeline Lease</td>
</tr>
<tr>
<td>RE</td>
<td>Regional Ecosystem</td>
</tr>
<tr>
<td>RoW(s)</td>
<td>Right of Way(s)</td>
</tr>
<tr>
<td>RRRMP</td>
<td>Remediation, Rehabilitation, Recovery and Monitoring Program</td>
</tr>
<tr>
<td>SCL</td>
<td>Strategic Cropping Land</td>
</tr>
<tr>
<td>SEVT</td>
<td>Semi Evergreen Vine Thicket</td>
</tr>
<tr>
<td>SGDA</td>
<td>Spring Gully Development Area</td>
</tr>
<tr>
<td>SMU</td>
<td>Soil Management Unit</td>
</tr>
<tr>
<td>TEC</td>
<td>Threatened Ecological Community listed under the EPBC Act</td>
</tr>
</tbody>
</table>
Term/Acronym | Definition/Expansion
---|---
VM Act | Vegetation Management Act (1999) (Queensland)
WTF | Water Treatment Facility
WTS | Water Transfer Station

3. Scope

3.1 Geographical Extent

The Denison Trough Gas Fields include the Petroleum Lease (PL) 41, 43, 44, 45, 54, 67, 173, 218, Punchbowl Gully PL183, Membrane PL219 and Lonesome PL220. The Denison Trough Development Area occupies an area from Injune in the south to Springsure in the north within Queensland’s Bowen Basin and covers an area of approximately 134,761 ha in the regional council areas of Maranoa and Central Highlands.

3.2 Land Uses and Tenure

The northern section of the Denison Trough Development Area is flat to undulating with cracking clay soils overlaying alluvium on the floodplains and basalts on the slopes and ridges. The southern section is located on undulating upland plains adjacent to the crest of the Great Dividing Range.

Land use in the north is predominantly cattle grazing on improved pasture with grain cropping restricted to more fertile soils. Land use in the south is restricted to grazing of natural rangelands, except in the southern-most areas where the brigalow-clay soils have been cleared for improved pastures. Cypress pine is harvested throughout much of the southern Denison Trough area. A nature reserve occurs in the Redcap Hill area.

Table 3: Land Usage Denison Trough Development Area

<table>
<thead>
<tr>
<th>Total area (km²)</th>
<th>1,347</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use category</td>
<td>% of Development Area</td>
</tr>
<tr>
<td>Nature conservation (national park / other conserved area)</td>
<td>1.0</td>
</tr>
<tr>
<td>Grazing natural vegetation / minimal use</td>
<td>64.9</td>
</tr>
<tr>
<td>Forestry – production (State forest, which may be grazed) (\dagger)</td>
<td>9.7</td>
</tr>
<tr>
<td>Dry-land cropping</td>
<td>22.3</td>
</tr>
<tr>
<td>Irrigated cropping</td>
<td>1.9</td>
</tr>
<tr>
<td>Reservoir / dam</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(Source: Qld Govt. ACLUMP 2006)

Table note:

\(\dagger\) Production forestry on state forest tenures – includes grazing activities as a co-use

The predominant land tenure in the development area is Freehold. The percentage of the total area comprised by each land tenure category is summarised in Table 4.

Table 4: Land Tenure Denison Trough Development Area

<table>
<thead>
<tr>
<th>Tenure category</th>
<th>% of Development Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freehold</td>
<td>50.8</td>
</tr>
<tr>
<td>Leasehold</td>
<td>36.9</td>
</tr>
<tr>
<td>National Park</td>
<td>1.0</td>
</tr>
<tr>
<td>State Forest</td>
<td>9.5</td>
</tr>
<tr>
<td>Roads and Easements</td>
<td>1.5</td>
</tr>
<tr>
<td>Covenant</td>
<td>0.3</td>
</tr>
</tbody>
</table>

(Source: Qld Govt DCDB 2013)

Table note:

\(\dagger\) Leasehold land also occupies areas of State land not used in this calculation
3.3 Environmental Authority Conditions

This Rehabilitation Plan has been prepared to address State government approval conditions for the Australia Pacific LNG Project relating to rehabilitation activities within the Denison Trough Gas Field. Specifically, this plan had been developed to address approval conditions Condition F6 within EPPG00787513 (PL 41, 42, 43, 44, 45, 54, 67, 173 and 218), Condition Land 7-9 and Rehabilitation 1-8 within EPPG00304413 (PL219) and Condition Land 6-8 and Rehabilitation 1-8 within EPPG00300013 (PL220), EPPG00303813 (PL183). Table 5, below displays where these conditions are addressed.

Table 5: Details of Where Relevant Denison Trough Environmental Authority Conditions are Addressed

<table>
<thead>
<tr>
<th>EA Condition</th>
<th>Section of Rehabilitation Plan where addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPPG00787513</td>
<td>Progressive rehabilitation techniques (re-instatement) for disturbed areas are outlined in Section 4.</td>
</tr>
<tr>
<td>EPPG00304413 and EPP00300013 (PL219 and PL220)</td>
<td></td>
</tr>
<tr>
<td>Land 6 (EPPG00300013) and Land 7 (EPPG00304413) Pipeline trenches must be backfilled and topsoils reinstated within three months after pipe laying</td>
<td>Section 4</td>
</tr>
<tr>
<td>Land 7 (EPPG00300013) and Land 8 (EPPG00304413) Reinstatement and revegetation of the pipeline right of way must commence within 6 months after cessation of petroleum activities for the purpose of pipeline construction</td>
<td>Section 4</td>
</tr>
<tr>
<td>Land 8 (EPPG00300013) and Land 9 (EPPG00304413) Backfilled, reinstated and revegetated pipeline trenches and right of ways must be: (a) A stable landform (b) Re-profiled to a level consistent with surrounding soils (c) Reprofiled to original contours and established drainage lines; and (d) Vegetated with ground cover which is not a declared pest species, and which is established and growing.</td>
<td>Section 4 and 6</td>
</tr>
<tr>
<td>Rehabilitation 1: A Rehabilitation Plan must be developed by a suitably qualified person and must include the: (a) rehabilitation goals; and (b) procedures to be undertaken for rehabilitation that will: i. achieve the requirements of conditions (Rehabilitation 2) to (Rehabilitation 8), inclusive; and ii. provide for appropriate monitoring and maintenance.</td>
<td>Sections 4-8 express the goals to achieve in rehabilitating land. Section 4 and 5 identifies the actions required to rehabilitate.</td>
</tr>
<tr>
<td>Rehabilitation 2: Significantly disturbed areas that are no longer required for the on-going petroleum activities, must be rehabilitated within 12 months (unless an exceptional circumstance in the area to be rehabilitated (e.g. a flood event) prevents this timeframe being met) and be maintained to meet the following acceptance criteria: (a) contaminated land resulting from petroleum activities is remediated and rehabilitated (b) the areas are: i. non-polluting ii. a stable landform iii. re-profiled to contours consistent with the</td>
<td>Sections 4 identify the rehabilitation methods and how they apply to disturbance types that align to the specifics of points (a) to (e).</td>
</tr>
<tr>
<td>EA Condition</td>
<td>Section of Rehabilitation Plan where addressed</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>surrounding landform</td>
<td>Section 4 and 6</td>
</tr>
<tr>
<td>(c) surface drainage lines are re-established</td>
<td></td>
</tr>
<tr>
<td>(d) top soil is reinstated; and</td>
<td></td>
</tr>
<tr>
<td>(e) either:</td>
<td></td>
</tr>
<tr>
<td>i. groundcover, that is not a declared pest species, is growing; or</td>
<td></td>
</tr>
<tr>
<td>ii. an alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained.</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation 3: All significantly disturbed areas caused by petroleum activities which are not being or intended to be utilised by the landholder or overlapping tenure holder, must be rehabilitated to meet the following final acceptance criteria measured either against the highest ecological value adjacent land use or the pre-disturbed land use:</td>
<td>Section 4 and 6</td>
</tr>
<tr>
<td>(a) greater than or equal to 70% of native ground cover species richness</td>
<td></td>
</tr>
<tr>
<td>(b) greater than or equal to the total per cent of ground cover</td>
<td></td>
</tr>
<tr>
<td>(c) less than or equal to the per cent species richness of declared plant pest species; and</td>
<td></td>
</tr>
<tr>
<td>(d) where the adjacent land use contains, or the pre-clearing land use contained, one or more regional ecosystem(s), then at least one regional ecosystem(s) from the same broad vegetation group, and with the equivalent biodiversity status or a biodiversity status with a higher conservation value as any of the regional ecosystem(s) in either the adjacent land or pre-disturbed land, must be present.</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation 4: Where significant disturbance to land has occurred in an environmentally sensitive area, the following final rehabilitation criteria as measured against the pre-disturbance biodiversity values assessment (required by conditions (Biodiversity 1) and (Biodiversity 2)) must be met:</td>
<td>Section 4 and 6</td>
</tr>
<tr>
<td>(a) greater than or equal to 70% of native ground cover species richness</td>
<td></td>
</tr>
<tr>
<td>(b) greater than or equal to the total per cent ground cover</td>
<td></td>
</tr>
<tr>
<td>(c) less than or equal to the per cent species richness of declared plant pest species</td>
<td></td>
</tr>
<tr>
<td>(d) greater than or equal to 50% of organic litter cover</td>
<td></td>
</tr>
<tr>
<td>(e) greater than or equal to 50% of total density of coarse woody material; and</td>
<td></td>
</tr>
<tr>
<td>(f) all predominant species in the ecologically dominant layer, that define the pre-disturbance regional ecosystem(s) are present.</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation 5: Conditions (Rehabilitation 2), (Rehabilitation 3) and (Rehabilitation 4) continue to apply after this environmental authority has ended or ceased to have effect.</td>
<td>Section 4 and 6</td>
</tr>
<tr>
<td>Rehabilitation 6: Prior to relinquishing all or part of an authority to prospect area, a rehabilitation report must be prepared which specifically relates to the area to be relinquished and demonstrates condition (Rehabilitation 2), (Rehabilitation 3) and (Rehabilitation 4) has been met.</td>
<td>Section 4 and 6</td>
</tr>
</tbody>
</table>
4. Rehabilitation Objectives

4.1 Rehabilitation hierarchy

The overall goal of rehabilitating significantly disturbed areas no longer required for petroleum activities is to achieve the pre-disturbance land use unless otherwise agreed with the landholder or other overlapping tenure holder and approved by the State government administering authority.

It must be noted that all significant disturbances are to be rehabilitated in a way that will meet the final acceptance criteria when compared to the adjacent land use or pre-disturbance land use unless there is an alternative intended land use to be utilised by the landholder or an overlapping tenure holder. The alternative option away from final acceptance criteria does not apply if the disturbance is a category A, B or C environmentally significant area where specific rehabilitation objectives are to be achieved.

Final rehabilitation goals will be determined according to the following hierarchy, in order of preference and prior condition:

1. Reinstatement and rehabilitation of the pre-disturbance land use.
   a. Where existing pre-disturbance; reinstating a self-sustaining and progressive native ecosystem with predominant species of the ecologically dominant layer where disturbance occurred within an environmentally sensitive area.
2. Establishing an alternative outcome for a higher environmental value than the prior land use
3. Reinstatement of the prior land use such as for the purpose of grazing or cropping
4. Establishing a beneficial use where land is intended to be utilised by the landholder or an overlapping tenure holder.

