

Santos GLNG Gas Field Development project

**Coordinator-General's evaluation report
on the environmental impact statement**

December 2015

The Department of State Development

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Synopsis

This report evaluates the potential impacts of the Santos GLNG Gas Field Development project (the GFD project). The report has been prepared in accordance with the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

The proponent for the GFD project is Santos GLNG. Santos GLNG is undertaking the GFD project on behalf of the joint venture participants Santos Limited, Petroliam Nasional Berhad (PETRONAS), Total, and Korean Gas Corporation (KOGAS).

The GFD project area is located in southern and central Queensland, within the local government areas of Banana Shire, Central Highlands, Maranoa and Western Downs Regional Councils. Santos GLNG intends to further develop its Queensland coal seam gas (CSG) resource to augment supply of natural gas to its currently operating GLNG project, which has approval to develop 2,650 production wells in the Surat and Bowen basins.

The terms of reference for the GFD project environmental impact statement (EIS) required the proponent to assess impacts for the maximum development scenario of up to 6,100 additional production wells and associated infrastructure over an estimated 30-year project life. Specifically, the GFD project maximum development scenario would expand the GLNG project's gas field tenure from 6,887 km² to 10,676 km² and would intensify development within existing GLNG project tenures. The EIS identified that market conditions, exploration results and technological advancements over the GFD project life would likely result in approximately half of the 6,100 additional production wells being developed.

The GFD project is scheduled to commence in 2016 and would be a progressive development involving the construction, operation, decommissioning and rehabilitation of production wells and associated supporting infrastructure. As a large-scale CSG development, the location of fixed components of the GFD project would be determined as resource exploration and constraints planning is undertaken throughout the life of the project.

To identify and assess the potential impacts of the GFD project, the proponent developed a modelling methodology based on the maximum development scenario within the EIS. The methodology considers desktop and field assessments and is comprised of the following linked stages:

- predictive modelling—to identify the extent of environmental values across the GFD project area
- constraints modelling—to categorise and incorporate the types of development permitted across the GFD project area and in each category of constraint
- land disturbance probabilistic modelling—to predict potential disturbance to the environmental values of the GFD project area based on predictive and constraints modelling.

In evaluating the GFD project, I have considered all EIS documentation, issues raised in submissions during public consultation, additional information to the EIS provided by

the proponent, and advice received from state government agencies, the Australian Government Department of the Environment, and the Independent Expert Scientific Committee on Coal Seam Gas and Large Scale Coal Mining Development.

The following provides an overview of the main issues considered in my evaluation and outcomes.

Matters of national environmental significance—threatened species and communities

Potential impacts on matters of national environmental significance (MNES) have been modelled based on the maximum development scenario and before the implementation of avoidance measures. Where significant residual impacts remain after avoidance, minimisation and mitigation measures have been implemented, offsets would be required in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Environmental Offsets Policy and Offsets Assessment Guide.

Threatened ecological communities

Six threatened ecological communities (TECs) occur within the GFD project area, five of which would potentially be directly impacted by project activities. The maximum potential direct impacts on TECs in the GFD project area modelled in the EIS are:

- 179ha of brigalow
- 124ha of coolibah–black box woodland
- 190ha of semi-evergreen vine thickets
- 288ha of natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- 517ha of weeping myall woodlands.

Threatened species

The EIS identified potential impacts on habitat for 21 threatened flora species and 22 threatened fauna species protected under the EPBC Act. Mitigation measures proposed in the EIS support the relevant priority actions and objectives for the recovery of threatened species described in available recovery plans, threat abatement plans and conservation advice.

Migratory species

The EIS identified potential impacts on supporting habitat for seven migratory bird species listed under the EPBC Act, totalling 17,229ha. Much of the 1,067,575ha project area supports habitat suitable for migratory species of which 83,238ha of riparian, floodplain eucalypt forest and wetland habitat could be classified as ‘important habitat’ as defined in the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*. Measures to avoid, minimise and mitigate potential impacts are described in the EIS for all phases of the GFD project.

TECs and habitat for threatened and migratory species are defined as moderate constraint areas in which only limited petroleum activities, such as well leases and

linear infrastructure, may be developed. Where impacts on these values cannot be avoided through field development and site selection processes, the proponent has identified adequate measures to minimise and mitigate these impacts and offset significant residual impacts.

I expect that potential impacts would be further reduced through field planning and implementation of the avoidance and mitigation measures proposed in the EIS. To ensure that offsets can be accurately determined for any potential significant residual impacts of the GFD project on EPBC Act listed species, I have recommended a condition to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan in accordance with the final adverse impact assessment methodology.

MNES—groundwater

Water balance and depressurisation

The GFD project area is located in the recharge area of the Great Artesian Basin. Over the life of the GFD project, up to 219GL of coal seam water could be extracted and potentially affect the rate of flow of groundwater in formations of the project area. The EIS predicted a maximum decrease in groundwater pressure in the Walloon Coal Measures and the Bandanna Formation to occur between 2020 and 2030. Predicted maximum decrease in groundwater pressure in relevant major aquifers varies across the four GFD project gas fields and is predicted to occur between 2023 and 2205.

Landholder bores

There are 872 registered landholder bores within the GFD project tenures, primarily for stock and domestic use. The proponent's groundwater modelling identified 61 landholder bores that could potentially be affected. Groundwater monitoring proposed by the proponent is detailed in the Draft EM plan and the Water Resource Management Plan. The proponent is required to undertake groundwater monitoring in accordance with the water monitoring strategy of the Surat Cumulative Management Area (CMA) Underground Water Impact Report (UWIR). The proponent is also required to undertake a bore assessment and enter into make-good agreements with affected or potentially affected bore owners.

Subsidence

The proponent's subsidence modelling predicted maximum differential settlements at the surface of 0.06m over a distance of 1.5km for the Roma gas field, 0.045m over a distance of 3km for the Arcadia and Fairview gas fields and 0.056m across 2km for the Scotia gas fields. It is expected that settlements of this scale are too small to cause changes to surface water or groundwater flow paths. The proponent has developed the Ground Deformation Monitoring and Management Plan which includes subsidence risk management.

Coal seam water use

The proponent's Coal Seam Water Management Strategy prioritises beneficial use over disposal. The proponent's Land Release Management Plan proposes measures to manage releases of water to land in the gas fields, including coal seam water use for irrigation, construction and operational purposes. To ensure that the potential for environmental harm is minimised, I have stated conditions on regulated dam design, monitoring and reporting and for monitoring water releases to land.

Brine and salt

The GFD project could generate up to 21.9 GL of brine and 824,000 tonnes of salt over the project life. Brine and salt management options identified in the EIS include brine injection into selected deep saline aquifers and the transfer of brine or solid salt for disposal into a licensed waste disposal facility. The EIS identified that transfer of brine or solid salt to a licensed waste management facility would only occur after other options have been assessed and considered unfeasible. Management of brine and salt would be undertaken in accordance with conditions of an environmental authority (EA) which must be granted before the GFD project can progress.

Springs and groundwater-dependent ecosystems

There are 72 spring complexes and 329 spring vents located within GFD Project tenure. Of these, 8 spring complexes and 13 watercourse springs are at risk of impacts caused by a decrease in groundwater pressure. The proponent would comply with the requirements of the Surat CMA UWIR which includes the development of a spring impact mitigation strategy for specified springs and spring monitoring in accordance with the Spring Monitoring Program. The proponent would implement the commitments of the Joint Industry Plan which includes an early warning system and response plan for springs protected by the EPBC Act.

Hydraulic fracturing

The proponent estimated 70 per cent of production wells would be hydraulically fractured over the remainder of the field life in the Fairview and Arcadia gas fields, 50 per cent in the Roma gas field and approximately 90 per cent of production wells in the Scotia gas field. Potential impacts on groundwater quality are expected to be localised within the target coal formations and within the GFD Project tenures. The proponent's Stimulation Impact Monitoring Program includes the practices and procedures for various stages of monitoring of hydraulic fracturing. I have stated conditions that require the proponent to undertake stimulation risk assessments for each well to be stimulated. Further, to ensure that groundwater quality is effectively managed, I have stated conditions requiring the proponent to conduct baseline bore and well assessments prior to hydraulic fracturing activities and implement a seepage monitoring program.

Potential impacts on groundwater resources are addressed by the statutory requirements in the Surat Underground Water Impact Report (UWIR). As the Surat UWIR is progressively updated every three years, I am satisfied that drawdown risks to

groundwater users and potential impacts on groundwater-dependent ecosystems would be managed for the life of the GFD project.

MNES—surface water

Potential impacts on surface water resources include erosion and sedimentation of watercourses, alteration of flow regimes and contamination of surface waters. Project activities including coal seam water extraction, low point drain condensate, hydrostatic test water and treated sewage effluent could generate water releases to land for either disposal or reuse. No authorised releases of coal seam water to surface waters have been sought through the EIS.

The constraints framework developed for the EIS incorporates surface water constraints and defines the type of project activities and infrastructure permitted throughout the GFD project area and ensures the level of development is appropriate to the sensitivity of the environment. I accept the mitigation measures described in the EIS would ensure potential impacts on agricultural productivity, ecosystem health and human health are acceptably managed.

I have stated conditions which describe the outcomes any release of water to land must achieve. Monitoring of surface waters would be undertaken in accordance with the requirements of relevant approvals including EA conditions and beneficial use approvals. Where site-specific conditions regarding surface waters are required, approvals must be granted before the GFD project can progress.

Matters of state environmental significance

Matter of state environmental significance (MSES) found within the GFD project tenures include protected areas, wetlands and watercourses, threatened species and species listed as 'special least concern'. A total of 73 threatened flora species and 33 threatened fauna species protected under the *Nature Conservation Act 1992* (NC Act) are known to occur within the GFD project tenures. The special least concern species, koala, platypus and echidna, are also protected under the NC Act and have been recorded in the GFD project area.

Approximately 30 per cent of the GFD project area supports remnant vegetation. Of the mapped regional ecosystems (REs), 29,333ha is 'endangered', 46,650ha is 'of concern' and 235,573ha is classed as 'no concern at present' in terms of biodiversity status. These areas support 42 'endangered' and 53 'of concern' REs.

Protected areas (as defined by the NC Act) located within the GFD project area are:

- ÿ Carraba Conservation Park
- ÿ Expedition National Park
- ÿ Humboldt National Park
- ÿ Lake Murphy Conservation Park.

Potential impacts on MSES values have been modelled on a maximum development scenario before avoidance measures have been implemented. I expect that ongoing

field development planning will further reduce the modelled impacts and where significant residual impacts remain, the values will be offset.

I have stated conditions within the EA which set maximum disturbance limits and require the proponent to offset significant residual impacts on MSES.

Land use, disturbance and rehabilitation

Vegetation clearing activities would be required during the project construction phase which would expose the land to potential erosion. Potential land contamination impacts within the GFD project area may result from the disturbance of existing contaminated land or contamination caused by project activities. The proponent has committed to a range of environmental management measures to minimise land disturbance. I have stated conditions which require land rehabilitation. Where site-specific conditions regarding impacts on land are required, approvals must be granted before the GFD project can progress.

Land disturbance from project activities and associated infrastructure may result in the loss of agricultural lands and is subject to further assessment by the proponent. Any development proposed in strategic cropping areas will require further approval.

Noise, vibration and air emissions

The main contributor of nuisance noise from the GFD project would be from the operation of hub gas compression facilities and flaring at gas compression facilities. For nuisance concentrations of air emissions, the greatest impacts are expected during construction phases when land clearance and earthworks are required. Vibration impacts were assessed to be low due to the absence of blasting events. Site planning would enable project activities to be appropriately located to avoid impacts on sensitive receptors and I have stated conditions to minimise potential impacts. Where site-specific conditions are required, approvals must be granted before the GFD project can progress.

Transport

The main traffic and transport impacts relate to increased pavement maintenance and rehabilitation of local roads due to a proposed increase in traffic movements which will require the proponent to make maintenance and rehabilitation contribution payments. I am satisfied with the proponent's commitments to engage with the Department of Transport and Main Roads and regional councils in the application of new and existing infrastructure agreements to the GFD project. I note a Road-use Management Plan (RUMP) was developed to manage the impact associated with the implementation of the GLNG project. I acknowledge that the proponent has committed to adapting the RUMP to manage the potential impacts resulting from the GFD project.

Social impacts

A social impact assessment conducted for the GFD project addressed community and stakeholder engagement, workforce management, housing and accommodation, local business and industry content and health, safety and community infrastructure. Action

plans and mitigation strategies have been developed to address potential social impacts.

The frameworks, mechanisms and stakeholder and community relationships adopted and established as part of the approved Social Impact Management Plan for the GLNG project would also be implemented for monitoring, mitigation and management strategies across the GFD project.

The proponent has committed to provide local, regional employment, training and development choices and opportunities as part of its established Workforce Management Plan. The proponent has set minimum targets of 20 per cent and 50 per cent for the employment of local/regional workers during construction and operation respectively.

Concern about 100 per cent fly-in, fly-out (FIFO) operations has prompted policy statements from the state government, particularly around the objective not to allow the use of a 100-per-cent FIFO workforce for resource projects located near a regional centre or existing resource community. This has led to the Queensland Parliamentary Inquiry into FIFO and the Queensland Government FIFO Review. This evaluation report was finalised prior to the whole of government FIFO policy framework being developed and implemented; therefore, no specific recommendations have been included in this report.

To support the government's FIFO commitments, I expect the following seven workforce management principles to be the guiding framework under which the proponent manages its workforce in meeting the local and regional employment targets. These principles are:

- (1) anyone must be able to apply for a job, regardless of where they live
- (2) provided they can meet the requirements of the job, people must have a choice where they live and be able to apply for jobs on the GFD project
- (3) the percentage of FIFO workers employed must be less than 100 per cent
- (4) an audit of existing housing capacity must be undertaken before the GFD project starts. To support those who wish to live locally, Santos GLNG will ensure the availability of accommodation that is fit for purpose and will make optimal use of existing housing capacity
- (5) the proponent must thoroughly assess its workforce requirements and plan to accommodate the likely number of workers who may live locally
- (6) social impacts associated with the local workforce, in relation to local housing services and infrastructure must be identified and mitigated in consultation with relevant local and state government service providers
- (7) the proponent's social impact mitigation measures should support regional towns in pursuing opportunities to ensure communities are strong and sustainable and that they are attractive places to live and work.

I have imposed conditions requiring an annual Social Impact Management Report that describes mitigation and management actions and outcomes for stakeholder and community consultation and engagement, social impacts relating to local and regional

housing and accommodation, training and development opportunities, community health, safety and social infrastructure and the implementation of workforce management arrangements for resident and FIFO (non-resident) workers.

Economic impacts

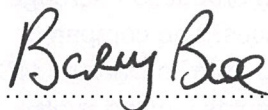
The EIS identified the direct and indirect impacts of the GFD project on the local, state and national economies. Direct economic benefits would be enhanced by the proponent's intention to source approximately 85 per cent of the goods and services (including contractors) required for the GFD project from domestic markets, half of which would be procured within the local region. The maximum development scenario would see the construction workforce peak in 2021 at 1,980 full-time equivalent (FTE) workers and the GFD project operations workforce peaking at just over 300 FTE workers over the life of the GFD project.

The GFD project has the potential to generate substantial economic impacts throughout the region, Queensland and Australia. These include an increase in Queensland's gross state product of up to \$20 billion under the maximum development scenario and increased taxes and royalties payable to the Queensland Government.

Coordinator-General's conclusion

I consider that the environmental impact assessment requirements of the SDPWO Act have been met for the Santos GLNG GFD project and that sufficient information has been provided to enable evaluation of the potential impacts of the GFD project. I expect the avoidance and mitigation measures, described in the management framework provided with the EIS, would ensure that any potential impacts are further reduced through progressive field development planning stages.

I conclude that there are significant local, regional and state benefits to be derived from the GFD project, and that any adverse environmental impacts can be adequately avoided, minimised, mitigated or offset by implementing the measures and commitments outlined in the EIS documentation. Conditions in this report have been formulated to further manage the GFD project's predicted impacts.



Barry Broe
Coordinator-General

3 December 2015

1. Introduction

This report has been prepared in accordance with Part 4 of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and provides an evaluation of the environmental impact statement (EIS) for the Santos GLNG Gas Field Development Project (the GFD project).

It is not intended to record all the matters that were identified, assessed in detail and evaluated. Rather, it concentrates on the substantive issues identified during the EIS process and is a summary report. The report:

- summarises the key issues associated with the potential impacts of the project on the physical, social and economic environments at the local, regional, state and national levels
- presents the findings of my evaluation of the project, based on information in the draft EIS, additional information to the draft EIS and submissions made on the draft EIS. Information and advice from advisory agencies and other parties, and the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) is also evaluated
- states and imposes conditions and makes recommendations under which the project may proceed.

2. About the project

2.1 The proponent

The proponent for the GFD project is Santos GLNG, which is undertaking the GFD project on behalf of joint venture participants Santos Limited, Petroliaam Nasional Berhad (PETRONAS), Total S.A, and Korea Gas Corporation (KOGAS).

Santos Limited has substantial gas and petroleum exploration and production acreage in Australia, with interests in all major Australian petroleum provinces. The company has been exporting liquefied natural gas (LNG) to Asia since 2006 from its Darwin LNG Plant and since 2014 from its Papua New Guinea LNG project. Santos Limited is also undertaking the Gladstone Liquefied Natural Gas (GLNG) project which commenced shipping LNG in October 2015.

2.2 Project description

Santos GLNG intends to further develop its Queensland coal seam gas (CSG) resources to augment supply of natural gas from its existing and previously approved GLNG project in the Surat and Bowen Basins. The 2009 GLNG project EIS indicated that 2,650 production wells would be insufficient to support the gas supply needs for the approved three-train LNG facility on Curtis Island and that Santos GLNG would

seek approval for additional production wells at a later stage. Consequently, the GFD project EIS proposed the construction, operation, decommissioning and rehabilitation of further production wells needed to provide gas over a project life exceeding 30 years.

The proponent proposes to expand the existing GLNG project's gas field tenure, from 6,887 square kilometres (km²) to 10,676km², an increase of 3,789km². The terms of reference required that the GFD project EIS assess the maximum development scenario of up to 6,100 additional production wells, beyond the currently authorised 2,650 production wells for the GLNG project. The EIS noted that market conditions, exploration results and technological advancements over the next 30 years would likely result in approximately half of the 6,100 additional production wells being developed.

A maximum development scenario would result in a total of 8,750 production wells being developed across both projects. This includes an intensification of development within existing GLNG project tenures. Up to 6,100 production wells proposed for the GFD project would be progressively developed across 12 petroleum tenements obtained for GFD project and 23 tenements obtained for the GLNG project. The 2,650 production wells authorised for the GLNG project would not be developed on GFD project tenements.

I note that on 24 September 2015, Senex Energy Limited, proponent of the Western Surat Gas Project, announced it had entered into an agreement to sell part of ATP889 to Santos GLNG. ATP889 was not included in the declared GFD project and therefore was not part of my assessment.

2.2.1 Location

The GFD project is located in southern Queensland's Surat Basin and central Queensland's Bowen Basin. Petroleum tenures are within the local government areas (LGA) of Banana Shire, Central Highlands, Maranoa and Western Downs Regional Councils.

Figure 2.1 details the GFD project area and primary infrastructure, with the GFD project location shown in the inset.

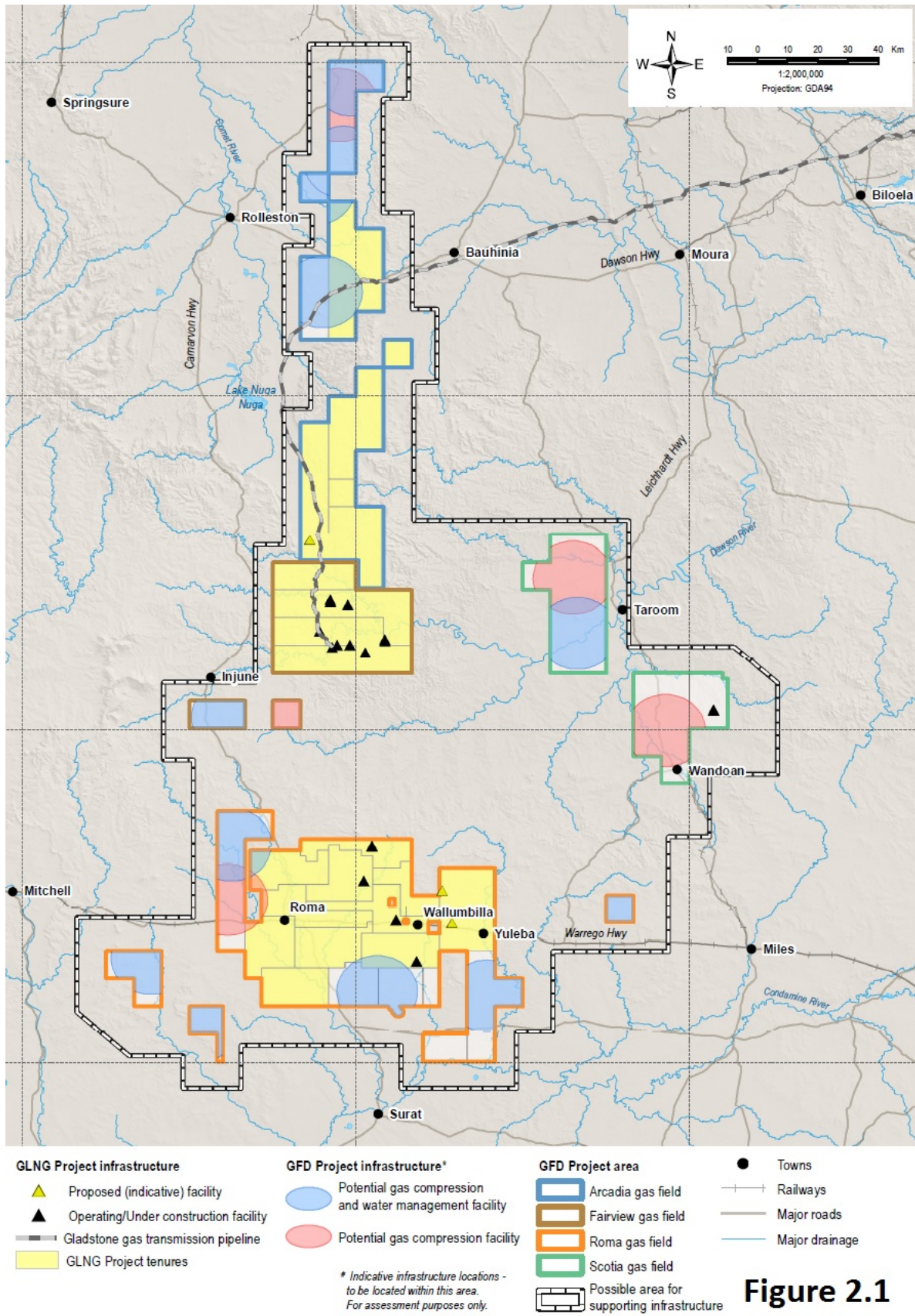


Figure 2.1

Figure 2.1 GFD project area and primary infrastructure

2.2.2 Project components

Key components of the GFD project are described Figure 2.2.

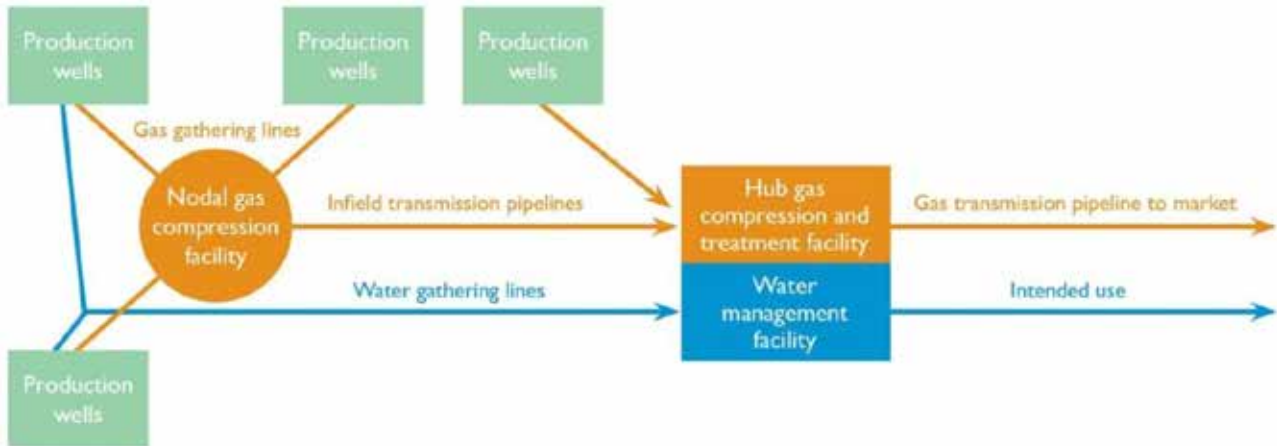


Figure 2.2 Schematic of gas gathering, transmission, compression and treatment

GFD project components as described in the EIS are summarised as follows:

Production wells

Production wells, fluid injection wells, monitoring bores and potentially underground gas storage wells would be located on well lease areas to accommodate the necessary drilling equipment and supporting services (refer Figure 2.3 below). Up to 6,100 production wells would be developed with a typical construction footprint of 1.5 hectares (ha) for a single well lease and 2.5ha for a multi-well lease.

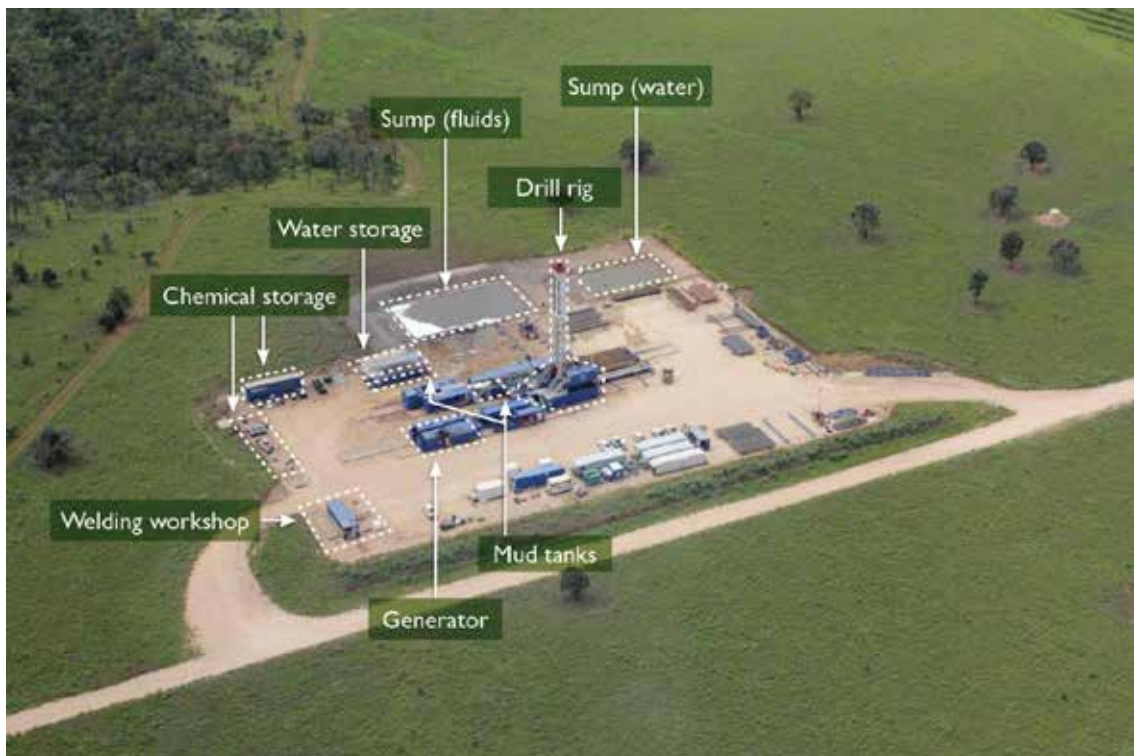


Figure 2.3 A typical Santos GLNG well lease area

Gas transmission pipelines and water gathering lines

Gas and water gathering lines would transport gas and water from well leases to gas compression facilities and water management facilities. The lines would be made of high density polyethylene (HDPE) pipe of between 100 millimetres (mm) and 1000mm in diameter. The construction footprint is expected to range from 1ha to 2.5ha per kilometre of pipeline.

Nodal gas compression facilities

Up to five stand-alone nodal gas compression facilities with a maximum capacity of 80 terajoules (TJ) per day, per facility would be installed in the field, where required. The facility would compress gas to the pressure required for transmission across significant distances or to achieve entry pressure into hub gas compression facilities. Construction would utilise modular structures and processing units with the footprint expected to range from 2ha to 8ha. A construction timeframe of one to two years is anticipated.

Gas transmission pipelines

Gas transmission pipelines would be constructed from steel pipe of 100mm to 600mm in diameter to transfer gas under pressure from nodal gas compression facilities to hub gas compression facilities. The construction footprint is expected to range from 2.5ha to 5ha per kilometre of pipeline.

Water transmission pipelines

Water transmission pipelines would be constructed from a combination of HDPE, glass reinforced epoxy and steel piping and would have a diameter up to 600mm to transfer water from water management facilities within and between tenure. The construction footprint is expected to range from 2.5ha to 5ha per kilometre of pipeline.

Hub gas compression facilities

Up to 10 centralised hub gas facilities would be constructed in the Arcadia, Fairview, Roma and Scotia gas fields to compress the gas required for transmission across significant distances. Each hub gas compression facility would vary in size and have the capacity to compress up to 240 TJ/day. Moisture and any other impurities would be removed to enable the gas to meet supply specifications. Construction would utilise modular structures and processing units with the footprint expected to range from 20ha to 40ha. A construction timeframe of two to three years is anticipated.

Water storage facilities and water management facilities

Water storage facilities would retain water in constructed dams with a capacity of up to 350 megalitres (ML) and tanks with a capacity up to 15.5ML. Up to 15 water management facilities would treat coal seam water which would have total dissolved solids ranging from 100 milligrams per litre (mg/L) (fresh water) to over 1,000mg/L (brackish water). Where practicable, the proponent would utilise existing pipelines and water management facilities.

The quality of water extracted from coal seams will influence the identification of management options for its beneficial use or disposal. If the management of the water extracted from coal seams requires a treatment such as desalination (e.g. reverse osmosis technology) it would remove dissolved salts and metals resulting in a dissolved salt content of around 20–60 grams per litre. The EIS reported that under the maximum development scenario, project operations could potentially produce 21.9 gigalitres (GL) of brine and 824,000 tonnes (t) of salt. The total salt contained in brine encapsulation facilities over the GFD project life is expected to be 755,000t. Options under consideration to manage this quantity of brine and/or solid salt include:

- commercial salt production where practicable
- brine injection into selected deep saline aquifers
- crystallisation to form solid salt for disposal to a licensed waste facility.

The proponent is currently treating GLNG project CSG water via desalination and generating brine at the Pony Hills Water Treatment Plant. The brine is subsequently injected into the Timbury Hills Formation in the Fairview Gas Field. Injections into the Timbury Hills Formation in the Roma Gas field are also being considered, pending the outcome of a feasibility study.

The EIS reported the management of brine and/or salt would be in accordance with the Coal Seam Gas Water Management Policy 2012 (DEHP). The transfer of brine or solid salt to a licensed waste management facility would only occur after other options have been assessed and considered unfeasible. Water management is discussed in more detail in section 5.5 of this report.

Other project components

- access roads and tracks
- accommodation facilities and associated services (e.g. sewage treatment)
- maintenance facilities, workshops, construction support, warehousing and administration buildings
- utilities such as water and power generations and supply (overhead and/or underground)
- lay down, stockpile and storage areas
- borrow pits and quarries.

2.2.3 Infrastructure requirements

The GFD project would utilise existing downstream GLNG infrastructure including the gas transmission pipeline and the LNG facility on Curtis Island. Most of the upstream infrastructure required for the GFD project would need to be constructed. Where practicable, the proponent would also utilise existing or already approved upstream GLNG project infrastructure (e.g. accommodation camps, compression facilities and water management facilities).

2.2.4 Development stages

The timing of GFD project development would depend on the exploration and appraisal of gas resources in conjunction with field development and assessment processes. It will also require land access agreements to be negotiated with land holders.

The EIS estimated that construction would occur progressively over a 25-year period, commencing at the Scotia gas field in 2016. Construction at the Arcadia, Fairview and Roma gas fields would commence in 2019. The 30-year operational phase is proposed to commence in 2016 as production wells come online in the Scotia gas field.

Decommissioning and rehabilitation would occur progressively throughout the life of the GFD project and would minimise its permanent disturbance footprint. Environmental authorities would be surrendered following decommissioning and rehabilitation. The process would include a final rehabilitation report as required under the *Environmental Protection Act 1994* (EP Act) and where necessary, landholder sign off.

2.2.5 Dependencies and relationships with other projects

The proposed GFD project is one of a number of CSG to LNG projects in Queensland. In addition to the GLNG project, three other LNG projects are operational in the state. These are the Australian Pacific LNG (APLNG) project, the Queensland Curtis LNG (QCLNG) Project and the Arrow Energy (Bowen and Surat) Gas project.

The EIS reported that in 2013, Santos GLNG and the APLNG joint venture signed a cooperation agreement to facilitate shared use of infrastructure, particularly in the Surat Basin. The agreement reduces the need for additional pipeline infrastructure for both projects. As part of the field planning and design process, Santos GLNG would also look to integrate with other projects through the co-location of infrastructure.

2.3 Project rationale

The GFD project has the potential to result in substantial economic impacts throughout the region, Queensland and Australia. The major economic benefits of the GFD project would include:

- meeting the increased global demand for more reliable, affordable and carbon-efficient energy supplies
- increasing the economic output of about \$2.9 billion regionally and \$3.6 billion at the state level
- employment benefits to the region, state and nation as the GFD project would potentially create up to 4621 full-time equivalent jobs in the Queensland economy over the GFD project life
- flow-on or indirect economic benefits such as growth in service industries
- up-skilling of workers following training and development opportunities
- expansion of Queensland's export industry

- supporting state and national policy directives, including the safe and sustainable development of Queensland's energy resources and the delivery of secure, reliable, and clean energy to consumers.

The GFD project is driven by the need to meet market gas supply demands, demands of the approved GLNG project's LNG facility and of third parties.

The main alternative to the GFD project is to source gas from a third party, which is the non-project alternative. This alternative has the potential to negatively impact the current supply and demand balance and would not reduce the overall environmental impact as the activities generating impact would occur elsewhere.

A full project description is contained section 4 of the EIS.

3. Environmental impact statement assessment process

This section discusses the steps in the project's EIS assessment process. In undertaking this evaluation, I have considered the following:

- the initial advice statement (IAS)
- the draft EIS
- technical reports
- agency advice from:
 - Department of Environment and Heritage Protection (DEHP)
 - Department of Natural Resources and Mines (DNRM)
 - Australian Government Department of the Environment (DE)
- properly made submissions from members of the public on the draft EIS
- additional information for the draft EIS.

The steps taken in the project's EIS process are documented on the project's webpage at www.statedevelopment.qld.gov.au/gasfield

3.1 Coordinated project declaration

On 16 November 2012, I declared this project to be a 'coordinated project' under section 26(1)(a) of the SDPWO Act. This declaration initiated the statutory environmental impact evaluation procedure of Part 4 of the Act, which required the proponent to prepare an EIS for the project.

3.2 Commonwealth assessment

On 3 December 2012, a delegate for the Commonwealth Minister for the Environment determined that the project is a 'controlled action' under the *Environment Protection*

and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) (EPBC ref. 2012/6615).
The relevant controlling provisions under the EPBC Act are:

- sections 16 and 17B, wetlands of international importance
- sections 18 and 18A, listed threatened species and communities
- sections 20 and 20A, listed migratory species.

The delegate also determined that the project should be assessed by way of an EIS under Part 8 of the EPBC Act, through the accredited bilateral agreement with the State. The EIS prepared by the proponent was therefore required to address potential impacts on matters of national environmental significance (MNES) under the EPBC Act.

On 17 October 2013, the Commonwealth Minister for the Environment confirmed the newly created controlled action: water resources—coal seam gas and large coal mining (sections 24D and 24E of the EPBC Act) also applied to the project.

Section 5 of this evaluation report lists each controlling provision under the EPBC Act and explains the extent to which the Queensland Government EIS process addresses the actual or likely impacts of the project on the matters covered by each provision.

After a copy of this evaluation report is provided to the Australian Government, a decision on the controlled action under section 133 of the EPBC Act will be made by the Commonwealth Minister for the Environment. The Minister will use the information in this report to decide whether the project should proceed, and if so, if any additional conditions, beyond those I have recommended in this report, will be applied to manage the impacts on MNES.

3.3 Terms of reference

The draft terms of reference (TOR) for the EIS for the proposed project were released for public and advisory agency comment from 15 December 2012 to 4 February 2013. Thirty-five submissions were received, comprising 26 from advisory agencies, 7 from non-government organisations and 2 from public submitters.