4.2 Reinstatement Objectives

Reinstatement refers to restoration and stabilisation of land following project disturbance or maintenance activities to establish a stable landform suitable for the operational phase of the project. Reinstatement is a precursor to rehabilitation. Reinstatement is evaluated using criteria for progressive rehabilitation defined in the gas field Environmental Authorities.

4.3 Rehabilitation Planning

4.3.1 Reinstatement Planning

A site specific reinstatement plan will be developed by a suitably qualified person addressing site specific measures to be implemented as part of the construction works to establish a stable area for the operational land use and support achieving the final rehabilitation objectives.

The site specific rehabilitation plan must include the following:

- Reinstatement and/or rehabilitation land use in accordance with the rehabilitation hierarchy
- revegetation species and methods
- land stabilisation and soil amelioration requirements


- details of any site specific measures that may differ from the general methods described in this plan (RRRMP), including justification demonstrating an equivalent or better environmental outcome.

4.3.2 Final Rehabilitation Planning

A site specific decommissioning and rehabilitation plan will be developed by a suitably qualified person addressing the site specific measures to be implemented as a part of the decommissioning and rehabilitation works to maintain/establish the desired operational land use. Attention to the environmental requirements are:

- Exploring opportunities for reuse or retention of infrastructure for a beneficial use
- Removing surface and underground infrastructure that may impede final rehabilitation
- Decontaminating and rehabilitating surroundings, and as required from disturbance;
- Stabilise the landform and revegetate with consideration to the rehabilitation objective (e.g. pasture, cropping or native vegetation establishment).

Rehabilitation Methods

This section outlines general rehabilitation methods. Note that for many infrastructure types, certain areas will be required to remain treeless during operations or may be intended to be utilised by the landholder or an overlapping tenure holder. These areas will be reinstated after construction. It is important to recognise the rehabilitation objectives described in Section 6 are applied only where they can be achieved for operating infrastructure or decommissioned infrastructure. Reinstatement may involve the return of soil, mulch, re-seeding with pasture grasses or native grasses and ground cover species or reliance upon natural regeneration. In some situations final reprefiling of the land form may not take place during reinstatement. An example of this is a well pad where a cut and fill is required to create a level surface for infrastructure, operational and maintenance requirements, and the well pad is required to remain open and free of shrubs and trees during operations. Final rehabilitation, may include return of woody native vegetation, where required in an environmentally sensitive area, this will take place once infrastructure is no longer required and is decommissioned. Any decommissioning plan for infrastructure should be informed by all environmental requirements.

4.4 Vegetation Clearing and Mulching

During vegetation clearing measures will be undertaken to harvest timber resources, minimise loss of habitat places and reserve mulch for use in reinstatement. The following requirements must be adhered to for the clearing, mulching and stockpiling of vegetation:

- Prior to commencing clearing in timbered areas, consult with the landholder to agree any timber harvesting requirements such as setting aside felled logs for landowner use
- Prior to and during clearing mature trees and trees with habitat values (e.g. hollows or potential nesting sites) will be identified by a suitably qualified person and marked in the field and where possible clearing will be avoided.
- Habitat features including logs, hollow bearing trees and rocks, will be identified by a suitably qualified person and retained for habitat recreation through relocation adjacent to the disturbed area
- Woody vegetation (other than habitat features and useable timber requested to be reserved by the landowner) will be mulched for use in rehabilitation unless otherwise authorised by the Origin Environmental Manager
- Mulch and cleared vegetation must be stockpiled to facilitate spreading or salvaging within the disturbance area in a location that facilitates later use in rehabilitation. Gaps will be left in stockpiles to avoid impeding vehicle, stock or wildlife movements,
- Mulch stockpiles will not be wider than 10m and higher than 2m, where practical and managed to reduce fire fuel loads at the base.
- Mulch stockpiles are to be stored separately to subsoils and kept free of waste and biosecurity restricted matters
- Mulch should be stockpiled separately from topsoil where practicable and necessary to preserve topsoil, however some mixing of mulch with topsoil is acceptable
- mulch stockpiles must be at least 10m from the top bank of the low flow channel of drainage features and not placed where they could obstruct flow or be washed away in a flow event
Denison Trough Rehabilitation Plan

4.5 Soil management

Effective management of soil is essential to successful reinstatement and rehabilitation. Management of topsoil and subsoil will be undertaken in accordance with the Soil Assessment and Management Plans (SAMP) for the gas fields. The gas fields SAMPs include requirements for site planning, soil identification, topsoil preservation, management of subsoils, stockpiling and amelioration.

4.6 Landform re-establishment

4.6.1 Backfilling

The following actions will be implemented in backfilling of trenches and reinstatement of excavations, although site specific requirements, will be implemented where necessary in precedence to those outlined below:

- pipeline trenches, bell holes and other open excavations will be backfilled as soon as practicable after pipe laying.
- pipeline trenches must be rehabilitated as soon as practicable but not longer than three (3) months after completion
- backfilled excavations should be suitably compacted to prevent subsidence. Notwithstanding this, compaction must not impede rehabilitation and establishment of vegetation
- excavated subsoils will be used for backfilling
- backfill materials (i.e. padding sand and subsoil) will not be contaminated with general rubbish or any foreign material
- subsoils will not be used as a surface capping layer
- certified clean, weed and disease free backfill material may be used where required. Clearance certificates and analysis reports must be kept on record, and;
- topsoil will not be used for backfill

4.6.2 Reinstating land form

Land form reinstatement involves surface contouring to create a stable land formation consistent with the surrounding land. This ensures water flow over the surface is in cohesion with the surrounding landscape and minimises the risk of potential gully erosion. General mitigation measures will be implemented to minimise potential impacts. These measures are:

- in areas of site levelling works, proposed formation levels will be set to reduce the need for significant cut and fill areas
- in areas where access tracks have been constructed the landform will be re-profiled to establish a landform consistent with the surrounding landscape and ensure it is in a stable condition
- restore all disturbed areas to a stable landform consistent with surrounding areas
- complete surface contouring prior to replacement of topsoil
- re-establish and stabilise surface drainage lines to prevent ongoing erosion
- restore all drainage lines to pre-disturbance bed level, channel width and longitudinal gradient, and;
- restore drainage line banks to stable profile which is as close to pre-disturbance conditions as practicable.

4.6.3 Compaction relief

Ripping assists with binding of the soil layers, increases retention time of water on the slope, aids water infiltration into the soil increasing the opportunity of seed germination success and reduces the volume and velocity of runoff generated from the slope. This will be undertaken along contours where practicable, particularly on heavily trafficked areas such as temporary access tracks, laydowns, working sides of RoWs camps and hardstands and other areas compacted by construction activities. Some points to inform ripping as a reinstatement practice are:
compaction relief of subsoil will occur in all disturbed areas where subsoil has been compacted and prior to topsoil replacement and where the area will not undergo compaction from ongoing operational activity. Where compaction of soil may occur due to ongoing operational use (e.g. tracks), compaction relief should occur following decommissioning (not construction reinstatement)

- compaction relief will utilise appropriate equipment designed for soil compaction alleviation ensuring soil inversion and exposure of subsoils is avoided, compaction is effectively relieved to the target depth, while avoiding forming large clods and smearing of soils
- ripping depth must be determined by a suitably qualified person and take in consideration the following aspects:
- depth and magnitude of compaction effects through assessment activities undertaken on the site
- depth of underground assets and restriction limits that may apply for protection of these assets
- Establish target compaction relief outcomes with regard to analogue or adjacent sites undisturbed by project activities
- ripping of the soil must take place when the soil is at friable consistency, check soil moisture prior to undertaking ripping. Identify the optimum window for conducting compaction relief. Refer to long-term climatic data and/or real time soil moisture measurements to facilitate decision-making
- where practicable rip along contours. On areas running down slope lift tines every 50m for 5m
- ripping will be excluded from under the drip lines of retained vegetation to avoid impacts on the root systems of adjacent vegetation, and;
- Establish access controls to prevent re-compaction of treated areas.

4.6.4 Fertiliser

Fertilisers will be applied as required on the basis of site soil assessment and based on land use and vegetation type. Fertiliser requirements will be determined by suitably qualified person, taking in consideration, soil characteristics, land use and vegetation required to re-establish. Fertiliser will be used on areas of agricultural land and operational areas, however no fertiliser is required to be used in areas where native vegetation regeneration is the rehabilitation outcome.

Fertiliser inputs will include the following:

- Fertilisers may be applied in reinstatement of pasture and grassed areas to stimulate revegetation
- fertiliser application in agricultural areas should take into account landowner requirements
- fertilisers will not be used for native vegetation establishment, as most native plants have adapted to low natural nutrient soil conditions
- fertilisers with a supply of sulphur (S) should not be used where soil conditions indicate a pH of <5, as this will contribute to further lowering the pH, and;
- fertiliser types and application rates are to be informed from soil analysis information and applied as instructed on packaging or advice guide.

4.6.5 Vegetation Respreading

Large felled native vegetation, mulch and other fauna habitat elements (large surface rocks and felled tree trunks) will be reserved where practical and placed adjacent to the edge of the disturbance area with consideration to site characteristics, site maintenance requirements and personnel safety. Stockpiled vegetation, mulch and other fauna habitat elements will be spread or stored after any seeding task as follows:

- mulched material will be evenly spread over the disturbed area to assist in the distribution of seed stock and provide erosion protection
- stockpiled vegetation may be stored or placed in a way on disturbance that does not impede operational maintenance or access considering site characteristics i.e. along the disturbance boundary linearly
- mulch will be spread once seeding and/or planting has been completed
- mulch layer thickness should generally not exceed 50mm and 70% coverage, unless authorised by an Environmental Advisor
• all reserved habitat features, vegetation and mulch will be used in any final rehabilitation task as to the durability over time of the natural product
• to prevent weed and soil pathogen spread and assist with appropriate revegetation and soil micro-organism recovery, topsoil, mulch and habitat elements will be sourced from salvage specific to that site
• where mulch has to be brought in from other source approval must be obtained from the Environment Advisor and be accompanied by a biosecurity hygiene declaration from the supplier
• felled vegetation will not be burnt unless directed by the regulatory authority, and;
• habitat features including logs, hollow bearing trees and rocks, will be identified prior to or during clearing by a suitably qualified person and retained for habitat recreation through relocation adjacent to the disturbed area.

4.6.6 Erosion and Sediment Control

Erosion and sediment control requirements relevant to reinstatement and rehabilitation will be carried out in accordance with the gas field Erosion and Sediment Control Plan (ESCP) and site specific ESCP that may be developed for a specific site. It must be noted that ESCP will be amended to suit site requirements and ESC installations are subject to the progress of land rehabilitation and land uses i.e. cropping over disturbances.

4.7 Revegetation & Rehabilitation types

Revegetation of a disturbance area involves the use of natural regeneration, direct seeding, propagates or tubestock to support an area achieving a similar pre-clearance native vegetation species richness, regional ecosystem species richness, cropping or pasture system. The following techniques will be discussed as methods for vegetating disturbance areas. Not all methods will be utilised at a given disturbance as each outcome to the disturbance type, infrastructure operations, maintenance inputs and final or existing land utilisation outcome remain different.