The final TOR was prepared, having regard to submissions received, and issued to the proponent on 28 March 2013.

3.4 Review of the EIS

The EIS, prepared by the proponent, was reviewed for technical adequacy by advisory agencies, including the relevant local councils and the Commonwealth Department of Environment (DE) from 19 September 2014 to 20 October 2014.

An updated draft EIS was submitted by the proponent addressing issues identified in the technical adequacy review and was publicly notified from 10 November 2014 to 22 December 2014.

Twenty-nine submissions were received comprising 20 agency submissions and 9 private submitters. Copies of the submissions were forwarded to the proponent and submissions about MNES were provided to DE. Key issues raised by private submitters and advisory agencies are listed in Table 3.1.

Table 3.1 Summary of public and agency submissions on the EIS

Agency	Issue
Queensland Government	Y air quality monitoring
Y Department of Aboriginal and Torres Strait Islander Partnerships (formerly known as Department of Aboriginal and Torres Strait Island and Multicultural Affairs)	Y assessment framework and methodology
Y Department of Agriculture and Fisheries (formerly known as Department of Agriculture, Fisheries and Forestry)	Y co-existence criteria
Y Department of Communities, Child Safety and Disability Services	Y complaint management
Y Department of Education and Training (formerly known as Department of Education, Training and Employment)	Y constraints protocol
Y Department of Energy and Water Supply	Y construction stages
Y Department of Environment and Heritage Protection	Y contaminated land
Y Department of Housing and Public Works	Y decommissioning and rehabilitation
Y Department of Infrastructure, Local Government and Planning (formerly known as Department of State Development, Infrastructure and Planning)	Y disposal of solid salt
Y Department of Justice and Attorney-General	Y drawdown on private landholder bores
Y Department of National Parks, Sport and Racing (formerly known as Department of National Parks, Recreation, Sport and Racing)	Y economic cost to agriculture
Y Department of Natural Resources and Mines	Y emergency response
Y Department of Transport and Main Roads	Y gross workforce numbers
Y Public Safety Business Agency (formerly Department of Community Safety)	Y groundwater quality and quantity
Y Queensland Ambulance Service	Y hazard and risk
Y Queensland Health	Y heavy/oversize vehicles
	Y housing and accommodation action plan
	Y Indigenous engagement policy
	Y location of accommodation camps
	Y management of CSG water
	Y noise and sensitive receptors
	Y offsetting MSES values
	Y pest and weed management plan
	Y public health regarding fracking chemicals
	Y <i>Regional Planning Interest Act 2014</i>
	Y road impact assessment
	Y road-use management plan
	Y stimulation impact management plan
	Y strategic cropping land
	Y subsidence
	Y surface water quality
	Y wells within 500m of schools

Agency	Issue
Commonwealth Government	<ul style="list-style-type: none"> Y assessment methodology Y constraints protocol Y decommissioned bores Y MNES ecology Y MNES water resources Y offset strategy Y water monitoring beyond the 30 year project life Y water risk assessment
Local Government	<ul style="list-style-type: none"> Y affordable housing Y beneficial re-use of CSG water Y energy supply Y groundwater Y population growth Y infrastructure agreements Y landfill capacity Y live local policy Y local business Y pest and weed management Y reliance on town water supply Y road impact assessment Y road-use management plan Y sewage and wastewater Y social impacts Y surface water quality Y workforce accommodation
Non-government organisations	<ul style="list-style-type: none"> Y agricultural land Y assessment methodology Y constraints protocol Y cumulative impacts Y CSG water management Y Impacts to flora and fauna Y groundwater Y impacts to springs Y location of impacts Y rehabilitation Y water monitoring
Private individuals	<ul style="list-style-type: none"> Y CSG water management Y depressurisation of groundwater Y local business and industry Y rehabilitation Y waste water Y worker safety

3.5 Additional information to the EIS

On 26 March 2015, I requested additional information to the draft EIS (AEIS) to further supplement issues including:

- offsets strategy
- salt balance for co-produced coal seam water
- groundwater–surface water interactions
- background to the existing Dawson River discharge approval for the GLNG project
- methodology used to calculate probability and magnitude of disturbance to terrestrial ecological values.

The proponent provided the information, which I have considered in my evaluation.

4. Project approvals

4.1 Statutory approvals

Following the release of this evaluation report, the proponent will need to obtain a range of statutory approvals from Australian, state and local government authorities before the GFD project can proceed. Approvals sought by the proponent and for which this Coordinator-General's evaluation report has provided recommended or stated conditions are listed in Table 4.1 below.

Table 4.1 Approval conditions sought from this Coordinator-General's report

Project component	Relevant approval	Legislation	Administering authority
Whole of project	Controlled action	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	DE (Commonwealth)
Petroleum activities on a petroleum lease (PL)	Environmental authority (EA) for a petroleum lease	<i>Environmental Protection Act 1994</i> (EP Act)	DEHP

The development of gas field projects is an incremental process where the locations of project infrastructure components are determined through ongoing field studies and planning and assessment. Due to the complex nature of the GFD project, it would require subsequent approvals for ongoing and site-specific development subject to separate application and assessment processes. The legislative framework for subsequent approvals is detailed in Table 4.2.

Table 4.2 Subsequent approvals potentially required for the GFD project

Relevant approval	Legislation	Administering authority
Petroleum and gas approvals		
Authority to prospect (ATP)	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DNRM
Petroleum lease	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DNRM
Petroleum pipeline licence (PPL)	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DNRM
Petroleum facility licence (PFL)	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DNRM
Land access code	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DNRM
Coal seam gas statement	<i>Mineral Resources Act 1989</i>	DNRM
Construction and operations approvals		
Indigenous Land Use Agreement (ILUA)	<i>Native Title Act 1993</i>	DE (Commonwealth)
Environmentally Relevant Activities (ERAs)	<i>Environmental Protection Act 1994</i>	DEHP
Notifiable activities	<i>Environmental Protection Act 1994</i>	DEHP
Contaminated soil disposal permit	<i>Environmental Protection Act 1994</i>	DEHP
Development application permits for: ☐ material change of use (MCU) ☐ operation works ☐ building works ☐ plumbing and drainage works ☐ reconfiguring a lot.	<i>Sustainable Planning Act 2009 (SPA)</i>	DILGP and relevant local government authorities
Building approvals	<i>Building Act 1975</i>	DHPW and relevant local government authorities
Notification of work affecting electricity entities works	<i>Electricity Act 1994</i>	Relevant energy entity
Approval for connection of electrical supply or an increase in connected load	<i>Electricity Act 1994</i>	Relevant energy entity
Licence to use, possess, store and transport explosives	<i>Explosives Act 1999</i>	DNRM

Relevant approval	Legislation	Administering authority
Environment, planning and safety approvals		
Environmental authority for a PL	<i>Environmental Protection Act 1994</i>	DEHP
Cultural Heritage Management Plan (CHMP)	<i>Aboriginal Cultural Heritage Act 2003</i>	DATSIP
Development permit for waterway barrier works	<i>Fisheries Act 1994</i>	DILGP
Approval for vegetation clearance in a State forest or forest reserve	<i>Forestry Act 1959</i>	DAF DNPSR
Interfering with or use of forest products and quarry material outside of a state land area	<i>Forestry Act 1959</i>	DAF
Permanent or temporary road closure permit	<i>Land Act 1994</i>	DNRM
Permit to occupy (for works required on unallocated State land, a reserve or a road)	<i>Land Act 1994</i>	DNRM
Protected animals movement permit	<i>Nature Conservation Act 1992</i>	DEHP
Protected plants clearing permit	<i>Nature Conservation Act 1992</i>	DEHP
Wildlife movement permit for wildlife (other than protected wildlife) in an area identified under a conservation plan	<i>Nature Conservation Act 1992</i>	DEHP
Permits for: <ul style="list-style-type: none"> • taking or interfering with cultural and natural resources of a protected area • rehabilitation permit (spotter catcher endorsement) • damage mitigation permit (removal and relocation). 	<i>Nature Conservation Act 1992</i>	DEHP
Permits to clear native vegetation outside the PL	<i>Vegetation Management Act 1999</i>	DILGP DNRM
Permit to enter a protected area	<i>Queensland Heritage Act 1992</i>	QHC DEHP
Regional interests development approval for development in: <ul style="list-style-type: none"> • a priority agricultural area (PAA) • a priority living area (PLA) • a strategic cropping area (SCA) • a strategic environmental area (SEA). 	<i>Regional Planning Interests Act 2014</i>	DILGP

Relevant approval	Legislation	Administering authority
Permit for construction works on State controlled roads reserve	<i>Transport Infrastructure Act 1994</i>	DTMR
Permit for over-dimension load	<i>Transport Operations (Road Use Management) Act 1995</i>	DTMR
Approval for beneficial use of coal seam water as a resource not authorised by PL or EA conditions	<i>Waste Reduction and Recycling Act 2011</i>	DEHP
Water licence, for taking or interfering with water from a watercourse	<i>Water Act 2000</i>	DNRM
Development permit (water licence) to take underground water	<i>Water Act 2000</i>	DNRM
Riverine protection permit, for excavation or placing fill in a watercourse, lake or spring	<i>Water Act 2000</i>	DNRM

4.1.2 Australian Government approvals

The GFD project was declared a controlled action on 3 December 2012 by the Commonwealth Minister for the Environment, in accordance with section 75 of the EPBC Act. The EIS process has been undertaken in accordance with the requirements of the bilateral agreement between the Queensland and Australian governments, as discussed in section 3 of this report. Following amendments to the EPBC Act to include water resources in relation to coal seam gas and large coal mining developments as a controlling provision, a decision was made on 17 October 2013 that the water resources provision also applied to the GFD project.

The Minister will use the information in section 5 of this report to make an informed decision whether or not to approve the controlled action under the EPBC Act, and if so, apply conditions to the approval necessary to manage the impact on MNES.

4.1.3 State government approvals

Petroleum and Gas (Production and Safety) Act 2004

A PL is required to conduct activities for the exploration, production and sale of gas within the lease area. A PL can only be approved after the granting of an EA and agreement with Native Title holders.

A PPL is required for the construction and operation of a pipeline to transport petroleum or gas outside of a granted PL. A PPL may also be required to transport gas between non-contiguous PLs in the gas fields for processing before transmission.

If the proponent proposes to develop a facility to process, store or transport gas that is not authorised by a PL or PPL, it will need to apply for a PFL.

An ATP allows the holder to undertake gas exploration activities and studies to evaluate the development potential of gas resources. ATPs held by the proponent must

be converted to PLs for the commercial production and sale of gas within the lease area.

Environment Protection Act 1994

Under the EP Act, an EA is required to carry out petroleum activities as defined under section 111 of that Act. The EA imposes environmental management conditions on petroleum activities undertaken on a PL or PPL and must be issued before a licence can be granted.

An EA issued by DEHP is required to carry out ERAs. The provisions of the EA will provide authority for any ERAs that occur on the PL as long as these support the petroleum activity. Any ERAs proposed for outside the petroleum activities EA and the PL will require separate applications. I have stated conditions in Appendix 1 of this report for inclusion in the draft EAs.

State Development and Public Works Organisation Act 1971

Under Division 8 of Part 4 of the SDPWO Act, I have the power to impose conditions for some matters where conditions cannot be applied through approvals under other specified legislation. Imposed conditions are provided in Appendix 3 of this report and relate to social impact matters.

Water Act 2000

A water licence would be required to take or interfere with groundwater for authorised activities. The *Water Act 2000* also requires a water licence to take or interfere with the flow of water within a watercourse, lake or spring.

A petroleum tenure holder is required to enter into a 'make good' agreement with a bore owner if the taking of water causes any impairment to private bore water supplies.

Sustainable Planning Act 2009

The SPA does not apply on a PL, however it may apply to GFD project development outside a PL. The GFD project will require a range of development approvals for actions undertaken outside petroleum tenures. These may include but are not limited to approvals for a material change of use, operational works and building works. The EIS advised that these approvals are likely to be initiated under the SPA and lodged through the State Assessment and Referral Agency (SARA).

In addition to approvals sought through SARA, approvals under the relevant local government planning scheme may be required. Building approvals may be sought under the *Building Act 1975* (Qld).

4.2 Environmental management plans

The EIS included project-wide management plans, developed to ensure all components of the GFD project comply with Commonwealth and State regulatory requirements. Initially developed for the GLNG project, the plans would allow the application of a consistent management approach within all of the proponent's gas

fields. The management plans and strategies applicable to the GFD project are shown in Table 4.3.

Table 4.3 GFD project management plans and strategies

Environmental management framework
Draft environmental management plan (including the following documents):
<ul style="list-style-type: none"> ÿ GFD Project environmental protocol for constraints planning and field development ÿ Environmental monitoring and reporting ÿ Contingency plan for emergency environmental incidents ÿ Erosion and sediment control management plan ÿ Chemical and fuel management plan ÿ Land release management plan ÿ Significant species management plan ÿ Fauna management plan ÿ Pest and weed management plan ÿ Noise management plan ÿ Waste management plan ÿ Rehabilitation management plan ÿ Decommissioning and abandonment management plan
Other strategies and management plans
<ul style="list-style-type: none"> ÿ Coal seam water management strategy ÿ Land access ÿ Offset strategy ÿ Social issues action plans ÿ Plan of operations
Water resources management plan (including the following documents):
<ul style="list-style-type: none"> ÿ Hydraulic connectivity characterisation ÿ Joint industry plan for EPBC Act-listed springs ÿ Evaluation of prevention or mitigation options for Fairview springs ÿ Stimulation impact monitoring program ÿ Ground deformation monitoring and management plan ÿ Hydraulic fracturing risk assessment: compendium of assessed fluid systems ÿ Dawson River discharge scheme receiving environmental monitoring program summary

5. Matters of national environmental significance

This chapter addresses the potential impacts of the GFD project on matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The GFD project was referred to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC, now the Department of the Environment) in November 2012 and declared a controlled action under the EPBC Act on 3 December 2012 (reference number EPBC 2012/6615) for the following controlling provisions:

- wetlands of international importance
- listed threatened species and communities
- listed migratory species.

Following amendments to the EPBC Act to include water resources in relation to coal seam gas (CSG) and large coal mining developments as a controlling provision, a decision was made on 17 October 2013 that the water resources provision also applied to the GFD project. The EIS process has been undertaken in accordance with the requirements of the bilateral agreement between the Queensland and Australian governments. Potential impacts on groundwater and surface water resources are discussed in section 5.5.2 and 5.5.3 of this report.

5.1 Assessment methodology

The development of large CSG fields is an incremental process where the location of fixed project components is determined by resource exploration and appraisal in consultation with constraints planning and assessment undertaken throughout the life of the project. To identify and enable an assessment of the potential impacts of the GFD project on MNES for the EIS, the proponent developed a modelling methodology based on a maximum development scenario of 6,100 production wells and associated infrastructure. This development is in addition to the existing approval for up to 2,650 production wells and associated infrastructure for the GLNG project. The methodology considers desktop and field assessments and is comprised of the following linked stages:

- predictive modelling—to identify the extent of threatened ecological communities (TECs) and threatened species habitat across the GFD project area
- constraints modelling—to categorise and incorporate the types of development permitted across the GFD project area and in each category of constraint
- land disturbance probabilistic modelling—to predict potential disturbance to the environmental values of the GFD project area based on predictive and constraints modelling.

Desktop assessment

The EIS reviewed 26 ecological assessments undertaken between 2002 and 2014 for this project, for other nearby projects or as published research where MNES values were identified in the GFD project area. The studies were used to inform the likely extent of TECs and habitat for EPBC listed species.

The desktop assessment also included searches of the following databases for records of relevant environmental values within the GFD project area and broader region:

- ÿ Atlas of Living Australia (Australian Government) 2013
- ÿ Biodiversity Planning Assessment mapping (Queensland Government) 2013
- ÿ Birdlife Australia database (Birdlife Australia) 2013
- ÿ EPBC Act 1999 Protected Matters Search Tool (Australian Government) 2013
- ÿ Environmentally Sensitive Area mapping (Queensland Government) 2013
- ÿ Essential Habitat Map, version 3.1 (Queensland Government) 2012
- ÿ HERBRECS database (Queensland Herbarium) 2013
- ÿ Zoology Data Search, terrestrial vertebrates, fish, crustacea and land snails (Queensland Museum) 2013
- ÿ Regulated Vegetation Management Map (Queensland Government) 2014
- ÿ Register of critical habitat (Australian Government) 2013
- ÿ Map of Referable Wetlands (Queensland Government) 2013
- ÿ Wildlife Online database (Queensland Government) 2013.

Field assessment

Field surveys conducted within the GFD project area were timed to account for seasonal variation in ecological assemblages. In total, the survey effort equates to 1,704 person/field days spread across the entire GFD project area. This is comprised of 789 days in the Fairview gas field, 626 days in the Roma gas field, 137 days in the Arcadia gas field and 152 days in the Scotia gas field.

These field survey sites were selected following the desktop assessment to sample representative examples of vegetation communities in the GFD project area and any special landscape features considered likely to support threatened species. New project tenures that had not been assessed in previous field surveys and areas potentially supporting TECs were identified in this process.

Flora assessment methodologies were developed using the principles of the Queensland BioCondition assessment framework; and recorded species census, canopy cover, tree height, stem counts and groundcover in formats compatible with CORVEG and HERBRECS guidelines. The assessments were used to validate and refine the predictive modelling of habitat for threatened flora species.

Fauna surveys and habitat assessments were also used to validate and refine the predictive modelling of fauna habitat. General assessments were undertaken at each vegetation assessment site to record fauna species and habitat features encountered

in the GFD project area. Habitat features recorded during the field assessment included:

- presence and density of tree hollows
- perching, sheltering and foraging structures
- coarse fallen woody material
- boulders and other rocky material
- watercourses and formed banks
- gilgai and cracking clays
- water availability and proximity
- weeds
- ground cover vegetation
- feeding resources.

Where habitat likely to support threatened species was encountered, the general assessments were undertaken in conjunction with targeted surveys.

Due to the extensive scale of the GFD project area, non-invasive and remote sensing techniques were adopted, rather than fauna trapping, to detect the presence of species of conservation significance. These techniques included:

- baited hair traps
- infra-red remote sensing cameras
- ANABAT devices
- call playback
- spotlighting
- active searches
- analysis of scat and scratch marks.

Likelihood of occurrence

A likelihood-of-occurrence assessment was undertaken and incorporated into the constraints modelling to identify species more likely to be at risk if the GFD project proceeds. The assessment considered records collected during field surveys, records from previous studies in the GFD project area and the presence and distribution of suitable habitat. Species were then classified according to the following criteria:

- a 'low likelihood of occurrence' if:
 - there are no previous records and the project area is outside current known distributions
 - species specific habitat types and resources are not present in the project area
 - the species is considered locally extinct
- a 'moderate likelihood of occurrence' if:
 - the species had been infrequently recorded in the project area

- specific habitat types and resources are present in the project area although in poor or modified condition
- the species is unlikely to maintain sedentary populations but may utilise resources within the project area

Y as 'known to occur' if:

- there are specimen-backed records for the species
- the species was observed during field investigations.

Predictive modelling

Field data and inputs from government databases were used to develop a predictive map of the TECs present in the GFD project area and to identify target areas for further field investigations. Inputs to the predictive model included:

- Y regional ecosystem (RE) mapping (version 6.1)—including field-verified RE amendments
- Y high resolution aerial photography (2014)
- Y site-based data associated with field verified TECs.

Predictive modelling was undertaken to identify areas that support or likely support habitat for species protected under the EPBC Act or the *Nature Conservation Act 1992* NC Act in the GFD project area. The modelling was used to recognise habitat requirements of conservation-significant species identified by the desktop analysis. It incorporated RE habitat associations and other relevant data sources including:

- Y Regulated Vegetation Management Map (Queensland Government) 2014
- Y Wetland mapping and Referable Wetlands mapping (Queensland Government) 2013
- Y Waterways mapping (Queensland Government) 2013
- Y Biodiversity Planning Assessment mapping (Queensland Government) 2008
- Y Wildlife Online (flora and fauna records) (Queensland Government) 2013
- Y EPBC Act Protected Matters Search Tool (Australian Government) 2013
- Y high resolution aerial photography (2014)
- Y field records of conservation-significant fauna species.

In modelling fauna habitat requirements, a number of species-specific assumptions were made to categorise the GFD project area into 'core habitat', 'essential habitat', 'general habitat' or 'unlikely habitat' for each protected species. The assumptions made for each species are described in the Significant Species Management Plan (Appendix Y-H of the EIS).

Constraints planning and assessment

The proponent developed the Environmental Protocol for Constraints Planning and Field Development (Constraints Protocol) (Appendix Y-B) as the framework for identifying and assessing the environmental values of the GFD project area during ongoing planning and field development processes. The protocol is based on a

hierarchy of management principles where land disturbance impacts are firstly avoided, then minimised, mitigated and rehabilitated. Any significant residual adverse impacts on MNES and matters of state environmental significance (MSES) would need to be offset in accordance with Queensland and Australian Government requirements.

The constraints protocol defines the levels of constraint and the type of project activity permitted in each category of constraint. Table 5.1 shows the type of project activity permitted in each constraint category. The types of project activities are described in Table 5.2.

Table 5.1 Permitted activities in each constraint area

Level of constraint	Low impact petroleum activities	Linear infrastructure	Limited petroleum activities	Petroleum activities
No-go area	No	No	No	No
Surface development exclusion area	Yes	No	No	No
High constraint area	Yes	Yes	No	No
Moderate constraint area	Yes	Yes	Yes	No
Low constraint area	Yes	Yes	Yes	Yes

Table 5.2 GFD project activity descriptions

Project activity	Description
Low-impact petroleum activity	A low-impact petroleum activity is one that does not result in clearing native vegetation or cause damage to vegetation that cannot be easily rehabilitated. Includes earthworks that do not cause a significant disruption to the soil profile. Examples include chipholes, coreholes, field surveys and installation of environmental monitoring equipment.
Linear infrastructure	Includes gas and water gathering lines, transmission pipelines, power lines, communication, roads and access tracks.
Limited petroleum activity	Any low impact petroleum activity, linear infrastructure and single or multi-well lease and associated infrastructure. Includes accommodation camps with sewage treatment works that are a 'no release' works.
Petroleum activity	Low impact petroleum activities, limited petroleum activities, and all other activities including major facilities such as permanent accommodation camps, gas treatment facilities, air strips, gas compression facilities, water management facilities such as water storage and water treatment facilities.

Table 5.2 shows the level of constraint applied to different areas within the GFD project area. Where multiple constraints overlap in a particular area, the highest level of constraint prevails.

Table 5.3 Constraint categories within the GFD project area

Level of constraint	Constraints categories
No-go area	<ul style="list-style-type: none"> ÿ Category A Environmentally Sensitive Areas (ESAs). For the GFD project this includes: <ul style="list-style-type: none"> – national parks – conservation parks – forest reserves ÿ Spring vents and/or spring complexes that are protected under the EPBC Act plus a 200m buffer zone ÿ 'Wetlands of high ecological significance' also known as 'high conservation value wetlands' as detailed in the Map of Referrable Wetlands dataset (QLD) ÿ Wetlands of national importance plus a 200m buffer
Surface development exclusion area	<ul style="list-style-type: none"> ÿ 200m primary protection zone buffers around Category A ESAs (national parks, conservation parks, forest reserves) ÿ The following Category C ESAs: <ul style="list-style-type: none"> – nature refuges – koala habitat areas – declared catchment areas ÿ The following Category B ESAs: <ul style="list-style-type: none"> – coordinated conservation areas – Ramsar Sites – State forest park/special forestry areas.
High constraint area	<ul style="list-style-type: none"> ÿ Watercourses plus a 100m buffer ÿ 'General ecologically significant wetlands' or 'wetlands of other environmental value' as detailed in the Map of Referrable Wetlands dataset ÿ All other spring vents/spring complexes (not protected under the EPBC Act) located within Santos GLNG tenures and a 200m primary protection buffer
Moderate constraint area	<ul style="list-style-type: none"> ÿ 100m secondary buffer zone around spring vents and/or spring complexes protected under the EPBC Act (including their 200m primary buffer zone) ÿ MNES including habitats (threatened species habitat and migratory species habitat), TECs (derived from state RE mapping or verified from field surveys), flora species ÿ 100m secondary protection zone buffer area around Category A ESAs plus the 200m primary protection zone buffer (national parks, conservation parks, forest reserves) ÿ Endangered REs (Category B ESAs) including a 200m primary protection buffer ÿ The following Category C ESAs plus a 200m primary protection buffer: <ul style="list-style-type: none"> – essential habitat and essential regrowth habitat – of-concern REs – resource reserves ÿ State forests and timber reserves ÿ Threatened species protected under the NC Act.

Level of constraint	Constraints categories
Low constraint area	<ul style="list-style-type: none"> • High value regrowth (endangered and of-concern REs) • 'no concern at present' REs • existing project infrastructure • other existing infrastructure that would have to be considered during field development.

Field development processes would need to consider additional constraints to ensure project activities comply with the requirements of government approvals. These constraints may include:

- cultural heritage (Indigenous and non-Indigenous) constraints
- land use and tenure constraints for:
 - areas of regional interest identified under Queensland's *Regional Planning Interests Act 2014*
 - land-use conflicts addressed through the Darling Downs and Central Queensland Regional Plans
 - disturbances to existing contaminated land
- additional development conditions for activities within national parks (limited depth) as assessed on a case-by-case basis
- pre-clearance assessments of activities that must identify koala habitat
- consideration of bioregional corridors where infrastructure may impact on the functionality of corridors
- siting camps or relevant permanent infrastructure subject to flood impact assessments
- noise constraints.

Land Disturbance Probabilistic Model

The extent and location of the constraint categories shown in Table 5.3 were mapped for use in the Land Disturbance Probabilistic Model. This was used to determine potential impacts to environmental values in the GFD project area based on the maximum development scenario of 6,100 production wells. The model assumed potential disturbances would be associated with gas well and linear infrastructure as any major infrastructure component would be located outside areas of environmental sensitivity.

The mapping placed a 1km × 1km grid system over GFD project tenures and calculated potential project disturbance for each square kilometre for three development scenarios of different intensity, one, two or three production wells per square kilometre. The model was run multiple times and results for each grid were aggregated for assessment against a range of likely development scenarios based on the results of gas exploration, to predict maximum potential disturbance areas to MNES values. The predicted potential disturbances to threatened species and communities

and migratory species listed under the EPBC Act are discussed in section 5.3 and 5.4 of this report respectively.

Pre and post disturbance processes

The proponent has developed internal approval processes to ensure any new land disturbances account for development constraints. The process is applied prior to disturbance during planning and design phases to inform a development decision and comprises the following six steps:

- (1) A disturbance initiation request proposing the infrastructure type and location.
- (2) A desktop assessment of the proposed location against mapped constraints data and identification of areas requiring pre-clearance surveys and assessment of alternative locations.
- (3) A field scout to assess potential adverse impacts on constraints, confirm the desktop assessment and provide recommendations on the proposed development.
- (4) Pre-clearance surveys targeting specific constraints.
- (5) Assess options relating to potential field development impacts and manage the risk of adverse impacts on environmental constraints such as MNES.
- (6) Collection and collation of field data from field surveys to increase the accuracy of future desktop assessments.

Subject to the activity and presence of constraints, internal environmental approvals would be issued describing the area to be disturbed, development conditions and remedial actions, internal environmental requirements, any additional external environmental and regulatory permits that may be required and period for which the approval remains valid.

Where disturbance to constraints is permitted, the location and extent of the disturbance and the environmental constraints disturbed would be recorded along with information supporting the justification of the action taken. The results of field scouts and pre-clearance surveys would be reported and relevant reports on gas field activities would be submitted to State and Commonwealth administering authorities as required.

Adverse impact assessment methodology

The proponent is finalising an adverse impact assessment methodology to assess the nature and extent of an impact on threatened species protected under the EPBC Act and if the impact is adverse or significant. The methodology is designed to be consistent with the EPBC Act Environmental Offset Policy and builds upon the significant impact criteria described in *the Matters of National Environmental Significance – Significant impact guidelines 1.1*. It assesses the following factors of a potential impact:

- ÿ habitat suitability (core, essential, general or unlikely)
- ÿ species resilience

- habitat resilience
- the nature of the disturbance (temporary or permanent).

Initially developed to assess disturbances associated with linear infrastructure development, the methodology has been adapted for application in the gas fields and undergone peer review to ensure its suitability. The peer review, undertaken in parallel with this evaluation, made several recommendations to ensure the methodology is fit for purpose. Accordingly, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan in accordance with the final adverse impact assessment methodology to ensure offsets can be accurately determined for any potential significant residual impacts of the GFD project on EPBC Act listed species.

5.2 Wetlands of international importance (sections 16 and 17B)

Wetlands of international importance were included as a controlling provision in the referral decision for the GFD project (EPBC 2012/6615). However, there are no Ramsar wetlands of international significance located either within or in close proximity to project area. The Narran Lake Nature Reserve in the Condamine-Balonne Catchment is the nearest Ramsar wetland, located in northern New South Wales approximately 320km south of the GFD project boundary. Potential localised impacts to water quality and flow may occur within the GFD project boundaries and immediately adjacent drainage lines from proposed GFD project activities; however, these impacts are considered unlikely to extend downstream to the Narran Lake Nature Reserve. Accordingly, no specific mitigation measures have been proposed.

5.3 Listed threatened species and communities (sections 18 and 18A)

The following TECs have been confirmed present in the GFD project area:

- brigalow (*Acacia harpophylla* dominant and co-dominant)
- coolibah – black box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (GAB)
- natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- weeping myall woodlands.

The MNES significant impact guidelines 1.1 defines a significant impact to a TEC as one that will:

- Y reduce the extent of an ecological community
- Y fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- Y adversely affect habitat critical to the survival of an ecological community
- Y modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- Y cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- Y cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
 - assisting invasive species that are harmful to the listed ecological community to become established, or
 - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community
- Y interfere with the recovery of an ecological community.

Potential direct and indirect impacts on TECs in the GFD project area are described in the following sections. The potential disturbance areas have been calculated using the land disturbance probabilistic model based on the maximum development scenario of 6,100 production wells.

Key issues raised in submissions on the EIS regarding potential impacts on threatened species and communities included:

- Y impacts on threatened species and communities
- Y the constraints framework and location of infrastructure
- Y proliferation of weed species
- Y alteration of fire regimes
- Y landscape connectivity and fragmentation of biodiversity corridors
- Y cumulative impacts of CSG development
- Y the extent of the field survey effort.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

Threatened ecological communities—Brigalow

The Brigalow TEC (*Acacia harpophylla* dominant and co-dominant) is listed as endangered under the EPBC Act. Within the GFD project area, it corresponds to the REs 11.3.1, 11.4.8, 11.4.9, 11.9.1 and 11.9.5 all of which are listed as endangered under Queensland's *Vegetation Management Act 1999* (VM Act).

The community varies in structure throughout the GFD project area from mature stands of forest with emergent eucalypt species to more prevalent areas of forest and woodland with simplified structures as a result of past and present land uses. Patch sizes range from less than a hectare up to approximately 1,120ha with smaller patches generally in poorer condition and affected by extensive weed invasion. Larger patches in good condition show little evidence of disturbance and weed invasion is restricted to edges. Table 5.4 shows the approximate area of brigalow in the GFD project area meeting the TEC description and the potential unmitigated disturbance area.

In addition, the EIS identified potential areas of endangered high value regrowth (HVR) brigalow in the GFD project area could potentially be included in this TEC. Brigalow patches are considered to constitute a part of the TEC if:

- they are more than 0.5ha in size
- show structural elements and species composition typical of the TEC
- exotic perennial species comprise less than 50 per cent of the total vegetation cover.

If results of pre-clearance surveys confirm patches of HVR meet the condition and diagnostic criteria of the Brigalow TEC, then mapping of the TEC will require updating.

Table 5.4 Brigalow TEC in the GFD project area

	Coverage in the GFD project area (ha)	Potential regrowth area (ha)	Potential disturbance area for 6,100 well scenario (ha)
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	18,373	11,980	179

Recovery plans, threat abatement plans, conservation advice

The approved conservation advice for the community identifies clearing, fire, invasive species, inappropriate grazing regimes and climate change as key threats that may either reduce its extent or cause a decline in condition. Priority recovery and threat abatement actions listed in the advice include:

- fire management
- weed and feral animal control, particularly targeting buffel grass and feral pigs
- protecting and encouraging understorey growth
- establishing buffer zones to protect remnant patches
- sediment, erosion and pollution control.

Threat abatement and recovery plans for the Brigalow TEC are not available; however, a draft recovery plan produced in 2007 proposed the following key objectives:

- ÿ increase the area of the brigalow ecological community and its representation in conservation reserves
- ÿ improve knowledge of the brigalow ecological community and its condition as habitat for native species
- ÿ mitigate key threats to the brigalow ecological community by controlling fire, weeds and animal pests.

Impacts

The total unmitigated potential impact of the GFD project on the Brigalow TEC is clearance of 179ha if all 6,100 proposed production wells are developed. This potential impact would likely be reduced through field development planning where avoidance measures would be implemented. In addition to land clearing, the EIS identified other potential impacts of the GFD project on the Brigalow TEC including:

- ÿ soil compaction that may slow water infiltration, reduce nutrient uptake and inhibit plant growth
- ÿ proliferation of weed and pest species that may result in displacement of native species and damage to vegetation by livestock grazing and trampling
- ÿ fragmentation and reduced connectivity that may inhibit movement of mobile species through biodiversity corridors
- ÿ edge effects that may promote the growth of different vegetation types along habitat edges
- ÿ barrier effects that may prevent movement of species between habitat areas.

Mitigation

The constraints protocol is the primary tool to mitigate impacts on the Brigalow TEC. During detailed field planning, the location of project infrastructure would be selected to avoid direct or indirect impacts where practicable. Where potential impacts cannot be avoided, the constraints protocol describes measures to minimise, mitigate and rehabilitate impacted areas to promote long-term recovery. The constraints protocol classifies TECs as a moderate constraint area in which only linear infrastructure, low impact petroleum activities and limited petroleum activities are permissible when specific mitigation measures are implemented.

The proponent has outlined mitigation measures for all GFD project phases relevant to the Brigalow TEC in the management framework comprised of:

- ÿ Significant Species Management Plan
- ÿ Rehabilitation Management Plan
- ÿ Pest and Weed Management Plan
- ÿ Environmental Protocol for Constraints Planning and Field Development (Constraints Protocol)
- ÿ Offsets Strategy

- ÿ Decommissioning and Abandonment Management Plan
- ÿ Draft Environmental Management Plan
- ÿ Erosion and Sediment Control Plan.

Mitigation measures listed in this framework relevant to TECs include:

- ÿ marking exclusion zones and the extent of disturbance for the duration of the clearing activity
- ÿ confining access to and from project locations to dedicated access tracks
- ÿ grading and re-profiling disturbed areas to contours consistent with the surrounding landform to minimise erosion and ensure natural functions as far as possible
- ÿ relocating microhabitat features to adjacent undisturbed areas
- ÿ offsetting and/or rehabilitating disturbed areas
- ÿ revegetating areas not needed for ongoing operations or maintenance
- ÿ enforcing vehicle and equipment wash down requirements and monitoring and controlling weed and pest species
- ÿ implementing the Santos GLNG Upstream Bushfire Management Plan.

Residual impact

The residual impact modelled for the EIS is a direct loss of 179ha of the Brigalow TEC. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where a significant residual adverse impact remains after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent are consistent with the approved conservation advice and can adequately manage potential impacts on the brigalow TEC. The potential disturbance area of 179ha has been determined before avoidance measures have been applied. I expect the residual impact will be reduced further during field development planning. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts on threatened species and ecological communities. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

Threatened ecological communities—Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions

The coolibah – black box woodland TEC is listed as endangered under the EPBC Act. In Queensland it corresponds to REs 11.3.3, 11.3.15, 11.3.16, 11.3.28, 11.3.37 and may include some areas mapped as the wetland RE 11.3.27. REs 11.3.37, 11.3.16 and 11.3.27 are listed as ‘least concern’ under Queensland’s VM Act. REs 11.3.28, 11.3.15 and 11.3.3 are listed as ‘of concern’ under the same Act.

Within the GFD project area, the TEC is present in large patches in good condition along the Dawson River and Robinson Creek and potentially in smaller patches in a number of project tenures. Table 5.5 shows the approximate area of the coolibah – black box woodland TEC in the GFD project area and the potential unmitigated disturbance area.

The EIS also identified potential regrowth of 434ha in the GFD project area, which may meet the condition thresholds of the TEC. Condition thresholds for the coolibah – black box woodland TEC include:

- patch sizes of at least 5ha
- tree canopy cover of at least 8 per cent
- the presence of hollow-bearing trees and mature or coppiced coolibah and/or black box in the canopy
- native graminoids, other herbs, chenopods and/or native low shrubs comprising 10% or more of the ground cover
- coverage of non-native perennial plant species does not exceed the coverage of native plant species (annual or perennial) in the ground layer.

If the results of pre-clearance surveys confirm areas of this regrowth meet the condition thresholds and qualify for inclusion in the TEC then mapping of the TEC and any offset requirements will require updating.