4.7.1 Reinstatement – Pasture and Ground Cover Establishment

Areas disturbed will be sown with appropriate pasture or native species seed mix sourced from reputable local seed suppliers and as agreed with the landholder to establish a stable vegetative cover. From time to time seeding for pasture re-establishment will be omitted if abundant seed is available in the topsoil seedbank and disturbance window is limited for topsoil storage. The use of a sterile cover crop seed may be added to the seed mix used in reinstatement, unless otherwise requested by the landholder. Seeding will generally occur directly following topsoil replacement and reinstatement to facilitate progressive rehabilitation. This task will be undertaken irrespective of whether the site is to undergo reinstatement or final rehabilitation.

Seeding methods to be employed can include:

• a direct seeding method can be undertaken using a spreader attached to the rear of a tractor which delivers seed onto the soil and suitably buries seed
• a drill seeding method that applies and presses the seed to a specified depth (harrowing will not be required for drill seeding)
• hand distribution where seed is broadcast. This method is mostly employed where steep slopes are present and impractical for machinery application methods, and;
• hydro-seeding and hydro-mulching or equivalent product may be used on steep slopes to encourage more rapid revegetation and, therefore, stabilisation of the rehabilitated area.

Seeding method application will be determined by site specific constraints. Seeding is to take place after surface preparations, but before final harrowing. For direct seeding and hand distribution harrowing is undertaken after seeding, the seed is covered with a small layer of soil to assist in the germination process and protect from predation such as avian and insect seed forages. Rehabilitation crews should assess each site on a case by case basis to ensure the most practical and cost effective (to desired outcome) application method is supplied to a disturbance area, according to the topography and level of risk involved if machinery is utilised.

4.7.2 Direct Seeding of Native Species for Final Rehabilitation

The selection of species to be used in the rehabilitation process where native vegetation is the final land use objective may be guided by the preclearance vegetation assessment, adjoining vegetation assessment or determined from analogue site surveys as outlined in Section 8. Species selection may be guided by soil conditions, micro-climate and aspect of the new land form. Information held within
analogue site surveys and associated reports may support the volume of seed and species required to be sourced which will require careful planning to ensure supplies are available and seed can be sourced from reputable local and selected seed suppliers that provide local provenance seed stock. Seeding may take place at seasonal times or times of suitable climatic conditions that are best suited to germination success.

Seeding is to be undertaken as soon as practicable after the topsoil has been spread or prepared and stable profile restored, but before spreading mulch or other habitat features. Sowing may take advantage of the most appropriate season for germination and establishment of seedlings (i.e. immediately before the commencement of the wet season) as manual watering will not be undertaken. A suitable seeding method will be undertaken following the techniques outlined in Section 6 above.

Direct seeding with sterile cover crop or grasses may be undertaken in areas where the rapid establishment of vegetation cover is required (e.g. watercourse crossings, steep slopes and other potential high erosion areas).

Where practicable or identified as necessary for recovery fencing off from stock may be required, depending on adjacent land use and stakeholder inputs to facilitate revegetation and regrowth until site stability is established. Fencing where required will be constructed to the Origin Energy specifications, given landholder input where MNES are being rehabilitated such as TECs, or EVNT plant species that are site specifically prone to detrimental impacts through grazing.

4.7.3 Natural Regeneration

Trees and shrubs will be allowed to regenerate naturally on reinstated areas not required to be kept tree free for the purpose of operation and maintenance, where establishment of native vegetation is the final land use objective. This practice will contribute to reducing barriers to fauna movement, especially to ground-dwelling fauna. Natural regeneration is the preferred method of revegetation in areas where native vegetation was cleared. To assist natural revegetation the following will be undertaken:

- Where topsoil does not require removal, root stock will be left in the ground where practicable to facilitate rapid regrowth
- preserve and utilise the existing seedbank in the topsoil to regenerate native vegetation
- use mulch to establish temporary ground cover for erosion protection of disturbed areas
- within 100m of downslope drainage lines and where the availability of mulch is not sufficient to provide 70% groundcover at 50mm thickness, natural regeneration must be supplemented with direct seeding of a sterile cover crop species during reinstatement.
- conduct rehabilitation monitoring to evaluate revegetation success and undertake direct seeding with native species if natural regeneration is unsuccessful when attempting EA final acceptance criteria.

4.7.4 Cropping areas

In areas of prior or intended (by the landholder) cultivation; seeding is not a required task. If a landholder has an intended land use of cultivation, where infrastructure has been installed then the approach to sow a cover crop or not to sow the disturbance area must be confirmed with the landholder.

4.7.5 Tubestock Planting

There will be certain situations where tubestock planting will be required as a primary response or a secondary response to establish the required vegetation cover and diversity, such as where species unsuited to direct seeding must be established, including communities such as Brigalow and some SEVT species. Tubestock planting may also be required to return plant species of conservation significance including MNES and State listed EVNT species and these may only be practically returned via direct planting. Requirements for tubestock planting are as follows:

- species to be selected for planting will be sourced from local suppliers wherever possible to meet volume requirements, necessary planning and preparations will be required to ensure the desired species and volume can be supplied
- tubestock will be planted in the early wet season (December – February) to take advantage of rainfall as no manual watering program will be conducted beyond the initial planting. Some ecosystems, such as SEVT revegetation will require supplementary watering during establishment as the diverse species are mostly very slow growing
- spacing will be determined according to the species, but will typically be 2m apart for most tree species
• tubestock will be watered immediately following planting
• moisture retention products (water crystals) at the time of planting may be utilised to support the establishment of plants
• where available mulch will be placed around tubestock plants, but should not touch the stems, and;
• fencing will be required following planting to prevent native and livestock browsing damage.

Engagement with tubestock suppliers will identify the requirement to deliver local provenance tubestock and supply will be guided by the list of key species developed for the relevant Regional Ecosystems, in consultation with land holders, in regard to adjoining vegetation community species and based on BioCondition reference data from analogue site survey (surveys outlined in Section 8) in certain situations, mentioned above, where tubestock planting will be required. Identified quantities of tubestock will be sourced from reputable local and specialist nursery stock suppliers. The collection, storage and sourcing of seed for tubestock propagation will be via the engagement of reputable local seed suppliers and specialist seed suppliers by contracted local and specialist nursery stock suppliers.

4.7.6 Seed Collection

To meet the requirements for direct seeding for diverse native species for final rehabilitation, seed will be sourced from native species, with preference for seed of species adapted to local conditions. It is anticipated seed collection will be affected by:

• climatic conditions such as rainfall and prolonged periods of drought affecting flowering and seed set
• natural predation of avian and insect fauna
• distribution of diverse seed types and sizes
• quantity of seed set and management of harvesting quantities within acceptable limits for natural reproduction of native species, and;
• supplier quality, quantity, accessibility and volume of seed and types available for harvesting.

Seed purchasing will be guided by several information sources such as the list of key species developed for the relevant Regional Ecosystems (found in Appendix A), and for pasture species, in consultation with land holders, adjoining vegetation community species and based on BioCondition reference data. Seed harvesting where identified as necessary will be conducted on request to suitably skilled contracted services and as required to the availability of target species to accommodate the commercial quantities of seed necessary as advised by lists of key species developed for the relevant Regional Ecosystems, and for pasture species, in consultation with land holders and based on BioCondition reference data. Where engaged reputable local seed suppliers and specialist seed suppliers will be suitably permitted to undertake collection and will be required to collect commercial quantities of seed to meet this demand. Seed the particular species assemblage will be required to be tested by the supplier and evidence of viability provided before sowing to ensure there will be adequate germination rates.

4.7.7 Remnant vegetation requirements

4.7.7.1 Disturbance limits

Ecological communities existing within the Gas Fields include listed ecological communities under the EPBC Act (Commonwealth), and Endangered, Of Concern, Least Concern Regional Ecosystems under the Vegetation Management Act 1999 (VM Act) (Queensland).

Threatened Ecological Communities (TECs) (EPBC status) present within the Gas Fields at the time of granting the 2009/4974 approval area include Brigalow, SEVT and Weeping Myall open woodland. No clearing of Weeping Myall woodland is permitted under the EPBC Approval 2009/4974, however clearing limits for Brigalow woodland and SEVT exist and are permitted. TECs present in the Gas fields but listed after 2009/4974 include Coolibah – Black Box Woodlands, no clearing limits are specified in this approval and rehabilitation requirements are not referred in Section 6.9, however the rehabilitation requirements remain for this community upon decommissioning actions as discussed Section 6.9.

Threatened Ecological Communities (TECs) (EPBC status) not identified within the gas fields include:

• Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland TEC
• White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and derived native Grassland
4.7.8 Rehabilitation techniques

There are slight differences in the techniques for revegetation of the dominant species within each RE, based on the species specific natural regeneration processes in response to fire and other natural or manmade disturbances. General soil handling and site preparation techniques during construction and operational maintenance will be similar irrespective of the broad vegetation group. The reinstatement of landforms and stability through operations will also be similar irrespective of infrastructure type. Regeneration will be supported where suitable to the operation of the infrastructure.

Post decommissioning of infrastructure the general technique will involve the support of regeneration and where required revegetation, for remnant vegetation. Revegetation as required will utilise direct seeding or for certain situations tubestock planting may also be required, such as where species fail to regenerate or species are unsuited to direct seeding, e.g. Brigalow and some SEVT species.

The seed mix for areas of remnant vegetation will be determined by the vegetation composition of the Regional Ecosystem as determined by analogue surveys or informed by assessment of the adjacent highest conservation value Regional Ecosystem. Consideration will be given to a seed mix including native grass species that will provide good protection from erosion in the short term but also allow shrubs and tree seedlings to establish successfully post decommissioning. Where it is necessary to keep areas free of trees during project operations (such as along pipeline ROWs and well lease pads) a seed mix containing native grasses and ground cover species or species applicable to the existing

4.7.7.2 Rehabilitation objective

The overall objective for the rehabilitation of native vegetation listed as a TEC under the EPBC Act is to achieve site remediation and rehabilitation of impacted areas to promote progressive recovery of affected environments. This practically involves maintaining a reinstated landform with a protective vegetative cover during Operations. The aim of the rehabilitation following decommissioning

- undertake environmental surveys for areas to identify as determined by risk, the correct Regional Ecosystem (RE) of the site to be disturbed
- utilise BioCondition reference site survey data at analogue sites to develop criteria for each RE for diversity, composition, stem density, and foliage cover
- set criteria for each RE based on the findings of the BioCondition reference site surveys and;
- monitor rehabilitation against set goals for the RE.

As the above threatened ecological communities have not been identified within the gas fields development area and clearing of Weeping Myall woodland is not permitted under the EPBC Approval 2009/4974, these TECs have not been addressed within this plan. If the above ecological communities are detected Australia Pacific LNG will develop and submit to DoEE for approval rehabilitation techniques for these TECs.