Table 5.5 Coolibah – Black Box Woodland TEC in the GFD project area

	Coverage in the GFD project area (ha)	Potential regrowth area (ha)	Potential disturbance area for 6,100 well scenario (ha)
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	4,328	434	124

Recovery plans, threat abatement plans, conservation advice

The listing advice and approved conservation advice identify clearing and fragmentation, altered hydrological flows, inappropriate grazing regimes, climate change and weed invasion as the key threats to this TEC. Infrastructure associated with mining and CSG developments in the Bowen and Surat basins is also identified as

a potential threat to the TEC. The listing advice notes that estimates of the area of the TEC protected in conservation reserves is very low, ranging from three to five per cent of the total current extent.

A recovery plan for the TEC is unavailable; however the conservation advice contains a number of priority recovery and threat abatement actions including:

- managing hydrological changes that may increase run-off, salinity, sedimentation or pollution
- retaining habitat features such as fallen logs and tree hollows
- developing management plans to control pest and weed species, particularly lippia (*Phyla canescens*)
- implementing stock management measures such as fencing of riparian areas and stream banks
- implementing suitable fire management strategies
- creating or restoring wildlife corridors and linkages.

Impacts

The total unmitigated potential impact of the GFD project on the coolibah – black box woodland TEC is clearance of 124ha if all 6,100 proposed production wells are developed. This potential impact would likely be reduced through field development planning where avoidance measures would be implemented. In addition to land clearing, the EIS identifies other potential impacts of the GFD project to the coolibah – black box TEC including:

- sediment transport and localised erosion from disturbed areas following significant rain events
- contamination of soil resources resulting from spillage of hydrocarbons
- proliferation of weed and pest species that may result in displacement of native species and damage to vegetation by grazing and trampling
- fragmentation and reduced connectivity that may inhibit movement of mobile species through biodiversity corridors
- edge and barrier effects that may promote the growth of different vegetation types along habitat edges and prevent movement of species between habitat areas
- surface water and shallow groundwater degradation from sedimentation and spillage of hydrocarbons.

Mitigation

The management framework and mitigation measures described in this report for the brigalow TEC apply to the coolibah – black box TEC.

Residual impacts

The residual impact modelled for the EIS is a direct loss of 124ha of the coolibah – black box woodland TEC. I expect additional opportunities for avoidance to be

investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where a significant residual adverse impact remains after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent are consistent with the approved conservation advice and can adequately manage potential impacts on the coolibah – black box woodland TEC. The potential disturbance area of 124ha has been determined before avoidance measures have been applied. I expect the residual impact will be reduced further during field development planning. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts on threatened species and ecological communities. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

Threatened ecological communities—Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

The semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and Nandewar Bioregions TEC is listed as endangered under the EPBC Act. Within the GFD project area it corresponds to the REs 11.9.4 and 11.8.3 and occurs in patches of variable size and condition which include some very large good quality patches with little evidence of disturbance. The TEC is characterised by a floristically diverse assemblage of species, and is known to be important habitat for numerous bird species. Although generally fire sensitive, the community provides a refuge for wildlife as it usually occurs as discrete patches within other vegetation types that serve as buffers to prevent the incursion of fires. Table 5.6 shows the approximate extent of the SEVT within the GFD project area and the potential unmitigated disturbance area.

The EIS also identified potential SEVT regrowth of 1,954ha in the GFD project area. Condition thresholds are not described in the national recovery plan or listing advice for the community. If the results of pre-clearance surveys confirm the potential regrowth areas support the characteristics of the TEC described in the SEVT recovery plan then mapping of the TEC and any offset requirements will require updating.

Table 5.6 Semi-evergreen vine thickets TEC in the GFD project area

	Coverage in the GFD project area (ha)	Potential regrowth area (ha)	Potential disturbance area for 6,100 well scenario (ha)
SEVT of the Brigalow Belt (North and South) and Nandewar Bioregions	9,189	1,954	190

Recovery plans, threat abatement plans, conservation advice

No conservation advice has been prepared for the SEVT TEC. A national recovery plan identifies the key threats relevant in the GFD project area as clearing, fire, weeds, grazing and vertebrate pests such as feral pigs and cane toads. The recovery plan recommends a number of actions to maintain and conserve the environmental values of the TEC over the long term including:

- mapping remnant SEVT
- identify areas of SEVT for inclusion in conservation reserves
- encouraging landholders to enter into conservation agreements
- developing appropriate burning practices and other procedures to minimise fire damage with landholders
- developing and implementing a pest management program to manage feral and native animals particularly the feral pig and cane toad.

Threat abatement plans for the biological effects, including lethal toxic ingestion, caused by cane toads and for predation, habitat degradation, competition and disease transmission by feral pigs are relevant to this TEC. The plans provide guidance for stakeholders to coordinate priority research and management actions at national, state and local levels to minimise the impact of cane toads and feral pigs on biodiversity.

Impacts

The total unmitigated potential impact of the GFD project on the SEVT TEC is clearing of 190ha if all 6,100 proposed production wells are developed. This potential impact would likely be reduced through field development planning where avoidance measures would be implemented. In addition to land clearing, the EIS identified other potential impacts of the GFD project on TECs including the SEVT TEC as:

- sediment transport and localised erosion from disturbed areas following significant rain events
- contamination of soil resources resulting from spillage of hydrocarbons
- proliferation of weed and pest species that may result in displacement of native species and damage to vegetation by grazing and trampling
- fragmentation and reduced connectivity that may inhibit movement of mobile species through biodiversity corridors
- edge and barrier effects that may promote the growth of different vegetation types along habitat edges and prevent movement of species between habitat areas

Y surface water and shallow groundwater degradation from sedimentation and spillage of hydrocarbons.

Mitigation

The management framework and mitigation measures described in this report for the brigalow TEC apply to the SEVT TEC.

Residual impacts

The residual impact modelled for the EIS is a direct loss of 190ha of the SEVT TEC. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where a significant residual adverse impact remains after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

In making my decision, I have had regard to the National recovery plan for the "*Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions*" ecological community, the *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* and the *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs*.

I am satisfied that the mitigation measures identified by the proponent are consistent with the approved conservation advice and can adequately manage potential impacts on the SEVT TEC. The potential disturbance area of 190ha has been determined before avoidance measures have been applied. I expect the residual impact will be reduced further during field development planning. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts on threatened species and ecological communities. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

Threatened ecological communities—The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

The community of native species dependent on natural discharge of groundwater from the GAB TEC is listed as endangered under the EPBC Act. Within the GFD project area, it corresponds to REs 11.3.1, 11.3.2, 11.3.3, 11.3.25 and 11.3.27. An approximate area of coverage for the TEC could not be calculated as water levels and flows fluctuate seasonally. Spring wetlands in Queensland range from 100 cm² up to 3 ha, with most less than 0.05ha in area. Species dependent on the natural discharge

from these springs can include plants and animals endemic to one or more springs as well as species with wider distributions throughout the GAB.

The community is known to occur in the southern portion of the Fairview gas fields within the GFD project area at the following spring complexes:

- ÿ Yebna 2/311 spring complex—18 spring vents
- ÿ Lucky Last spring complex—12 spring vents
- ÿ Spring Rock Creek spring complex—1 spring vent.

Additional patches of this TEC may potentially occur outside of the Fairview, Arcadia and Scotia gas fields.

Recovery plans, threat abatement plans, conservation advice

Conservation advice is not available for the TEC; however, a recovery plan has been developed to:

- ÿ maintain or enhance groundwater supplies to GAB discharge spring wetlands
- ÿ maintain or increase the area and health of habitat
- ÿ increase all populations of endemic organisms.

Key threats listed in the recovery plan are aquifer drawdown, excavation of springs, exotic plants, stock and feral animal disturbance, exotic aquatic animals, tourist access and impoundments. The plan lists a number of actions required for recovery of the community including:

- ÿ controlling flow from strategic bores
- ÿ reviewing historic spring flows
- ÿ monitoring current spring flows
- ÿ controlling new groundwater allocations
- ÿ protecting and managing GAB discharge springs through perpetual agreements
- ÿ fencing appropriate springs to exclude stock
- ÿ controlling feral animals
- ÿ preventing further spread of mosquito fish (*Gambusia holbrooki*) and other exotic fauna
- ÿ studying the interactions between native and exotic fauna
- ÿ completing an inventory of endemic species in GAB springs
- ÿ monitoring populations of endemic species
- ÿ implementing protocols to avoid transportation of organisms from one location to another
- ÿ re-establishing the natural values of reactivated springs
- ÿ encouraging landholders to responsibly manage springs
- ÿ increasing involvement of Indigenous custodians in spring management.

Threat abatement plans for the biological effects, including lethal toxic ingestion, caused by cane toads and for predation, habitat degradation, competition and disease

transmission by feral pigs are relevant to this TEC. The plans provide guidance for stakeholders to coordinate priority research and management actions at national, state and local levels to minimise the impact of cane toads and feral pigs on biodiversity.

Impacts

The constraints protocol classifies this TEC as a no-go area in which no petroleum activities are permitted. No disturbances within this community or within a 200m buffer zone of the community would be undertaken.

Potential indirect impacts arising from GFD project activities include the proliferation of weed and pest species, fire, dust deposition, sediment transport and contamination of soil resources, surface water and shallow groundwater.

Mitigation

Desktop and field assessments would confirm the presence and extent of the community during field development planning to ensure infrastructure is sited in accordance with the constraints protocol. Management measures to mitigate potential indirect impacts described for the brigalow TEC in the report would also apply to this community.

Residual impacts

No residual impact would occur to this TEC after implementation of the constraints protocol and mitigation measures for potential indirect impacts.

Offsets

As no residual impact would occur to this TEC, an offset would not be required.

Coordinator-General's conclusion

I am satisfied that direct impacts to this TEC would be avoided through siting infrastructure in accordance with the constraints protocol and that the mitigation measures described in the EIS can adequately manage any indirect impacts resulting from GFD project activities. In making my decision, I have had regard to the *National recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*, the *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* and the *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs*.

Threatened ecological communities—Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

The natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC is listed as endangered under the EPBC Act. Within the GFD project area, it corresponds to REs 11.3.21, 11.9.3 and 11.8.11, which were not identified during field surveys undertaken for the EIS but could potentially occur in tenures in the Roma gas fields.

Condition thresholds have been developed for the TEC to focus protection efforts on vegetation remnants in relatively good to excellent condition. Patches with at least 200 tussocks of the key indicator grass species, and where foliage cover from a tree layer is 10 per cent or less, are included in the TEC. Patches considered best quality are at least 1ha in size, comprise at least four native grass indicator species, have a total shrub foliage cover of less than 30 per cent and non-woody introduced species make up less than five per cent of the total perennial foliage cover.

Good quality patches are greater than 5ha, have at least three native grass indicator species present, a total shrub foliage cover of less than 50 per cent and non-woody introduced species making up less than 30 per cent of the total perennial foliage cover.

Table 5.7 shows the approximate extent of the grasslands TEC within the GFD project area and the potential unmitigated disturbance area.

Table 5.7 Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC in the GFD project area

	Coverage in the GFD project area (ha)	Potential additional area (ha)	Potential disturbance area for 6,100 well scenario (ha)
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	18,141	393	288

Recovery plans, threat abatement plans, conservation advice

Recovery plans and threat abatement plans are not available for this community.

The approved conservation advice identifies the main threats to the community as grazing, cropping and pasture improvement, weeds and pest animals, mining activities, construction of roads and other infrastructure. Potential threats are a lack of knowledge about grasslands and climate change.

Priority actions to aid the recovery and abatement of threats to the community are identified in the advice and include:

- surveying potential habitat to locate remnants
- developing and implementing management plans for the eradication of weeds such as parthenium (*Parthenium hysterophorus*), parkinsonia (*Parkinsonia aculeata*), prickly acacia (*Acacia nilotica* subsp. *indica*) and buffel grass (*Cenchrus ciliaris*)
- managing sites to prevent introduction of invasive weeds
- maintaining a good cover of native perennial grasses and spelling the grasslands
- ensuring development in areas where the ecological community occurs
- minimising adverse impacts on known sites
- investigating arrangements to include the community in conservation reserves
- ensuring chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the ecological community

• avoiding mowing and slashing during peak flowering season from spring to summer.

Impacts

The total unmitigated potential impact of the GFD project on the grasslands TEC is clearing of 288ha if all 6,100 proposed production wells are developed. This potential impact would likely be reduced through field development planning where avoidance measures would be implemented. In addition to land clearing, the EIS identified other potential impacts of the GFD project on TECs, including the grasslands TEC, as:

- sediment transport and localised erosion from disturbed areas following significant rain events
- contamination of soil resources resulting from spillage of hydrocarbons
- proliferation of weed and pest species that may result in displacement of native species and damage to vegetation by grazing and trampling
- fragmentation and reduced connectivity that may inhibit movement of mobile species through biodiversity corridors
- edge and barrier effects that may promote the growth of different vegetation types along habitat edges and prevent movement of species between habitat areas
- surface water and shallow groundwater degradation from sedimentation and spillage of hydrocarbons.

Mitigation

The management framework and mitigation measures described in this report for the brigalow TEC apply to the grasslands TEC.

Residual impacts

The residual impact modelled for the EIS is a direct loss of 288ha of the grassland TEC. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where a significant residual adverse impact remains after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent are consistent with the approved conservation advice and can adequately manage potential impacts to the grasslands TEC. The potential disturbance area of 288ha has been determined before avoidance measures have been applied. I expect the residual impact will be reduced further during field development planning. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts to threatened species and ecological

communities. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

Threatened ecological communities—Weeping Myall Woodlands

The weeping myall woodlands TEC is listed as endangered under the EPBC Act. Within the GFD project area it may occur as a component of RE 11.3.2. The TEC can occur in a range of forms, including woodland and shrubby or grassy woodlands in areas with a flat topography, shallow depressions and clay to clay-loam soils. Weeping myall (*Acacia pendula*) must be the dominant overstorey species although other species such as eucalypts may be present in the canopy layer. It is generally restricted to sparse or scattered stands along floodplains or minor depressions in the CSG fields and only scattered individuals or small clumps have been found in the GFD project area.

Table 5.8 shows the approximate extent of the weeping myall woodlands TEC within the GFD project area and the potential unmitigated disturbance area. This approximate extent is considered an over estimate as it is based on the coverage of RE 11.3.2. As only some areas of 11.3.2 are classed as the weeping myall woodlands TEC the actual area is likely to be less.

The EIS also identifies potential regrowth of 517ha in the GFD project area which may meet the condition thresholds of the TEC. Condition thresholds for inclusion in the TEC relate to patch size, density of living or dead weeping myall trees and community structure. If the results of pre-clearance surveys confirm that areas of this regrowth qualify for inclusion in the TEC, then mapping of the TEC and any offset requirements will need to be updated accordingly.

Table 5.8 Weeping myall woodlands TEC in the GFD project area

	Coverage in the GFD project area (ha)	Potential regrowth area (ha)	Potential disturbance area for 6,100 well scenario (ha)
Weeping myall woodlands	26,859	7,383	517

Recovery plans, threat abatement plans, conservation advice

Recovery plans and threat abatement plans are not available for this community, however priority recovery and threat abatement actions have been identified in the approved conservation advice including:

- protecting remnants of the listed ecological community through the development of conservation agreements and covenants
- the use of strategic grazing that allows regeneration
- replanting of understorey species where they have been depleted
- use of lopping methods that do not result in the death of the dominant tree species
- avoiding the application of fertilisers and herbicides in or near remnants

- protecting remnants from weeds including the speedy eradication of any new invasions
- raising awareness of the TEC within the community.

Impacts

The total unmitigated potential impact of the GFD project on the weeping myall woodlands TEC is clearing of 517ha if all 6,100 proposed production wells are developed. This potential impact would likely be reduced through field development planning where avoidance measures would be implemented. In addition to land clearing, the EIS identifies other potential impacts of the GFD project on TECs as:

- sediment transport and localised erosion from disturbed areas following significant rain events
- contamination of soil resources resulting from spillage of hydrocarbons
- proliferation of weed and pest species that may result in displacement of native species and damage to vegetation by grazing and trampling
- fragmentation and reduced connectivity that may inhibit movement of mobile species through biodiversity corridors
- edge and barrier effects that may promote the growth of different vegetation types along habitat edges and prevent movement of species between habitat areas
- surface water and shallow groundwater degradation from sedimentation and spillage of hydrocarbons.

Mitigation

The management framework and mitigation measures described in this report for the brigalow TEC apply to the weeping myall woodlands TEC.

Residual impacts

The residual impact modelled for the EIS is a direct loss of 517ha of the weeping myall woodlands TEC. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where a significant residual adverse impact remains after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent are consistent with the approved conservation advice and can adequately manage potential impacts to the weeping myall woodlands TEC. The potential disturbance area of 517ha has been determined before avoidance measures have been applied. I expect the residual impact would be reduced further during field development planning. To ensure this, I

have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts to threatened species and ecological communities. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

Threatened flora

The desktop assessment identified 25 threatened flora species listed under the EPBC Act either known to occur or predicted to occur within the GFD project area. An assessment of the likelihood of occurrence for each species determined 19 species are known to occur, four species have a moderate occurrence based on the presence of suitable habitat and one species has a low likelihood of occurrence as it was last recorded more than 30 years ago approximately 9km north of the GFD project area. One species, *Amphibromus whitei*, previously recorded in the GFD project area, is now considered extinct under the EPBC Act. Table 5.9 shows threatened flora species in the GFD project area.

Table 5.9 EPBC Act listed threatened flora species

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
<i>Xerothamnella herbacea</i>	Xerothamnella	Endangered	Known to occur
<i>Tylophora linearis</i>	–	Endangered	Moderate
<i>Eriocaulon carsonii</i>	Salt pipewort	Endangered	Known to occur
<i>Bertya opponens</i>	–	Vulnerable	Known to occur
<i>Daviesia discolor</i>	–	Vulnerable	Known to occur
<i>Swainsona murrayana</i>	Slender darling-pea	Vulnerable	Moderate
<i>Westringia parvifolia</i>	–	Vulnerable	Moderate
<i>Logania diffusa</i>	–	Vulnerable	Low
<i>Acacia curranii</i>	Curly-bark wattle	Vulnerable	Known to occur
<i>Acacia grandifolia</i>	–	Vulnerable	Known to occur
<i>Calytrix gurlmundensis</i>	–	Vulnerable	Known to occur
<i>Eucalyptus beaniana</i>	Bean's ironbark	Vulnerable	Known to occur
<i>Homoranthus decumbens</i>	–	Endangered	Known to occur
<i>Phaius australis</i>	Swamp orchid	Endangered	Known to occur
<i>Pterostylis cobarensis</i>	Cobar greenhood orchid	Vulnerable	Moderate
<i>Amphibromus whitei</i>	–	Extinct	Historically known, now deemed extinct
<i>Aristida annua</i>	–	Vulnerable	Known to occur
<i>Arthraxon hispidus</i>	Hairy-joint grass	Vulnerable	Known to occur
<i>Dichanthium queenslandicum</i>	King bluegrass	Endangered	Known to occur
<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Known to occur

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
<i>Homopholis belsonii</i>	Belson's panic	Vulnerable	Known to occur
<i>Hakea fraseri</i>	Fraser's hakea	Vulnerable	Known to occur
<i>Thesium australe</i>	Toad flax	Vulnerable	Known to occur
<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Known to occur
<i>Macrozamia platyrhachis</i>	Cycad	Endangered	Known to occur

Recovery plans, threat abatement plans, conservation advice

Recovery plans, threat abatement plans and conservation advice are available for a number of threatened flora species potentially impacted by the GFD project. These are:

- ÿ Threat abatement advice for predation, habitat degradation, competition and disease transmission by feral pigs (2013)
- ÿ Threat abatement plan for competition and land degradation by unmanaged goats (2008)
- ÿ Threat abatement plan for competition and land degradation by rabbits (2008)
- ÿ Approved Conservation Advice for *Xerothamnella herbacea* (2008)
- ÿ Approved Conservation Advice for *Tylophora linearis* (2008)
- ÿ Approved Conservation Advice for *Daviesia discolor* (2008)
- ÿ Approved Conservation Advice for *Swainsona murrayana* (Slender Darling-pea) (2008)
- ÿ Approved Conservation Advice for *Westringia parvifolia* (2008)
- ÿ Approved Conservation Advice for *Acacia curranii* (Curly-bark Wattle) (2008)
- ÿ Approved Conservation Advice for *Acacia grandifolia* (2014)
- ÿ Approved Conservation Advice for *Calytrix gurlmundensis* (2008)
- ÿ Approved Conservation Advice for *Eucalyptus beaniana* (2008)
- ÿ Approved Conservation Advice for *Homoranthus decumbens* (2013)
- ÿ Approved Conservation Advice for *Phaius australis* (Common Swamp-orchid) (2014)
- ÿ Approved Conservation Advice for *Aristida annua* (a tufted grass) (2014)
- ÿ Approved Conservation Advice for *Arthraxon hispidus* (Hairy-joint Grass) (2008)
- ÿ Approved Conservation Advice for *Dichanthium queenslandicum* (king blue-grass) (2013)
- ÿ Approved Conservation Advice for *Dichanthium setosum* (blue-grass) (2008)
- ÿ Approved Conservation Advice for *Homopholis belsonii* (2008)
- ÿ Approved Conservation Advice for *Thesium australe* (austral toadflax) (2013)
- ÿ Approved Conservation Advice for *Cadellia pentastylis* (Ooline) (2008)
- ÿ Recovery plan for *Bertya* sp. Cobar-Coolabah (2002)
- ÿ Recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (2010)

ÿ National Multi-species Recovery Plan for the cycads, *Cycas megacarpa*, *Cycas ophiolitica*, *Macrozamia cranei*, *Macrozamia lomandroides*, *Macrozamia pauliguilmi* and *Macrozamia platyrhachis* (Queensland Herbarium 2007)

These documents identify the key known and potential threats to EPBC listed flora species in the GFD project area as:

- ÿ clearing of habitat for mining, agriculture, roadworks and other infrastructure development
- ÿ crop production, cultivation and pasture improvement
- ÿ invasion of habitat and displacement by weeds species
- ÿ increased fuel loads from weed species
- ÿ habitat destruction by pest animal species
- ÿ inappropriate grazing regimes and damage by livestock, and native animals
- ÿ soil compaction by domestic stock
- ÿ predation of seeds by insects
- ÿ inappropriate fire regimes
- ÿ increasing fragmentation and loss of remnants
- ÿ localised extinction where populations are small and scattered
- ÿ inbreeding which threatens genetic diversity in small populations
- ÿ loss of insect pollinators
- ÿ low seed viability
- ÿ legal and illegal harvesting
- ÿ pollution
- ÿ surface erosion
- ÿ hydrological change
- ÿ salinisation of habitat
- ÿ drought
- ÿ aquifer drawdown
- ÿ excavation of springs.

A number of priority actions to support the recovery of these species are identified including:

- ÿ management of weed and pest species
- ÿ implementing the threat abatement plans for the control and eradication of feral goats, rabbits and pigs
- ÿ investigating options for linking, enhancing or establishing additional populations
- ÿ translocating individual plants under threat to suitable nearby habitat
- ÿ controlling access routes to constrain access to known sites
- ÿ protecting populations through the development of conservation agreements and/or covenants
- ÿ developing and implementing appropriate grazing regimes

- ÿ installing exclusion fencing or other barriers for stock and macropods at known sites
- ÿ identifying populations of high conservation priority
- ÿ undertaking surveys to locate any additional populations
- ÿ monitoring known populations to identify key threats, progress of recovery and effectiveness of management actions
- ÿ identifying and implementing suitable fire management strategies
- ÿ ensuring weed management controls do not have a significant adverse impact on populations
- ÿ undertaking appropriate seed collection and storage
- ÿ ensuring there is no unnecessary disturbance in areas where threatened flora species occur
- ÿ managing hydrological changes that may result in changes to the water table levels, increased run-off, or salinity levels
- ÿ controlling pasture improvement at sites where threatened species occur
- ÿ developing and implementing strategies to minimise inappropriate collection and harvesting
- ÿ controlling bores that may benefit flows to springs
- ÿ monitoring spring flows
- ÿ raising awareness of threatened species in the local community.

Impacts

The MNES significant impact guidelines 1.1 define a significant impact to a threatened species as one that will:

- ÿ lead to a long-term decrease in the size of a population
- ÿ reduce the area of occupancy of the species
- ÿ fragment an existing population into two or more populations
- ÿ adversely affect habitat critical to the survival of a species
- ÿ disrupt the breeding cycle of a population
- ÿ modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- ÿ result in invasive species that are harmful to a species becoming established in the species' habitat
- ÿ introduce disease that may cause the species to decline
- ÿ interfere with the recovery of the species.

The criteria above apply to all species listed as endangered or critically endangered under the EPBC Act. For species listed as vulnerable, the impacts must occur to an important population to be considered significant. The guidelines define important populations as necessary for a species' long-term survival and recovery and may include:

- ÿ key source populations either for breeding or dispersal

• populations necessary for maintaining genetic diversity

• populations near the limit of the species range.

The EIS identified the key potential impacts to threatened flora species in the GFD project area as:

• habitat loss and fragmentation during construction phases

• reduction in biological viability of soil to support plant growth due to soil compaction

• displacement of threatened species from invasion of weed and pest species

• reduced connectivity of biodiversity corridors leading to a loss of ecological function and movement of threatened species

• edge effects that may promote the growth of different vegetation types including weed species

• deposition of dust where GFD project activities take place near threatened species habitat.

Table 5.10 shows the potential unmitigated impact to threatened flora species habitat and the extent of habitat in the GFD project area based on the maximum development scenario of 6,100 production production wells. This area is considered a maximum impact scenario and would likely be reduced through field development planning where avoidance measures are implemented.

Table 5.10 Residual impacts on EPBC listed threatened flora species habitat

Scientific name	Common name	Habitat in the GFD project area (ha)	Potential disturbance area (ha)
<i>Xerothamnella herbacea</i>	Xerothamnella	7,725	129
<i>Tylophora linearis</i>	–	140,986	975
<i>Eriocaulon carsonii</i>	Salt pipewort	60,575	2,330
<i>Bertya opposens</i>	–	26,211	478
<i>Daviesia discolor</i>	–	1,013	7
<i>Swainsona murrayana</i>	Slender darling-pea	5,152	40
<i>Westringia parvifolia</i>	–	36,858	263
<i>Acacia curranii</i>	Curly-bark wattle	42,777	328
<i>Acacia grandifolia</i>	–	123,608	859
<i>Calytrix gurlmundensis</i>	–	6,339	115
<i>Eucalyptus beaniana</i>	Bean's ironbark	41,529	243
<i>Homoranthus decumbens</i>	–	173,665	1,051
<i>Phaius australis</i>	Swamp orchid	72,912	481
<i>Aristida annua</i>	–	5,152	40
<i>Arthraxon hispidus</i>	Hairy-joint grass	60,409	346
<i>Dichanthium queenslandicum</i>	King bluegrass	6,203	40
<i>Dichanthium setosum</i>	Bluegrass	1,729	4
<i>Homopholis belsonii</i>	Belson's panic	50,992	1,937

Scientific name	Common name	Habitat in the GFD project area (ha)	Potential disturbance area (ha)
<i>Thesium australe</i>	Toad flax	31,961	1,659
<i>Cadellia pentastylis</i>	Ooline	9,189	232
<i>Macrozamia platyrhachis</i>	Cycad	197,368	2496

Mitigation

The constraints planning process is the primary tool to mitigate impacts on threatened flora species. Locations for project infrastructure would be selected during detailed field planning phases to avoid direct or indirect impacts where reasonable and practicable. Where potential impacts cannot be avoided, the constraints process describes measures to minimise, mitigate and rehabilitate impacted areas to promote long-term recovery. The EIS included a management framework outlining mitigation measures for all project phases comprising the following documents:

- ÿ Significant Species Management Plan
- ÿ Rehabilitation Management Plan
- ÿ Pest and Weed Management Plan
- ÿ Environmental Protocol for Constraints Planning and Field Development (constraints protocol)
- ÿ Offsets Strategy
- ÿ Decommissioning and Abandonment Management Plan
- ÿ Draft Environmental Management Plan
- ÿ Erosion and Sediment Control Plan.

Specific measures to mitigate impacts to threatened flora species are described in these documents and include:

- ÿ assessing the presence of threatened flora species in the GFD project area through desktop and ground-truthing studies
- ÿ identifying potential threats caused by project activities
- ÿ siting infrastructure in accordance with the constraints protocol
- ÿ training site personnel on specific measures implemented for works undertaken near threatened flora species
- ÿ marking out exclusion zones surrounding individual plants or patches of plants adjacent to planned disturbances
- ÿ ensuring exclusion areas remain marked out for the duration of the activity
- ÿ clearing activities would be supervised by an environmental representative
- ÿ deploying dust suppression strategies to prevent excessive smothering threatened flora
- ÿ storing hazardous substances in containment systems designed to relevant Australian Standards
- ÿ maintaining buffers around potential ignition sources

- ÿ implementing appropriate erosion and sediment control measures
- ÿ limiting access to project locations to designated tracks
- ÿ limiting movement into or out of areas of weed infestation
- ÿ washing down vehicle equipment
- ÿ maintaining access tracks to be free of declared or significant weed species
- ÿ monitoring infestations for response to control measures
- ÿ developing weed and pest eradication and control measures in accordance with Biosecurity Queensland, local government and other best practice methods
- ÿ revegetating disturbed areas to achieve consistency with the floristic composition of adjacent habitat.

Residual impacts

The residual impacts modelled for the EIS are shown in Table 5.10. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where significant residual adverse impacts remain after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent can adequately manage potential impacts to threatened flora species and are consistent with the approved conservation advices, recovery plans and threat abatement plans. The potential disturbance areas identified for threatened flora species habitat has been determined before the application of avoidance measures. I expect the residual impact would be reduced further during field development planning. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts to threatened species and ecological communities. Field planning processes would refine and confirm the potential impacts of the GFD project as it develops. The results of this process will need to be reflected in updated version of the offset management plan. Any significant residual impacts would need to be offset in accordance with the offset management plan and the adverse impact assessment methodology.

The proponent provided an assessment of the conservation listing advices, conservation advice and recovery plans for species protected under the EPBC Act. The assessment matched the threats and priority actions described in these documents with the assessment of potential impacts and the management measures proposed in the EIS. For completeness, and to assist the Commonwealth Minister for the Environment make an informed decision whether or not to approve the controlled

action under the EPBC Act, I have included the assessment in Appendix 5 of this report.

Threatened fauna

Desktop assessments identified 26 threatened fauna species listed under the EPBC Act that are either known to occur or predicted to occur within the GFD project area. A likelihood of occurrence analysis found 14 threatened species are known to occur, considered 11 species moderately likely to occur and one species, the paradise parrot (*Psephotus pulcherrimus*) has a low likelihood of occurrence. The paradise parrot is considered locally extinct and suitable habitat is absent from the GFD project area; and it is listed as presumed extinct under the provisions of the EPBC Act. Table 5.11 shows threatened fauna species in the GFD project area.

Table 5.11 EPBC Act listed threatened fauna species

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
Birds			
<i>Botaurus poiciloptilus</i>	Australasian bittern	Endangered	Moderate
<i>Rostratula australis</i>	Australian painted snipe	Endangered	Known
<i>Turnix melanogaster</i>	Black-breasted button-quail	Vulnerable	Moderate
<i>Poephila cincta cincta</i>	Black-throated finch	Endangered	Moderate
<i>Psephotus pulcherrimus</i>	Paradise parrot	Presumed extinct	Low
<i>Erythrotriorchis radiatus</i>	Red goshawk	Vulnerable	Moderate
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	Vulnerable	Known
<i>Neochmia ruficauda</i>	Star finch	Endangered	Moderate
<i>Polytelis swainsonii</i>	Superb parrot	Vulnerable	Moderate
<i>Lathamus discolor</i>	Swift parrot	Endangered	Moderate
<i>Pedionomus torquatus</i>	Plains-wanderer	Vulnerable	Moderate
Fish			
<i>Maccullochella peelii</i>	Murray cod	Vulnerable	Moderate
Mammals			
<i>Petrogale penicillata</i>	Brush-tailed rock-wallaby	Vulnerable	Known
<i>Nyctophilus corbeni</i>	Eastern long-eared bat	Vulnerable	Known
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	Vulnerable	Known
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Known
<i>Chalinolobus dwyeri</i>	Large pied bat	Vulnerable	Known
<i>Dasyurus hallucatus</i>	Northern quoll	Endangered	Moderate
<i>Onychogalea fraenata</i>	Bridled nailtail wallaby	Endangered	Known
Reptiles			
<i>Delma torquata</i>	Collared delma	Vulnerable	Known

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
<i>Furina dunmalli</i>	Dunmall's snake	Vulnerable	Known
<i>Rheodytes leukops</i>	Fitzroy River turtle	Vulnerable	Known
<i>Anomalopus mackayi</i>	Five-clawed worm-skink	Vulnerable	Moderate
<i>Denisonia maculata</i>	Ornamental snake	Vulnerable	Known
<i>Egernia rugosa</i>	Yakka skink	Vulnerable	Known

Recovery plans, threat abatement plans, conservation advice

Recovery plans, threat abatement plans and conservation advice are available for a number of the threatened fauna species potentially impacted by the GFD project (and listed in Table 5.11). These are:

- Approved Conservation Advice for *Phascolarctos cinereus* (Koala) (2012)
- Approved Conservation Advice for *Pedionomus torquatus* (Plains-wanderer) (2015)
- Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian bittern) (2011)
- Approved Conservation Advice for *Denisonia maculata* (Ornamental snake) (2014)
- Approved Conservation Advice for *Egernia rugosa* (Yakka skink) (2014)
- Approved Conservation Advice for *Delma torquata* (Collared delma) (2008)
- Approved Conservation Advice for *Rheodytes leukops* (Fitzroy tortoise) (2008)
- Approved Conservation Advice for *Anomalopus mackayi* (Five-clawed worm-skink) (2008)
- Approved Conservation Advice for *Neochmia ruficauda ruficauda* (Star finch (eastern)) (2008)
- Approved Conservation Advice for *Furina dunmalli* (Dunmall's snake) (2014)
- Approved Conservation Advice for *Geophaps scripta scripta* (Squatter pigeon (southern)) (2008)
- Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (2013)
- National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (2011)
- National Recovery Plan for the Black-throated finch southern subspecies *Poephila cincta cincta* (2007)
- National Recovery Plan for the Brush-tailed rock-wallaby *Petrogale penicillata* (2011)
- National Recovery Plan for the Red goshawk (*Erythrotriorchis radiatus*) (2012)
- National Recovery Plan for the Murray cod (*Maccullochella peelii peelii*) (2012)
- National Recovery Plan for the Northern quoll (*Dasyurus hallucatus*) (2010)
- National Recovery Plan for the Superb parrot (*Polytelis swainsonii*) (2011)
- Recovery Plan for the Bridled nailtail wallaby (*Onychogalea fraenata*) (2005-2009)

- ÿ Threat abatement plan for beak and feather disease affecting endangered psittacine species (2005)
- ÿ Threat abatement plan for predation by the European red fox (2008)
- ÿ Threat abatement plan for competition and land degradation by unmanaged goats (2008)
- ÿ Threat abatement plan for predation by feral cats (2015)
- ÿ Threat abatement plan for competition and land degradation by rabbits (2008)
- ÿ Threat abatement plan to reduce the impacts of tramp ants on biodiversity in Australia and its territories (2006)
- ÿ Threat abatement advice for predation, habitat degradation, competition and disease transmission by feral pigs (2013).

These documents identify the key known and potential threats to EPBC listed fauna species in the GFD project area as:

- ÿ loss, degradation and fragmentation of habitat and habitat which supports prey species
- ÿ crop production and cultivation of native grasslands
- ÿ inappropriate grazing regimes and trampling of habitat
- ÿ removal of wood debris, rocks and microhabitat features
- ÿ increased competition for nest hollows
- ÿ insecticide use, exposure to agrichemicals and poisoning by contaminants used in mining operations
- ÿ weed invasion inhibiting ground movements and hunting
- ÿ predation and habitat destruction by feral and native animals
- ÿ direct competition for food resources from native and introduced species
- ÿ legal and illegal trapping, capture, fishing, hunting and trading
- ÿ inappropriate fire regimes and alterations to fuel loads
- ÿ firewood collection and timber production activities
- ÿ climate change
- ÿ poisoning resulting from the ingestion of cane toads
- ÿ changes to seasonal food availability
- ÿ drought
- ÿ incidences of extreme heat
- ÿ vehicle strike
- ÿ inappropriate roadside management
- ÿ soil pollution
- ÿ altered hydrological regimes, drainage of swamps and regulation of waterways
- ÿ reduced water quality as a result of increasing salinity, siltation and pollution and impoundments
- ÿ barriers to fish movement

- ÿ isolation of populations
- ÿ genetic decline
- ÿ information gaps relevant to the management and conservation of threatened fauna species
- ÿ psittacine beak and feather disease
- ÿ spread of diseases and parasites
- ÿ tree dieback
- ÿ poisoning.

Priority actions and objectives to support the recovery of these species are identified in the documents and include:

- ÿ identify populations of high conservation priority
- ÿ investigate options for inclusion of habitat in reserve tenure
- ÿ minimise adverse impacts from land use at known sites
- ÿ manage threats to areas that support important populations
- ÿ retain microhabitat features such as fallen logs, leaf litter and rocks at known and potential habitat sites
- ÿ control access routes to known habitat sites and mitigate risk of vehicle strike
- ÿ protect riparian habitat where populations of Fitzroy River turtles are known or have the potential to occur
- ÿ prevent trampling and habitat damage by grazing animals through exclusion fencing or other barriers
- ÿ manage hydrological changes that may affect water levels, salinity, sedimentation or pollution
- ÿ develop and implement management programs to control or eradicate weed and pest species including appropriate recommendations from relevant threat abatement plans. Control methods include mustering, baiting, shooting, trapping, poisoning, exclusion fencing and fumigation or destruction of dens and warrens
- ÿ develop and implement suitable fire management strategies for threatened species habitat
- ÿ undertake targeted surveys, mapping and habitat modelling
- ÿ secure selected sites for conservation
- ÿ monitor the effectiveness of management actions and the need to adapt them if necessary
- ÿ translocate animals to areas of suitable habitat.

Impacts

The MNES significant impact guidelines 1.1 define a significant impact to a threatened species as one that will:

- ÿ lead to a long-term decrease in the size of a population
- ÿ reduce the area of occupancy of the species

- Y fragment an existing population into two or more populations
- Y adversely affect habitat critical to the survival of a species
- Y disrupt the breeding cycle of a population
- Y modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Y result in invasive species that are harmful to a species becoming established in the species' habitat
- Y introduce disease that may cause the species to decline
- Y interfere with the recovery of the species.

The criteria above apply to all species listed as endangered or critically endangered under the EPBC Act. For species listed as vulnerable, the impacts must occur to an important population to be considered significant. The guidelines define important populations as necessary for a species' long-term survival and recovery and may include:

- Y key source populations either for breeding or dispersal
- Y populations necessary for maintaining genetic diversity
- Y populations near the limit of the species range.

The EIS identified potential impacts to threatened fauna species and habitat associated with GFD project activities, these include:

- Y injury and mortality from ground disturbance activities, vegetation clearing and vehicular movement
- Y entrapment within dams, trenches and other excavations
- Y habitat loss and degradation from vegetation clearing and ground disturbance
- Y habitat fragmentation and creation of barriers restricting movement between habitat areas
- Y impacts from increased noise, lighting and vibration levels during the construction and operation of the GFD project
- Y displacement, predation and competition from weed and pest species.

Table 5.12 shows the potential unmitigated impact to threatened fauna species habitat and the extent of habitat in the GFD project area based on the maximum development scenario of 6,100 production wells. This area is considered a maximum impact scenario and would likely be reduced through field development planning where avoidance measures are implemented. In modelling fauna habitat requirements, a number of species specific assumptions were made to enable categorisation of the GFD project area into 'core habitat', 'essential habitat', 'general habitat' or 'unlikely habitat' for each protected species. The assumptions made for each species are described in the Significant Species Management Plan (Appendix Y-H of the EIS).

Table 5.12 Residual impacts on EPBC listed threatened fauna species habitat

Scientific name	Common name	Habitat in the GFD project area (ha)	Potential disturbance area (ha)
Birds			
<i>Botaurus poiciloptilus</i>	Australasian bittern	7,485	168
<i>Rostratula australis</i>	Australian painted snipe	7,485	168
<i>Turnix melanogaster</i>	Black-breasted button-quail	8,934	233
<i>Poephila cincta cincta</i>	Black-throated finch	109,358	2,745
<i>Erythrotriorchis radiatus</i>	Red goshawk	73,261	15,738
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	221,515	4,032
<i>Neochmia ruficauda</i>	Star finch	167,363	3,244
<i>Polytelis swainsonii</i>	Superb parrot	67,934	2,136
<i>Lathamus discolor</i>	Swift parrot	185,382	1,987
<i>Pedionomus torquatus</i>	Plains-wanderer	17,205	278
Fish			
<i>Maccullochella peelii</i>	Murray cod	2,929	73
Mammals			
<i>Petrogale penicillata</i>	Brush-tailed rock-wallaby	5,343	166
<i>Nyctophilus corbeni</i>	South-eastern long-eared bat	173,943	4,202
<i>Phascolarctos cinereus</i>	Koala	217,401	3,303
<i>Chalinolobus dwyeri</i>	Large-eared pied bat	49,766	1,950
<i>Dasyurus hallucatus</i>	Northern quoll	210,024	4,855
Reptiles			
<i>Delma torquata</i>	Collared delma	181,252	2,703
<i>Furina dunmalli</i>	Dunmall's snake	179,161	2,512
<i>Rheodytes leukops</i>	Fitzroy River turtle	2,929	73
<i>Anomalopus mackayi</i>	Five-clawed worm-skink	6,203	40
<i>Denisonia maculata</i>	Ornamental snake	19,644	279
<i>Egernia rugosa</i>	Yakka skink	129,174	4,144

Mitigation

The constraints protocol is the key tool to enable the avoidance, minimisation and mitigation of potential impacts to threatened fauna species associated with all gas field activities. Locations for GFD project infrastructure would be selected during detailed field planning phases to avoid direct or indirect impacts, where reasonable and practicable, in accordance with the constraints protocol. The EIS contained a management framework outlining mitigation measures for potential impacts to threatened fauna species and habitat of all GFD project phases. The framework is consistent with the relevant recovery plans, threat abatement plans and conservation advice and consists of the following documents:

- ÿ Significant Species Management Plan
- ÿ Fauna Management Plan
- ÿ Rehabilitation Management Plan
- ÿ Pest and Weed Management Plan
- ÿ constraints protocol
- ÿ Offsets Strategy
- ÿ Decommissioning and Abandonment Management Plan
- ÿ Draft Environmental Management Plan.

Key mitigation measures relevant to potential impacts to threatened fauna species and habitat are described in this framework including:

- ÿ undertaking desktop and ground-truthing studies to evaluate the presence of threatened fauna species and habitat
- ÿ siting infrastructure to avoid potential impacts to threatened fauna habitat
- ÿ avoiding clearing near wetlands, cave structures and outcrops
- ÿ creating 100m exclusion zones around active breeding places
- ÿ creating 500m exclusion zones around identified Fitzroy River turtle nests
- ÿ marking out disturbance areas
- ÿ timing construction works to avoid breeding periods
- ÿ selecting watercourse and wetland crossings to avoid suitable breeding places
- ÿ training site personnel of specific limitations of construction works in proximity to threatened species habitat
- ÿ retaining or relocating microhabitat features such as rocks, timber, tree hollows and mature trees
- ÿ establishing traffic controls for access tracks and sensitive areas
- ÿ sequencing and directing clearing activities to allow wildlife escape to adjacent habitat areas
- ÿ installing exclusion fences around excavated trenches
- ÿ directing light away from sensitive areas
- ÿ rehabilitating or offsetting disturbed areas
- ÿ implementing weed and pest management measures
- ÿ undertaking a case-by-case basis assessment of the feasibility of weed and pest eradication programs.

Residual impacts

The residual impacts modelled for the EIS are shown in Table 5.12 above. I expect additional opportunities for avoidance to be investigated during detailed field development planning processes in order to further reduce this impact.

Offsets

Where significant residual adverse impacts remain after mitigation measures have been implemented, the proponent must provide an offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures identified by the proponent can adequately manage potential impacts to threatened fauna species and are consistent with the approved conservation advices. In making this decision I have had regard to the relevant recovery plans and threat abatement plans.

The potential disturbance areas identified for threatened fauna species habitat has been determined before the application of avoidance measures. I expect residual impacts would be further reduced during the field planning and development process. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts to threatened species and ecological communities. The results of the field planning and development process will need to be reflected in an updated version of the offset plan and any significant residual impacts would need to be offset in accordance with the offset plan and the adverse impact assessment methodology.

The proponent provided an assessment of the conservation listing advices, conservation advice and recovery plans for species protected under the EPBC Act. The assessment matched the threats and priority actions described in these documents with the assessment of potential impacts and the management measures proposed in the EIS. For completeness, and to assist the Commonwealth Minister for the Environment make an informed decision whether or not to approve the controlled action under the EPBC Act, I have included the assessment in Appendix 5 of this report.

Cumulative impact assessment

A cumulative impact assessment for ecological values potentially affected by the GFD project was conducted using the following steps:

- ÿ identifying the stand-alone residual impacts of the GFD project using existing baseline conditions
- ÿ identifying other projects to be considered in the cumulative impact assessment and their residual impacts
- ÿ identifying spatial boundaries for the analysis
- ÿ identifying timing for the analysis such as overlaps of construction timelines
- ÿ determining the relevance and significance for each different environmental values
- ÿ developing mitigation measures for significant cumulative impacts.

The assessment considered 26 projects within a 50km buffer of the GFD project tenures. The major potential impacts to biodiversity values identified for the GFD are applicable to all projects considered in the cumulative assessment and include:

- ÿ habitat loss
- ÿ habitat fragmentation, edge effects and barrier effects
- ÿ reduced connectivity of biodiversity corridors
- ÿ fauna species injury or mortality
- ÿ soil compaction and a reduction in the biological viability of soil
- ÿ displacement of species from weed and pest invasion
- ÿ noise, dust and light
- ÿ increase in litter.

The EIS considered the greatest potential cumulative impacts would be to the SEVT TEC, grasslands TEC and weeping myall woodland TEC. Based on the development of all projects considered in the assessment, the predicted cumulative impact to all TECs occurring in the GFD project area is 89,046ha. With the inclusion of the GFD project the predicted impact area would be approximately 90,344ha. I expect the avoidance and mitigation measures described in the management framework provided with the EIS would see that this potential impact is further reduced through field development planning stages.

5.4 Listed migratory species (sections 20 and 20A)

Migratory species and supporting habitat in the GFD project area protected under international agreements were identified through desktop and field assessments. The species and status under the Bonn convention, the Japan–Australia Migratory Bird Agreement (JAMBA), the China–Australia Migratory Bird Agreement (CAMBA) and the Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA) are listed in Table 5.13.

The desktop assessment identified 23 migratory bird species predicted to occur in the GFD project area of which six were recorded during field assessments undertaken for the EIS. Other migratory species not recorded during the EIS field assessment, but which have specimen-backed records in the GFD project area, are also listed as known to occur. Only one species predicted to occur through the desktop assessment is considered to have a low likelihood of occurrence based on an absence of suitable habitat in the GFD project area.

The GFD project area supports approximately 83,238ha of suitable habitat for migratory bird species including riparian zones, floodplain eucalypt forest and wetlands which could be classed as ‘important habitat’ defined in the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* as it is habitat:

- ÿ utilised by a Migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- ÿ within an area where the species is declining.

Further, seasonal and semi-permanent shallow lakes known to provide important breeding habitat are located within the GFD project area. Where they are situated on a floodplain, agricultural lands may also provide important habitat or refugia during wet seasons.

Table 5.13 Migratory species identified in the GFD project area

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
<i>Monarcha melanopsis</i>	Black-faced monarch	Migratory (Bonn), Marine	Known to occur
<i>Limosa limosa</i>	Black-tailed godwit	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Moderate
<i>Hydroprogne caspia</i>	Caspian tern	Migratory (CAMBA), Marine	Known to occur
<i>Ardea ibis</i>	Cattle egret	Migratory (JAMBA, CAMBA), Marine	Known to occur
<i>Calidris ferruginea</i>	Curlew sandpiper	Critically Endangered, Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Moderate
<i>Tringa nebularia</i>	Common greenshank	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Ardea modesta</i>	Great egret	Migratory (JAMBA, CAMBA), Marine	Known to occur
<i>Apus pacificus</i>	Fork-tailed swift	Migratory (JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Plegadis falcinellus</i>	Glossy ibis	Migratory (CAMBA), Marine	Known to occur
<i>Gallinago hardwickii</i>	Latham's snipe	Migratory (JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Tringa stagnatilis</i>	Marsh sandpiper	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Pandion haliaetus</i>	Osprey	Migratory (Bonn), Marine	Moderate
<i>Pluvialis fulva</i>	Pacific golden plover	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Merops ornatus</i>	Rainbow bee-eater	Migratory (JAMBA), Marine	Known to occur
<i>Rhipidura rufifrons</i>	Rufous fantail	Migratory (Bonn), Marine	Known to occur
<i>Myiagra cyanoleuca</i>	Satin flycatcher	Migratory (Bonn), Marine	Known to occur
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Known to occur
<i>Symphosiachrus trivirgatus</i>	Spectacled monarch	Migratory (Bonn), Marine	Known to occur
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	Migratory (CAMBA), Marine	Known to occur

Scientific name	Common name	EPBC Act status	Likelihood of occurrence
<i>Phaethon lepturus</i>	White-tailed tropicbird	Migratory (JAMBA, CAMBA), Marine	Low
<i>Hirundapus caudacutus</i>	White-throated needletail	Migratory (JAMBA, CAMBA), Marine	Known to occur
<i>Tringa glareola</i>	Wood sandpiper	Migratory (Bonn, JAMBA, CAMBA, ROKAMBA), Marine	Known to occur

Impacts

The EIS identified a number of potential impacts to migratory species and habitat, most of which are expected to be short-term and occur during the construction phase of the GFD project. These include:

- habitat loss
- habitat fragmentation
- injury, mortality and entrapment during the construction phase
- noise, lighting and vibration
- soil contamination
- invasion of weed and pest species
- surface water and groundwater degradation.

Mitigation measures

The proponent has developed measures to mitigate potential impacts to migratory species and habitat from the GFD project in the Significant Species Management Plan. The measures address activities for the planning, construction, operational and decommissioning phases of the project and include:

- locating infrastructure in areas where adverse impacts to migratory birds and habitat are avoided where practicable
- creating 100m exclusion zones around active nests
- creating 50m restricted zones around nests that become active after construction commences
- limiting night works in restricted zones
- retaining mature trees where clearing is to occur
- undertaking pre-disturbance surveys by a licensed spotter-catcher
- implementing traffic control measures
- marking vegetation clearing footprints and exclusion zones
- clearing in a sequential manner to direct fauna escape to adjacent habitat areas
- implementing the Pest and Weed Management Plan
- avoiding blasting in areas with large congregations of migratory birds (such as wetlands)
- grading and contouring cleared areas of habitat to minimise erosion

- directing lighting away from active nests and habitat areas to limit disturbance due to light spillage
- revegetating disturbed areas to achieve consistency with the floristic composition of adjacent habitat.

Migratory species habitat is classed as a moderate constraint area in the constraints protocol. The types of development permitted in moderate constraint areas are described in section 5.1 of this report. However, some migratory species habitat areas have higher levels of protection. For example, Lake Murphy is entirely contained within the Lake Murphy Conservation Park, a Category A environmentally sensitive area, and is classed as a no-go area for development in the constraints protocol.

Residual impacts

The total residual impact to migratory bird species habitat is 17,229ha based on an unmitigated potential disturbance if all 6,100 production wells are developed. Residual impact areas were calculated using the land disturbance model for each species as shown in Table 5.14.

Table 5.14 Potential residual impacts on migratory species habitat

Scientific name	Common name	Habitat in the GFD project area (ha)	Potential impact area (ha)
<i>Rostratula australis</i>	Australian painted snipe	7,485	168
<i>Ardea ibis</i>	Cattle egret	458,147	8,162
<i>Ardea modesta</i>	Great egret	7,485	168
<i>Plegadis falcinellus</i>	Glossy ibis	7,485	168
<i>Pandion haliaetus</i>	Osprey	101,322	2,687
<i>Merops ornatus</i>	Rainbow bee-eater	790,479	15,738
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	101,322	2,687

Offsets

Where a significant residual adverse impact occurs after mitigation measures have been implemented, the proponent must provide an appropriate offset in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide.

Coordinator-General's conclusion

I am satisfied that the mitigation measures proposed by the proponent can adequately address potential impacts to migratory bird species and the habitat utilised by these species. The potential disturbance areas identified for migratory species habitat has been determined before the application of avoidance measures. I expect residual impacts would be further reduced during the field planning and development process. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment requiring the proponent to prepare an offset management plan to compensate for authorised unavoidable impacts to migratory species. The results of the field planning and development process will need to be reflected in an

updated version of the offset plan and any significant residual impacts would need to be offset in accordance with the offset plan and the adverse impact assessment methodology.

The proponent provided an assessment of the conservation listing advices, conservation advice and recovery plans for species protected under the EPBC Act. The assessment matched the threats and priority actions described in these documents with the assessment of potential impacts and the management measures proposed in the EIS. For completeness, and to assist the Commonwealth Minister for the Environment make an informed decision whether or not to approve the controlled action under the EPBC Act, I have included the assessment in Appendix 5 of this report.

5.5 Protection of water resources from CSG development and large coal mining development (sections 24D and 24E)

5.5.1 Independent Expert Scientific Committee

The Gas Field Development project proposes the taking of an action involving CSG development that is likely to have significant impact on water resources, including any impacts of associated salt production. In accordance with section 131AB of the EPBC Act, advice on the proposal was sought from the Independent Expert Scientific Committee for Coal Seam Gas and Large Coal Mining Development (IESC).

On 4 November 2014, I submitted to the IESC a joint request for advice with the DE on water-related matters for the GFD project. The matter was considered at the IESC meeting of 9-10 December 2014.

The request for advice sought the IESC's opinion on the adequacy of the:

- (1) proponent's interpretation of the GFD project's impact to groundwater, as predicted by the Surat Cumulative Management Area (CMA) groundwater model
- (2) draft EIS:
 - (a) to identify impacts to MNES, including surface and groundwater-dependent species and communities, springs and water resources; and
 - (b) to address mitigation and management of these impacts
- (3) geological conceptualisation of faults for the groundwater impact assessment
- (4) assessment of risk of hydraulic stimulation resulting in aquifer connection.

IESC advice

The IESC responded with advice on 18 December 2014 which was made publicly available on its website on 6 January 2015. The IESC provided advice on potential impacts from the proposed project on surface water and groundwater and associated ecosystems. The IESC identified 'considerable scientific uncertainty' around these

impacts owing to the scale, the early stage and geographic extent of proposed development, together with other CSG projects in the region.

Generally, the IESC considered that information provided was appropriate to understand cumulative, or regional, impacts of the GFD project, however was not considered adequate to enable an understanding of potential impacts at the local scale, particularly to ecological assets. Further, the IESC identified that predicted impacts of the GFD project had not been differentiated from those of other proponents simultaneously represented in cumulative modelling (Surat CMA) or from the GLNG project.

The IESC identified key potential impacts as:

- ÿ reduced water supply to GDEs, including EPBC Act listed GAB discharge and watercourse springs and endangered ecological communities, and groundwater users
- ÿ cumulative impacts of Surat and Bowen basin activities, particularly CSG and coal mining, on groundwater pressures and lag-time effects on water resources
- ÿ hydrological and ecological consequences of surface water discharge into the tributary gully, waterhole and Dawson River potentially impacting the surface water flow regime, geomorphology, water quality and instream biota
- ÿ changes to groundwater and surface water quality due to direct GFD project activities and management of co-produced water.

Specifically, with regard to the request for advice, the IESC advised that:

- (1) The modelling approach does not enable assessment of local-scale impacts of the GFD project, and that assessment of groundwater-surface water connectivity is restricted which limits interpretation of the potential impacts to surface water resources (particularly watercourses and GAB discharge springs).
- (2) The draft EIS:
 - (a) identifies potential impacts to water-related MNES and assesses the significance of these, however considers that a quantitative risk assessment considering likelihood and consequence should also have been undertaken
 - (b) inappropriately relies upon monitoring to reduce the magnitude of impact to springs; and the reliance on existing GLNG project monitoring and management plans to address potential impacts within the GFD project needs justification.
- (3) The geological conceptualisation of faults is adequate for regional groundwater impact assessment, including predicting drawdown impacts at the regional scale, but is not adequate to assess potential impacts on individual springs.
- (4) The risk of hydraulic stimulation resulting in aquifer connection has not been assessed; the EIS only considers this based on conceptualisation of interconnectivity in the Surat CMA groundwater model, which assumes limited potential for vertical interconnectivity between hydrogeological units.

Consideration of IESC advice

The Queensland Government Office of Groundwater Impact Assessment (OGIA) provided specialist guidance on the purpose, functionality and limitations of the Surat CMA model.

CMAs are declared in areas of concentrated gas development, as the potential for impacts from water extraction by individual proponent operations may overlap. The *Water Act 2000* provides for underground water impact reports (UWIR) for CMAs. The OGIA is responsible for assessing impacts and requiring management and monitoring of regional impacts on groundwater through the UWIRs. As illustrated in Figure 5.1, the GFD project lies entirely within the Surat CMA.

The UWIR for the Surat CMA is underpinned by the Surat CMA model. The UWIR focuses only on GDEs which are considered to potentially be at risk from large scale pressure reductions in GAB aquifers due to CSG related groundwater extraction, namely artesian spring vent complexes and watercourse springs.

The UWIR requires proponents to undertake monitoring at sites where there is risk of future impacts so that a record of background behaviour at the springs can be established. That record will assist in ongoing refinement of risk and in properly identifying any unexpected future impacts. The monitoring program is revised as a part of the update of the Surat CMA UWIR every three years

In addition to the routine monitoring, OGIA also carries out spring research activities in cooperation with CSG operators. Those studies are currently directed at improving the understanding of the hydrogeological setting of springs with a view to improving methods of risk assessment and improving monitoring methods. Research directions are set out in UWIR.

When the Surat CMA UWIR is updated, based on an updated Surat CMA model that incorporates the latest knowledge of the groundwater flow system, the potential impact on aquifers feeding springs at the location of springs is reassessed. .

The GDEs other than those mentioned above include 'terrestrial' GDEs. Based on current knowledge, OGIA advised that that these ecosystems are likely to be predominantly supported by groundwater flow within shallow systems which are unlikely to be impacted by CSG related groundwater extraction which targets deeper formations. If terrestrial GDEs were considered to be at potential risk, future revisions of UWIR would provide for further assessment and management actions at those sites.

In summary, the UWIR arrangements provide for ongoing improvement in the knowledge about the risk to springs and associated management, with work carried out by OGIA in cooperation with CSG operators, or by CSG operators under direction through the UWIR.

Coordinator-General's conclusions

The UWIR forms part of Queensland's regulatory framework for managing the impact of CSG development on groundwater levels and the flow of water to GDEs.

Accordingly, I consider the Surat CMA model is an appropriate model to assess cumulative impacts of the GFD project. With regard to the IESC's concerns that understanding the potential impacts of the GFD project at a local level is not possible, I understand that the Surat CMA model used is not intended to predict impacts at this local scale, however model results together with the results of spring monitoring and spring research carried out under the UWIR enable ongoing local scale assessment.

I am satisfied the proponent's approach to understand impacts to water-related MNES matters is consistent with the advice from Queensland Government agency experts and addresses the matters raised in the IESC advice.

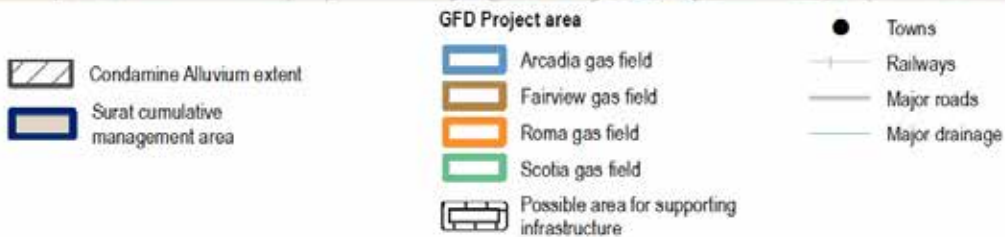
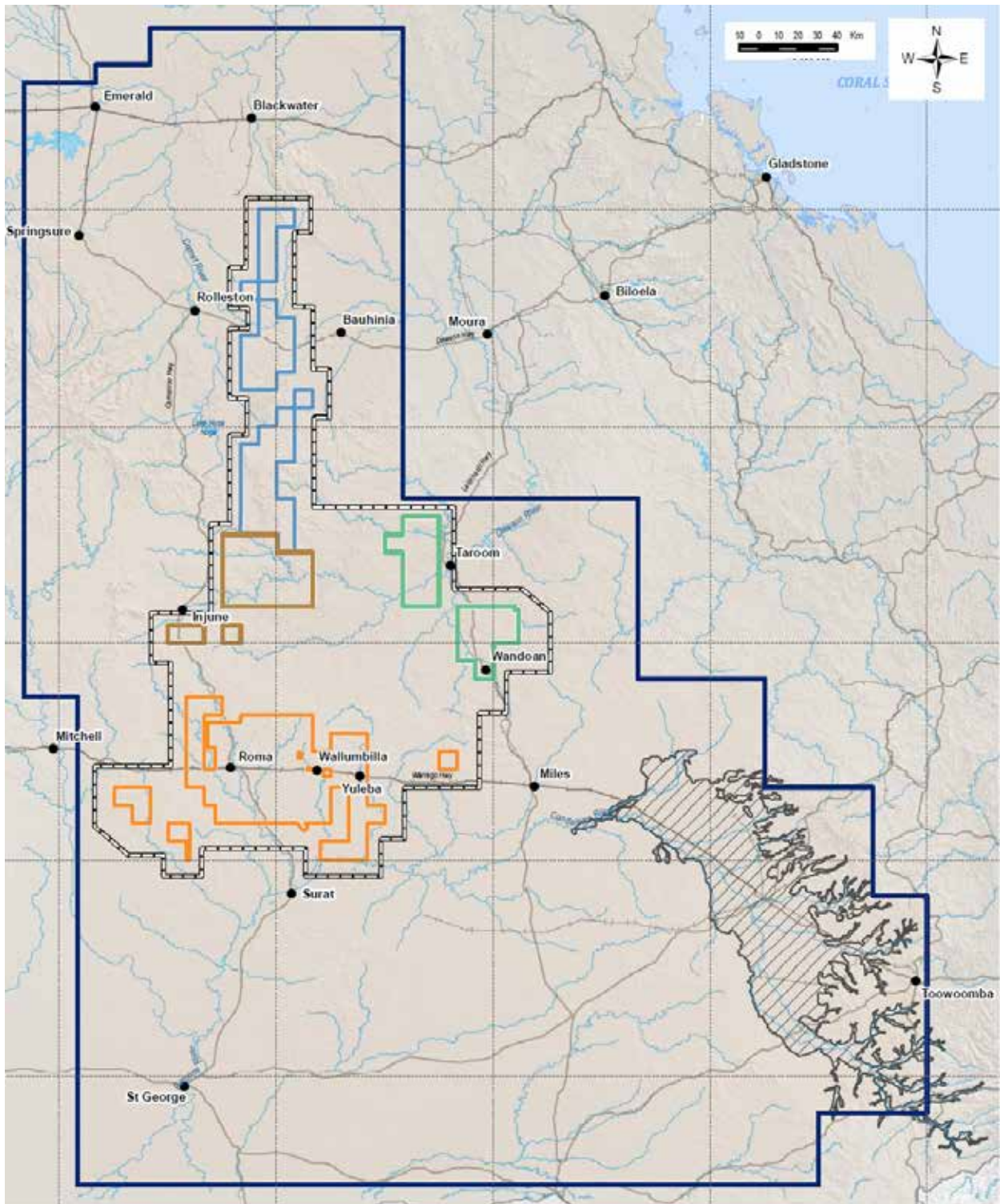


Figure 5.1

Figure 5.1 Location of Surat Cumulative Management Area and GFD project area

5.5.2 Groundwater

Key issues regarding groundwater raised in submissions on the EIS concerned the proponent's assessment of:

- make-good provisions and security of groundwater supply
- impacts on springs and GDEs
- increased groundwater flux between geological formations
- the scale of the groundwater assessment
- the cultural and spiritual importance of springs
- impacts of groundwater drawdown on surface waters
- the loss of pressure in the GAB
- the management of coal seam water
- uncertainty of potential impacts and adopting an adaptive approach to GFD project development
- groundwater and surface water contamination.

I have considered each submission and the responses provided by the proponent in my evaluation of the potential impacts of the GFD project on groundwater and surface water resources.

Introduction

The regional stratigraphic sequence, shown in Figure 5.2, is summarised as follows: the Permian Blackwater Group including the Bandanna Formation, overlain by the Triassic Rewan Group and Clematis Group Sandstones. These are followed by the Jurassic Precipice and Hutton Sandstones, Walloon Coal Measures and Springbok and Gubberamunda Sandstones. These are followed by the Cretaceous Mooga Sandstone and Bungil Formation, and then the Cenozoic Main Range Volcanics, Chinchilla Sands and Quaternary alluvial aquifer systems.

The GFD project tenures are located within the GAB, which consists of Surat Basin sediments and the Clematis Sandstone of the underlying Bowen Basin. As noted in the EIS and submissions on the EIS, GAB aquifers are the source of springs of high ecological and cultural significance. Regionally, the basal unit of the GAB is formed by the Rewan Group.

The coal seams of interest for the GFD project are the Walloon Coal Measures in the Surat Basin and the Permian Bandanna Formation in the Bowen Basin.

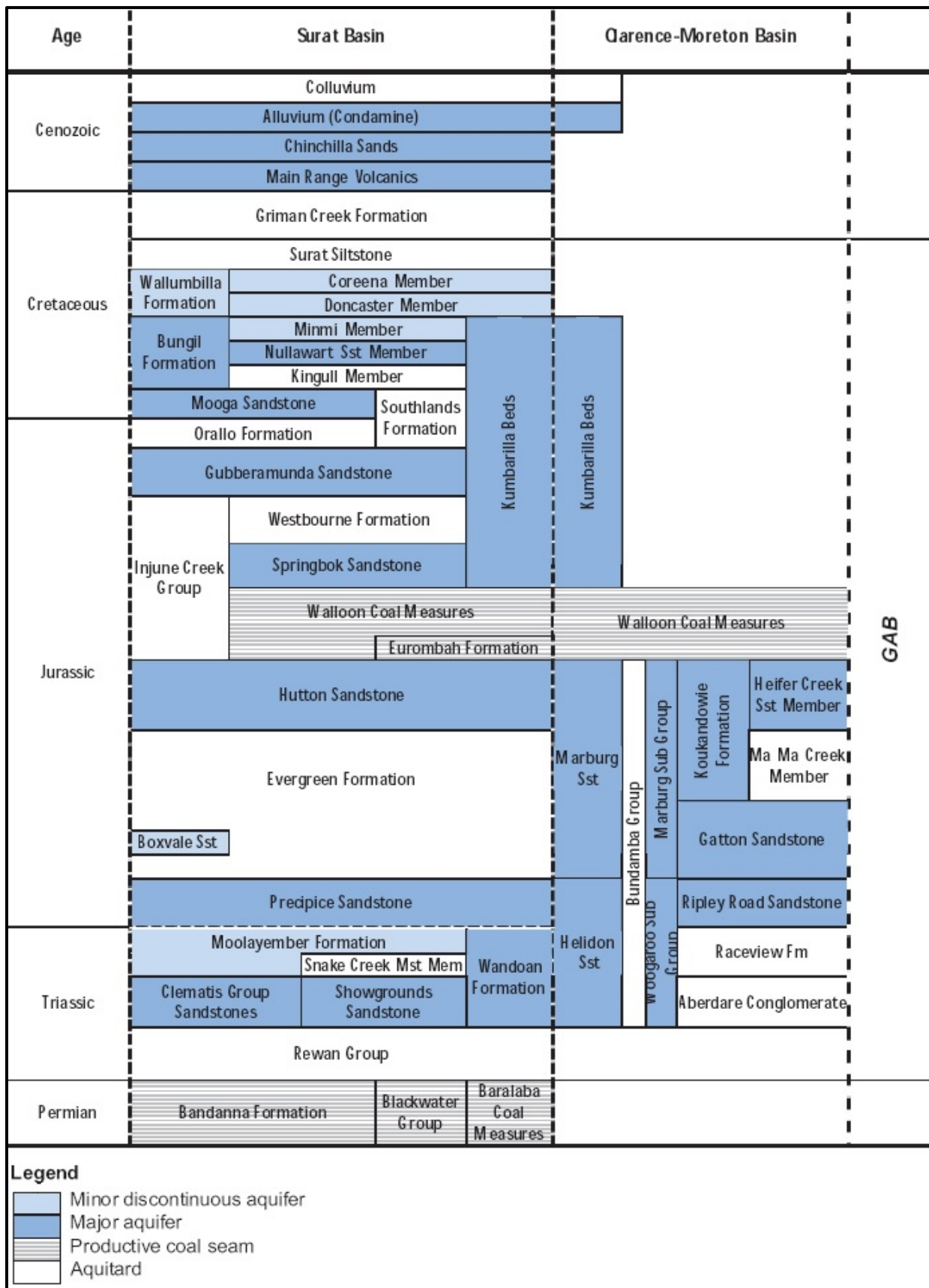


Figure 5.2 Regional hydrostratigraphy

The groundwater regime in the GFD project area is considered to include:

- Y Quaternary alluvial aquifer systems associated with the unconsolidated sediments of the Condamine-Balonne River, the Dawson River and the Comet River systems
- Y minor aquifers within Tertiary fractured basalt and sediments caps
- Y water bearing formations of the GAB including the Clematis Sandstone, Precipice Sandstone, Hutton Sandstone, Springbok Sandstone, Gubberamunda Sandstone, Mooga Sandstone and Bungil Formation.

The GFD project area is located in the recharge area of the GAB where most recharge occurs by rainfall along outcrop areas in the north, north-west, north-east and east along the Great Dividing Range. Recharge rates into GAB aquifers are estimated in the EIS to range from 1 to 30mm per year with a median of 2.8mm per year.

Within the GAB, recharge water flows primarily along the bedding planes and fractures of aquifers and aquitards from the recharge areas to the south, south-west and west. The EIS identified that groundwater moves very slowly in the GAB and flow velocities range from 1 to 5m per year. Groundwater movement is dominated by sub-horizontal flow in the aquifers, with vertical leakage from the aquifers through the low permeability aquitards at a much slower rate. Regional groundwater flow is from the topographically higher recharge areas around the basin margins towards the lowest parts of the basin in the south-west.

In the GFD project area, natural discharge from aquifers occurs through vent springs, watercourse springs, vertical leakage between aquifers and subsurface flow into adjoining areas. Groundwater is extracted via bores used for stock and domestic supply, agriculture, urban supply and industrial purposes.

Under the *Great Artesian Basin Water Resource Plan 2006*, groundwater is divided into geographical areas called groundwater management areas (GMAs). GMAs are further subdivided into groundwater management units, comprising one or more geological formations with similar hydrogeological properties. The GFD project's gas fields span 3 of the 25 GAB GMAs: Surat, Surat North and Mimosa.

The Roma Shallow Gas Project Area is contained within the boundaries of the Surat GMA 19 and its main aquifers include the Mooga Sandstone, the Gubberamunda Sandstone and the Hutton Sandstone.

The Fairview Project Area is contained within the boundaries of Surat North GMA 20 and its primary aquifers include the Hutton Sandstone, the Precipice Sandstone and the Clematis Sandstone.

The Scotia Project Area is contained within Surat North GMA 20 and its main aquifers include the Birkhead formation of the Injune Creek Group (Springbok and Eurornbah Sandstones), the Hutton Sandstone and the Precipice Sandstone.

Within the Arcadia Valley Project Area, the main aquifers include the Precipice Sandstone, which outcrops within the southern portion of the field, and the Moolayember Formation, the Clematis Sandstone and the Aldebaran Sandstone in the northern portion of the field.

A regional fault, the Hutton-Wallumbilla Fault, is orientated through the Roma gas field in a south-east to north-west direction. The fault system is approximately 2km wide and consists of a main and numerous associated secondary faults.

Landholder bores

There are 21,000 registered landholder bores in the Surat CMA, 872 of which are located within GFD project tenures. Of these 872 bores, 842 are used for stock and domestic use, 18 are used for urban supply, 6 are used for agriculture and 6 are used for industrial purposes. Figure 5.3 illustrates the spatial distribution of registered landholder bores and their use in the GFD project tenures. A high proportion of registered bores within the GFD project tenures take groundwater from the Mooga Sandstone. There are no registered bores screened in the Bandanna Formation in the GFD project tenements.

Hydraulic connectivity

The EIS presented information from the Surat UWIR on the conceptual understanding of the hydraulic connectivity of the both the Walloon Coal Measures and the Bandana Formation coal seams to overlying and underlying formations.

Walloon Coal Measures

The Walloon Coal Measures averages 300m thickness (comprising 25m thickness of coal seams and 275m of other sedimentary rocks) and its coal seams are separated by lower permeability mudstone, siltstone and fine-grained sandstone. The thickness of the aquitard layer between the productive coal seams of the Walloon Coal Measures and the Springbok Sandstone is about 15m, although in some places the aquitard layer does not exist.

The lithology of the aquitards is variable. The EIS identified the horizontal hydraulic conductivity could range from 1.5 m/day to 2.5×10^{-6} m/day, averaging 9×10^{-3} m/day. The vertical hydraulic conductivity was estimated in the EIS to be one to three times lower than the horizontal hydraulic conductivity.