Where there are direct impacts on TECs and State significant values, offsets will be provided in accordance with the State approved and Federally recognized Environmental Offsets Strategy (QLNG01-15-EA-0021). The strategy is based on the following policies at the time of writing the Environmental Offsets Strategy:

- Queensland Government Environmental Offset Policy (QGEOP)
- The Queensland Department of Environment and Resource Management Policy for Vegetation Management Offsets VEG/2006/2888 – version 2.4 (21/10/2009) will not be referred in this plan. Environmental protection aspects of petroleum extraction are regulated under the Environmental Protection Act 1994 (Qld) and this policy does not apply to the Project.

More specifically Threatened Ecological Community Management Plans (TECMP) (Q-LNG01-15-MP-0114) for the TECs had been approved in 2011 and amendments remain for Minister approval. TECMP has made specific references to the recovery of these threatened ecological communities and include measures on avoidance, mitigation and management practices to minimise impacts and aid recovery.
grass cover of the disturbance area or natural regeneration of ground cover will be used. In areas where vegetation is removed, but the soil and roots are not extensively disturbed, natural regeneration only will be relied upon for revegetation.

Each ecosystem contains a range of species with different germination and seedling establishment requirements. Some plants germinate from the topsoil without any action required. Some species only require seed to be collected and sown across the site (direct seeding), while others require some seed treatment, e.g. exposure to smoke, prior to sowing. Determining the germination and seedling establishment requirements of a range of appropriate plant species will be required when undertaking final revegetation efforts post decommissioning.

4.8 Rehabilitation Types

4.8.1 Native Vegetation

Following decommissioning, all native vegetation areas will be rehabilitated to a stable landform with self-sustaining ground cover where applicable to the ecosystem/s impacted. Vegetation diversity and ecologically dominant species, will represent establishing ecologically dominant species similar to adjoining undisturbed areas.

4.8.2 Rehabilitation Objective

The process of developing specific goals for individual sites for the species to be established, the landholder requirements, the required species diversity, the required abundance, the required ground cover and habitat variables, composition and the required cover percentage will involve the following:

1. Determine the land use requirements and general land requirements of the landholder
2. determine the correct Regional Ecosystem of the site to be disturbed as to the adjacent highest quality standing community
3. assessment of adjacent land use to develop criteria for each RE for ecologically dominant species diversity, composition, ground cover, habitat variables and foliage cover
4. set criteria for each location were remnant revegetation recovery is undertaken post decommissioning
5. monitor rehabilitation against set goals for the adjoining analogue and that of the EA conditions

For any new infrastructure as proposed in the Denison Trough Plan of Operations rehabilitation areas will be compatible with the surrounding landscape. This will include linking rehabilitated areas with undisturbed native vegetation to provide larger areas of wildlife corridors where feasible. This will in part be achieved through active rehabilitation of riparian areas adjacent to stream crossings where feasible.

4.8.3 Rehabilitation Technique

The aim of the rehabilitation following disturbance of all native vegetation is to restore a stable landform, with self-sustaining vegetation cover and species similar to adjoining undisturbed areas. There will be differences in the techniques for revegetation of the dominant species within each RE, based on these species natural regeneration processes in response to fire and other natural disturbances.

The general revegetation technique for native vegetation, upon decommissioning will be as required with preference to direct seeding with groundcover species or regeneration of the seed bank. Planting of native vegetation will be a consideration post monitoring rounds and if required thorough observation may be undertaken to improve the species diversity, and cover percentage to achieve final acceptance criteria objectives.

The seed mix for areas of native vegetation will be determined by the vegetation composition of surrounding undisturbed areas. Consideration will be given to a seed mix including native grass species that will provide good protection from erosion in the short term but also allow shrubs and tree seedlings to establish successfully. In areas where vegetation is removed, but the soil and roots are not extensively disturbed, natural regeneration only will be relied upon only for revegetation.

4.8.4 Rehabilitation techniques for TECs

This section contains specific rehabilitation techniques for vegetation communities listed as TECs under the EPBC Act.

4.8.4.1 Brigalow communities

Brigalow community REs represent forests and woodlands dominated or co-dominated by Acacia harpophylla (Brigalow). Brigalow communities are damaged by intense fires which can effect key
4.8.4.2 Semi-evergreen Vine Thicket (SEVT)

Vine thickets are dominated by species such as Ehretia membranifolia, Apophyllum anomalum, Geijera parviflora, Capparis spp., Croton phebaloides, Erythroxylum australae, Alectryon diversifolius, Cadellia pentastylis and Carissa ovata. SEVTs may also have Brigalow trees and Brachychiton species (Bottle Trees) may form an emergent layer above the vine thicket.

Semi-evergreen vine thickets have a high diversity of tree and shrub species compared to other ecosystems in the region. Their rehabilitation will best be achieved by enhancing the regrowth of existing remnant patches. SEVTs can be damaged by cattle, with seedling establishment often inhibited, so fencing of rehabilitation areas may be a worthy requirement.

Seeds of SEVT species are produced within capsules that remain unopened on the tree for a few years. Store capsules in a paper bag, where the capsules will open and drop seed within days of collection from the tree. No seed treatment is necessary. Sow fresh seed of Belah directly onto the site. Typically associated eucalypts include Eucalyptus coolabah, E. cambageana, E. wooliiana and E. populnea. The seed of these eucalypts falls from the capsules when mature, although seed is not always produced annually. Collect mature capsules before or as seed is released. Seed should be sown fresh with no pre-treatment necessary.

Managing for fire prevention on supporting landholders properties will involve fire prevention around operating infrastructure and as conducted by the landholder themselves. Maintaining low fuel loads in adjacent eucalypt woodlands, through grazing is the most practical application where land management is the responsibility of the landholder. The maintenance measures for maintaining low fuel loads within Brigalow woodlands will be undertaken on properties owned by Australia Pacific LNG. The landowners on estates adjacent to the development area are responsible for the management of the vegetation. Where Brigalow woodlands are invaded by exotic grasses, especially Buffel Grass, reduction of the fuel loads through stock grazing, or herbicide control of grasses on the margins may be a management option.

Many different weed and pest species are invaders of Brigalow communities. Weed species cause the greatest impact where edge to area ratio is high. Feral pigs are identified as the most likely pest species to cause the greatest impact on Brigalow communities.

For existing Brigalow communities adjacent to infrastructure on-ground management activities likely to assist in recovery as outlined in the Brigalow (Acacia harpophylla dominant and co-dominant) Conservation Advice (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and roads) in or adjacent to remnants to minimise weed incursion
- avoiding fragmentation of Brigalow communities
- appropriately manage grazing pressure of livestock in agreement with landholder
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses), and
- managing grass fuel loads and maintaining property fire breaks
- maintaining quality of litter cover and woody debris.

Conservation Advice (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and roads) in or adjacent to remnants to minimise weed incursion
- avoiding fragmentation of Brigalow communities
- appropriately manage grazing pressure of livestock in agreement with landholder
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses), and
- managing grass fuel loads and maintaining property fire breaks
- maintaining quality of litter cover and woody debris.

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propagated by a suitably qualified nursery stock provider to deliver SEVT species tubestock for revegetation efforts on a needs basis.

Vine thicket plantings may require supplementary watering support during establishment depending upon climatic conditions, as they are mostly very slow growing. Plantings are prone to invasion by weeds, especially grasses, and will require several maintenance treatments over the first 3-5 years.

Semi-evergreen vine thicket plants are damaged by fires, even of a low intensity. While some scrub plants may re-shoot following a fire, their canopy height is lost and they are slow to recover. Fires allow grasses to invade the SEVTs, which promote subsequent fires. Keeping fire out of rehabilitation areas is important for all rehabilitating ecosystems, but especially so for SEVTs. Low fuel loads should be maintained in woodlands adjacent to rehabilitating vine thickets, through grazing or regular, low intensity burning of eucalypt woodlands. These responsibilities outside of infrastructure fire management are the responsibilities of the landholder for their property management.

Further best practice management practices for SEVTs are outlined in the National Recovery Plan for SEVTs (MacDonald 2010). For existing SEVT communities adjacent to infrastructure on-ground management activities likely to assist in recovery as outlined in the National Recovery Plan for SEVTs (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and roads) in or adjacent to remnants to minimise weed invasion
- manage feral animal impacts
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses), and;
- managing grass fuel loads and maintaining fire breaks to avoid hot fires in remnants.

4.8.5 Flora Species of Conservation Significance

Flora species of conservation significance are those species listed under the EPBC Act as Extinct, Extinct in the wild, Critically Endangered, Endangered, Vulnerable or Conservation dependent and/or the under the NC Act as Endangered, Vulnerable or Near Threatened (EVNT). The Threatened Flora Management Plan (Q-LNG01-15-MP-0108) identifies the Threatened and Near Threatened flora species that are known or potentially occur within the Gas Fields area.

4.8.5.1 Rehabilitation objective

The primary objective will be to avoid populations of flora species of conservation significance as outlined in the Australia Pacific LNG Environmental Constraints and Field Development Protocol (Q-LNG01-15-MP-0109) and the Threatened Flora Management Plan (Q-LNG01-15-MP-0108). Where impacts are unavoidable the rehabilitation objective in relation to significant flora is the successful regeneration of flora species, successful translocation or establishment of offsets to ensure no net loss of individuals or populations. This will be determined for specific sites where populations are detected on an individual species basis on the advice of an approved ecologist and or outlined in State issued Nature Conservation Act 1992 protected plant clearing permits.

4.8.5.2 Rehabilitation techniques

Natural regeneration will be used to rehabilitate areas containing flora species of conservation significance. Translocation, propagation and replanting of tubestock of plant species will be undertaken where established to be effective for that particular species. These actions are to be informed by species monitoring activities post construction.

In areas where threatened flora (i.e. NC Act listed EVNT or EPBC Act listed MNES species) are present prior to disturbance (construction) and regenerating post disturbance (maintenance), it is mandatory to strip and preserve seed bank prior to removing remainder of topsoil profile. Strip the top 50mm of soil and keep separate from other stockpiles. Strip the area containing the threatened flora population to be cleared plus a ten meter buffer within the disturbance area (NB: do not exceed disturbance area) The seed bank stockpile must be signposted to inform personnel that the stockpile is to be kept separate and replaced during rehabilitation as the top layer.

In addition to the general rehabilitation techniques listed above, the following specific control measures will be site dependant and may need to be put in place during the rehabilitation process:

- install erosion and sediment control measures as per site specific specifications of erosion and sediment control plans to protect the location/s of conservation significant flora from scouring and sedimentation without significantly altering surface water conditions
- avoid broad-scale spraying of herbicides for weed management in proximity to populations of flora species of conservation significance
• undertake the construction of fencing until plant populations have established, to prevent grazing or browsing damage
• implement targeted weed control measures where weeds are identified a threat to flora species of conservation significance
• introduce species provenances where genetic influences limit population viability e.g. *Rutidosis lanata*
• implement pest animal control measures if on Australia Pacific LNG land, and;
• implement ecological fire management guidelines if on Australia Pacific LNG land.

4.8.6 Habitat of Fauna Species of Conservation Significance

The Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) identifies fauna species of conservation significance that are known or potentially occurring within the Gas Fields area.

4.8.6.1 Rehabilitation objective

The primary Project and Operations maintenance/decommissioning objective is to avoid habitat of fauna species of conservation significance as outlined in the Protocol and the Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan Addendum (Q-LNG01-15-MP-0113_01). Where impacts are unavoidable the rehabilitation objective in relation to fauna habitat is the successful rehabilitation of fauna species habitat, or establishment of populations in translocation sites and/or establishment of offsets as outlined in Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) and any relevant offset proposals.