Prior to gas development in the Walloon Coal Measures, a difference in water levels existed between the coal measures and the overlying and underlying aquifers, which could mean there was limited hydraulic connection between the formations. However depressurisation of the coal measures has resulted in steeper hydraulic gradients and increased potential for induced flow between the units. Depressurisation of the Walloon Coal Measures is expected to have the greatest contribution of potential impact on GAB aquifers and springs as well as groundwater users.

The cumulative groundwater model for the Surat CMA predicted relatively small impacts on the Condamine Alluvium from depressurisation of the underlying Walloon Coal Measures.

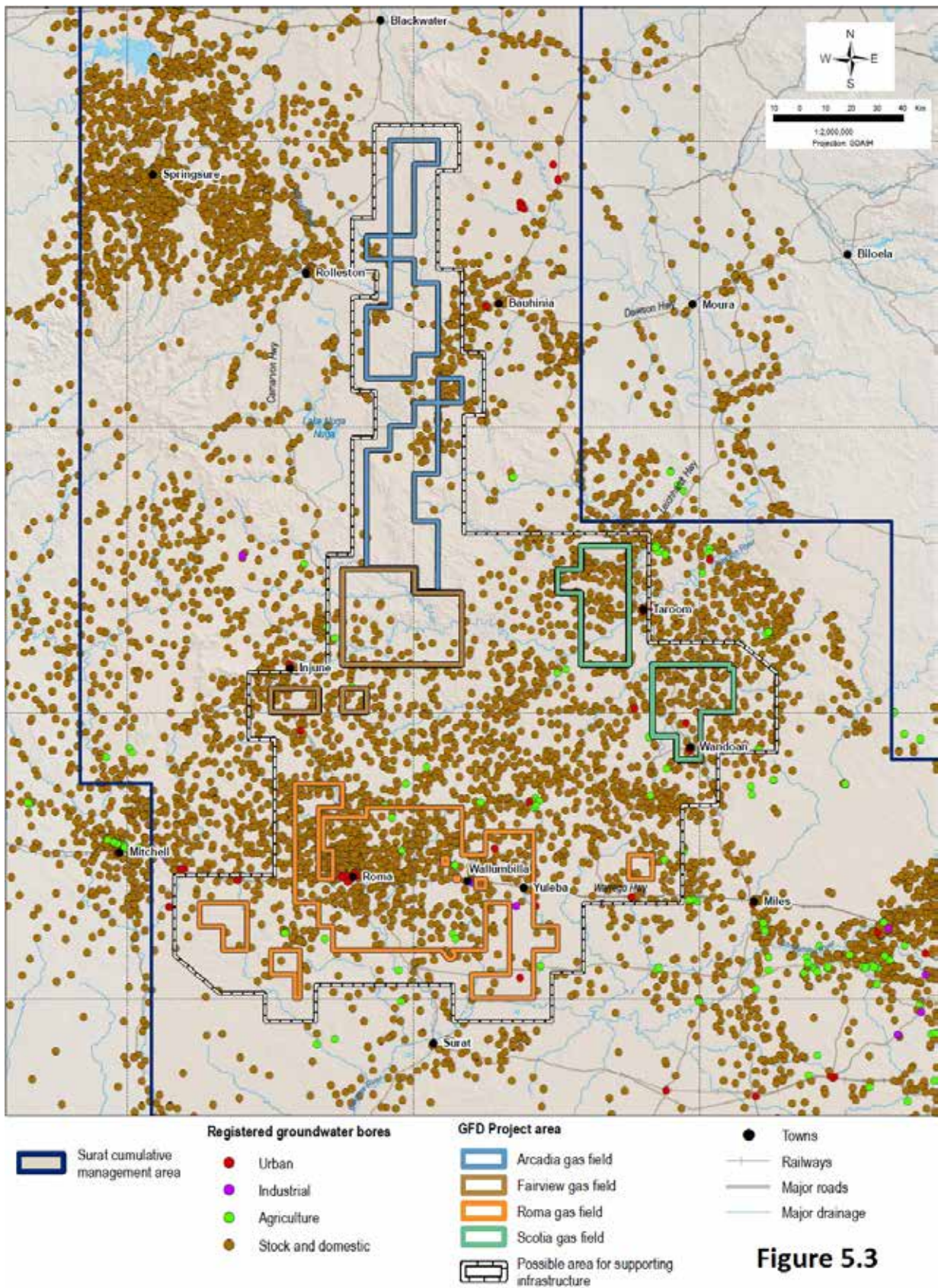


Figure 5.3

Figure 5.3 Spatial distribution of registered landholder bores and their use

Bandanna Formation

The Bandanna Formation is approximately 100m thick (comprising 10m thickness of coal seams and 90m of other sedimentary rocks) and is laterally isolated from equivalent coal measures by erosion or faulting. Therefore, the EIS considered depressurisation of the Bandanna Formation unlikely to affect aquifers north and east of the GFD project area.

The overlying main aquifers are generally isolated from the Bandanna Formation by the thick and low permeability mudstone units of the Rewan Group. The depressurisation of the Bandanna Formation is expected to generally be mitigated by those aquitards. However, to the east of Injune and south west of the Fairview gas field, there is a narrow, north–south trending zone where the overlying Rewan Group and Clematis Sandstone have eroded away. This has brought the Precipice Sandstone into direct contact with Bandanna Formation and underlying Permian formations. Due to this unconformity, there is potentially a hydraulic connection between the Bandanna Formation and the Precipice Sandstone in this area.

The Precipice Sandstone is separated from the overlying Hutton Sandstone by the Evergreen Formation—a thick aquitard. The Evergreen Formation is an effective seal and trap for conventional petroleum and gas resources. The EIS considered depressurisation of the Bandanna Formation likely to be largely mitigated in the Precipice Sandstone and intervening Evergreen Formation, thus mitigating impacts on the overlying Hutton Sandstone.

Hydraulic connectivity studies

The proponent's bore monitoring network includes single-level and a variety of multi-level piezometers. The proponent also monitors up to 85 landholder bores for groundwater pressure. Data collected from the pumped bores was assessed to determine the suitability of the bores for hydraulic analysis to estimate hydrogeological parameters (e.g. transmissivity and hydraulic conductivity). Groundwater pressure data from monitored bores would also be used to determine long-term groundwater pressure trends.

The proponent conducted a variety of studies to assess hydraulic connectivity including:

- the monitoring of water pressures and water quality at bores
- the implementation of a field coring program, which involved hydraulic conductivity testing
- managed aquifer recharge trials within the Roma gas field, which comprised injection and pumping tests and the assessment of the hydraulic responses
- testing of hydraulic conductivity for the major coal seams of the Walloon Coal Measures.

The proponent identified in the EIS that the results of these hydraulic connectivity studies showed limited hydraulic connectivity between the formations under natural conditions.

The Condamine Alluvium, illustrated in Figure 5.1 in section 5.5.1 of this report, is a significant and highly used alluvial system in the Surat CMA.

The current Condamine Connectivity Project was initiated by OGIA since the Condamine Alluvium is extensively used by the local community, as discussed in 6.2 of this report. The Condamine Connectivity Project will identify the level of connectivity between the Walloon Coal Measures and the alluvium formation and reassess the risk to private bores. OGIA has developed two additional hydraulic connectivity projects in the Surat CMA to cover different areas and account for different geological settings. The results of these OGIA studies will contribute to the revision of the regional groundwater flow model, which will be used to update the next Surat UWIR, expected in December 2015.

Springs

There are 72 spring complexes and 329 spring vents located within GFD project tenure. Springs matching the description of the threatened ecological community *the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin* are assessed in section 5.3 of this report.

The three main forms of groundwater–surface water interactions in the GFD project area are:

- ÿ discharge of groundwater to streams (watercourse or baseflow springs)
- ÿ recharge of groundwater systems via leakage from streams
- ÿ interaction between streams and associated alluvial groundwater resources.

The most significant interaction in the GFD project area is the discharge of groundwater to streams by watercourse springs. Stream discharges in the GFD project area typically show distinct seasonal distribution with the majority of flow occurring during the wet season months of December through March. Stream flows in the GFD project area are predominately ephemeral, highly episodic and with discharges typically resulting from significant runoff events.

GDEs and stygofauna

The main types of GDEs present in the GFD project area are spring vents, which are grouped into complexes, and watercourse springs fed by natural discharge from aquifers of the GAB. OGIA springs data, which was used to develop the Surat UWIR, was also used in the EIS to assess these GDEs.

Other GDE types in the GFD project area include wetlands, streams and terrestrial ecosystems directly underlain by GAB sediments. These GDEs were assessed using data from the Queensland GDE.

The EIS assessed impacts on GDEs against environmental values, including the EPBC Act or NC Act listing of a spring complex. The EIS identified that any GDEs associated with GAB aquifers were considered relevant to the GFD project.

Queensland GDE mapping identified one wetland and 385 streams within GFD tenures. The Robinson and Palm Tree Creeks Wetland, located in the Scotia gas field,

is recognised under the Directory of Important Wetlands and a portion is protected under the NC Act, as discussed in 6.1 of this report. The GDE mapping indicated a low or moderate confidence that the wetlands and streams in the Surat CMA are groundwater dependent.

There are 51 terrestrial areas within GFD tenures that have been identified by GDE mapping to occur with moderate confidence to be groundwater dependent. These mapped areas of potential terrestrial GDEs support the REs identified in Table 5.15.

The EIS predicted a high likelihood that the majority of stygofauna taxa in the Queensland Bowen Basin live in alluvial aquifers. Therefore, the EIS predicted a relatively low likelihood of stygofauna within the coal measures of the GFD project tenure. There are no known occurrences of stygofauna in GFD project area.

Table 5.15 REs associated with terrestrial GDEs in GFD project tenures

REs	Biodiversity status	GFD project tenements
11.3.25/11.3.2	Of concern	ATP 631P, PL 309, PL 310, PL 314, ATP 708, PL 13
11.10.9/11.10.11/11.7.2	No concern at present	ATP 631P
11.9.5/11.9.10	Endangered	PL 310 PL 315
11.10.9	No concern at present	PL 309, PL 310, PL 314, ATP 708
11.9.7	Of concern	PL 309, PL 310
11.3.2/11.10.11	Of concern	PL 314
11.9.10/11.9.5	Endangered	PL 314
11.9.5a	Endangered	PL 314
11.10.11/11.3.2	Of concern	PL 13, ATP 708P
11.10.11/11.10.9	No concern at present	ATP 708P
11.9.5	Endangered	PL 13

Surat Cumulative Management Area

As discussed in section 5.5.1 of this report, OGIA is an independent entity established under the Water Act, responsible for assessing cumulative impacts in CMAs and establishing integrated management arrangements through the preparation of UWIRs.

Due to expansion in conventional petroleum and gas production by multiple proponents in the Surat and southern Bowen basins, OGIA declared the Surat CMA in 2011 (refer to Figure 5.1 in section 5.5.1 of this report).

Hydraulic fracturing

Hydraulic fracturing is a method of coal seam stimulation where fluid is pumped into the coal seams to open small passageways and interconnect the naturally occurring fractures. The fluid, known as flow back fluid, then goes back into the well and is pumped to the surface. Fractures are generally several millimetres wide and can extend up to 50m horizontally away from the well.

The hydraulic fracturing process is designed so that fracturing remains within the target seam. However, the process has the potential to impact groundwater levels or pressures by creating or enhancing a pathway between the coal seam and an adjacent overlying or underlying aquifer. The process has the potential to impact water quality within the target coal seams and hydrogeological units connected to them, which may affect the water quality of landholder water supplies and springs.

Assessment methodology

Underground water impact report

In 2012 OGIA released the UWIR for the Surat CMA which assessed the cumulative impacts of water extraction by petroleum and gas production on groundwater in the Surat CMA and established integrated management arrangements. OGIA must review and update the UWIR at least every three years.

The trigger thresholds for water level impacts identified in the Surat UWIR are five metres for consolidated aquifers and two metres for unconsolidated aquifers. This is because a decline in water level in a bore of more than these trigger thresholds increases the risk of impairment of water supply from the bore.

The Annual Report 2013 for the Surat UWIR outlined a number of changes to the industry development profile and information about private water bores since the Surat UWIR was prepared. Based on these changes, the Annual Report identified 65 registered bores (out of the estimated 21,000 bores within the Surat CMA) that would experience water level declines of more than five metres in the short term.

In developing a new UWIR, OGIA will build a new model, re-calibrated with new water monitoring and geological data. The latest plans for petroleum and gas development will be used in model simulations. When it is released, the new UWIR will update the proponent's responsibilities for bores potentially requiring make-good agreements, water monitoring, and requirements for monitoring of springs or any action to mitigate future impacts. The GFD project would be incorporated into the development scenarios that the proponent would submit to OGIA for inclusion in subsequent UWIR reports.

Numerical groundwater model

OGIA undertook numerical groundwater modelling to predict the cumulative potential impacts of petroleum and gas water extraction on groundwater pressure. The initial model simulation and subsequent amendments informed the Surat UWIR and included the GLNG project's approved production activity.

Amendments to the industry development profile have slightly altered long-term impacts resulting in predicted impacts on fewer bores. The alterations also resulted in slight changes to predicted impacts in aquifers beneath springs in the northern most part of the development area. In consideration of these changes and their consequences, the spring impact management arrangements specified in the Surat UWIR remain precautionary.

The numerical regional groundwater flow model for the Surat CMA was developed using the MODFLOW 2005 code, which has been comprehensively tested and utilised

within the groundwater industry. MODFLOW 2005 and sub-models were utilised to determine an accurate representation of drawdown in groundwater levels. A separate sub-model, utilising output from the regional groundwater flow model, was used to simulate water level behaviour in the Condamine Alluvium, as that model has a finer grid resolution allowing a more detailed representation of drawdown in groundwater levels.

Potential cumulative impacts of depressurisation of the Walloon Coal Measures and Bandanna Formation were also assessed using the numerical groundwater predictive model for the Surat CMA.

The numerical groundwater flow model provided a baseline scenario, the 'UWIR scenario', which included the GLNG production activities and all other petroleum tenure holders.

A second simulation, referred to as the 'EIS scenario', was run in 2013 which incorporated development plans of the GFD project and other changes to planned gas development. The inputs to the model for the EIS scenario adopted a conservative approach by applying the groundwater extraction rates from the highest producing bores in the surrounding areas.

The estimated water production rates were used to provide an initial water extraction rate at each simulated gas well and therefore simulated a realistic time to full depressurisation within the field. Within the model, the water production rate decreases below this initial rate as the simulated pressure in the target coal seam approaches 40m head of water above the target coal seam. The life of each gas field was assumed to be 30 years from peak production at each tenure.

The cumulative impact assessment methodology follows a similar approach to the methodology in the Surat UWIR. Impacts were assessed using the 95th percentile results of the numerical groundwater flow modelling as a precautionary approach so the maximum likely impacts could be assessed. Therefore, actual impacts of the GFD project identified in the EIS scenario are likely to be less than what was presented in the EIS.

Water balance model

The conceptual water balance model considered the GFD project's maximum development scenario. In accordance with the IESC guidelines, the conceptual water balance models presented:

- ÿ changes to aquifer storage properties and groundwater flows as a result of depressurisation of the target coal measures
- ÿ vertical flux or the exchange of water between overlying or underlying aquifers and the target coal measure
- ÿ volumes of coal seam water extracted, water treatment processes to be adopted and the volumes of treated water and brine produced through the process
- ÿ volumes and qualities of coal seam water and treated coal seam water used in the various beneficial use options implemented for the GFD project

• baseline water flows for the system including recharge and discharge from each aquifer, and rainfall interception and evaporation from surface water stores.

A variety of coal seam water management options were used in the models to reflect the requirements of IESC guidelines and to demonstrate coal seam water management options are available in every area. Coal seam water management options would be refined following further field development planning by the proponent.

The models were informed by a wide range of input from various sources other than the Surat UWIR. This enabled individual conceptual water balance models to be prepared for the Fairview, Arcadia, Roma and Scotia gas fields of the GFD project. These water balance models consider both the GFD project in isolation (local water balance) and together with other petroleum developments in the region (regional water balance).

The GFD project conceptual water balance models comprised:

- rates of water to be extracted from target coal seams
- groundwater budgets and inter-aquifer transfer for aquifers within each field
- surface water storages and treatment.

Coal seam water management

The maximum development scenario assumption used in the EIS counteracts uncertainties in the prediction of the rate, volume and quality of coal seam water to be extracted, and weather variability. The maximum development scenario assumed:

- existing Santos GLNG Project infrastructure to manage GFD project coal seam water is not used and therefore new infrastructure is required
- a maximum size of infrastructure under an unlikely scenario where all water is required to be stored and treated by desalination
- storage infrastructure requirements were calculated under the scenario that all brine produced over the lifetime of the GFD project is stored in dams, and no further concentration measures for brine are employed.

These maximum development scenario assumptions are considered precautionary as it is yet to be determined if the proponent would utilise existing water management facilities. Further, likely brine management measures identified in the EIS were fluid injection or disposal.

The water management approach identified in the EIS was intended to maintain flexibility to respond to changes in policy, technology and field conditions.

Salt balance models

Individual conceptual salt balance models were developed for each of the Fairview, Arcadia, Roma and Scotia gas fields. The salt balance models were developed for the respective years of peak water production for each of the gas fields. The salt balance models were also developed in isolation of the other petroleum tenure activities in the region, as the models were informed by a wide range of input from various sources.

The conceptual salt balance models conservatively assumed that all water is required to be stored and treated at a water management facility by desalination. Therefore, it is likely that actual salt production from the GFD project, and therefore the size of water management facilities and associated storages, would be lower than the predictions in the EIS.

Regional modelling for springs

A potentially affected spring is defined under the Water Act as a spring overlying an aquifer where the water level is predicted to decline by more than the spring trigger threshold. The potentially affected aquifer is not necessarily the spring source aquifer.

Springs of interest were identified in the EIS by using groundwater model results for the EIS Scenario where springs of interest were defined as either:

- springs underlain by a formation where the long-term maximum predicted impact on water pressures at the location of the spring exceeds 0.2m, or
- springs within 10km of depressurisation of 0.2m.

As a precautionary approach, EPBC listed springs located within 15km of depressurisation of 0.2m were also included as springs of interest.

The EIS used a risk-based methodology to assess cumulative impacts of gas development in the Surat CMA under the EIS scenario. The EIS identified springs of interest as being at risk if the spring had an impacted source aquifer nominated in the OGIA dataset. The EIS included the 6 spring complexes and 12 watercourse springs located within or near Santos GLNG tenure that were identified in the Surat CMA UWIR to be at risk of impacts.

The methodology was developed in consultation with OGIA and follows a similar approach used in the UWIR for the Surat CMA. The approach recognised some uncertainty associated with source aquifers nominated in the OGIA dataset.

Where numerical groundwater modelling predicted impacts to an underlying aquifer that is not the source aquifer, further springs of interest were considered at risk if:

- the spring was identified in the Surat UWIR as requiring monitoring, or
- a hydrogeological assessment indicated the impacted aquifer could be the source aquifer for the spring.

Residual impact significance assessment

The EIS used a significance assessment methodology similar to a risk assessment, but the criteria applied related to sensitivity and magnitude rather than to likelihood and consequence. The significance of each environmental impact was determined by combining the sensitivity and magnitude criteria in a risk assessment process (i.e. major, high, moderate, low and negligible).

The significance of residual impacts on groundwater was assessed after application of the mitigation and management measures at the construction, operations and decommissioning phases of the GFD project.

Residual impacts with moderate significance identified in the significance assessment were:

- reduced spring flow and loss or degradation of dependent ecosystems (including EPBC listed springs)
- subsidence, altering groundwater flow paths and aquifer storage
- loss or degradation of ecosystems dependent on springs sourced from affected aquifers (including EPBC listed springs).

Hydraulic fracturing fluid risk assessment

Hydraulic fracturing fluid generally includes up to 99 per cent water and sand, with around 1 per cent additives. The proponent completed a qualitative and quantitative assessment of the risks posed by using hydraulic fracturing fluid mixtures in gas extraction processes. This included an assessment of potential for adverse ecological effects to terrestrial and aquatic ecological receptors that may be exposed to hydraulic fracturing fluids.

The proponent would potentially utilise multiple hydraulic fluid systems with differing chemistries in the various gas fields. The hydraulic fracturing fluid risk assessment considered six hydraulic fracturing fluid mixtures and evaluated their chemical constituents. In accordance with Queensland regulations, the fracturing fluid does not contain benzene, toluene, ethylbenzene, xylenes or polycyclic aromatic hydrocarbons.

The hydraulic fracturing fluid risk assessment evaluated the toxicity of individual substances that may be used and characterised the cumulative risks of the total effluent toxicity and eco-toxicity in accordance with the National Water Quality Management Strategy. Toxicity for each constituent was assessed for persistence, bio-accumulation and aquatic toxicity, terrestrial toxicity and human health toxicity.

Following the initial screening, the hydraulic fracturing fluid risk assessment considered the cumulative risks posed by each constituent to human health and terrestrial receptors.

Impacts

Water balance

The conceptual water balance models indicated that potential impacts include increased groundwater flux into the target coal measures from overlying and underlying formations due to extraction of coal seam water.

For the Walloon Coal Measures, the water balance model predicted that over the modelled 100-year extraction period:

- under conditions similar to no petroleum development (i.e. the baseline), an upward flux from the Walloon Coal Measures to the overlying aquifers is estimated at a total of 1,763GL and an upward flux of 716GL was estimated from the deeper formations to the Walloon Coal Measures

• as a result of the GFD project, a 162GL increase of the flux from overlying formations is expected to the Walloon Coal Measures and no change is expected of the flux from underlying formations in comparison to the baseline scenario

• cumulative gas development (i.e. the GFD project and other petroleum projects) has the potential to increase the downward flux of groundwater migrating into the Walloon Coal Measures from overlying formations by a total of 1,070GL.

For the Bandanna Formation, the water balance model predicted that over the modelled 100-year extraction period:

• under conditions similar to no petroleum development (i.e. the baseline), an upward flux from the basement to the Bandanna Formation is estimated at a total of 44GL and a downward flux from the overlying formations to the coal measures at a total of 675GL

• as a result of the GFD project, a 53GL increase of the flux from overlying formations is expected to the Bandanna Formation and a 42GL increase of the flux from underlying formations is expected

• cumulative gas development (i.e. the GFD project and other petroleum projects) has the potential to increase the flux of groundwater migrating into the Bandanna Formation from overlying formations by a total of 423GL and from underlying formations at a total of 337GL.

There are no expected increases in recharge from surface water systems to underlying aquifers, implying that impacts of drawdown at the surface would not be significant.

Table 5.16 shows the predictions of the conceptual water balance models considering the peak water extraction rates in each gas field under the maximum development scenario.

Table 5.16 Predicted water extraction rates

GFD project gas field	Predicted peak production year(s)	Target coal seam for each gas field	Predicted peak water extraction rate from each gas field due to the GFD project	Predicted total water extraction rate from the target coal seam due to cumulative regional gas development	Predicted total water extraction from each gas field over the GFD project life
Roma	2023	Walloon Coal Measures	27.6ML/day	416ML/day	68.2GL
Fairview	2020 and 2022	Bandanna Formation	40.0ML/day	76.8ML/day	79.0GL
Arcadia	2026		3.2ML/day		32.1GL
Scotia	2022		10.0ML/day		39.5GL

As identified in Table 5.16, over the life of the GFD project a potential volume of up to 218.8GL of coal seam water could be extracted. The EIS predicted coal seam water extraction across the GFD project would peak at a rate of approximately 73ML/day in

2022, reduce to less than 20ML/day after 2025 and then reduce further to less than 10ML/day after 2030.

Notably, the time in which peak extraction is expected to occur does not necessarily represent the time in which the maximum depressurisation impact is likely to occur. This is due to the influence of other petroleum development activities in the region and the variable drawdown rates from each aquifer.

Depressurisation

Potential aquifer depressurisation could lead to loss or reduction of supply to downstream surface water users, reduced spring or watercourse spring flow, subsidence, and loss or degradation of GDEs including EPBC listed springs.

The EIS scenario was compared to the UWIR scenario to enable assessment of the change in cumulative depressurisation impacts due to the GFD project.

Model results indicate the GFD project would not result in increased depths of depressurisation compared to the UWIR scenario. However, the results indicate the area of depressurisation impacts would increase due to the GFD project. This comparison, which is illustrated in Figure 5.4, shows the area of cumulative aquifer depressurisation impacts is generally larger in the EIS scenario than the UWIR scenario.

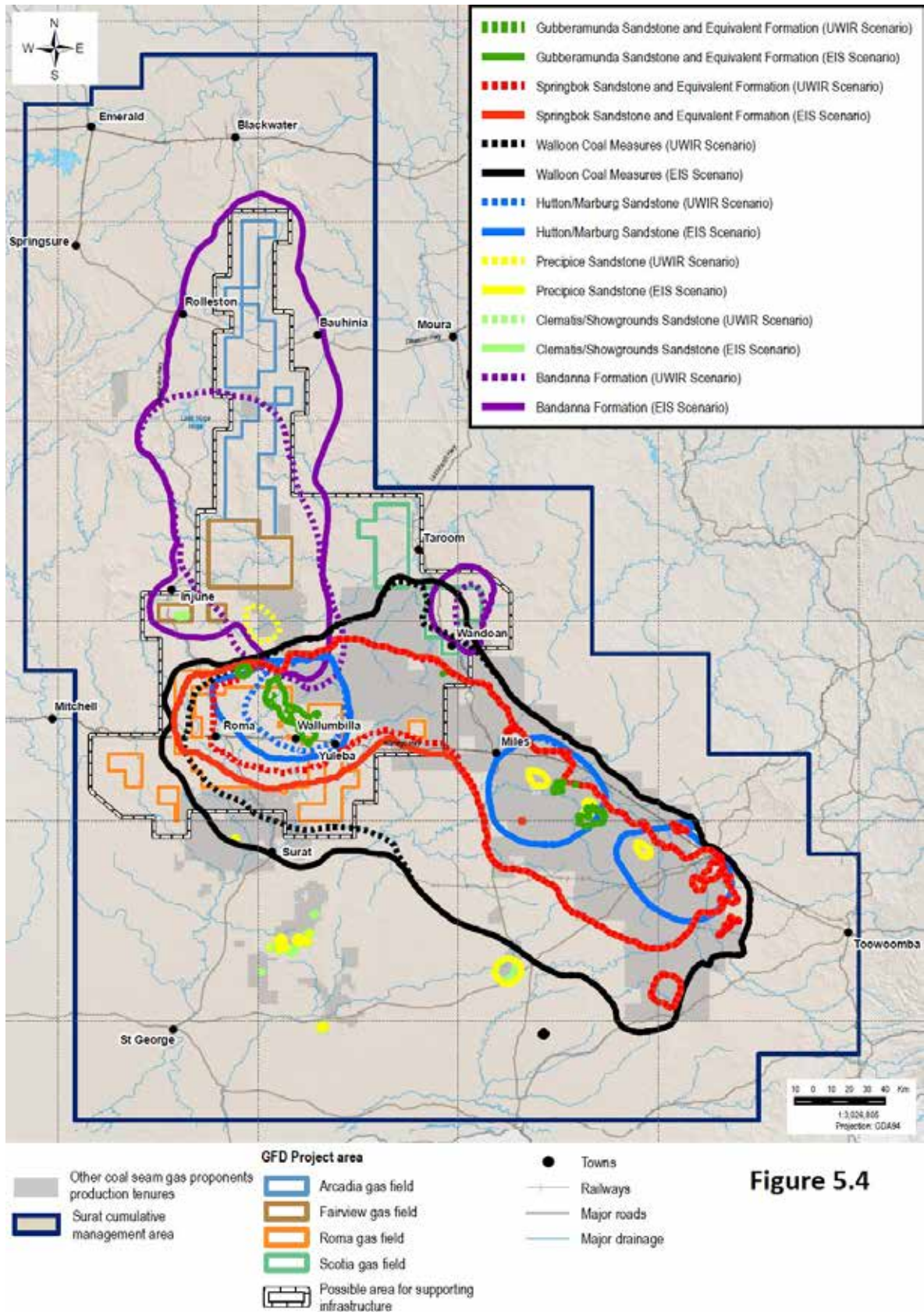


Figure 5.4

Figure 5.4 Areas of groundwater impact under the UWIR and EIS scenarios

The EIS predicted maximum depressurisation in the coal formations is expected to occur between 2020 and 2030 with a lag in the time to maximum depressurisation in overlying and underlying formations, as the timeframes depend on vertical hydraulic conductivity.

Predicted cumulative maximum depressurisation depths in the target coal seams and affected aquifers in each gas field are shown in Table 5.17.

Table 5.17 Predicted cumulative maximum depressurisation in each gas field

GFD project gas field	Predicted maximum depressurisation in coal seams	Predicted maximum depressurisation in aquifers
Roma	Walloon Coal Measures in 2025	Springbok Sandstone (75.4m) in 2058 Gubberamunda Sandstone (23.2m) in 2069 Hutton Sandstone (20.7m) in 2155
Fairview	Bandanna Formation in 2020 Walloon Coal Measures (less than 0.5m) would occur after a significant time lag	Clematis/Showground Sandstone (5.4m) in 2053 Precipice Sandstone (3.4m) in 2023 Hutton/Marburg Sandstone (less than 0.5m) would occur after a significant time lag
Arcadia	Bandanna Formation in 2030	Clematis/Showground Sandstone (0.2m) would occur after a significant time lag
Scotia	Bandanna Formation in 2022 Walloon Coal Measures in 2058	Springbok Sandstone, Hutton Sandstone, Precipice Sandstone and Clematis Sandstone (each less than 2m) between 2058 and 2205

For aquifers in the Roma gas field separated from gas bearing formations by aquitards (e.g. Bungil Formation/Mooga Sandstone), the predicted drawdown is comparatively small and it would take decades before maximum impacts occur. Groundwater modelling predicted negligible depressurisation impacts to the underlying Walloon Coal Measures in the vicinity of the Condamine Alluvium due to GFD operations. Therefore no increase in drawdown in the Condamine Alluvium is expected.

The rate of recovery is expected to be greatest in the years after water extraction ceases but would reduce over time. The coal measures and the significantly affected aquifers are expected to reach a 50 per cent recovery from maximum impact 30 to 80 years after maximum depressurisation. Poorly connected aquifers could take several hundred years to reach 50 per cent recovery.

Landholder bores

The Surat UWIR in 2012 predicted that 13 landholder bores in the GFD project tenures would be impacted due to petroleum and gas development in Surat CMA. Under the EIS scenario, 48 additional private water bores in the GFD project tenures were predicted to be impacted by a decline in groundwater pressure of more than 5m at some time in the future. Therefore, the EIS identified the potential for a total of 61

landholder bores within GFD project tenures to be cumulatively impacted in the EIS scenario.

The proponent conducted a baseline assessment of the additional 48 potentially impacted bores located in GFD project tenures. Of the 48 bores:

- 32 bores were observed to be in use by the landholder
- 11 bores could not be located by the landholder, or were abandoned or not in use
- 5 private water bores have not yet been surveyed, and would be assessed in accordance with the Surat UWIR.

The Surat UWIR assigned responsibility to the proponent for impacts to one bore where water levels are predicted to decline by more than five metres within three years.

The most significant potential impacts for water bores are drawdown and depressurisation. DNRM identified the potential for water quality to be affected at water bores, should coal seam gas migrate into aquifers. Without adequate controls in place, constructed wells could create a connection between previously isolated aquifers, inducing vertical leakage of groundwater within the borehole. This could affect water levels in nearby bores and spring flow.

Further, without adequate controls in place, management of artesian flow could lead to uncontrolled flow of groundwater at the surface. Uncontrolled artesian flow could depressurise aquifers and adversely affect water levels in nearby bores.

Gassy bores

Methane gas occurs naturally within geological formations of the project area and can naturally enter private landholder water bores, potentially impairing the bores capacity, as groundwater extraction and subsequent depressurisation contribute to the possibility of fugitive gases entering water bores. This is a problem known as 'gassy bores'. The Department of Natural Resources and Mines CSG Compliance Unit hold records of complaint that consider the CSG industry may be contributing to the problem of gassy bores. It is difficult to confirm if the landholder concerns about individual water bores are a result of CSG industry activity, extraction for agricultural and other industrial purposes or natural processes. To determine the root cause of a gassy bore, baseline data and ongoing monitoring and more research are required. Make-good obligations, to compensate for the impaired capacity of a water bore, would apply if a gassy bore is found to result from CSG activities.

I expect that any landholder bore considered to be of impaired capacity and found to be the result of activities related to the GFD project would be subject to make-good obligations.

Subsidence

Due to depressurisation of multiple coal seams, there is potential for the interburden formations to also be depressurised, causing increased subsidence. Subsidence could affect groundwater flow paths and aquifer storage or cause ground surface displacement and alteration of surface water flow paths.

For the proponent's existing operations, subsidence modelling indicates that for an average reduction in pressure head of 700m in the Walloon Coal Measures, the calculated subsidence in the Walloon Coal Measures is 0.28m. For an average reduction in pressure head of 1,000m in the Bandanna Formation, the calculated subsidence in the Bandanna Formation is 0.15m.

In the EIS, subsidence modelling predicted maximum differential settlements at the surface of 0.06m over a distance of 1.5km for the Roma gas field, 0.045m over a distance of 3km for the Arcadia and Fairview gas fields, and 0.056m over a distance of 2km for the Scotia gas field. The EIS considered settlements of this scale too small to cause changes to surface water or groundwater flow paths.

Further, the EIS predicted that although pressure reductions in the coal seams are expected to occur as a result of GFD project operations, the risk of significant subsidence of the land surface is very low. This is since the pressure reductions are predicted to occur in formations comprising consolidated rock and the greatest pressure reductions are predicted to occur at depths of several hundred metres or more below the surface.

Groundwater movement

DNRM identified the potential for depressurisation and faults to impact on groundwater movement.

The EIS considered the Hutton-Wallumbilla Fault would not be a barrier to horizontal flow above the Evergreen Formation and that the fault should not influence vertical or horizontal drawdown resulting from coal seam depressurisation.

Coal seam water use

Over-irrigation using coal seam water has the potential to impact on water quality in shallow aquifers through seepage from storage ponds or dams.

Further, the beneficial use of coal seam water has the potential to cause localised impacts on shallow groundwater resources. This could also impact nearby groundwater users and springs or other GDEs if over-irrigation occurs.

Based on the maximum development assumptions, the maximum capacity of potential treatment facilities and associated storages within each field are listed in Table 5.18. Assumptions include the treatment of all coal seam water through reverse osmosis and the requirement of storage for the life of the GFD project.

Table 5.18 Coal seam water treatment facility and storage capacities

Gas field	Treatment capacities	Coal seam water management dam	Treated water management dam	Brine management dam
Roma	28ML/day	580ML	795ML	1,685ML
Fairview	40ML/day	545ML	675ML	2,030ML
Arcadia	3.5ML/day	75ML	55ML	665ML
Scotia	10ML/day	120ML	145ML	775ML

Brine and salt

Where desalination of coal seam water is required, brine is generated. Conceptual salt balance models for the GFD project maximum development scenario presented in the EIS identified that 21.9GL of brine and 824,000 tonnes of salt would be produced over the life of the GFD project. The total salt encapsulated over the GFD project life is expected to be 755,000 tonnes.

Potential groundwater quality impacts from brine and salt could occur through:

- seepage of brine from storage dams to shallow aquifers
- leakage from licensed waste disposal facilities where salts are disposed
- cross-flow of aquifers due to incorrectly constructed injection wells or failure of injection wells due to corrosion.

Springs and GDEs

The EIS identified 45 spring complexes and 33 watercourse springs located within the Surat CMA as springs of interest. Of these, 8 spring complexes and 12 watercourse springs are located within or near GFD project tenures and are at risk of depressurisation impacts under the EIS scenario, as illustrated in Figure 5.5.

Eight spring complexes and 12 watercourse springs within or near GFD project tenures could be impacted due to the cumulative development of gas in the Surat CMA under the EIS scenario.