4.8.6.2 Rehabilitation techniques

Natural regeneration where practicable to operating infrastructure will be used to rehabilitate the habitat of fauna species of conservation significance. Direct seeding or tubestock planting with native species representative of the ecologically dominant layer for the site specific RE and ground habitat features will also be undertaken, as required, at the time of decommissioning. At this time it will be necessary to ensure rehabilitation includes food trees appropriate to the fauna species, the habitat, and land tenure type (e.g. Belah for Glossy Black Cockatoo or Spotted Gum for Sugar Glider). Species specific requirements are outlined in Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01).

In addition to revegetation, the retention of habitat features such as logs, hollows and litter will be vital for maintaining habitat values. The following measures will be put in place to maintain habitat features during Project construction and operational maintenance, in particular during clearing and re-spreading of timber:

• where trees with hollows are felled and suitable equipment is present on site, relocate to suitable adjacent habitat
• retain some felled timber to locate within adjacent habitat to increase sheltering opportunities for displaced animals
• spread mulch, timber (where practicable) and leaf litter into the area to assist in the restoration of micro-habitat and artificially increase ground debris , and
• install suitable nest boxes, if recommended by an ecologist or outlined in a Species Management Plan, within surrounding confirmed habitat if trees bearing medium to large hollows are felled, and where practicable, fencing off from stock may be required, depending on adjacent land use, to prevent degradation of habitat of listed fauna species.

If habitat of species of conservation significance are located within riparian vegetation downstream of the clearing site or in adjacent wetland areas, the following measures will also be implemented:

• install erosion and sediment control measures as per site specific specifications of erosion and sediment control plans to protect the habitat from scouring and sedimentation without significantly altering surface water conditions
• minimise impacts of infrastructure on temporary shallow wetlands through alteration of drainage conditions or siltation, and
• avoid the broad application of herbicides, insecticides and other chemicals when undertaking maintenance near wetlands and other water bodies.
4.8.7 Pastoral Land

In terms of individual properties, the level of disruption to agricultural land uses will depend upon the siting of wells, access roads, underground pipelines and treatment facilities. Given the nature of the gas resource, there is some flexibility to adjust the location of wells (subject to operational needs). Similarly, the location of access tracks and pipeline easements may be varied to a degree. It is Australia Pacific LNG's intention to discuss the location of these items with landholders to reduce the level of potential disruption.

The Project will put in place mitigation measures where the potential to disrupt farming practices exists. These measures would include the exchange of information about proposed Project activities with individual property owners. Such information will include an overview of infrastructure layouts, activity outlines, timetable of events, environmental and vehicle hygiene management plans and potential compensation arrangements. Landholders will be encouraged to contact a member of the Australia Pacific LNG landholder relations group in relation to their property and/or the Project.

4.8.7.1 Rehabilitation objective

The aim of rehabilitation is to restore the production potential of pastoral land. Australia Pacific LNG will determine the required land use of individual properties in consultation with landholders. This will guide soil preparation upon reinstatement and determine the seed mix that is applied.

4.8.7.2 Rehabilitation techniques

Areas where grazing is the required final land use will be sown with appropriate pasture species as agreed with landholders. Local native grasses may be used in some situations, such as where it is desirable to return an area to grazing on unimproved native pasture. The application of desired seed mixes may not always result in the establishment of the preferred pasture as seed presence within the soil seed bank will influence the vegetation presence including pasture growth and diversity.

4.8.8 Cropping Land

The location of infrastructure is selected and negotiated with landholders to minimise the impact to agricultural land productivity. Infrastructure will, in some situations be sited within Strategic Cropping Land (SCL), but where practicable SCL is avoided, and where SCL is present options for pad drilling will be assessed.

Pre-disturbance soil surveys of areas to be disturbed has been undertaken broadly at a scale of 1:100000 for the pipeline well and flowline network and 1:25000 for facilities locations. This will ensure that soil management specific conditions in the various EAs within Schedule D, in regard to soil assessment and management are met. Further efforts to identify soils and management measures at a lower scale is undertaken prior to construction and sources similar information to help inform the construction method undertaken.

Landholders will be consulted where Project infrastructure (such as access tracks and pipelines) is to be established through GQAL to ensure timing of the works does not unduly affect farming operations. Where possible, access tracks and associated pipelines will use existing tracks, fence lines and road reserves.

4.8.8.1 Rehabilitation objective

The aim of rehabilitation is to restore the production potential of cropping land. Australia Pacific LNG will determine the required land use of individual properties in consultation with landholders. This along with soil management information utilised to determine construction methods will guide soil preparation, in regard to removal, stockpiling and reinstatement with or without amendment dependant to advice. Although cropping is the desired final land use, areas may be sown with sterile grass species to stabilise soils if required by the landholder.

4.8.8.2 Rehabilitation techniques

Where disturbance of cropping land is unavoidable, the careful management of topsoil and subsoil will form an important component of the rehabilitation strategy. On cropping land access tracks will seek to avoid cropping areas and will generally not be gravelled. At the completion of construction, wastes will be removed, temporary access routes will be closed and subsoils will be replaced with a topsoil capping.

Before topsoil re-spreading on cropping land, topsoil that has been stockpiled for long periods will be re-analysed. In the event that soil stockpiles have existed for longer than 12 months and/or it is suspected that topsoil has been degraded by construction works (for example excessive traffic or

Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) will make specific reference to the measures necessary to be undertaken within the gas field development more specifically adopted for MNES.
blending with subsoils or mulch) then laboratory analysis must be undertaken to determine suitability for reuse. Analysis shall be undertaken for the following parameters and reports given to an Environmental Advisor with recommended mitigation measures (e.g. amelioration):

- pH
- Electrical Conductivity
- Total Nitrogen
- Colwell phosphorous
  - Exchangeable Cations (Calcium, Magnesium, Potassium, Sodium) using the pre-wash method to enable calculation of Cation Exchange Capacity (CEC)
  - Calcium/Magnesium ratio (Ca:Mg)
  - Exchangeable Sodium Percentage (ESP)
- Soil classification based on particle size.

Additional nutrients (specifically nitrogen and phosphorus-based fertilisers, depending on the type of revegetation planned), organic fertilisers (manure) or conditioners may be required to improve topsoils and return them to a productive state for cropping. Fertilisers and soil supplements will be used only as necessary and with the agreement of landholders.

Following topsoil spreading, areas may be sown with appropriate cover grass species, however in cropping areas generally no seed will be planted as agreed with the landowner.

4.8.9 Riparian Areas and Water Crossings

Riparian areas and watercourses have the potential for higher biodiversity than the surrounding landscape. They provide water for many flora and fauna species adapted to specialist habitats characterised by permanent/semi-permanent surface water.

The Gas Fields area is dissected by creek systems with associated alluvial soils that support open forests of *Eucalyptus tereticornis* (Queensland Blue Gum), *E. camaldulensis* (River Red Gum), *Angophora floribunda* (Rough-barked Apple), *A. leiocarpa* (Smooth-barked Apple) and *Casuarina cunninghamiana* (River She-oak). These communities have often been retained as a vegetated riparian corridor through cleared agricultural land. They provide an important habitat for a wide variety of fauna.

The Gas Fields area contains several significant major creeks and it will be necessary for pipelines and access tracks to cross them in some locations.

4.8.9.1 Rehabilitation objective

The primary objective is to minimise impacts to riparian areas and watercourses by selecting a suitable crossing point in regard to the vegetation community, landform constraints and the landholder requirements. Where impact is unavoidable, mitigation measures will be adopted including minimising the area of disturbance and impacts on riparian vegetation and water quality.

Where clearing of riparian vegetation is unavoidable the objective will be to reinstate the creek bed and banks and establish a ground cover as soon as practical post-construction. This reinstatement will be consistent where practicable with the surrounding environment and contours of the channel at the time of construction. Further objectives are to minimise erosion and destabilisation of creek banks, and restore vegetation and fauna habitat.

Upon decommissioning the establishment of predominant species of the ecologically dominant layer to the RE will be encouraged to grow through regeneration, active planting or seeding, as specific sites require.

4.8.9.2 Rehabilitation techniques

Rehabilitation of waterway crossings will involve contouring disturbed areas to where practicable match the surrounding land or an alternative stable bank design as soon as practicable after pipe laying and backfilling. Erosion controls will be constructed or installed, such as surface stabilisation, matting or armouring where necessary. The surface preparation will usually be lightly scarified before spreading the topsoil, to promote vegetation growth and protect against the topsoil loss.

Rehabilitation will be undertaken and will ensure that:

- Disturbed drainage lines will be stabilised as soon as practicable following disturbance and construction works staged to minimise the duration of exposed disturbed areas. Stabilisation
may include soil binders, biodegradable matting or meshes or rock as required based on stream flow rate

- any water ingress into trenches will be handled with pumping from the trench utilising APIA Code methods for sediment and erosion control
- temporary facilities such as waterway barriers will be removed and the areas reinstated
- seed spreading or planting of tubestock consisting of bank stabilisation species will be carried out in areas at risk of erosion or in densely vegetated watercourses to enhance natural regeneration, and;
- pipelines will be backfilled and the potential for normal flow reinstated as soon as practicable.

### 4.8.10 Stock Routes

The primary purpose of the stock route network is to provide for travelling stock, although other secondary uses may occur within a stock route. These other uses may include the short-term adjustment of parts of the route, the establishment of watering agreements with private landholders, and the construction and maintenance of stock route facilities. A road that is a stock route may be used as a transport corridor for vehicles or for communication and utility infrastructure facilities, for example phone, power and gas lines. Impacts on stock routes will generally arise from the clearing of vegetation and ground disturbance associated with the laying of gas and water pipeline networks. No plant or water storage sites will be located within a stock route.

#### 4.8.10.1 Rehabilitation objective

It is a Coordinator General’s condition (Coordinator General’s Report, Appendix 1, Part 1, Condition 6) that parts of the stock route network disturbed or affected by works be rehabilitated upon completion of the Project to a state that is safe for travelling stock and drovers, and the travelling public, and is consistent with the area’s pre-disturbance state unless otherwise agreed by DEHP and the local government.

#### 4.8.10.2 Rehabilitation techniques

Ground disturbance to stock routes will be reinstated as soon as practicable following the cessation of construction activities. Stock routes will be reinstated to return the topsoil profile and establish a ground cover consistent to that of the surrounding land use. Any watering points disturbed by construction activities are to be reinstated.

### 4.9 Pest Species Management

#### 4.9.1 Restricted Invasive plant species

Some restricted invasive plant species are a potential threat to rehabilitation, and to MNES, given the nature of the proposed activities (particularly clearing and soil disturbance during construction). Species identified as restricted matters under the Queensland Biosecurity Act 2014 are present in the Gas fields areas and will be managed in accordance with the Origin Energy Biosecurity Management Plan – Queensland (CDN/ID 8057416)

The Biosecurity management plan is supplemented by the following procedures:

- Biosecurity Management – Construction (Q-1000-15-AP-072)
- Biosecurity Management Procedure (OEU-P1000-PRO-ENV-042)
- Biosecurity Hygiene Procedure (OEU-Q1000-PRO-ENV-036)
- Biosecurity Imported Cargo Procedure (OEU-Q1000-PRO-ENV-041).

Restricted invasive species are managed by following:

- Queensland LNG Operations & Pilots Record of Weed Management Form (QLD-1000-ENV-FRM-00012)
- Site specific weed management plans, and;
- Technical instructions for specific species weed management i.e.: Parthenium (*Parthenium hysterophorus*), Mother of millions (*Bryophyllum* sp.), Prickly Pear (*Opuntia* sp.)
4.9.2 Prohibited or restricted invasive animals

Some restricted invasive animals are a potential threat to rehabilitation, and to MNES via predation or grazing impacts. Species identified as restricted invasive animals within the land management responsibilities of Australia Pacific LNG/Origin Energy under the Queensland Biosecurity Act 2014 will be managed in accordance with the Origin Energy Biosecurity Management Plan – Queensland (CDN/ID 8057416).

The Biosecurity management plan is supplemented by the following procedures:

- Biosecurity Imported Cargo Procedure (OEU-P1000-PRO-ENV-041), and;
- Site specific pest management plans for Origin Energy and Australia Pacific LNG properties.

4.10 Fire Management

The risk of bushfire is a concern of all landholders and for rehabilitation works as a bushfire can severely impact upon all land uses. The damage to crops, fodder, buildings and other farm infrastructure from fire can be devastating to landholder livelihoods. Gas Fields development and operation must maintain the safety of people and property by mitigating any introduced risk. Given the nature of the Project and its rural setting, it is impractical to locate all project components to avoid bushfire hazard areas. The Australia Pacific LNG Fire Management Strategy (Q-LNG01-15-EA-0062) is utilized as a guide to inform the service providers of fire mitigation requirements for the Project.

In regard to operating infrastructure, bushfire risk will be managed utilising Area Asset Mitigation Plans and Area Preparedness and Response Plans specific to the asset location (i.e.: Condbri tenure). Practically asset protection zones or APZs will be managed around infrastructure.

4.11 Land Maintenance

Following reinstatement, limited access to infrastructure will be allowed to perform essential maintenance, such as mowing or repair requirements and drilling activities such as well workovers. All other traffic is prohibited on topsoil areas and should remain off the rehabilitating areas to enable successful establishment of groundcover.

Maintenance will take place as required following monitoring to ensure the following objectives are met:

- landforms remain stable
- erosion control measures remain effective
- stormwater runoff and seepage from reinstated areas does not negatively affect the environmental values of any waters
- plants show healthy growth and recruitment is occurring, and;
- Restricted matter weed species are managed in accordance with the Biosecurity Act 2014 requirements.

4.11.1 Watering

Due to scarcity of water and large potential areas, it is not be feasible to apply water to seeded or regenerating areas for reinstatement or ongoing rehabilitation. Watering will be utilised where specified in site specific rehabilitation plans for high risk locations including pond batters. Where applicable for final rehabilitation, rehabilitation areas of the SEVT TEC, where there is a high water requirement for the establishment of vine thicket species, will require watering, where tubestock planting is undertaken. Initial watering after tubestock planting will be a necessity to establishment. Watering is to be undertaken with water of a quality suitable for the purpose and authorised for this use. Use of untreated CSG water must comply with the General Beneficial Use Approval – Associated water (including Coal Seam Gas water), 2014 (BUA).

4.12 Corrective actions

4.12.1 Construction corrective actions

Upon completion of reinstatement an end of construction Field Inspection Checklist (FIC) is undertaken utilising reinstatement criteria for the construction activity. Corrective actions identified from this inspection action is added to a punch list of items forwarded to the responsible contractor for follow up rectification. Ongoing monitoring continues in this timeframe via walk downs and further identified defects are raised and logged to the principle contractor. The contractor will work towards the close out the open items of this defect list and handover to operational management occurs where any ongoing requirements or maintenance requirements for land management are undertaken. Operational management is discussed below.
4.12.2 Operational corrective actions

Sites not displaying stability and adequate vegetation cover through either regrowth or direct seeding may undergo reseeding, replanting or another supported effort for regeneration. This requirement will be determined via rehabilitation monitoring as discussed in Section 8. Monitoring for reinstatement and rehabilitation success is undertaken post construction and in the subsequent years of operation and decommissioning. In areas where native vegetation is required as a ground cover or ecosystem, and regeneration efforts or direct seeding was unsuccessful, follow up reseeding or tubestock planting may be required dependent upon the necessary outcome for the site (e.g. operational or final rehabilitation). Corrective actions will be informed via the Oracle Enterprise Asset management System (eAMS), a work request system outlining the location and necessary task to be completed as well as a scheduled timeframe for the task. The work request system will involve the necessary site planning and environmental requirements to rectify the identified issue, with works scheduled for delivery via contracted services and overseen by Origin Energy Civil Supervisors.

Where operational corrective actions are required the following may be undertaken as a minimum:

- Site assessment will be undertaken by a suitably qualified and experienced person to determine the likely cause of reinstatement or rehabilitation failure or defects, and develop site specific corrective actions
- implement site specific corrective actions
- monitor effectiveness of actions taken to restore land
- works may be conducted in consultation with the relevant landholder.

4.13 Waste Management and Removal

Waste management for the Project and Operations is undertaken in accordance with the Australia Pacific LNG Upstream Waste Management Plan (Q-1000-15-MP-0001) which provides requirements for the safe handling, management and disposal of waste.

All construction wastes must be removed from site and disposed of in accordance with the Waste Management Plan and legislative requirements as part of reinstatement activities.

On asset decommissioning and at final rehabilitation all above ground infrastructure will be removed with the exception of infrastructure for beneficial use as agreed with the landholder. All below ground infrastructure i.e.: pipelines (steel and HDPE) will be suspended and abandoned as per the Pipeline Suspension and Abandonment Procedure (OEU-P1000-PRO-PIP-002). All wastes from surface and any wastes which would inhibit achievement of final rehabilitation objectives will be removed at the necessary depth and disposed of in accordance with the Waste Management Plan and legislative requirements.

Specific requirements for the removal of infrastructure such as concrete columns under GPF structures will be addressed in infrastructure specific decommissioning plans.

5. Remediation

5.1 Notifiable Activities

Activities that have been identified as likely to cause land contamination are listed in Schedule 3 of the Environmental Protection Act 1994. Under the Act, landowners or occupiers and local government must inform the department (DEHP) that land has been or is being used for a notifiable activity. Land that has been or is being used for a notifiable activity is recorded on the Environmental Management Register (EMR), which is maintained by DEHP.

Australia Pacific LNG Project Gas Field EMP’s list the range of notifiable activities associated with Gas Field development and they are listed below as they appear in Schedule 3 Environmental Protection Act 1994:

- 7. Chemical storage (other than petroleum products or oil under item 29)-storing more than 10t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code
- 23. Metal treatment or coating-treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5L of paint per week (other than spray painting within a fully enclosed booth)
- 29. Petroleum product or oil storage-storing petroleum products or oil-
(a) in underground tanks with more than 200L capacity; or
(b) in above ground tanks with-
   (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the
doing goods code-more than 2500L capacity; or
   (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous
goods code-more than 5000L capacity; or
   (iii) for petroleum products that are combustible liquids in class C1 or C2 in
Australian Standard AS 1940, 'The storage and handling of flammable and
combustible liquids' published by Standards Australia-more than 25 000L
capacity.

- 37. Waste storage, treatment or disposal-storing, treating, reprocessing or disposing of regulated
waste (other than at the place it is generated), including operating a nightsoil disposal site or
sewage treatment plant where the site or plant has a design capacity that is more than the
equivalent of 50,000 persons having sludge drying beds or on-site disposal facilities.

Areas within the Gas Field operation that include these notifiable activities will be registered on the
EMR. Land may be removed from the EMR if the landowner or occupier has information that shows the
listing was either incorrect, i.e. the land has not been used for a notifiable activity or that the land is not
contaminated. Land is removed from the EMR if, after a site investigation report has been submitted to
the administering authority no contamination is found or work is done to satisfactorily remediate the
land.

Where notifiable activities have taken place and or hazardous materials have been released a site
specific remediation plan must be developed by a suitably qualified person.

5.2 Site Investigation

A formal contaminated land procedure is currently in revision and will replace the Australia Pacific LNG
Land Contamination Procedure Discovered or Known land contamination (Q-LNG01-15-AP-0013) and
will be finalised February 2017 as a process of refreshing the HSE objectives for the LNG Integrated
Gas business. Following completion of the HSE refresh this procedure will direct the necessary actions
from the site investigation step through the management of contaminated land.

Preliminary site investigations are conducted to determine the presence or absence of site
contamination where notifiable activities have been conducted, where evidence of leakage or spillage
of hazardous material is detected.

A preliminary site investigation will include the following components:
- development of a site history
- an inspection of the site
- a basic sampling program to determine if contamination is present; and
- report preparation.

Investigations will be conducted by suitably qualified persons. The Environmental Protection Act 1994
requires persons submitting contaminated site investigation reports to be members of a prescribed
professional organisation listed in Schedule 8 of the Environmental Protection Regulation 2008.
Persons conducting site investigations should hold appropriate qualifications, have experience relevant
to the investigation and be approved by DEHP.

A comprehensive site history of the investigation area will identify all past and present potentially
contaminating activities. Information obtained from the site history research will be used to assess the
potential for contamination on the site and determine the most appropriate locations for sampling.
Sampling is required in areas where the site history research indicates that possible contaminating
activities have been conducted. Site history information will be supported by all available copies of
original site plans, local authority zoning records, flammable and combustible liquids licence details,
sewerage/trade waste and stormwater drainage plans, aerial photographs, environmental licences etc.
All available evidence, including verbal interviews and analysis reports, will be included. Interviewees'
relationship to site activities should be documented.

The possibility of contamination due to activities on adjacent land and the possibility of contamination
extending beyond the site boundaries should also be examined and areas which have received
imported fill should also be assessed.
Site investigations should be conducted in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* and attending Schedules and the provisions of the *Environmental Protection Act 1994*.

5.3 Site investigations should be conducted in a Mitigation Strategies

5.3.1 Dams

Several types of saline dams will operate for the treatment of associated water and other by-products. These facilities are defined as regulated dams under DEHPs draft Manual for Assessing Hazard Categories and Hydraulic Performance of Dams where hydraulic design parameters and liner performance requirements are specified.

Mitigation strategies in relation to saline dams are identified in the tenure specific Australia Pacific LNG Water Management Plans.

5.3.2 Soils

Contaminated soils will be assessed following the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Where remediation is required contaminated soils will undertake further assessment and remediated to site specific needs following the preferred order or options for site clean-up and management of a particular site:

- on-site treatment of the soil so that the contaminant is destroyed or the associated hazard is reduced to an acceptable level
- off-site treatment of excavated soil so that the contaminant is destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.

Purpose built soil remediation areas may be established for the remediation of contaminated soil from various locations. Dependent upon the preferred order for site clean up contaminated soils may be transported to the purpose built soil remediation area for remediation. Following the removal of contaminated soils visual inspections and contamination testing will be undertaken to confirm that all contaminated soil has been removed.