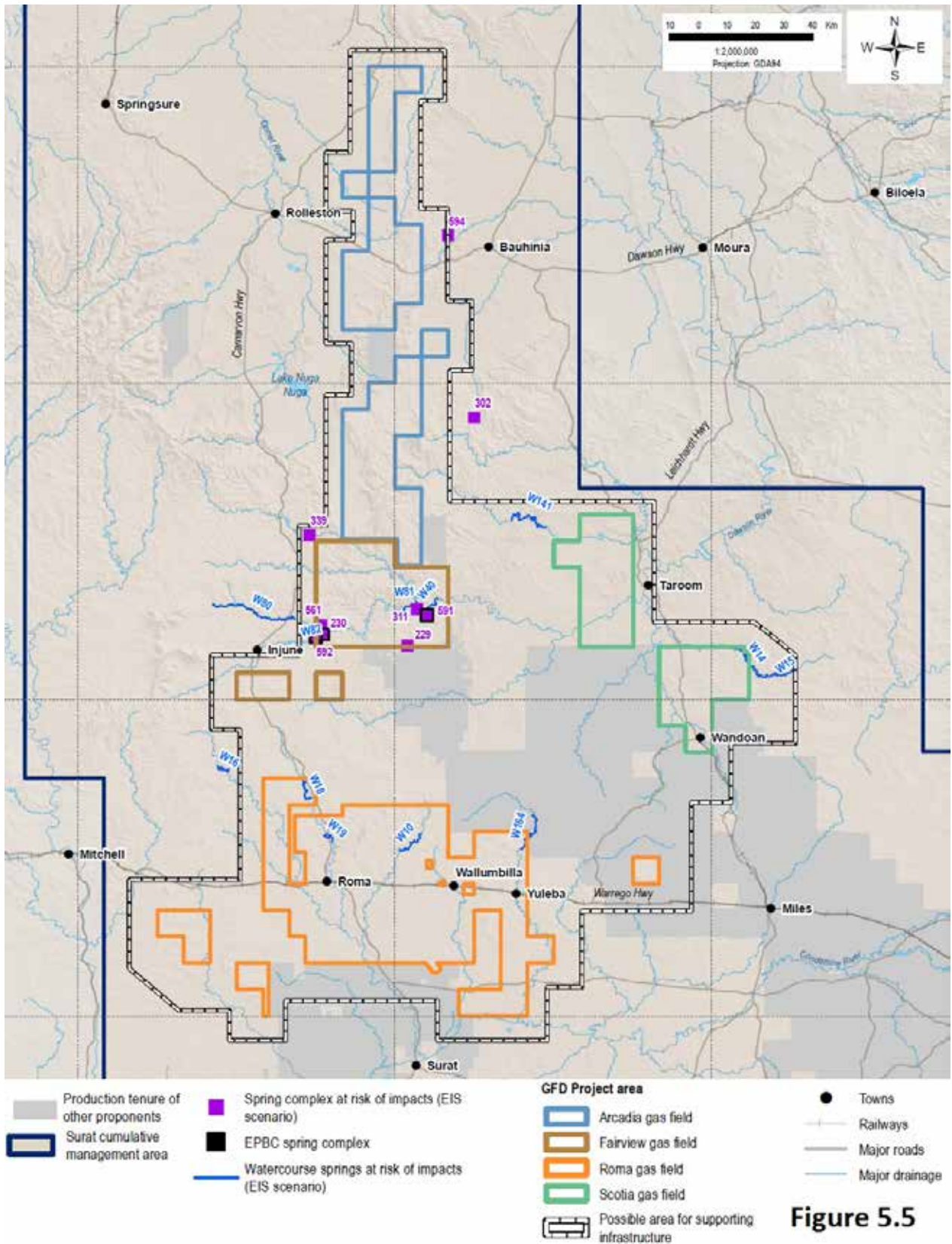


Figure 5.5 Great Artesian Basin springs at risk of impacts

Hydraulic fracturing

The results of groundwater modelling in the EIS indicated limited connectivity between the coal seams and adjacent aquifers. Therefore, the EIS predicted that the majority of gas and fracturing fluid transport is likely to occur within the target coal seams themselves.

The proponent proposed to hydraulically fracture approximately 70 per cent of wells over the remainder of the field life in the Fairview and Arcadia gas fields, approximately 50 per cent in the Roma gas field and approximately 90 per cent of wells in the Scotia gas field. The number of wells hydraulically fractured in the Scotia gas field would be determined by ongoing exploration and appraisal activities. Up to 30 per cent of the wells in the various gas fields may require re-fracturing, where the wells are subjected to additional hydraulic fracturing events or the fractures may be cleaned using nitrogen gas under high pressure.

The EIS identified that the transport of remnant hydraulic fracturing fluids could impact water quality within the target coal seams and in the hydrogeological units connected to them. The transport of fluids from the coal seams could occur along faults or fractures and unconformities within the rock, or as a result of failures in the casing or seals of production wells. This could then affect the water quality of landholder water supplies and springs.

As specific hydraulic fracturing locations are determined through ongoing field development, the assessment in the EIS conservatively assumed that all gas well locations have the potential to be fractured.

The proponent's hydraulic fracturing fluid risk assessment determined that the chemicals used in hydraulic fracturing fluid are generally non-hazardous with no high hazard chemicals identified in the assessments. Carcinogenic compounds, benzene, toluene, ethylbenzene, xylene and polycyclic aromatic hydrocarbons are not proposed in any hydraulic fracturing fluid systems.

The potential exposure pathways identified in the risk assessment were:

- incidental ingestion and dermal contact by potential trespassers at well pads
- livestock and native fauna exposure to flow-back fluids via ingestion at the well pads
- spill of transported or stored chemicals or flow-back fluids to aquatic environments.

These exposure pathways occur at the ground surface and would therefore be managed at the surface. Therefore, potential impacts from hydraulic fracturing fluids were considered generally unlikely.

The EIS identified that impacts could occur to groundwater quality of the Bandanna Formation in the northern area and the Walloon Coal Measures in the central and southern areas. These impacts are expected to be localised within the target coal formations and within the GFD project tenures.

Other potential impacts of hydraulic fracturing include water quality impacts on springs where the coal seam is the source aquifer, or to groundwater users taking groundwater from the coal seams. However, the EIS considered the likelihood of exposure to

fracturing fluids due to the fluid escaping the target coal seam and contaminating overlying aquifers as insignificant. This is since Santos GLNG currently uses a thorough well design that promotes well integrity and an extensive system of procedures to minimise the likelihood of the fracture and the fracturing fluid leaving the target area. The construction of the wells includes drilling the well borehole through the groundwater aquifers and aquitards and cementing the well borehole into place using specialised cement types prior to advancing into deeper petroleum units. Queensland State drilling regulations specifically address groundwater protection, including requirements for the surface casing to be set below the lowest groundwater aquifer.

Further, Santos GLNG's systems of procedures include extensive testing programs, and operational and systems monitoring to ensure hydraulic fracturing activities are confined to the target units. If a loss of integrity is identified in a well immediate measures are employed to decommission the well, or rectify the situation.

The EIS identified that most of the hydraulic fracturing fluids are removed when the flow back fluid is stored in mud pits and turkeys nests for sediment settlement until the fluid meets the criteria for re-use or is disposed off-site. Potential off-site human and ecological exposure to flowback water could possibly occur in the event of a spill or overflow from the turkey's nest or mud pit. The EIS considered the likelihood of exposure to fracturing chemicals through flowback water as low. This is since all of the following unlikely conditions would need to occur:

- a failure of the lining of the turkey's nest or mud pit
- a high permeability unit beneath the drill pad that is able to transmit the flowback water to an underlying aquifer
- a shallow aquifer present in the subsurface beneath the drill pad that either is used as water supply or discharges into a creek.

This scenario is also considered as a low likelihood of exposure to fracturing chemicals in a concentration to be concerned of since the concentrations of hydraulic fracturing chemicals in the flowback water are lower than those injected and the toxicity of those chemicals is expected to rapidly decrease.

Mitigation and management measures

The constraints protocol

As discussed in section 5.1 of this report, the constraints planning process would play a significant role in mitigating potential groundwater impacts. Constraints related to groundwater and the GFD project activities permitted for each level of constraint are shown in Table 5.19.

Table 5.19 Groundwater-related constraints

Level of constraint	Constraint type	Permitted activities
No-go area	EPBC Act listed spring vents and complexes, including primary 200m buffer	No petroleum activities are permitted
Surface development exclusion zone	Declared catchment areas as per <i>Water Act 2000</i> (Qld) (Category C)	Only low impact petroleum activities are

	environmentally sensitive area)	permitted
High constraint area	Watercourses, including 100 m buffer. Spring vents and complexes (not protected under EPBC Act), including primary 200m buffer.	Low impact petroleum activities and linear infrastructure are permitted
Moderate constraint area	Secondary 100m buffer for EPBC Act spring vents and complexes. Endangered REs including primary 200m buffer.	Low impact petroleum activities, linear infrastructure and limited petroleum activities are permitted
Low constraint area	Existing Santos GLNG infrastructure. Existing road, rail, pipeline and other infrastructure.	All petroleum activities are permitted

Water balance and depressurisation

Groundwater monitoring would be undertaken for the GFD project in accordance with the requirements of the Surat UWIR and reflected in the Draft EM plan and Water Resource Management Plan.

The Draft EM Plan identified the environmental values potentially affected by the GFD project and proposes measures to manage the risk of potential adverse impact to these environmental values. The Draft EM plan describes:

- environmental values potentially affected by the GFD project
- environmental management objectives and associated management measures, including coal seam water management
- environmental monitoring and reporting.

The Water Resource Management Plan included:

- a hydraulic connectivity characterisation
- a Joint Industry Plan for EPBC Act listed springs
- an Evaluation of Prevention or Mitigation Options for Fairview Springs
- a Stimulation Impact Monitoring Program
- a Ground Deformation Monitoring and Management Plan
- a Hydraulic Fracturing Risk Assessment
- a Dawson River discharge scheme receiving environment monitoring program.

As identified in the EIS, the proponent would comply with water monitoring activities and spring impact management activities as required under section 9.2.2 of the Surat CMA UWIR.

Landholder bores

Compliance with the requirements of the Surat UWIR also includes conducting bore assessments and entering into make-good agreements with affected landholders. A make-good agreement is an agreement between a proponent and a bore owner that provides details of the measures to be undertaken by the proponent to manage, mitigate or offset impacts.

Measures potentially considered for make-good agreements include:

- ÿ deepening of bores or pumps to increase available drawdown
- ÿ subsidising increased pumping costs
- ÿ replacing pumps
- ÿ replacing or relocating bores
- ÿ constructing additional bores
- ÿ increasing water storage capacity
- ÿ treating water to mitigate changes in water quality
- ÿ providing alternative water sources.

The UWIR assigned the proponent responsible for managing impacts to one bore where water levels are predicted by the Surat UWIR to decline by more than five metres within three years. The proponent has completed a bore assessment and entered into a make-good agreement with the owner of this bore which specifies the measures to be implemented to minimise the impacts on the affected bore owner.

The proponent has an existing groundwater monitoring program which could identify potential impacts on private bores before the impacts become material.

The *Water Act 2000* (Qld) defines trigger levels for landholder bores as five metres of drawdown in consolidated aquifers and two metres in unconsolidated aquifers. Where monitoring indicates water extraction by the proponent is affecting, or has the potential to affect, supply from an existing bore, the proponent would undertake a bore assessment and enter into a make-good agreement with the bore owner, in accordance with Surat UWIR requirements.

I have stated conditions on well integrity requirements to ensure water quality is not affected at landholder bores.

Subsidence

The proponent has developed a Ground Deformation Monitoring and Management Plan which includes subsidence risk management, monitoring methods, exceedance management measures, and response and reporting requirements.

The subsidence trigger associated with CSG production is defined as an annual average ground motion of 16mm/year for over 50 per cent of data points in an area. The proponent would carry out an investigation to identify the process resulting in any exceedance. If the risk of observed ground motion exceedance is regional and due to CSG activities, the proponent would carry out a risk analysis focusing on the risk and consequence of deformation on springs and hydrology networks. If the risk is unacceptable, then the proponent would carry out an assessment of mitigation options and the timing of the long-term impact. If required, a mitigation plan would then be developed.

The proponent currently monitors ground movement and deformation across all of its existing CSG fields. An interim report on the ongoing baseline monitoring program would be prepared for the DE that maps the average annual deformation measured in

each of the areas assessed at the end of the first year of data collection. All ground motion data collected would be reviewed, reported and analysed every five years regarding the risk of possible ground motion effect on receptors. Where effects on receptors are identified, the possible causes of deformation shall be identified, and an ongoing monitoring and management plan would be proposed.

Groundwater movement

DNRM has identified that faults need to be taken into account in any future modelling work on groundwater movement.

Coal seam water use

The proponent's Coal Seam Water Management Strategy for the GFD project has adopted the management hierarchy in the Queensland Coal seam gas water management policy 2012, where the first priority is beneficial use and the second priority is disposal. Beneficial use comprises the use of coal seam water for a purpose that is beneficial to existing users including project requirements, new water users, or existing or new water-dependent industries. Beneficial use also enables the proponent to meet obligations in make-good agreements.

After feasible beneficial use options have been considered, coal seam water would be disposed of in a way that firstly avoids, and then minimises and mitigates, impacts on environmental values. Options proposed by the proponent for managing coal seam water include:

- the utilisation of extracted water for make-good arrangements
- operational use
- substitution of water allocation
- depleted coal seam water injection and aquifer injection
- the provision of water for landholder activities or other regional users
- surface water release
- evaporation of water in accordance with relevant guidelines.

Options for managing coal seam water would be finalised by the proponent in collaboration with the relevant administering agency.

I have stated conditions which limit the release of coal seam water to land where it is only used for dust suppression, construction and operational purposes, irrigation, or domestic or stock purposes. For any coal seam water released to land for the purposes of irrigation or domestic or stock purposes, I have stated a condition that requires that the water quality must comply with the set criteria.

The Coal Seam Water Management Strategy also outlined how the proponent proposed to manage coal seam water in accordance with the regulatory framework established by the Queensland and Commonwealth Governments.

The proponent has proposed beneficial water use portfolios for each gas field where practicable. Given the number of management options available in each field, a number of combinations of water management options may be used.

Managed aquifer recharge, or the injection of treated coal seam water into aquifers, is proposed by the proponent as a potential option for the Gubberamunda Sandstone aquifer near Roma and across other project areas. The injection water proposed near Roma has an electrical conductivity (EC) of approximately 500µS/cm, which is a substantially lower EC than the average EC in the receiving Gubberamunda Sandstone aquifer (which has an EC of approximately 1,284µS/cm). This mitigation measure would have a positive impact on the groundwater pressure and quality of the Gubberamunda Sandstone.

The proponent conducted managed aquifer recharge trials at Hermitage within the Roma gas field. These trials comprised injection and pumping tests and the assessment of the hydraulic responses. The proponent has also provided groundwater quality data for the relevant hydrogeological units in the GFD Project area in section 3.4.6 of Appendix U2 in the EIS. In the GFD project's draft EM Plan, the proponent identified that managed aquifer recharge would only occur as authorised under the EA.

Coal seam water would be treated to ensure water is of an appropriate quality for the proposed use. Where a different water quality is needed, the proponent would use one of, or a combination of, the following approaches:

- desalination using reverse osmosis to separate a portion of the total dissolved solids and other constituents into a concentrated fluid waste stream (brine) and produce a better quality permeate stream
- amendment using chemical dosing to lower the sodium adsorption ratio and pH/residual alkalinity of coal seam water
- temperature and ionic balance adjustment
- filtration to remove suspended solids (thus, lowering the turbidity), bio-toxic elements and nutrients that can lead to algal blooms from the water
- sterilisation to remove bacteria
- de-oxygenation
- blending of separate water of differing quality to achieve the target water quality.

To prevent potential groundwater quality impacts from coal seam water storage, the EIS identified that storage dams would be constructed and operated in accordance with relevant guidelines for the management of regulated dams. The proponent proposed to develop a seepage monitoring program which would include procedures to detect seepage to groundwater as a result of storing contaminants in a regulated dam.

Conditions regarding regulated structures, including dam design, monitoring and reporting requirements will be applied through EAs for relevant GFD project tenures. Conditions must consider the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* where warranted by the consequence category of the structure.

The proponent has also prepared a Land Release Management Plan which addressed the management of releases of water to land, including coal seam water use for irrigation, construction and operations purposes. The plan includes the principles, methods and controls to effectively manage and minimise the risk of environmental

harm being caused by release of water to land. The desired outcomes identified in the plan are:

- Y vegetation is not damaged
- Y soil quality is not adversely impacted
- Y there is no surface ponding or runoff to waters
- Y there is no aerosols or odours
- Y deep drainage below the root zone of any vegetation is minimised
- Y the quality of shallow aquifers is not adversely affected.

Coal seam water use management measures in the Land Release Management Plan include:

- Y requirements for the evaluation of quality and quantity of coal seam water used for irrigation
- Y preferences for the frequency and intensity of use of coal seam water for dust suppression, where lighter, more frequent application is preferred over less frequent, heavier applications.

The proponent has proposed the following potential management measures for the release of water to land, in addition to any site-specific requirements:

- Y discharges are conducted on land exhibiting grades of less than five per cent and at a distance of at least 100m from a water body to prevent potential impacts on surface water resources
- Y discharges to land are controlled to ensure that the rate of discharge is less than the infiltration capacity of soils and evaporation rates for the area, to mitigate the potential for ponding and runoff and to ensure that the discharge avoids or minimises scouring and erosion
- Y discharges are conducted in large areas of land, to facilitate infiltration and evaporation and to avoid overland flow and discharge to surface water
- Y manual discharges of released waters are supervised, to ensure that the activities are conducted in a manner to prevent erosion and runoff
- Y no discharges are conducted in areas of shallow groundwater or where sand or gravel soils exist, to prevent impacts on groundwater or subterranean flows of discharged water.

Brine and salt

Brine requires appropriate management and disposal in accordance with regulatory requirements. The Queensland Coal Seam Gas Water Management Policy 2012 sets out a management hierarchy for prioritising the management of brine where the first priority is beneficial use (treated brine or salt creates useable products) and disposal is the second priority.

The EIS identified the commercial recovery of saleable salt product as an unfeasible option due to the energy intensity, cost and low commercial volumes of salt.

Other brine and salt management options include brine injection into selected deep saline aquifers and the transfer of brine or solid salt for disposal into a licensed waste disposal facility.

The proponent has approval to inject brine into the Timbury Hills Formation in the Fairview Gas Field and is undertaking feasibility studies for injection into the Timbury Hills Formation in the Roma gas field for the GLNG project. Transfer of brine or solid salt to a licensed waste management facility would be in accordance with the Queensland *Coal Seam Gas Water Management Policy 2012* and would only occur after other options have been assessed and considered unfeasible.

I expect the proponent will use an evaporation dam only if an evaluation of alternatives for CSG water management shows there are no feasible alternatives. At the EA application stage the proponent must provide information to DEHP which details how CSG water, brine and salt will be managed on relevant GFD project tenures.

Springs and GDEs

The Surat UWIR is a statutory document under the *Water Act 2000* (Qld) and identifies potentially affected springs as a result of water extraction by petroleum tenure holders in the Surat CMA. The *Water Act 2000* (Qld) includes a trigger threshold to identify potentially affected springs and the Surat UWIR includes a Spring Impact Management Strategy for those springs at any significant risk of impact.

As identified in the EIS, the proponent would implement the commitments of the Joint Industry Plan which was developed by CSG operators in the southern Bowen and Surat Basins to facilitate a groundwater monitoring and management system that ensures EPBC listed springs are not impacted by CSG production. The Joint Industry Plan enables CSG proponents to comply with reporting requirements in chapter 9.2.2 the Surat UWIR. The Joint Industry Plan includes an early warning system and response plan for springs complexes identified in the Surat UWIR to ensure that adequate time is available for assessment and implementation of management measures prior to the occurrence of potential adverse impacts.

The early warning system uses the regional cumulative impact model developed for the Surat UWIR to set action triggers, using the 95th percentile prediction of drawdown. The EIS considered this conservative approach was aligned with the Precautionary Principle, as defined in section 391(2) of the EPBC Act.

The Joint Industry Plan also summarises the monitoring requirements of the proponents in the Surat CMA and identifies which proponent is responsible for any management actions at individual springs.

Further, the EIS identified that the proponent would comply with the requirements of the Surat UWIR, which requires the development of a spring impact mitigation strategy for specified springs and spring monitoring in accordance with the spring monitoring program under the Surat UWIR. The Surat CMA UWIR's spring monitoring program identifies changes in the volume and chemistry of water flowing to a spring and changes to the general character of springs.

As a requirement of the GLNG project approval, the proponent has developed the *Evaluation of Prevention or Mitigation Options for Fairview Springs* which is a report that identified preferred options for preventing or mitigating potential spring impacts. The impact prevention and mitigation options in it include:

- utilising a hydraulic barrier that actively controls and prevents groundwater level changes reaching the springs
- increasing recharge to Precipice Sandstone from surface infiltration
- recharging aquifers by injection.

These and other potential mitigation options were screened for feasibility and effectiveness in section 4.0 of Appendix AE-C of the EIS.

Hydraulic fracturing

The EIS predicted the likelihood of exposure to fracturing fluids due to the fluid escaping the target coal seam and contaminating overlying aquifers as insignificant. The proponent uses a system of procedures, including testing programs and monitoring, in its existing operations to minimise the likelihood of fracture stimulation fluid leaving the target area. If an impact is identified, immediate measures are employed to decommission the well or otherwise rectify the situation.

The proponent identified the following management measures in the EIS to prevent potential impacts on groundwater from hydraulic fracturing:

- design of the hydraulic fracturing process to retain fluids within the target seam
- assessment of chemicals through a Hydraulic Fracturing Risk Assessment
- performance of pressure tests of well casing and cement prior to hydraulic fracturing to confirm the integrity of the well
- appropriate containment, management, recycling or disposal of flow-back fluids in accordance with regulatory requirements
- implementation of spill containment procedures to prevent migration of chemicals into shallow groundwater systems.

The proponent has developed a Chemical and Fuel Management Plan which incorporates a management framework comprising chemical hazard identification, chemical risk assessment and control measures, chemical approval and emergency preparedness.

The proponent has also developed the Stimulation Impact Monitoring Program which includes the practices and procedures for pre-stimulation monitoring, stimulation fluid and flow back monitoring, and post-stimulation monitoring.

During the hydraulic fracturing process, the continuous monitoring of the casing pressure and fluid viscosity provides critical feedback. The proponent proposes to closely monitor any significant changes in pressure to immediately identify conditions that would indicate loss of well integrity or overburden layer integrity.

In addition to process pressures, the flow rate and total volumes of hydraulic fracturing fluids are monitored. Changes in the flow rate together with pressure changes are

utilised along with modelled simulations to determine the performance and propagation of fractures. Variables for hydraulic fracturing are continuously monitored.

I have stated conditions which address the potential water quality impacts of hydraulic fracturing in order to prevent environmental harm. These include the regulation of hydraulic fracturing fluids, the integrity of stimulation wells and the monitoring of wells and water quality.

One of the conditions I have stated requires the proponent to undertake a detailed stimulation risk assessment for each well that will be stimulated, prior to stimulation activities at that well.

I have also stated a condition that requires the proponent to monitor relevant bores monthly for the first six months subsequent to the stimulation activities being undertaken. Following this, the proponent is required to monitor relevant bores annually for the first five years subsequent to the stimulation activities, or until specified analytes and physico-chemical parameters are not detected in concentrations above baseline bore monitoring data on two consecutive monitoring occasions.

I have further stated a condition requiring the internal and external mechanical integrity of GFD project wells prior to and during hydraulic fracturing, so that there is no significant leakage or fluid movement into another aquifer.

Decommissioning bores

The proponent has prepared a Decommissioning and Abandonment Management Plan which describes the management framework in place for when petroleum activities cease. The objectives of the plan include:

- ÿ the decommissioning of assets while complying with regulatory requirements and minimising the risk of environmental harm
- ÿ a landform that is stable and compatible with intended post-closure land use
- ÿ the beneficial re-use of infrastructure to third parties, where an agreement has been signed by both parties and regulatory authorities are in accord.

Monitoring of groundwater under the Water Act

As discussed in section 5.5.1 of this report, Chapter 3A of the *Water Act 2000* (Qld) established OGIA which has powers to oversee the groundwater impacts of the petroleum and gas industry. OGIA carries out the functions specified in Chapter 3 of the *Water Act 2000* (Qld) including the UWIR functions.

OGIA's powers include the ability to:

- ÿ require petroleum tenure holders to conduct integrated monitoring
- ÿ require petroleum tenure holders to implement other management measures such as a Spring Impact Management Strategy
- ÿ assign specific responsibilities of the management requirements to individual petroleum tenure holders.

DEHP administers Chapter 3 of the *Water Act 2000* (Qld) and has the powers to investigate and enforce compliance by tenure holders with monitoring obligations established under the UWIR.

Impacts from current and planned CSG development on groundwater levels are assessed by OGIA through the use of a regional groundwater flow model. Under the Queensland regulatory framework, OGIA progressively updates the model to incorporate new knowledge about the groundwater flow system.

Using the model output and other information, OGIA assesses the long-term risk to GDEs and specifies in UWIRs the requirements of petroleum tenure holders for more detailed assessment and monitoring at sites. Among other statutory requirements in Chapter 3 of the *Water Act 2000* (Qld), the UWIRs must contain specific details on predicted groundwater impacts, a water monitoring strategy, a spring impact management strategy, and the proposed responsible tenure holder who must comply with any make-good obligations for water bores.

The Surat UWIR sets out such assessments and management arrangements for the Surat CMA, including the assignment of a proposed responsible tenure holder for each obligation. The Surat UWIR also requires that petroleum tenure holders evaluate the options for avoiding or mitigating the predicted pressure impact in the source aquifer at the springs.

Through its statutory powers, OGIA collects groundwater information in CMAs and updates the UWIRs every three years, including the specification of any requirements for further assessment and management actions at sites. Outcomes from the OGIA's research projects are expected to be incorporated in a revised groundwater flow model which will be used to develop an updated Surat UWIR in December 2015.

The Surat UWIR, developed and updated by OGIA, focuses on potential impacts on artesian spring vent complexes and watercourse springs. These are considered to be the types of GDEs that could be at risk from large scale pressure reductions in GAB aquifers due to CSG-related groundwater extraction. The Surat UWIR provides for monitoring to be carried out and for detailed assessment of local groundwater flow behaviour at key sites.

Chapter 9 of the Surat UWIR identifies proponents' reporting obligations for water monitoring activities (which specified under chapter 7 of the Surat UWIR) and spring impact management activities (which are specified under chapter 8 of the Surat UWIR).

Chapter 7 of the Surat UWIR requires the water monitoring strategy, which consists of the following requirements, to be implemented by petroleum tenure holders:

- construction and maintenance of monitoring installations
- securing agreement about access to existing bores where necessary
- installing monitoring instrumentation
- the implementation and operation of a regional groundwater monitoring network
- the ongoing collection and reporting of:
 - water pressure and water quality data

- water production data from petroleum and gas wells
- water quality and bottom hole pressures in selected CSG wells

• reporting data and progress on implementation on a six-monthly basis.

DEHP is the administering authority responsible for ensuring that petroleum tenure holders comply with the above responsibilities. The OGIA interacts with petroleum tenure holders to track the progress of monitoring network implementation, analyse monitoring data and provide annual reports to the UWIR.

The spring monitoring program under chapter 8 of the Surat UWIR is directed at identifying changes in the volume and chemistry of water flowing to a spring, and any changes to the general character of springs. Chapter 8 of the Surat UWIR identified spring sites for which petroleum tenure holders are required to undertake quarterly monitoring and report results every six months.

For each of the sites listed in Table H-8 within Appendix H-5 of the Surat UWIR, an Evaluation of Mitigation Options Report is to be prepared by the responsible tenure holder. The Evaluation of Mitigation Options Report must meet the following requirements:

- evaluate the options for mitigating impacts on water pressures in the source aquifer for any identified spring
- discuss the advantages and disadvantages of each of the options and their relative viability for the specified spring complex
- identify the option or combination of options that are the preferred approach for mitigating impacts at the site, including the rationale for the proposed option
- identify a program to assess local hydrogeology at the site to provide increased certainty with regard to the spring's source aquifer and improve the understanding of the relationship between reductions in water pressure in the source aquifer and the flow of water to the spring.

Coordinator-General's conclusions

To ensure that groundwater quality is effectively managed, I have stated conditions requiring the proponent to conduct baseline bore and well assessments prior to hydraulic fracturing activities and to implement a seepage monitoring program.

Potential drawdown impacts are addressed by the statutory requirements in the Surat UWIR, which includes the requirement for the proponent to enter into make-good agreements with any potentially affected groundwater users where water levels are predicted to decline by more than 5m within three years of the UWIR.

As OGIA will progressively update the Surat UWIR every three years, I am confident that drawdown risks to groundwater users would be managed for the life of the GFD project. The ongoing updates to the Surat UWIR water monitoring strategy and spring impact management strategy ensure that potential impacts to GDEs would also be managed for the life of the GFD project.

Further, I have recommended to the Commonwealth Minister that the Department of the Environment impose conditions to address any groundwater impacts where those impacts are not addressed under state legislation.

I consider the impacts on groundwater resources are adequately addressed through the conditions I have stated and recommended, in conjunction with the significant requirements of the Surat UWIR and the proponent's proposed management and mitigation measures.

5.5.3 Surface water

Introduction

The GFD project lies within the Fitzroy River basin and the Condamine-Balonne River Basin across 6 major sub-catchments:

Ÿ Fitzroy River Basin:

- Upper Dawson River
- Lower Dawson River
- Comet River.

Ÿ Condamine-Balonne River Basin:

- Dogwood Creek
- Upper Balonne River Tributaries
- Amby Creek (tributary of Maranoa River).

The Fitzroy River Basin forms the largest river catchment flowing to the eastern coast of Australia. The Condamine –Balonne River catchment covers about 14% of the Murray-Darling Basin. The region is characterised by a variety of landscapes including steep hills and mountains, undulating hills, floodplain, creeks, riparian areas and townships. The north of the region is dominated by steep hills and mountains, which are connected to and are part of the Expedition Range. The terrain is undulating and dominated by grazing land in the east, and steep ridgelines are separated by creeks in the south. In the south, the region consists of rolling hills, small valleys and riparian areas.

Watercourses in this area are mostly ephemeral due to high evaporation rates and highly variable rainfall and runoff with the exception of the eastern portion of the Dawson River and parts of the Condamine River. Watercourses typically show moderate to high levels of impact from land clearing, stock access and removal of riparian vegetation in this area.

Land use changes in steep headwater catchments have exacerbated stream bank erosion, generating the movement of large volumes of sediment during high energy floods. Mid catchment watercourses show more lateral instability, anabranching and sediment deposition as well as higher levels of impact from existing land use activities that has resulted in significant stream bank and bed instability. Lower reaches of watercourses are located on broad alluvial floodplains and often contain features of lateral instability such as multiple active channels, high sinuosity and frequent meander

cut-offs. High energy flood events can cause rapid adjustments in channel morphology for most watercourses in the GFD project area. The sub-catchments studied to assess baseline surface water values in the GFD project area are shown in Figure 5.6.

Key issues raised in submissions on the EIS regarding potential impacts on surface water included:

- contamination of surface water resources
- release of coal seam water to surface waters
- impact of drawdown on surface water flows
- cumulative impacts of CSG development on surface water resources.

I have considered each submission and how the proponent has responded to the issues raised as part of my evaluation of the environmental impacts of the GFD project.

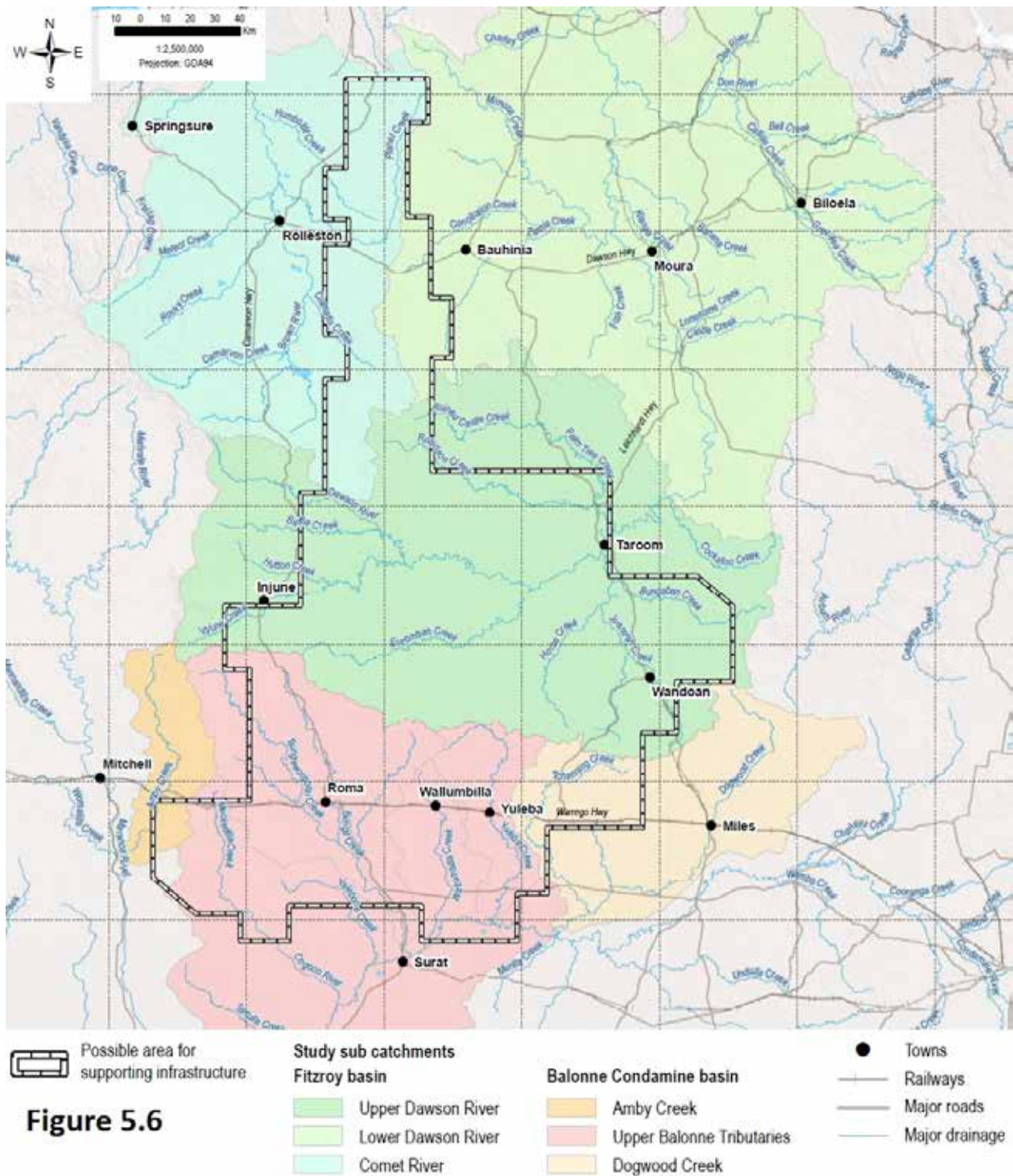


Figure 5.6 Sub-catchments studied in the GFD project area

Environmental values

Environmental values (EVs), defined under the Environmental Protection (Water) Policy 2009 (EPP Water), are available for the Upper Dawson River and Comet River catchments. For the Condamine and Balonne Rivers and their tributaries, EVs are not defined in the EPP Water; however, draft EVs have been recommended in the Healthy

Waters Management Plan (2012), produced by Queensland Murray-Darling Committee for use as a basis for developing water quality objectives (WQOs) These EVs are:

- ÿ aquatic ecosystems
- ÿ irrigation
- ÿ agriculture
- ÿ stock watering
- ÿ aquaculture
- ÿ human consumption
- ÿ primary recreation
- ÿ secondary recreation
- ÿ visual appreciation
- ÿ raw drinking water
- ÿ industrial use
- ÿ cultural and spiritual values.

An assessment of water entitlements and existing users within and downstream of the GFD project area was undertaken and found the following values were most sensitive:

- ÿ livestock water
- ÿ impound water (e.g farm dams; fire-fighting water supply)
- ÿ domestic supply
- ÿ water harvesting
- ÿ industrial use
- ÿ town water supply.

The following water-related ecological assets were identified within the GFD project area including:

- ÿ aquatic ecosystems; which include watercourses, lakes and wetlands
- ÿ springs; which includes both vent complexes and watercourse springs
- ÿ groundwater dependent ecosystems.

Water quality

Physiochemical characterisation of the water quality throughout the GFD project area was undertaken by analysing data collected by the proponent and from secondary sources which included other studies undertaken within the project area. The results were compared with guideline values derived from the Upper Dawson and Lower Dawson sub-basin WQOs and the ANZECC regional guidelines to determine appropriate WQOs for the GFD project.

The assessment identified trends regarding consistent exceedances of the water quality parameters considered to be most sensitive to additional inputs to the receiving environment as a result of GFD project activities. These include:

- ÿ elevated levels of dissolved oxygen in most sub-catchments

- elevated levels of chromium, copper, lead and zinc in the majority of sub-catchments
- elevated levels of total nitrogen, oxidised nitrogen, reactive and total phosphorus in the majority of sub-catchments
- elevated levels of ammonia throughout the Upper Dawson River
- a connection between low flow conditions and elevated EC levels
- alkaline pH in throughout the Comet and upper Dawson River sub-catchments, neutral pH in the Upper Balonne River tributaries and slightly acidic pH in Dogwood Creek.

The assessment found existing water quality guidelines are generally appropriate; however, site-specific guidelines may need to be re-assessed for some parameters once more accurate baseline conditions have been established through ongoing monitoring.