Subject to assessment, soil remediation strategies may include opportunities in:

- excavating contaminated soil and burying it at one location on site (this reduces the area containing contaminated soil)
- installing horizontal, vertical or reactive barriers
- constructing an engineered landfill cell on site (for situations with shallow groundwater, permeable soils, leachable contaminants or very high results)
- solidifying (locking contaminants in solidified matrix) or stabilising (converting contaminants to a less mobile and/or less toxic form, typically by chemical reaction) when contaminants are highly leachable, then incorporating with one of the above options
- land farming volatile contaminants and reusing soil on-site (if no sensitive receptors are nearby)
- land farming volatile contaminants at an offsite location then returning the soil to site
- on-site or off-site treatment, for example thermal desorption
- in-situ biological (e.g. air stripping, sparging or venting) or chemical treatments. These be considered for permeable soils but are usually slow processes.

Each soil remediation situation/task will be unique and an appropriate solution or combination will be utilized in accordance with site specific constraints.

6. Success Criteria

Rehabilitation success criteria are provided in the EA, Schedule of Rehabilitation conditions. Measurable success criteria have been developed based on model conditions for petroleum activities to reinstate and rehabilitate areas within the Gas Fields.

Reinstatement success is measured by the stability, drainage and soil environment that provides for a stable ground cover. Reinstatement success is the guiding requirement for the operational success of the asset in regard to the land management component of the infrastructure, and is measured by meeting the desirable success criteria in Table 6.
Final rehabilitation acceptance criteria site success is identified in comparison to adjoining vegetation assessment and/or analogue site baseline information measured at an RE reference site and is determined by meeting the measurable success criteria indicated in Table 6. Success criteria in relation to Rehabilitation types and MNES to address EPBC 2009/4974 Condition 15e are provided in Table 7.

### 6.1.1 Reinstatement and Operating Infrastructure criteria- Success criteria

#### Table 6: Reinstatement and Operating infrastructure measurable success criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Indicator</th>
<th>Measurable success criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>All significantly disturbed areas no longer utilized for petroleum activities are reinstated within 9 months (3 months for pipelines)</td>
<td>Land is reinstated to the a stable non-polluting landform that either is consistent with surrounding landform contours or is another landform that is stable for operating purposes.</td>
<td>Rehabilitation monitoring as defined in Section 8 has confirmed all reinstatement has been completed within the 9 month (3 months for pipelines) time period.</td>
</tr>
<tr>
<td>Contaminated land is remediated</td>
<td>Land remediation plan implemented and no residual contamination present above trigger thresholds.</td>
<td>Plan implementation has been verified.</td>
</tr>
<tr>
<td>Areas are non-polluting, a stable landform and profiled contours are consistent to the surrounding landform or is otherwise stable for operating purposes.</td>
<td>Landform stability, and; Subsidence and erosion.</td>
<td>Reinstatement acceptance criteria has been met via rehabilitation monitoring defined in Section 8.</td>
</tr>
<tr>
<td>Surface drainage lines are established.</td>
<td>Stable drainage established.</td>
<td></td>
</tr>
<tr>
<td>Topsoil is reinstated.</td>
<td>Topsoil has been returned to the disturbance area.</td>
<td></td>
</tr>
<tr>
<td>Groundcover is present or an alternative soil stabilization methodology is employed and maintained.</td>
<td>Groundcover or other stabilisation method is present.</td>
<td></td>
</tr>
</tbody>
</table>

### 6.1.2 Final Rehabilitation Acceptance criteria - Success Criteria

#### Table 7: Final Rehabilitation Acceptance measurable success criteria*

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Indicator</th>
<th>Measurable success criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 70% of native ground cover species</td>
<td>A minimum 70% native ground cover is present when compared to the paired analogue site.</td>
<td>Monitoring program validates the indicator at the assessed location.</td>
</tr>
<tr>
<td>≥ total % ground cover</td>
<td>A minimum total percent ground cover is present when compared to the paired analogue site (e.g.: 30% vegetation cover at paired analogue would require a ≥ 30% ground cover on original disturbance)</td>
<td></td>
</tr>
<tr>
<td>≤ % species richness of category 2-5 restricted invasive plant pest species</td>
<td>Species richness of category 2-5 restricted invasive plant species on the disturbance area is ≤ the paired analogue site</td>
<td></td>
</tr>
</tbody>
</table>
### Requirement | Indicator | Measurable success criteria
--- | --- | ---
≥ 50% of organic litter cover | A minimum 50% organic litter cover is present when compared to the paired analogue site. |
≥ 50% of total density of coarse woody material | A minimum 50% coarse wood material is present when compared to the paired analogue site or as presented in an analogue vegetation assessment of a comparable RE (Section 8). Whichever is the lesser value to account for land management over the time frame of the operation and follow up decommissioning/rehabilitation. |
All predominant species of the EDL that define the pre-disturbance RE(s) are present | All dominant species present in the recovering RE that form the EDL are present and healthy on disturbance as compared to the paired analogue site. |

*Any corrective action may be undertaken from monitoring or observation and will be managed in accordance with site specific or landholder requirements to rectify the issue via the Oracle Enterprise Asset Management System.

### 6.2 Monitoring and Compliance Reporting

#### 6.2.1 Survey and Monitoring Prior to Construction

A pre-clearance ecological assessment will be undertaken prior to undertaking petroleum activities that involve significant disturbance to land to meet conditions under the various EA Schedule D conditions, following the methods outlined in the Protocol. The survey will be undertaken to ground truth and map REs and ESAs and confirm the location of EVNT listed flora and fauna species and MNES. This will include assessment of the condition, type and ecological value of any vegetation in any areas where significant disturbance is proposed to take place.

This assessment will be undertaken by a suitably qualified person and include the carrying out of field validation surveys, observations and mapping of any Category A, B or C Environmentally Sensitive Areas and the presence of species classed as endangered, vulnerable or near threatened under the Nature Conservation Act 1992.

If the assessment indicates that a Regional Ecosystem mapped as Endangered or Of Concern by the Queensland Herbarium is of a different conservation value classification, petroleum activities may proceed in accordance with the conditions of the relevant environmental authority based on the confirmed on-the-ground conservation value.

During the infrastructure planning phase, targeted threatened species surveys will be undertaken to confirm the absence or presence of threatened species and MNES in areas proposed to be disturbed as outlined in EPBC2009/4974 (Condition 5(o)) and outlined Section 7.2 of in the Protocol.

#### 6.2.2 Monitoring of Areas of Conservation Significance

Monitoring the condition of EPBC and State listed species and communities and endangered regional ecosystems will be undertaken through assessment of representative monitoring sites located within 200m of major project disturbance activities. This will occur in accordance with the following procedure as outlined in Section 7.5 of the Protocol.

#### 6.2.3 Remnant Vegetation Analogue Site Surveys

Information on the vegetation structure and species composition, including abundance, has been collected at established analogue (reference) sites as an information source to compare the effectiveness of rehabilitation efforts as necessary. Reference sites have been established and surveyed using the BioCondition reference site methodology (Eyre et al. 2006). Reference sites include pre-existing disturbances where this represents site conditions where Australia Pacific LNG will undertake activities. Reference sites have been selected to be representative of each of the Endangered, Of Concern, and Least Concern REs to be disturbed. At each reference site the following has been measured:

- the percentage foliage cover of tree and shrub species
- height of each vegetation stratum
• flora species richness and diversity, and
• fauna habitat features litter cover, fallen woody material (coarse wood debris) and the number of hollow logs.

The Queensland Herbarium’s Methodology for the Establishment and Survey of Reference Sites for BioCondition (Eyre et al. 2006) has been used to select survey sites and for the survey of vegetation, along with fauna records (where observed) of the reference sites. This methodology requires that a minimum of three reference sites be set up and surveyed for each RE. Photo monitoring points are numbered, locatable by GPS.

Analogue survey data and results are found within the following documents:

• Analogue Sites – Combabula and Walloons Development Areas, Combabula Spur and Western HP Network (Q-1810-15-TR-0001)
• Rehabilitation Analogue Sites – Condabri Development Area, Australia Pacific LNG Mainline Pipeline – Hub to Midline Station and Eastern high Pressure Network (Q-1800-15-TR-0007)

6.3 Monitoring on the Completion of Reinstatement

A sign-off of the disturbance area is required on completion of development scope of work to ensure reinstatement or rehabilitation has been completed to the required standard and the site is in a state of progressive rehabilitation. The Reinstatement Field Inspection Checklists (FIC) and like documents are used for specific situations to verify reinstatement criteria has been achieved for land post infrastructure construction.

Infrastructure walk downs are another activity conducted by the construction contractor and Origin Energy/Australia Pacific LNG representatives to identify and address any land management defects post construction prior to completion of construction and handover of reinstated areas for ongoing operational use. On completion of construction reinstatement, monitoring will occur for the first 6 months followed by a follow up inspection at 12 months upon asset transfer to LNG Operations.

6.4 Monitoring During Operation

Monitoring will be required at various intervals for a range of parameters to ensure that reinstatement and operating infrastructure success criteria are progressing towards achievement targets. Monitoring intervals for operational monitoring and final rehabilitation monitoring (to meet final rehabilitation acceptance criteria) are distinctly different activities determined by both site specific rehabilitation requirements and infrastructure decommissioning and are identified for several variables and frequency of monitoring within Table 8 (reinstated landforms and progressive rehabilitation) and Table 9 (Final acceptance criteria for remnant ecosystems).

It must be acknowledged that monitoring the operational status of infrastructure is a different data set to monitoring the final acceptance criteria of decommissioned infrastructure. Assessment of remnant vegetation establishment, due to ongoing maintenance of infrastructure footprints will not occur until the infrastructure is decommissioned and a final rehabilitation objective can occur uninterrupted by petroleum activities. Furthermore it should be acknowledged that final rehabilitation objectives are impacted by landholder land management and property operations/management and potential success of rehabilitating remnant vegetation is closely tied to land management actions of the landholder and engagement actions between the landholder and Australia Pacific LNG.

A land holder sign off is necessary for rehabilitated infrastructure footprints to determine the maintenance requirements for land management are no greater than for surrounding areas, and obtain approval, in writing or recorded verbal acknowledgement, that land can be used for its pre-disturbance land use.

Where relevant, monitoring will involve comparison with data collected during pre-clearing surveys, analogue site survey data, monitoring of areas of conservation significance or assessment of adjoining land uses or ecosystems in comparison to the disturbance location (by Project and/or Operations).
### Table 8: Operational monitoring (within Operations management) intervals/details for reinstatement and operating infrastructure success criteria

<table>
<thead>
<tr>
<th>Rehabilitation Indicator</th>
<th>Baseline assessment post-handover to Operations (Year 1)</th>
<th>Year 2 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline)</th>
<th>Year 3 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline and Yr2)</th>
<th>Year 4 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline, Yr2 and Yr3)</th>
<th>'Year 5 (Follow up assessment of baseline monitoring locations at 5th year post Operations handover)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground cover species richness</td>
<td>All rehabilitation indicators to be assessed at desktop selected and ground truth monitoring points where a paired assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) location. Survey is to be undertaken as instructed in the Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029) dependent upon the site specific rehabilitation requirements and infrastructure decommissioning.</td>
<td></td>
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<tr>
<td>Total ground cover percentage</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Category 2-5 restricted invasive plant species</td>
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<tr>
<td>Category restricted invasive animal species</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Erosion and Subsidence</td>
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<tr>
<td>Landform stability</td>
<td></td>
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<tr>
<td>Watercourse bed and bank (where intersected by infrastructure)</td>
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<td></td>
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</tr>
<tr>
<td>Landholder maintenance</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
| *Obtain Landholder validation of land use capability | Not required during these intervals/years, however landholders may request and be approved grazing access to infrastructure footprints. | | | | *

*Landholder validation can occur to selected infrastructure or at the landholder property scale depending upon the infrastructure types to be assessed.

¹This validation will involve any infrastructure that has a desktop selected and ground truth point where a baseline assessment has been conducted. Consideration is required to staggered development of infrastructure due to the progressive development of the gas fields.
Table 9: Final Rehabilitation Acceptance monitoring intervals and details of monitoring for final acceptance rehabilitation success criteria at remnant vegetation recovery areas

<table>
<thead>
<tr>
<th>Rehabilitation Indicator</th>
<th>Baseline assessment post decommissioning (Year 1)</th>
<th>From Baseline assessment determine management inputs</th>
<th>Year 2 (Only sites that are decommissioned and have not met final acceptance criteria at the baseline assessment)</th>
<th>From Year 2 assessment determine management inputs</th>
<th>Year 3 (Only sites that are decommissioned and have not met final acceptance criteria at the Year 2 assessment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground cover species richness</td>
<td>As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029). No further monitoring will be required if the site assessed meets the rehabilitation indicators where a paired analogue assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) remnant vegetation location.</td>
<td>Further time for regeneration or management inputs (e.g.: tubestock planting of EDL species) may be necessary to meet the Final rehabilitation acceptance criteria as stated in the tenure specific EA. A site specific management outcome will be determined from the baseline assessment and implemented as required.</td>
<td>As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029). No further monitoring will be required if the site assessed meets the rehabilitation indicators where a paired assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) remnant vegetation location.</td>
<td>Further time for regeneration or management inputs (e.g.: tubestock planting of EDL species) may be necessary to meet the Final rehabilitation acceptance criteria as stated in the tenure specific EA. A site specific management outcome will be determined from the baseline assessment and implemented as required.</td>
<td>As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029)</td>
</tr>
<tr>
<td>Total ground cover percentage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Category 2-5 restricted invasive plant species</td>
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<td></td>
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<tr>
<td>Organic litter cover percentage</td>
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<tr>
<td>Coarse woody material cover assessment</td>
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<tr>
<td>Predominant species of the EDL for the RE assessed</td>
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6.5 Data Management

Australia Pacific LNG will set up a data management system that will include:

- a GIS data management system with the GPS location of every rehabilitation monitoring point stated in Tables 8 and 9 and retain data schemas for variables monitored at an assessed point
- rehabilitation monitoring survey procedures to ensure all operational rehabilitation monitoring actions stated in Tables 8 and 9 are recorded in GIS at every monitoring point
- a photographic record of rehabilitation monitoring with the GPS locations and direction of orientation of photo monitoring points*, and;
- Document management systems operating as an information storage.

*Currently stored in Open Text document control system under Operations HSE.

6.6 Compliance Reporting, Contents and Frequency

6.6.1 Record of Impacts to MNES

If an impact occurs (which may include a presumed impact where a species is presumed to be present) to a MNES during Gas Field development, operation, or decommissioning the Australia Pacific LNG will record the impact, (as required by EPBC 2009/4974 Condition 13 a) by reference to the:

- location, specific site and type of infrastructure or activity
- each MNES subject to disturbance
- the related site assessment or field ecological survey documentation and recommendations, or the decision that the particular MNES was presumed to be present
- the total disturbance limit
- the remaining disturbance limit for each affected MNES
- the reason for the decision, including justification for the action taken, description of the efforts to avoid the impact, and an explanation why other constraints might justify the impact on the MNES, and;
- actions and commitments by the Australia Pacific LNG to remediate, rehabilitate, or make good any unauthorized disturbance.

This information must be recorded to a standard that can be independently audited.

6.6.2 Annual Environmental Return

An Annual Environmental Return will be provided to DoEE which will address compliance with EPBC 2009/4974, Conditions 112 and 113 and contains the following:

- records any unavoidable adverse impacts to MNES
- outlines mitigation measures applied to avoid adverse impacts on MNES
- outlines any rehabilitation work undertaken in connection with any unavoidable adverse impact on MNES
- identifies all non-compliances with DoEE conditions, and;
- identify any amendments to plans (including this RRRMP) to achieve compliance with EPBC 2009/4974 conditions.

6.6.3 Environmental Authority Reporting

An annual monitoring report will be prepared and submitted to the administering authority (DEHP) upon request as required under the various EA Schedule A requirements. This submission will cover reporting on the rehabilitation monitoring required under various rehabilitation EA Schedule requirements.
7. References


DSEWPaC (2011). To develop, construct, operate and decommission the coal seam gas field component of the Australia Pacific LNG project in the Walloons gas fields within the Surat basin in south central Queensland (EPBC 2009/4974). DSEWPaC. Canberra ACT.


8. Document information and history

### DOCUMENT CUSTODIAN GROUP

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<th>Title</th>
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### DOCUMENT HISTORY

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<td>Andrew Beckman</td>
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CDN/ID 12883952
Appendix A  Statutory Declaration of suitably qualified person

Oaths Act 1867

QUEENSLAND
Statutory Declaration
TO WIT

I, Adam David Christlson
of Level 6 135 Coronation Drive, Milton, Queensland, 4064, in the State of Queensland
do solemnly and sincerely declare that

I am a suitably qualified person to prepare the Denison Trough Rehabilitation Plan, in preparing the aforementioned written document CDN/ID 12743080 I declare that:

1. All relevant material has been considered in the written document CDN/ID 12743080
2. That the content of the written document is accurate and true
3. That the written document meets the requirements of the relevant condition of the environmental authority

And I make this solemn declaration conscientiously believing the same to be true, and by virtue of the provisions of the Oaths Act 1867.

Signature of declarant/defendant

Taken and declared before me at
this 12th day of
July 2017

A Justice of the Peace/Commissioner for
Declarations.

135 Coronation Drive Milton Queensland 4064
Appendix B  Resume of suitably qualified person

Adam Christison

SENIOR ENVIRONMENT ADVISOR - Rehabilitation

Profile
I have obtained over fourteen (14) years of experience through various public and private sector roles obtaining a wide range of skills in botanical, ecological, pest management and conservation disciplines. I have successfully completed a Bachelor of Applied Science (Protected Area Management) in 2002 and in 2016 completed a Masters in Environmental Management (Conservation Biology).

Following completion of an undergraduate degree I commenced my professional career within the Queensland Department of Primary Industries and Fisheries in the field of pest management working in an Inspectors role for a state quarantine program. Here I was responsible for providing advice, direction and auditing compliance of and to private and public stakeholders in pest management and quarantine.

Taking a progressive career step I started in conservation roles firstly as a pest and land management inspector with Redland Shire Council providing advice and direction for land managers on the control of declared weed species and the development of fire management infrastructure. Following this role I spent five (5) years with the Pine Rivers Shire Council and Moreton Bay Regional Councils in a role as Bushcare Officer which drove the conservation effort within the local Council. This role was an extension service to landholders providing direction for conservation based land management and property planning as well as the support and direction of volunteer groups in delivering on ground conservation outcomes. The role also operated as a service provider internally to deliver on ground species specific conservation efforts in regard to negotiation, planning, budgeting, project management, maintenance planning and coordination of delivery.

Currently I am employed as a Senior Environment Advisor - Rehabilitation with Origin Energy (5 years) where my role is to provide rehabilitation monitoring services and advice internally within the business to drive compliance with environmental authorities on rehabilitation objectives. In this role I deliver an advice service to internal stakeholders (both development and operation) in regard to rehabilitation (land management, soil management, vegetation management, pest management) and rehabilitation monitoring; with direction to the data gathering to meet environmental approvals requirements. My unique exposure to field activities, planning tasks and extension services on rehabilitation topics to an array of internal and external customers has provided a broad skill set for addressing environmental management issues in regard to land rehabilitation.

Qualifications
- 2016 - Master of environmental Management (Conservation Biology), University of Queensland, St Lucia, Queensland.
- 2014 - Graduate Diploma - Environmental Management, University of Queensland, St Lucia, Queensland.
- 2011 - Graduate Certificate - Environmental Management, University of Queensland, St Lucia, Queensland.
- 2002 - Bachelor of Applied Science (Protected Area Management), University of Queensland, Gatton, Queensland.

Affiliations
- EIANZ
- SQLRG

Environment Institute of Australia and New Zealand Member
Southern Queensland Land Rehabilitation Group Member

Career Summary
2011 - Present
2006 - 2011 Bushcare Officer, Pine Rivers Shire Council/Moreton Bay Regional Council, Strathpine, Queensland.


2002 - 2005 Inspector - Pest Management and Quarantine, Queensland Department of Primary Industries and Fisheries (QDPIBF), Oxley, Queensland.

Areas of expertise
- Land Management - land management/property management for rehabilitation, conservation and monitoring
- Botany - plant identification, propagation and delivery of survey
- Ecology - vegetation assessments and surveying, and;
- Pest Management - experience with the delivery of pest quarantine, control and management

Industry experience

Land Management experience

Land Rehabilitation, Moreton Bay Regional Council. Proposed Koala Conservation offset at Petrie, North Brisbane, Queensland. I was responsible for coordinating and undertaking site vegetation and fauna surveys, site planning, project delivery and follow up site management to deliver a quality patch of vegetation and habitat for local Koala populations to a specific project budget.

Land Rehabilitation, Moreton Bay Regional Council. I was responsible for the delivery of conservation efforts via volunteer support to protect and enhance bushland within the ownership of Moreton Bay Regional Council.

Rehabilitation monitoring, Origin Energy. I was responsible for field assessment and reporting on land rehabilitation post reinstatement to both record rehabilitation progress and provide advice in locations requiring maintenance.

Botany/Ecology experience

Analogue Vegetation Surveys, Origin Energy. In addressing Environmental Authority conditions for rehabilitation, I was responsible for coordinating, planning and directing the survey of 36 Regional Ecosystems (RE) (108 locations) and delivering field investigations and reports of vegetation community impacted by development. The information is available to inform land rehabilitation of remnant REs.

Extension Service, Moreton Bay Regional Council. Survey of conservation sites in and around the Moreton Bay Regional Council area of responsibility. Providing identification service for flora and fauna species in diverse communities from temperate riparian rainforest to coastal mudflats.

Pest Management experience

Quarantine Inspections, Redland Shire Council, I was responsible to survey land and provide control advice to landholders public and private on strategies to meet compliance requirements for the management of declared pests and fire management.

Quarantine Inspections, QDPIBF. I was responsible to consult large and small business as well as public and private entities, providing advice and management options as well as auditing to of landholders and businesses on preventative and control strategies to meet compliance requirements for the quarantine management of invasive pests.