Wetlands

Lake Murphy and part of the Palm Tree and Robinson Creek wetland complex located in the Lake Murphy Conservation Park are listed as nationally important wetlands. High Ecological Value wetlands either entirely or partially within the GFD project area have been identified in tributaries of the Upper Balonne River, Upper Dawson River, Humboldt Creek and Comet River. Using the Queensland Wetland Classification Method, the EIS identified:

- 476 wetland areas covering approximately 43,187ha within Upper Balonne Tributaries catchment
- 670 wetland areas covering approximately 79,150ha within the Upper Dawson River catchment
- 127 wetland areas covering approximately 10,557ha within the Comet River
- 21 wetland areas covering around 375ha within Amby Creek
- 83 wetland areas covering around 4,924ha as part of Dogwood Creek
- 68 wetland areas covering approximately 7,582ha within the Lower Dawson River

These areas include palustrine wetlands, lacustrine wetlands, artificial or modified wetlands such as farm dams and irrigation channels, riverine wetlands, floodplain swamps and Melaleuca and Eucalypt tree swamps.

Assessment methodology

The surface water assessment considered the fluvial geomorphology, hydrology and water quality characteristics of the GFD project area to enable a comparison with guideline values and determine appropriate WQOs. A significance methodology was then used to assess the magnitude of potential impacts on the underlying environment and the sensitivity of environmental values that may be affected. The following classification was used to define the significance of potential impacts:

- Y major significance: where widespread harm is caused to an EV that is irreversible and irreplaceable. Avoidance through appropriate design responses is the only effective mitigation
- Y high significance: where an activity exacerbates threatening processes affecting the character and structure of an EV. Replacement of unavoidable losses is possible although avoidance through appropriate design responses is preferred
- Y moderate significance: where a reasonably resilient EV would be further impacted due to the scale of the impact and replacement of the EV is achievable
- Y low significance: where an activity would not adversely affect the viability of an EV provided environmental controls are implemented
- Y negligible significance: where an impact would not result in any noticeable change in its intrinsic value, usually.

Impacts

The EIS identified the potential impacts on surface water resources from GFD project activities during the construction, operational and decommissioning phases as:

- Y increased sedimentation within watercourses
- Y erosion of stream banks
- Y decreased water quality
- Y contamination of surface water
- Y altered surface water flow regimes
- Y altered geomorphic character.

Mitigation measures

As the location and form of GFD project infrastructure is determined through ongoing field assessment and evaluation, the constraints planning process would play a significant role in mitigating potential impacts on surface water values. Constraints related to surface water and the GFD project activities permitted for each level of constraint are shown in Table 5.20.

Table 5.20 Surface water-related constraints

Level of constraint	Constraint type	Permitted activities
No-go area	Category A environmentally sensitive areas including national parks, conservation parks and forest reserves (<i>Nature Conservation Act 1992</i>). EPBC Act listed spring vents and complexes, including primary 200m buffer. Wetlands of national importance, including 200m buffer. Wetlands of high ecological significance or high conservation value as detailed in the Map of Referrable Wetlands dataset (Qld).	No petroleum activities are permitted
Surface development exclusion zone	Primary 200m buffer for Category A environmentally sensitive areas.	Only low-impact petroleum activities

Level of constraint	Constraint type	Permitted activities
	Declared catchment areas as per <i>Water Act 2000</i> (Qld) (Category C environmentally sensitive area). Ramsar sites listed as wetlands of international importance (Category B environmentally sensitive area).	are permitted
High constraint area	Watercourses, including 100m buffer. Wetland defined as 'general ecologically significant wetland' or 'wetland of other environmental value'. Spring vents and complexes (not protected under EPBC Act), including primary 200m buffer.	Low-impact petroleum activities and linear infrastructure are permitted
Moderate constraint area	Secondary 100m buffer for Category A environmentally sensitive areas. Secondary 100m buffer for EPBC Act spring vents and complexes. MNES including habitats, TECs and flora species. Endangered REs including primary 200m buffer.	Low-impact petroleum activities, linear infrastructure and limited petroleum activities are permitted
Low constraint area	No concern at present REs. Existing Santos GLNG infrastructure. Existing road, rail, pipeline and other infrastructure. Remaining areas once other constraints have been applied	All petroleum activities are permitted

The proponent has outlined measures for all project phases to mitigate potential impacts on surface water resources. The measures would be implemented through a management framework comprised of the following documents:

- constraints protocol
- Water Resource Management Plan
- Draft Environmental Management Plan
- Erosion and Sediment Control Management Plan
- Land Release Management Plan
- Decommissioning and Abandonment Management Plan
- Chemical and Fuel Management Plan.

Specific management measures within these documents include:

- diverting stormwater run-off around disturbed areas such as stockpiles and waste storage areas
- installing lateral catch drains and flow diversion banks to minimise rill erosion

- ÿ installing velocity control and energy dissipation structures to reduce flow velocity in channels and at the outlets of banks and drains
- ÿ lining channels with scour resistant materials
- ÿ managing water application rates to prevent run-off
- ÿ managing the intensity of use of coal seam water for dust suppression with preference for lighter, more frequent application over less frequent, heavier application
- ÿ installing spill kits appropriate for the types of stored chemicals, fuels and classes of dangerous goods
- ÿ engineering chemical and fuel containment systems in accordance with relevant Australian Standards with impermeable bases and located away from stormwater drains, pits and surface waters
- ÿ ensuring that the quality of coal seam water complies with relevant regulatory water quality requirements and is 'fit for purpose'
- ÿ managing brine and solid salts in accordance with the *Coal Seam Water Management Policy* (DEHP 2012).

Conditions regarding regulated structures, including dam design, monitoring and reporting requirements will be applied through EAs for relevant GFD project tenures. Conditions must consider the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* where warranted by the consequence category of the structure.

Water released to land for disposal or re-use would be generated by GFD project activities including coal seam water extraction, low point drain condensate, hydrostatic test water and treated sewage effluent. The controlled application to land will be managed in accordance with the Land Release Management Plan, provided with the EIS, to ensure potential impacts on agricultural productivity, ecosystem health and human health are managed to acceptable limits and to allow for the beneficial re-use of waters where possible. To ensure this, I have stated conditions for inclusion in a draft EA requiring any release of water to land achieve the following outcomes:

- ÿ vegetation is not damaged
- ÿ soil quality is not adversely impacted
- ÿ there is no surface ponding or runoff to waters
- ÿ there is no aerosols or odours
- ÿ deep drainage below the root zone of any vegetation is minimised
- ÿ the quality of shallow aquifers is not adversely affected.

Monitoring

Monitoring of surface waters would be undertaken in accordance with the requirements of relevant approvals. The approvals include EA conditions and beneficial use approvals for authorised releases of coal seam water to land for activities such as irrigation. Indicative parameters, locations and frequencies for surface water monitoring have been described in the EIS for the construction and operational phases of the GFD

project. I have stated conditions for a draft EA requiring surface water sampling to be undertaken by a suitably qualified person in compliance with the methods set out in the *Queensland Monitoring and Sampling Manual*.

Authorised releases of coal seam water to surface waters have not been sought by the proponent through the EIS. The GLNG project has an approved scheme for the release of treated coal seam water to the Dawson River, which would potentially be utilised for coal seam water produced by wells assessed as part of the GFD project. If increased releases or additional release schemes are required in the future, the proponent must seek approval through an EA application similar to the process undertaken for the Dawson River release scheme. Such an approval would outline programs to monitor, identify and any describe potential adverse impacts on surface water environmental values, quality and flows. Water quality objectives would need to be set for water quality parameters and specified in an EA. The WQOs would be derived from published water quality guidelines for identified EVs for the relevant catchment and from baseline water quality data collected from the receiving environment.

For the existing Dawson River release scheme, the proponent must develop a Receiving Environment Monitoring Program to monitor, identify and describe any adverse impacts on surface water EVs resulting from the authorised release of coal seam water in accordance with current EA conditions and the *Receiving environment monitoring program guideline* (DEHP 2014).

Residual impacts

The EIS assessed residual impacts on surface water resources after mitigation measures had been implemented by using a significance assessment methodology. If an impact were to occur, the methodology considered the following aspects to determine the residual significance of the impact:

- the perceived sensitivity and/or vulnerability of relevant EVs to development activities
- the magnitude of a potential impact based on the sensitivity of EVs
- significance of potential impacts as a function of sensitivity and magnitude
- mitigation measures that could reduce the significance of impacts
- the residual significance of impacts following implementation of mitigation measures.

The results are shown in Table 5.21.

Table 5.21 Significance of residual impacts on surface water environmental values

Potential impact	Residual significance		
	Construction	Operation	Decommissioning
Increased sedimentation	Low	Low	Low
Decreased water quality	Low	Low	Low
Contamination of surface water	Moderate	Moderate	Low
Altered surface water flow regimes	Moderate	Low	Low
Altered geomorphic character	Low	Low	Low

Cumulative impacts

The cumulative impact of resource development has the potential to affect downstream environmental flows and surface water quality. The degree to which cumulative impacts would be realised is dependent on factors including:

- the reduction in catchment areas from GFD project development
- the application of constraints planning to avoid development in and near watercourses
- erosion and sediment controls to minimise sedimentation of watercourses
- optimising the beneficial reuse of coal seam water
- progressive rehabilitation of disturbed areas no longer required by resource projects.

I am satisfied the mitigation measures described in the EIS can adequately manage the contribution of potential impacts of the GFD project to the cumulative impact of gas extraction activities on surface water resources in and downstream of the GFD project area.

Coordinator-General’s conclusion

I am satisfied that the EIS has adequately identified the potential impacts on surface waters for all stages of the GFD project and the proposed management framework and mitigation measures can minimise these impacts.

Regulation of activities with the potential to impact surface water resources will be undertaken through the conditions of the EA. To ensure potential impacts are minimised, I have stated conditions for inclusion in the relevant EAs to protect surface water resources. The stated conditions address monitoring requirements, works in watercourses, wetlands and floodplains, releases of contaminants to waters and uses of produced water from CSG extraction activities.

In addition, I have recommended a condition of approval to the Commonwealth Minister for the Environment to impose conditions to address any potential impacts on surface water resources where those impacts are not regulated under State legislation. My recommended condition also requires any release of coal seam water to surface water to be authorised by an EA.

5.6 Ecologically sustainable development

I have assessed the GFD project in accordance with the principles of ecologically sustainable development, defined in section 3A of the EPBC Act as:

- Y the integration principle: decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- Y the precautionary principle: if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- Y the inter-generational equity principle: the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- Y the biodiversity principle: the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making
- Y the valuation principle: improved valuation, pricing and incentive mechanisms should be promoted.

The EIS examined the short-term and long-term environmental, economic and social considerations of the GFD project and adopted a precautionary approach based on the assessment of a maximum development scenario. Both the TOR and draft EIS were released for comment by advisory agencies and the public. All submissions received during these comment periods have been considered in this evaluation.

Conservation of biodiversity and ecological integrity will be managed for the construction, operation and decommissioning phases by implementing the mitigation measures described in the management framework proposed in the EIS. As the location of GFD project infrastructure components is not yet known, the management framework and constraints planning process will provide greater certainty about potential impacts by identifying areas suitable for development and the types of development appropriate for those areas.

Where significant residual impacts on protected environmental values are unavoidable, an offset commensurate with the potential impact will be required. To ensure this, I have stated a condition for inclusion in the EAs requiring the proponent to submit an offset plan detailing how any offset obligations for matters of state and national environmental significance will be acquitted.

I am satisfied the development and assessment methodology described in the EIS will ensure that any potential impacts on the controlling provisions are not unacceptable. Potential impacts of the GFD project will be managed through EAs administered by DEHP including the conditions stated in Appendix 1. These conditions and my recommendations to the Commonwealth Minister for the Environment support protecting the environment for future generations, allowing for the sustainable development of the GFD project.

5.7 Coordinator-General's conclusion

I have reviewed all of the EIS documentation provided and I am satisfied that the proponent has adequately assessed potential impacts on the controlling provisions under the EPBC Act as a result of the GFD project. The EIS has had regard to relevant conservation advices, recovery plans and threat abatement plans. The proponent has provided a management framework describing management and monitoring measures to ensure any potential impacts are appropriately managed. My conditions and recommendations outlined in Appendix 1 and Appendix 2 will ensure that the requirements of the EPBC Act are met.

I consider that the requirements of the bilateral agreement have been satisfied. Based on my conclusions for each of the controlling provisions, I am satisfied that the GFD project would not result in unacceptable impacts on MNES.

6. Evaluation of environmental impacts

6.1 Matters of state environmental significance

This section assesses potential impacts on matters of state environmental significance (MSES). Potential impacts on MSES that are also protected under the EPBC Act are addressed in section 5 of this report.

Key issues raised in submissions on the EIS regarding potential impacts on MSES included:

- the field survey effort
- the constraints framework and location of infrastructure
- proliferation of weed species
- alteration of fire regimes
- landscape connectivity and fragmentation of biodiversity corridors
- cumulative impacts of CSG development
- impacts on threatened species and habitat.

I have considered each submission and how the proponent has responded to the issues raised as part of my evaluation.

The methodology of assessment involved desktop and field assessments, likelihood of occurrence analysis and habitat and disturbance modelling. The methodology is described in section 5.1 of this report. MSES found within the GFD project area are:

- protected areas
- threatened species
- special least-concern species
- regulated vegetation
- areas of essential habitat for threatened species

- Y REs that intersect with watercourses and wetlands
- Y wetlands of 'high ecological significance'
- Y watercourses in 'high ecological value waters'.

Vegetation communities

Much of the GFD project area has been cleared for agricultural purposes and contains non-remnant vegetation. Vegetation in areas not previously cleared generally remains in good condition and can be found in large tracts in the Arcadia and Fairview gas fields. Smaller patches tend to be subject to higher levels of weed invasion, edge effects and disturbances from grazing. Approximately 315,614ha (30 per cent) of the GFD Project tenures are mapped as supporting remnant vegetation.

The level of protection accorded to remnant vegetation is aligned to the biodiversity status of the REs. Of the REs mapped within the GFD project area, 29,333ha is 'endangered', 46,650ha is 'of concern' and 235,573ha is classed as 'no concern at present' in terms of biodiversity status. These areas support 42 'endangered' and 53 'of concern' REs.

REs with a biodiversity status of 'endangered' or 'of concern' are defined as a 'moderate constraint area' in which only limited and low-impact petroleum activities and linear infrastructure activities are permitted with a 200m protection buffer around these REs.

Non-remnant vegetation, high-value regrowth and REs with a biodiversity status of 'no concern at present' are considered 'low constraint areas' in which a wider range of petroleum activities are permitted following the application of standard mitigation measures to manage indirect impacts. A description of the activities permitted in each of the constraint areas is provided in section 5.1 of this report.

Threatened flora

The likelihood of occurrence assessment found 73 threatened flora species are known to occur within the GFD project area. The assessment considered the availability of suitable habitat, specimen-backed records and field assessments undertaken for the EIS. Table 6.1 lists the 54 threatened flora species, protected under the (NC Act) and known to occur in the GFD project area that are not protected under the EPBC Act.

Table 6.1 NC Act listed threatened flora species

Scientific name	Common name	NC Act status	Likelihood of occurrence
<i>Cerbera dumicola</i>	–	Near threatened	Known
<i>Livistona fulva</i>	Tablelands palm	Near threatened	Known
<i>Livistona nitida</i>	Carnarvon fan palm	Near threatened	Known
<i>Cymbonotus maidenii</i>	Darling daisy	Endangered	Known
<i>Picris barbarorum</i>	Plains picris	Vulnerable	Known
<i>Rutidosis crispata</i>	–	Vulnerable	Known
<i>Rutidosis glandulosa</i>	–	Near threatened	Known

Scientific name	Common name	NC Act status	Likelihood of occurrence
<i>Rutidosia lanata</i>	–	Endangered	Known
<i>Commersonia pearnii</i>	–	Endangered	Known
<i>Senna acclinis</i>	Rainforest cassia	Near threatened	Known
<i>Wahlenbergia islensis</i>	Cliff bluebell	Near Threatened	Known
<i>Apatophyllum teretifolium</i>	Sandstone prickly bush	Near threatened	Known
<i>Callitris baileyi</i>	Bailey's cypress	Near threatened	Known
<i>Cyperus clarus</i>	–	Vulnerable	Known
<i>Eleocharis blakeana</i>	–	Near threatened	Known
<i>Leucopogon grandiflorus</i>	Large-flowered beardheath	Near threatened	Known
<i>Bertya pedicellata</i>	–	Near threatened	Known
<i>Daviesia quoquoversus</i>	–	Vulnerable	Known
<i>Desmodium macrocarpum</i>	Large-podded trefoil	Near threatened	Known
<i>Zornia pallida</i>	–	Near threatened	Known
<i>Myriophyllum artesium</i>	Milfoil	Endangered	Known
<i>Plectranthus blakei</i>	–	Near threatened	Known
<i>Lysiana filifolia</i>	–	Near threatened	Known
<i>Acacia argentina</i>	–	Vulnerable	Known
<i>Acacia barakulensis</i>	Waajie wattle	Vulnerable	Known
<i>Acacia calantha</i>	Cracow wattle	Near threatened	Known
<i>Acacia islana</i>	Isla Gorge wattle	Vulnerable	Known
<i>Acacia spania</i>	Western rosewood	Near threatened	Known
<i>Acacia storyi</i>	–	Near threatened	Known
<i>Acacia tenuinervis</i>	–	Near threatened	Known
<i>Acacia wardellii</i>	Thomby Range wattle	Vulnerable	Known
<i>Calytrix islensis</i>	–	Vulnerable	Known
<i>Eucalyptus curtisii</i>	Plunket mallee	Near threatened	Known
<i>Eucalyptus pachycalyx</i> subsp. <i>waajensis</i>	Pumpkin gum	Endangered	Known
<i>Eucalyptus sideroxylon</i> subsp. <i>improcera</i>	–	Vulnerable	Known
<i>Homoranthus decasetus</i>	–	Near threatened	Known
<i>Melaleuca groveana</i>	Grove's paper-bark	Near threatened	Known
<i>Melaleuca irbyana</i>	Swamp tea-tree	Endangered	Known
<i>Melaleuca pearsonii</i>	–	Near threatened	Known
<i>Micromyrtus carinata</i>	Gurulmundi heathmyrtle	Endangered	Known

Scientific name	Common name	NC Act status	Likelihood of occurrence
<i>Micromyrtus patula</i>	–	Endangered	Known
<i>Ochrosperma obovatum</i>	–	Vulnerable	Known
<i>Sannantha brachypoda</i>	–	Near threatened	Known
<i>Notelaea pungens</i>	–	Near threatened	Known
<i>Chiloglottis longiclavata</i>	Northern wasp orchid	Near threatened	Known
<i>Pseudanthus pauciflorus</i>	–	Near threatened	Known
<i>Digitaria porrecta</i>	Finger panic grass	Near threatened	Known
<i>Sporobolus partimpatens</i>	–	Near threatened	Known
<i>Cryptandra ciliata</i>	Silky cryptandra	Near threatened	Known
<i>Solanum dissectum</i>	–	Endangered	Known
<i>Solanum elachophyllum</i>	–	Endangered	Known
<i>Solanum papaverifolium</i>	–	Endangered	Known
<i>Solanum stenopterum</i>	–	Vulnerable	Known
<i>Thelypteris confluens</i>	Swamp fern	Vulnerable	Known

Areas supporting threatened flora species protected under either the NC Act or EPBC Act are classed as a 'moderate constraint'.

Where essential habitat has been mapped for flora species protected under the NC Act, these areas also form a moderate constraint in which only linear infrastructure, low-impact and limited petroleum activities are allowed with a 200m buffer. Essential habitat for protected flora species has been mapped in in the GFD project area for the following species: *Eucalyptus beaniana*; *Xerothamnella herbacea*; *Calytrix islensis*; *Acacia islana*; *Melaleuca irbyana*; *Eriocaulon carsonii* subsp. *Orientalis*; *Homopholis belsonii*; *Picris barbarorum*; *Solanum papaverifolium* and *Cadellia pentastylis*.

Threatened fauna

The likelihood of occurrence assessment found 33 threatened fauna species are known to occur within the GFD project area. The assessment considered the presence of suitable habitat, specimen backed records and results of field surveys undertaken for the EIS. Table 6.2 lists the 23 threatened fauna species in the GFD project area protected by State legislation that are not protected under the EPBC Act.

Table 6.2 NC Act listed threatened fauna species

Scientific name	Common name	NC Act status	Likelihood of occurrence
Amphibians			
<i>Litoria cooloolensis</i>	Cooloola tree frog	Near threatened	Low
<i>Cyclorana verrucosa</i>	Rough frog	Near threatened	Known
Lepidoptera			
<i>Jalmenus eubulus</i>	Pale imperial hairstreak butterfly	Vulnerable	Known
Birds			
<i>Melithreptus gularis</i>	Black-chinned honeyeater	Near threatened	Known
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	Near threatened	Known
<i>Nettapus coromandelianus</i>	Cotton pygmy-goose	Near threatened	Known
<i>Stictonetta naevosa</i>	Freckled duck	Near threatened	Known
<i>Calyptorhynchus lathami</i>	Glossy black-cockatoo	Vulnerable	Known
<i>Accipiter novaehollandiae</i>	Grey goshawk	Near threatened	Known
<i>Lophochroa leadbeateri</i>	Major Mitchell's cockatoo	Vulnerable	Known
<i>Grantiella picta</i>	Painted honeyeater	Vulnerable	Known
<i>Ninox strenua</i>	Powerful owl	Vulnerable	Known
<i>Lophoictinia isura</i>	Square-tailed kite	Near threatened	Known
<i>Neophema pulchella</i>	Turquoise parrot	Near threatened	Known
Mammals			
<i>Chalinolobus picatus</i>	Little-pied bat	Near threatened	Known
Reptiles			
<i>Paradelma orientalis</i>	Brigalow scaly-foot	Vulnerable	Known
<i>Pseudechis colletti</i>	Collett's snake	Near threatened	Moderate
<i>Acanthophis antarcticus</i>	Common death adder	Near threatened	Known
<i>Tympanocryptis pinguicolla</i>	Darling Downs earless dragon	Endangered	Known
<i>Tympanocryptis tetraporophora</i>	Eyrean earless Dragon	Endangered	Moderate
<i>Strophurus taenicauda</i>	Golden-tailed gecko	Near threatened	Known
<i>Hemiaspis damelii</i>	Grey snake	Endangered	Known
<i>Aspidites ramsayi</i>	Woma	Near threatened	Known

Areas supporting threatened fauna species protected under either the NC Act or EPBC Act are classed as a moderate constraint.

Essential habitat for fauna species protected under the NC Act has been mapped in the Arcadia, Roma and Scotia gas fields. Areas mapped as essential habitat are also classed as moderate constraint areas in which only linear infrastructure, low-impact and limited petroleum activities are allowed, with a 200m buffer protection zone.

Essential habitat has been mapped for the following species: *Chalinolobus dwyeri* (Large-eared pied bat), *Delma torquata* (Collared delma), *Geophaps scripta scripta* (Squatter pigeon), *Paradelma orientalis* (Brigalow scaly-foot), *Egernia rugosa* (Yakka skink), *Grantiella picta* (Painted honeyeater), *Jalmenus eubulus* (Imperial hairstreak butterfly (northern subspecies)) and *Nyctophilus corbeni* (Greater long-eared bat).

With respect to the *Queensland Environmental Offsets Regulation 2014*, species listed as special least concern are defined as MSES. Special least concern species are the koala (*Phascolarctos cinereus*), short-beaked echidna (*Tachyglossus aculeatus*) and platypus (*Ornithorhynchus anatinus*), all of which have been recorded in the GFD project area.

Areas of koala habitat as per the Nature Conservation (Koala) Conservation Plan 2006 are classed as surface development exclusion areas in the constraints protocol in which only low-impact petroleum activities are permitted. A low-impact petroleum activity is one that does not result in clearing native vegetation or cause a significant disturbance to the soil profile.

With regard to platypus habitat, watercourses and a surrounding 100m buffer zone are classed as high constraint areas in which only low-impact petroleum activities and linear infrastructure are permitted following the implementation of specific mitigation measures.

The *Significant Residual Impact Guideline 2014* which supports the *Queensland Environmental Offset Policy 2014 Version 1.1* defines an action as likely to have a significant impact on a special least concern species if it will result in:

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

An offset for koala, platypus or echidna habitat may be required if disturbance from project activities meets this criteria.

The EIS described 11 broad fauna habitat types occurring within the GFD project area by grouping vegetation communities according to vegetation structure and composition and geomorphological features. The fauna habitat types and extent within the GFD project tenures is shown in Table 6.3.

Table 6.3 Fauna habitat types in the GFD project tenures

Habitat category	Corresponding REs	Total area (ha)
Mature eucalypt/corymbia woodland and forest	11.4.7, 11.4.8, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.9, 11.7.4, 11.7.6, 11.8.4, 11.8.5, 11.9.2, 11.9.7, 11.9.10, 11.10.1, 11.10.4, 11.10.7, 11.10.9, 11.10.11, 11.10.13	402,552
Mature riparian and floodplain Eucalypt/corymbia forest	11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.17, 11.3.18, 11.3.19, 11.3.25, 11.3.27, 11.3.28, 11.3.39	77,787
Mature dry rainforest (including semi-evergreen vine thickets)	11.4.1, 11.8.3, 11.9.4, 11.9.8, 11.10.8	9,214
Mature acacia woodlands	11.7.2, 11.9.6, 11.10.3	18,255
Mature brigalow forest	11.3.1, 11.4.3, 11.4.9, 11.7.1, 11.9.1, 11.9.5	28,479
Mature mulga woodlands	6.5.2, 11.5.13	3,509
Mature micromyrtus shrubland	11.5.18, 11.7.5	5,919
Wetlands and springs	11.3.25, 11.3.27, 11.3.2, 11.3.3, 11.3.1	5,451
Regrowth communities	All areas mapped as high value regrowth	40,210
Mature native grasslands	11.3.21, 11.8.11, 11.9.3	17,697
Non-native grasslands	Non-remnant and cleared areas	750,281

Note: Total habitat areas include a 25km buffer around GFD Project tenures. REs can correspond to more than one habitat category where mixed polygons have been mapped.

Protected areas

Protected areas located within the GFD project area are:

- ÿ Expedition National Park—approximately 63,558ha within the Arcadia and Fairview gas fields
- ÿ Humboldt National Park—approximately 7,445ha within the Arcadia gas fields
- ÿ Lake Murphy Conservation Park—approximately 520ha within the Scotia gas fields
- ÿ Carraba Conservation Park—approximately 49ha within the Scotia gas fields.

National parks and conservation parks are defined as no-go areas in the constraints protocol in which no petroleum activities are permitted. A surface development exclusion area extends to a 200m buffer around these areas in which only low-impact petroleum activities are permitted. Low-impact activities do not result in vegetation clearing or disruption of the soil profile and are described in section 5.1 of this report.

Wetlands

The GFD project area supports major watercourses, riverine wetlands, floodplains and palustrine wetlands and lacustrine wetlands. Farm dams and artificial wetlands are prevalent throughout the region. Most of the natural wetland areas are ephemeral and

associated with major watercourse and floodplains. Approximately 5,451ha of referable wetlands have been mapped within the GFD project tenures.

Lake Murphy in the Scotia gas field is one of the larger wetland areas in the GFD project area and provides important refuge habitat. Lake Murphy is entirely contained within the Lake Murphy Conservation Park—a Category A Environmentally sensitive area—and is classed as a no-go area for development in the constraints protocol.

Wetlands of national importance and a surrounding 200m buffer are also no-go areas. Wetlands mapped as high ecological significance or high conservation value on the Map of Referable Wetlands form no-go areas, according to the constraints protocol. Wetlands defined as ‘general ecologically significant’ or a ‘wetland of other environmental value’ under the Map of Referable Wetlands are classed as high-constraint areas.

Weed and pest species

Weed and pest species, declared under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act), recorded in the GFD project area, are shown in Tables 6.4 and 6.5 respectively.

Table 6.4 Weed species identified in the GFD project area

Species name	Common name	LP Act status
<i>Parthenium hysterophorus</i>	Parthenium	Class 2
<i>Harrisia martini</i>	Harrisia cactus	Class 2
<i>Opuntia aurantiaca</i>	Tiger pear	Class 2
<i>Opuntia stricta</i>	Prickly pear	Class 2
<i>Opuntia tomentosa</i>	Velvety tree pear	Class 2
<i>Acacia nilotica</i>	Prickly acacia	Class 2
<i>Lycium ferocissimum</i>	African boxthorn	Class 2
<i>Tamarix aphylla</i>	Athel pine	Class 3

Table 6.5 Pest species identified in the GFD project area

Species name	Common name	LP Act status
<i>Felis catus</i>	Cat	Class 2
<i>Canis lupus dingo</i>	Dingo	Class 2
<i>Canis lupus familiaris</i>	Dog	Class 2
<i>Oryctolagus cuniculus</i>	European rabbit	Class 2
<i>Sus scrofa</i>	Feral pig	Class 2
<i>Capra hircus</i>	Goat	Class 2
<i>Vulpes vulpes</i>	Red fox	Class 2

Declared pests can cause economic, environmental and social impacts. Management of pest species requires coordination and is subject to programs led by local government, community or landowners. Under the LP Act, landholders are obliged to control Class 2 pests on their land.

Class 3 pests are those that are already established in Queensland. The purpose of the declaration of a Class 3 pest is to prevent the further spread of these pests into new areas. Landholders are not required to control Class 3 pests unless their land is adjacent to an environmentally significant area and they are issued with a pest control notice.

The proponent has developed a Pest and Weed Management Plan (PWMP) for the GFD project area describing measures to control and/or eradicate weed and pest species including:

- isolating infestations to prevent further spread and establishing quarantine zones
- implementing best practice control measures in accordance with Queensland Biosecurity guidelines, Santos GLNG procedures and landholder requests
- limiting movement into or out of areas of infestation
- enforcing vehicle and equipment wash down requirements
- maintaining access tracks to be free of declared or significant weed species to avoid accidental contamination of vehicles and machinery
- monitoring controlled infestations for response to controls.

The proponent has committed to review the local government's weed and pest management plans and apply measures from these to the PWMP where appropriate.

Impacts

The EIS modelled potential direct impacts on ecological values based on a maximum development scenario of 6,100 production wells and associated infrastructure. The modelling methodology is described in section 5.1 of this report. Potential impact areas, shown in Table 6.6, were calculated using the Land Probabilistic Disturbance Model and before avoidance measures have been implemented. I expect that residual impacts would be further reduced during field development planning as opportunities for site selection are considered.

Table 6.6 Predicted maximum disturbance areas

Ecological receptor	GFD project maximum disturbance area (ha)
Endangered vegetation (REs and high value regrowth) (biodiversity status)	740
Of-concern vegetation (REs and high value regrowth) (biodiversity status)	2,240
Essential habitat	95
Wetlands (general ecological significance)	144
Resource reserves	252
State forest and timber reserves	1,567

The EIS identified potential impacts on terrestrial ecological values associated with all project phases including:

- habitat loss and degradation
- fauna injury or mortality from vehicle strikes or entrapment in structures and excavations
- compaction of soil resources
- invasion of weed and pest species and displacement of native species
- reduced connectivity of biodiversity corridors
- habitat fragmentation, edge effects and barrier effects
- disturbances from noise, dust and light.

Mitigation

The constraints protocol is the key tool to enable the avoidance, minimisation and mitigation of potential impacts on MSES associated with all gas field activities. Locations for project infrastructure would be selected during detailed field planning phases to avoid direct or indirect impacts where reasonable and practicable in accordance with the constraints protocol. More detail on the constraints protocol can be found in section 5.1 of this report. The EIS contains a management framework outlining mitigation measures for potential impacts comprised of the following documents:

- Draft Environmental Management Plan
- Fauna Management Plan
- Significant Species Management Plan
- Rehabilitation Management Plan
- Decommissioning and Abandonment Plan
- Pest and Weed Management Plan
- Offsets Strategy.

Key measures to mitigate potential impacts on MSES described in this framework include:

- Y establishing 100m exclusion zones around identified active breeding places for threatened fauna
- Y establishing exclusion zones around individual plants and/or patches of plants immediately adjacent to disturbances
- Y timing construction works to avoid threatened bird breeding periods
- Y pre-clearance surveys, monitoring of clearing activities and relocation of fauna to undisturbed areas by licensed spotter-catchers
- Y employing sequential clearing methods to direct escaping wildlife away from clearing activities into adjacent habitat areas
- Y marking out disturbance areas prior to and for the duration of clearing activities
- Y retaining microhabitat features and moving them to adjacent undisturbed areas where possible
- Y implementing traffic controls such as speed limits near sensitive areas and limiting access to designated tracks
- Y directing lighting away from sensitive environmental areas and employing engineering solutions to reduce light spillage
- Y installing temporary exclusion fencing around excavated trenches
- Y undertaking fire management and response activities in accordance with the Santos GLNG Bushfire Management Plan and in consultation with local authorities
- Y implementing weed and pest management measures
- Y rehabilitating or offsetting disturbed areas.

Aquatic ecology

The GFD project area lies within the catchment areas of the Dawson River, Comet River and the Condamine-Balonne River. These catchments contain watercourses, wetlands and springs supporting habitat for aquatic flora and fauna. Watercourses within the GFD project area are predominantly ephemeral and generally in moderate-to-poor condition due to clearing and cattle grazing activities which have disturbed the banks of streams and degraded embankments.

The aquatic ecology assessment involved a desktop assessment including review of surveys undertaken by the proponent and other resource operators and review of relevant databases. A catchment characterisation assessed aquatic habitat and the condition of waterways and wetlands with consideration given to bank stability, channel diversity, in-stream habitat, aquatic flora, macroinvertebrates, fish and turtles. A targeted survey for the Boggomoss snail was also undertaken.

The EIS found a total of 47 aquatic flora species have been recorded in the GFD project area, of which 5 are exotic and 42 are native. A likelihood-of-occurrence assessment found 26 fish species are known to occur within the catchments of the GFD project area. This included the common carp (*Cyprinus carpio*) and mosquito fish (*Gambusia* spp.) which are declared noxious species under the *Fisheries Regulation*

2008. A further 12 fish species are considered likely to occur within the GFD project area.

Aquatic species protected under the NC Act potentially occurring in the GFD project area are:

- ÿ *Myriophyllum artesium* (Artesian milfoil)—listed as endangered
- ÿ *Eleocharis blakeana*—listed as near threatened
- ÿ *Fimbristylis vagans* (Wandering fringe-rush)—listed as near threatened.

The white-throated snapping turtle (*Eiseya albagula*), listed as least concern under the NC Act, is a high priority species under Queensland's Back on Track species prioritisation framework. It is known to inhabit springs in the GFD project area and could also occur in major watercourses and wetlands.

Impacts and mitigation

The EIS identified potential impacts on aquatic environmental values from:

- ÿ inadvertent sediment release to water
- ÿ inadvertent chemical release to water
- ÿ altered flow regimes
- ÿ disturbance of stream channels and associated habitat
- ÿ a loss of abundance and diversity of riparian vegetation and aquatic biota.

Avoidance of impacts in accordance with the constraints protocol is the primary method of protecting aquatic environmental values. Relevant constraints include the following which are all classed as high constraint areas in which only linear infrastructure and low-impact activities are permitted:

- ÿ mapped watercourses (stream orders) plus a 100m buffer
- ÿ general ecologically significant wetlands
- ÿ wetlands of other environmental value (as determined on the Map of Referable Wetlands)
- ÿ spring vents and spring complexes plus a 200m primary buffer.

The following management plans describe measures to mitigate potential impacts of the GFD project on aquatic ecological values:

- ÿ Chemical and Fuel Management Plan
- ÿ Contingency Plan for Emergency Environmental Incidents
- ÿ Decommissioning and Abandonment Management Plan
- ÿ Draft Environmental Management Plan
- ÿ Erosion and Sediment Control Management Plan
- ÿ Fauna Management Plan
- ÿ Land Release Management Plan
- ÿ Rehabilitation Management Plan
- ÿ Significant Species Management Plan

ÿ Water Resource Management Plan.

Mitigation measures described in the plans include:

- ÿ avoiding clearing works in and around wetlands
- ÿ avoiding deep pools and river sandbanks likely to be suitable breeding places where watercourse and wetland crossings are required
- ÿ implementing a monitoring regime to identify and describe the condition of receiving environments resulting from the release of treated coal seam water
- ÿ identifying and implementing site-specific drainage controls such as:
 - diversion of up-slope stormwater runoff around disturbed areas such as stockpiles and waste storage areas
 - installation of lateral catch drains or flow diversion banks to minimise rill erosion especially associated with linear infrastructure
 - lining channels with scour resistant material such as erosion control matting or rock lining
 - use of energy dissipation structures at the outlets of banks, drains and chutes
- ÿ avoiding clearance of mature trees within 200m of a wetland and/or watercourse
- ÿ installing fauna passage devices such as pipes to allow the movement of fish and other aquatic fauna when crossings are required for access.

Offsets

The *Environmental Offsets Act 2014* (EO Act) provides a head of power for the environmental offsets framework in Queensland. The framework commenced progressively between May and December 2014 and describes the prescribed environmental matters and options for offset delivery. The EIS assessment was largely undertaken prior to commencement of the EO Act.

The EIS modelled potential residual impact areas for the ecological receptors shown in Table 6.6 above which does not consider all environmental matters prescribed in the current offsets framework. The proponent's assessment is presented in the Offset Strategy provided with the EIS, which also considers MNES related offsets likely to be required by the Commonwealth Minister for the Environment under the EPBC Act. The strategy proposes a staged approach to offset delivery that would be aligned to stages of field development activity.

The proponent has calculated that potentially 50,000ha of land would be required to meet offset obligations for proposed disturbances associated with the combined maximum development scenario of the approved GLNG project and the proposed GFD project. I note that the proponent has acquired properties supporting the values potentially requiring offsets and is investigating further options, including properties on tenure held by the proponent.

Section 5 of the EO Act provides that the EO Act does not affect or limit the powers of the Coordinator-General under the SDPWO Act. Accordingly, the Coordinator-General has the discretionary power to state conditions regarding offsets for inclusion in an EA for a coordinated project. Based on the information presented in the EIS, I have stated

a condition for inclusion in the EA requiring the proponent to prepare an offset plan. As the administering agency, DEHP must implement this condition. Any additional conditions imposed on the EA by DEHP must not be inconsistent with the stated offset condition.

The offset plan must be submitted to DEHP following a decision by the Commonwealth Minister for the Environment and specify how any offset requirements under the EPBC Act will be delivered. It must also propose offsets to address any significant residual impacts to the ecological receptors listed in my condition and demonstrate that the impacted values can be offset. The offset plan must demonstrate how offsets obligations for disturbances associated with GFD project activities will be differentiated from disturbances authorised for the GLNG project. It should become a single plan to coordinate all of the offset obligations on GFD project tenures administered by DEHP.

As offset obligations are quantified for each stage, suitable offset areas would need to be managed and secured through the offset plan.

Coordinator-General's conclusions

I accept that the modelled impacts to the ecological constraints shown in Table 6.6 are based on a project-wide maximum development scenario and the proposed avoidance and mitigation measures will likely reduce the impacted areas. I have stated a condition requiring maximum disturbance limits for these values to be included in future EAs. The sum total of these should not exceed the maximum disturbance limits identified in Table 6.6 for the GFD project tenures.

I am satisfied that the mitigation and management measures described in the EIS would minimise potential impacts on MSES. Where significant residual impacts remain, the values would need to be offset. The location of surface impacts would be determined progressively over the life of the GFD project. Accordingly, the proponent will need to ensure the ongoing availability of offsets for MNES and MSES values. Noting that residual impacts were modelled on a maximum development scenario before site selection avoidance measures are implemented, I expect actual impacts would be further reduced through ongoing field planning.

6.2 Land use, disturbance and rehabilitation

The EIS assessed land use, disturbance and rehabilitation in the GFD project area. Submissions on the EIS, relating to land use, disturbance and rehabilitation matters raised the following issues:

- part of the Arcadia gas field being mapped within a Priority Agricultural Area (PAA)
- requirements under the *Forestry Act 1959* (Forestry Act)
- the use of offsets to sterilise agricultural interests and productivity
- possible sterilisation of coal resources.

I have considered each submission and how the information provided by the proponent has addressed responded to submitter issues as part of my evaluation.

6.2.1 Land use

The EIS reported that land tenements of the GFD project area cover a total of 10,802 cadastral allotments as described in Table 6.7.

Table 6.7 GFD project area—land tenures

Gas field	Freehold	Lands lease	National park	Reserve	State forest	Unallocated state land	Total
Arcadia	40	15	2	2	6	2	67
Fairview	112	18	2	10	5	1	148
Roma	6,461	144	0	159	8	77	6,849
Scotia	637	60	2	46	0	8	753
Remainder*	2,579	185	2	159	17	43	2,985
Total	9,829	422	8	376	36	131	10,802

*Additional land area within the boundary of the possible area for supporting infrastructure as denoted in Figure 2.1: GFD project area and primary infrastructure

Twenty-seven per cent of land tenements (2,985) surround the gas fields and may be impacted by off-lease supporting infrastructure such as gas and water transmission pipelines, groundwater monitoring bores, roads and/or power lines (refer Figure 6.1)

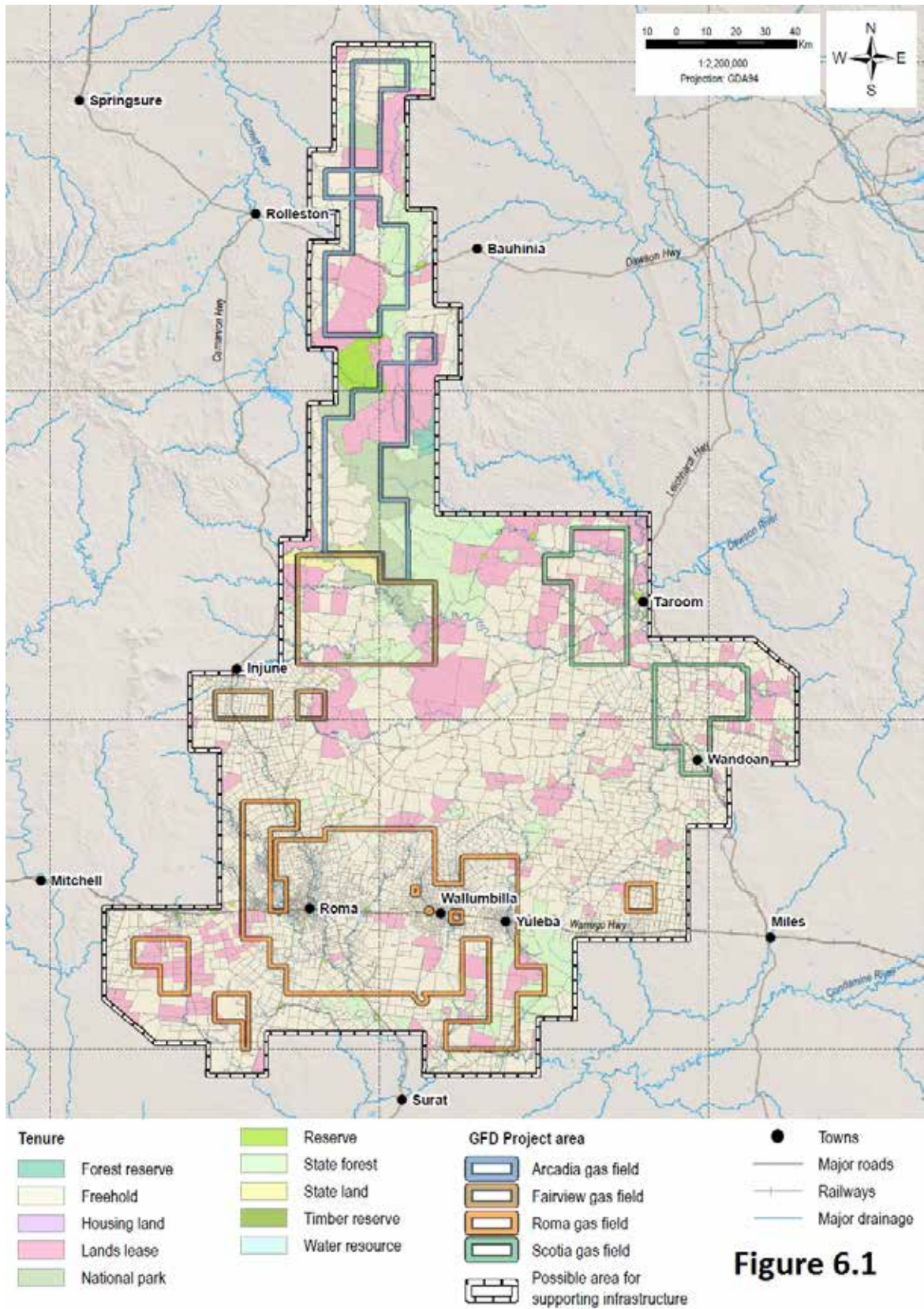


Figure 6.1 Land tenure in the GFD project area

Agriculture represents approximately 85 per cent of the total land use within the GFD project area. This includes livestock grazing and to a lesser extent, dryland cropping. Some agricultural activities are likely to be temporarily restricted in localised areas during construction. Other land uses include resource extraction, conservation and recreational activities and urban and rural residences.

Regional planning—protected areas

Regional plans for Central Queensland and the Darling Downs, prepared under the *Regional Planning Interests Act 2014* (RPI Act), provide for the identification and protection of regional interests. These include Priority Living Areas (PLAs), PAAs, Strategic Cropping Areas (SCAs) and Strategic Environmental Areas (SEAs). Regional plans also identify Priority Agricultural Land Uses (PALUs) which include cropping, grazing, horticulture and plantation forestry. In circumstances where a resource activity is proposed on land being used for a PALU in a PAA, the regional plan gives priority to the PALU through the application of co-existence criteria. Agricultural land uses across the GFD project tenements are detailed in Table 6.8.

Table 6.8 Protected agricultural areas in the GFD project area

Gas field	PAA (ha)	PALU (ha)
Arcadia	6,992	4,867
Fairview	0	629
Roma	0	74,316
Scotia	0	25,946
Remainder*	20,626	169,099

*Additional land area within the boundary of the possible area for supporting infrastructure as denoted in Figure 2.1: GFD project area and primary infrastructure

Assessment of the GFD project against the RPI Act must be conducted prior to construction. The assessment would need to evaluate impacts on regional interests and determine relevant development conditions to minimise potential impacts from project activities. The EIS reported that the proponent would avoid and minimise to the maximum extent practicable any impacts on SCAs in the Arcadia gas fields. Potential impacts would generally be short term and occur during the construction phase. Apart from the operations footprints, rehabilitation would occur after construction in compliance with relevant regulatory approvals.

Topography

The topography of the GFD project area is characterised by undulating hills dominating the eastern areas. A mesa landscape with steep slopes and escarpments features at the border of the GFD project tenure in the east, north and south-west. Alluvial plains are associated with major watercourses and their tributaries, such as the Dawson River in the north-east, Comet River in the north-west to west, and Balonne River in the south-west. The local community extensively uses the Condamine Alluvium, which is located near Dalby and is a significant alluvial system in the Surat CMA. Surface

elevations across the GFD project area vary from 164m to 770m Australian Height Datum (AHD).

Forestry

Forestry resources occur within the tenures of the GFD project area. These are managed under the NC Act and the Forestry Act. Localised impacts on forestry resources over the life of the GFD project may include:

- restriction of access to forestry resources
- loss or premature harvesting of millable timber
- reduction of the amount of land available for growing timber
- interference with logging operations
- additional traffic on logging tracks.

Potential impacts on forestry resources would be minimised by the proponent's Environmental Protocol for Constraints Planning and Field Development (Constraints Protocol) (Appendix Y-B). The hierarchy of management principles would see land disturbance impacts firstly avoided, then minimised, mitigated and rehabilitated. Constraints planning and assessment is discussed in detail in section 5.1 of this report. Constraints to the development of forestry areas are described in Table 6.9.

Table 6.9 Constraints to the development of forestry areas

Level of constraint	Constraint layer	Project activities permitted
No-go area	Forest reserves (NC Act)	None
Surface development exclusion area	Primary 200m buffer for forest reserves State forest park and special forestry areas (Forestry Act)	Low impact petroleum activities
High constraint area	Nil	N/A
Moderate constraint area	Secondary 100m buffer for forest reserves State forests and timber reserves (Forestry Act)	Low impact petroleum activities Linear infrastructure Limited petroleum activities
Low constraint area	Nil	N/A

Existing and proposed resource industries

The EIS reported that the GFD project tenure overlaps with exploration and production tenements held by other resource companies. These tenements relate to existing, proposed and potential extractive resource industries including coal and gas. Where the GFD project tenure overlaps with other resource tenures, restrictions to exploration and subsequent extraction of resources may occur.

Although there is potential for short to long-term disruption of resources extraction from these tenements, the extraction of gas does not preclude the subsequent extraction of coal. Gas extraction prior to the extraction of coal can lower concentrations of fugitive emissions and other dangerous gas concentrations caught in coal seams, potentially benefitting coal miners.

The location of wells, gathering lines and variable rates of production would be considered during the detailed design stage to ensure the development of other resource and extractive industries can occur. Santos GLNG will minimise the risk of resource sterilisation by establishing agreements with overlapping tenure holders. Where agreement cannot be reached, the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) and the *Mineral Resources Act 1989* are in place to manage overlapping tenure.

Landscape and visual amenity

Landscape and visual amenity was assessed in the EIS to evaluate the impacts the GFD project would have on scenic amenity. Visual impacts associated with infrastructure would be managed by avoiding impacts to sensitive receptors during field planning and location selection. The proponent would engage with the landholder to determine the siting of infrastructure and visual mitigation, if required. Provided mitigation and management strategies are implemented, visual impacts were assessed to be low or negligible.

6.2.2 Land disturbance

Typical land disturbance areas associated with various project infrastructure components are described in Table 6.10. As the locations and density of GFD project infrastructure are yet to be established, a total land disturbance area has not been calculated by the proponent.

Table 6.10 Disturbance footprint of project infrastructure

Infrastructure component	Construction footprint	Operational footprint
Well lease	Single well lease: 1.5 ha each Multi-well lease 2.5 ha each	Single well lease: 0.3 ha each Multi-well lease 0.5ha each
Access tracks and roads	1.5–3ha per km	0.8–1.5ha per km
Gas and water gathering lines	1–2.5ha per km	None (right of way maintained)
Gas and water transmission pipelines	2.5–5ha per km	None (right of way maintained)
Hub gas compression facilities	20–40ha each	10–15ha each
Nodal gas compression facilities	2–8ha each	1–4ha each
Gas and water transmission pipelines	2.5–5ha per km	None (right of way maintained)
Hub gas compression	20–40ha each	10–15ha each

Infrastructure component	Construction footprint	Operational footprint
facilities		
Nodal gas compression facilities	2–8ha each	1–4ha each
Water management facilities	5–10ha each	2–5ha each
Water storage	Tanks: Up to 1ha each Large dams: 5–16ha each	Tanks: Up to 0.5ha each Large dams: 3–8ha each
Fluid (brine) storage	Large dams: 5–16ha each	Large dams: Up to 8ha each
Accommodation camps	1–20ha each	0.5–10ha each
Laydown and storage yards	5–40ha each	None – construction only
Borrow pits	5–50ha each	None – construction only

Potential impacts as a result of land disturbance include authorised release of coal seam water to soil and aquifer depressurisation resulting in subsidence as a result of groundwater extraction. These potential impacts are assessed in section 5.5.2 of this report.

Loss of soil from erosion

Soil structure, depth, texture and chemistry are the major factors limiting the suitability of some soils for rehabilitation activities within the GFD project area. Soils across the GFD project area include uniform coarse textured (sandy) soils, uniform and gradational medium-textured (loamy) soils, gravelly loams, red and yellow earths and lateritic red earths. Problem' soils identified within the GFD project area include sodic, sandy duplex, reactive and saline soils.

Impacts

The EIS reported that vegetation clearing activities would be required during the GFD project's construction phase. The pre-mitigated significance of soil loss resulting from clearing activities during construction was assessed to be moderate. Clearing of vegetation and stripping of topsoil resources exposes the land to potential erosion. This is due to the combined effects of surface slope and form, the soil's physical and chemical properties as well as surface run on/off potential and the effects of wind erosion over time. The EIS stated that twenty-one per cent of the total GFD project area is assessed to be prone to high-risk erosion with a soil loss of >150t/ha/annum.

Impact management

To identify erosion and sedimentation risks associated with local soil characteristics, an erosion and sediment control management plan has been developed in accordance with the *Guideline: EPA Best Practice Urban Stormwater Management—Erosion and Sediment Control* (Environmental Protection Agency 2008).

To reduce the risk of erosion during construction, soil management measures would be implemented, including consideration of:

- soil testing to identify problem soils and amelioration if required
- stripping the maximum depth of topsoil available from proposed disturbance areas, to maximise re-use for later rehabilitation
- stockpiling of topsoil and subsoil separately
- stockpiling and mulching cleared vegetation for spreading over disturbed areas
- minimising the period that soil is left exposed to erosion through progressive ground cover revegetation
- ripping and seeding of soil stockpiles proposed to be retained for longer periods prior to use (i.e. more than six months)
- installation and maintenance of drainage, erosion and sediment control devices appropriate to the erosion and sediment risk of the activity.

Following the implementation of these mitigation measures, the EIS significance assessment found that the residual significance of soil loss via erosion was low.

Land contamination resulting from uncontrolled release to soil

Potential land contamination impacts within the GFD project area may include those resulting from the disturbance of existing contaminated land or contamination caused by project activities. Without adequate mitigation and control of these activities, there is a potential for human health risks as well as surface water, groundwater and soil degradation which may lead to the reduction of productive land and further use of natural resources.

Impacts

Existing Santos GLNG and proposed GFD project activities have the potential to cause land contamination associated with the use or production of chemicals and wastes, including:

- diesel and other fuels
- cleaning and processing chemicals
- water extracted from coal seams
- concentrated waste brine from water treatment
- chemicals used in water management processes
- drilling fluids
- hydraulic fracturing chemicals
- sewage effluent.

The quantity of chemicals and wastes produced by the GFD project is discussed in section 6.6: Waste.

Chemicals and waste associated with the GFD Project will generally be stored within the operational areas including: well leases (during well drilling and completion), water management facilities, gas compression facilities, accommodation camps and laydown areas. The storing of petroleum, chemicals and regulated wastes are notifiable activities and the land parcels on which they occur are required to be listed on the

Environmental Management Register. These operational areas therefore have the highest potential for contamination within the GFD project area. The pre-mitigated significance of uncontrolled release to soil resulting from construction activities was assessed to be moderate.

Impact management

The EIS reported that the proponent will manage and monitor the use and storage of fuel and chemicals in accordance with practices specified in the chemical and fuel management plan, which aligns to AS 1940: The storage and handling of flammable and combustible liquids. Spill response equipment and materials would be provided at facilities, with key operations equipment and on operations and maintenance personnel service trucks. Following the implementation of these mitigation measures, the EIS significance assessment found the residual significance land contamination from uncontrolled release to soil to be low.

Coordinator-General's conclusion

I have stated conditions requiring the effective containment of chemicals and fuels in accordance with Australian Standards. To reduce impacts resulting from contamination and to allow for remediation to occur, I also require the proponent to notify the administering authority within 48 hours of any unauthorised significant disturbance to land or any unauthorised release of contaminants greater than the quantities stipulated in the land rehabilitation schedule in Appendix 1: Stated conditions.

6.2.3 Land rehabilitation and decommissioning

The P&G Act requires holders of petroleum and gas tenures to undertake rehabilitation and decommissioning activities for project-related disturbances. Only then would the proponent be able to successfully surrender an EA associated with the relevant assets.

Rehabilitation and decommissioning of disturbed land areas would occur progressively throughout the GFD project in accordance with environmental management plans and conditions of any approved EA under the EP Act. The objective of rehabilitation and decommissioning is to achieve a post development landform that is:

- ÿ safe for humans, native fauna and livestock
- ÿ non-polluting
- ÿ stable and able to sustain appropriate land use.

The EIS provided an overview of the lifecycle of disturbances within the GFD project area (refer Figure 6.2).

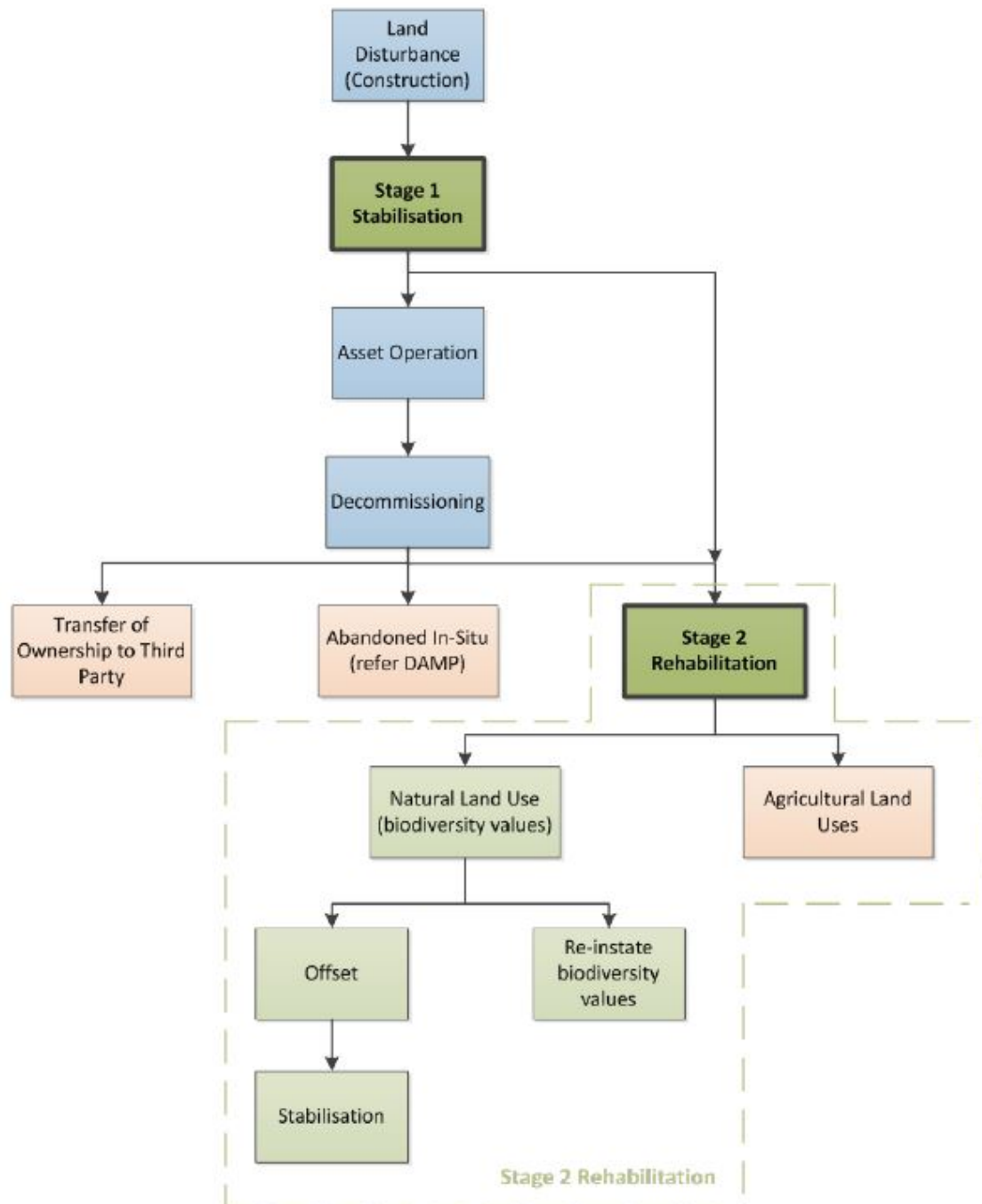


Figure 6.2 GFD project disturbance lifecycle

A rehabilitation management plan (RMP) has been prepared by the proponent to outline the rehabilitation objectives for disturbances within the Santos GLNG upstream project area. Rehabilitation would be phased to achieve stabilisation in stage 1 and final rehabilitation in stage 2. The RMP:

- identifies key rehabilitation objectives and the criteria to achieve these objectives
- outlines actions to be undertaken when rehabilitating a disturbance

• provides an overview of the monitoring and maintenance actions to be conducted on rehabilitated areas.

The management of the RMPs rehabilitation objectives within the Santos GLNG upstream project area would be supported by the following additional management plans:

- decommissioning and abandonment management plan
- erosion and sediment control management plan
- pest and weed management plan
- environmental offsets strategy.

Stage 1 stabilisation

Consistent with current GLNG project upstream operations, a two-stage rehabilitation approach would be pursued. Stage 1 pertains to stabilisation works which would be completed post construction within the footprint of operational assets including well leases and operational pipeline easements. The land is stabilised to ensure the safe and effective operation of assets and to minimise the risk of erosion, soil loss and weed invasion. Where possible, the proponent would return land to the landholder for productive use (e.g. grazing).

Stabilisation works would include:

- remediating areas of contaminated land resulting from petroleum activities
- re-establishing surface drainage lines and re-profiling contours for operational use
- establishing a safe landform for humans and livestock in areas of significant cut and fill
- reinstating top soil
- improving the condition of soil through the appropriate assessment and treatment of soils where required
- promoting the establishment of groundcover vegetation.

Stage 2 rehabilitation

Stage 2 rehabilitation activities relate to disturbance footprints no longer required for operational purposes of the GFD project. The EIS reported that rehabilitation activities in stage 2 would return remaining disturbance footprints to an appropriate land use in accordance with landholder needs and applicable regulatory requirements. Agricultural land uses and natural areas comprising MNES, ESAs and other forms of vegetation are the two most common pre-disturbance land uses the proponent would rehabilitate. An overview of the proponent's rehabilitation framework including the final rehabilitation acceptance criteria is described in Figure 6.3.

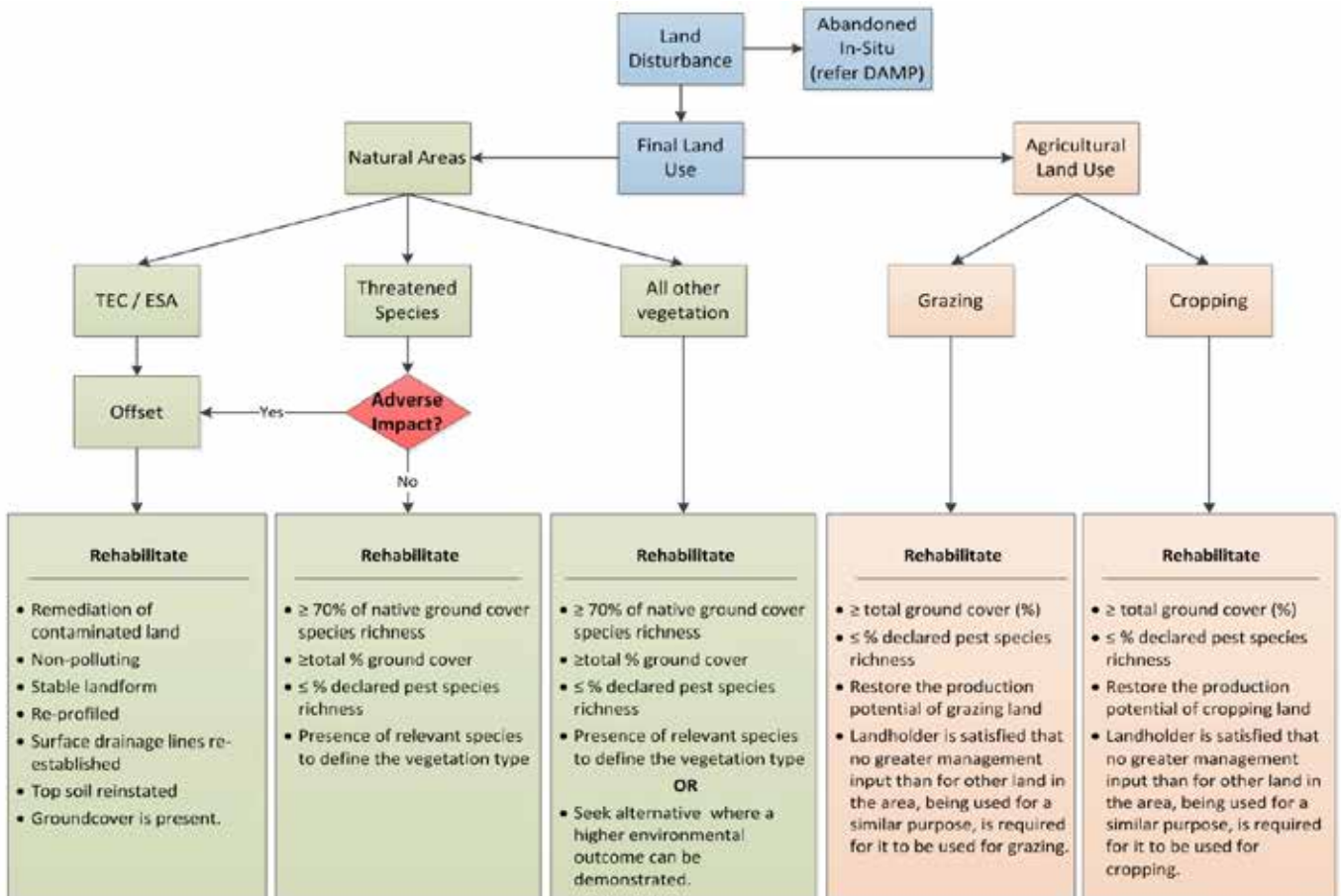


Figure 6.3 GFD project rehabilitation framework and objectives

The GFD project would include rehabilitation of land following:

- ÿ construction works (including site establishment and pipeline construction)
- ÿ short-term infrastructure, such as appraisal wells and temporary drill camps
- ÿ production wells and associated infrastructure after the depletion of gas supply
- ÿ remaining supporting infrastructure such as water management facility sites, wastewater dams and compressor stations, prior to the relinquishment of the petroleum tenure and EA.

The EIS reported that rehabilitation of significant cut and fill operations (e.g. borrow pits and quarries) would not be rehabilitated to the pre-existing or adjacent land use as this is not a practicable or achievable outcome. Instead, the landform would be managed through rehabilitation methods such as benching, surface re-profiling, contouring and stormwater diversion. The final landform would be stable, non-polluting and safe to humans and livestock.

The identification and implementation of site-specific erosion and sediment controls are defined in the rehabilitation management plan. Specific mitigation measures under the rehabilitation management plan include:

- ÿ spreading mulch or retained native vegetation over disturbed areas as soon as practicable after construction to reduce erosion and sheet erosion
- ÿ use of erosion blankets (e.g. jute and coir matting) as an alternative to mulching in draining channels or areas of strong winds or overland flow
- ÿ use of sediment traps and sediment basins
- ÿ use of 'ripping' or similar techniques on finished soil surfaces to encourage revegetation where required
- ÿ routine inspection of erosion and sediment controls and maintenance for capacity and structural integrity, particularly following significant rainfall events.

Decommissioning, demolition and abandonment

The EIS included a DAMP that addresses the decommissioning, demolition and abandonment of infrastructure at the conclusion of Santos GLNG operations for both the GFD and GLNG projects. The DAMP describes the proposed decommissioning and abandonment of specific project assets and also identifies infrastructure types that would be abandoned in-situ. Conduct and compensation agreements can be used to provide post-petroleum beneficial use of dams or other assets but may require agreement by the administering authority in accordance with the respective EA.

Coordinator-General's conclusion

Prior to the rehabilitation stage, I require the proponent to prepare a rehabilitation plan developed by a suitably qualified person. To ensure continuous rehabilitation is achieved over the life of the GFD project, I have stated conditions requiring all significantly disturbed areas that are no longer required for on-going petroleum activities to be rehabilitated within 12 months. I also condition the proponent to remediate all contaminated land resulting from petroleum activities as part of the rehabilitation acceptance criteria. To demonstrate the acceptance criteria have been achieved, the proponent must prepare a rehabilitation report for all or part of the area to be relinquished and obtain conditional approval from the administering authority.

For all rehabilitation activities in ESA's, I have conditioned stringent final rehabilitation acceptance criteria which must be achieved before land is relinquished. At a minimum, rehabilitation acceptance criteria would ensure rehabilitated landforms are non-polluting, stable and consistent with the surrounding land uses.

6.3 Greenhouse gas emissions

The EIS assessed greenhouse gas (GHG) emissions in the GFD project area. Submissions on the EIS, relating to GHG matters raised the following issues:

- ÿ loss of terrestrial climatic habitat caused by anthropogenic emissions of GHGs
- ÿ impact of GHGs on human health.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

The GHG emissions inventory for the GFD project was based on the methodology detailed in the Greenhouse Gas Protocol (World Business Council for Sustainable Development and the World Resource Institute 2004) and methodologies described under the *National Greenhouse and Energy Reporting Act 2007* (Cwlth) (NGER Act) and NGER Determination. Under the NGER Act, the proponent must report on GHG emissions in accordance with the corporate group thresholds when emissions exceed a carbon dioxide equivalent (CO₂e) of 50,000 tonnes (t) per annum and energy production or consumption exceeds 200 terajoules per year.

The NGER Act prescribes an accounting methodology and includes the following scope definitions for emissions attributable to a project:

- scope 1—direct emissions (must be reported)
- scope 2—indirect emissions from the consumption of purchased electricity (must be reported).
- scope 3—all indirect emissions that are not included in scope 2, and are a consequence of the activities not owned or controlled by the entity (reporting is not mandatory).

For the purposes of reporting GHG emissions, this section only evaluates the potential impacts of scope 1 and scope 2 GHG emissions during the construction and decommissioning phases of the GFD project. The 2009 GLNG EIS and 2010 GLNG supplementary EIS calculated GHG emissions during the operations phase by forecasting potential GHG emissions from a range of gas production scenarios. These scenarios were based on the volume of gas (production gas) required to supply the LNG facility over the life of the GFD project.

It is estimated that based on a 50 per cent electrification scenario, operational scope 1 and 2 GHG emissions for the life of the GFD project total 56,910,000t CO₂e. Operational GHG emissions associated with the GFD project have been included in the previous GLNG project as baseline emissions and therefore do not form part of the evaluation of the GFD project's EIS.

6.3.1 Impacts and mitigation

The main sources of scope 1 and scope 2 GHG emissions generated by the GFD project during the construction and decommissioning phases would include:

- diesel fuel used in drilling rigs
- construction equipment
- transportation of equipment, materials and personnel
- generators in camps
- land clearing for the construction of well lease and supporting infrastructure
- flaring during well completion activities.

GHG emissions during construction and decommissioning are provided in Table 6.11.

Table 6.11 GFD Project estimated Scope 1 and Scope 2 GHG emissions (during construction and decommissioning phases)

Activity	Carbon dioxide (tCO ₂ -e)	Methane (tCO ₂ -e)	Nitrous oxide (tCO ₂ -e)	Total (tCO ₂ -e)
Construction				
Land clearing	3,632,900	-	-	3,632,900
Fuel consumption in drilling	288,100	400	800	289,300
Fuel consumption in vehicles	150,800	400	1,100	152,300
Well completions and connections	316,800	14,000	3,400	334,200
Decommissioning				
Fuel consumption in vehicles and heavy machinery	75,400	200	550	76,150
Total emissions	4,464,000	15,000	5,850	4,484,850

Operations emissions from the GFD Project were included in assessment of the previous 2009 GLNG EIS and 2010 GLNG supplementary EIS.

The EIS evaluated the GFD project's potential contribution to national and state emissions. Construction and decommissioning phase emissions are expected to contribute 0.03 per cent to the nation's total GHG emissions and 0.10 per cent to the state's total emissions.

When emissions from the production of gas in the operational phase of the GFD project are included, the GFD project is estimated to represent 0.4 per cent of the nation's emissions and contribute 1.5 per cent of the state's total emissions.

Under the NGER Act, annual reporting for GHG emissions, energy production and energy consumption must be performed by the proponent. To comply with the NGER Act and further reduce potential impacts from GHG emissions, the proponent would, in accordance with the draft EM plan:

- ÿ design adequate metering and measurement systems to monitor emissions in compliance with the NGER Act and review energy efficiency opportunities
- ÿ prepare and monitor delivery of energy efficiency plans with site-specific targets
- ÿ prepare and implement standard operating procedures for reducing energy use and loss
- ÿ employ an incentive program for the reduction of fuel utilisation and loss
- ÿ consider the use of energy in purchasing procedures for new plant, equipment and other new acquisitions
- ÿ undertake an equipment maintenance service program to ensure that GFD project equipment uses fuel efficiently
- ÿ minimise vegetation clearing during construction and implement effective rehabilitation practices to encourage re-growth on disturbed areas.

6.3.2 Coordinator-General's conclusions

I am satisfied that the assessment of GHG emissions in the EIS adequately quantified scope 1 and scope 2 GHG emissions in accordance with the methodology of the NGER Act and NGER determination. I note that the proponent is aware of the legislative requirements of the NGER Act to report on CO₂e and has committed to implement measures to reduce GHG emissions over the life of the GFD project.

6.4 Air quality

The EIS assessed air quality in the GFD project area. Submissions on the EIS, relating to air quality matters raised the following issues:

- Y baseline air quality monitoring at proposed production well locations
- Y consistency of proposed EA conditions for air quality with the "Streamlined Conditions – Protecting Air Values" contained in DEHP Guideline EM1274 "Streamlined model conditions for petroleum activities".

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

The potential impacts from dust and pollutant emissions generated by GFD project activities were assessed against the objectives of the Environmental Protection (Air) Policy 2008 (EPP (Air)). These objectives are designed to protect human health and the biodiversity of ecosystems as well as preserve the amenity of adjoining land uses. The proponent's air quality assessment predictively modelled concentrations of nitrogen dioxide (NO₂), carbon monoxide (CO) and particulate matter with aerodynamic diameters equivalent to 10 microns or less (PM₁₀) and 2.5 microns or less (PM_{2.5}).

The EIS reported that the number, size, scale and location of various GFD project components would be influenced by the locations of gas resources over the life of the project. The proponent's assessment included an evaluation of the likely emission sources from individual GFD project components. During the detailed design stage, prior to construction, an additional detailed air quality assessment will be conducted. This additional assessment is expected to confirm the results of the preliminary predictive modelling, and will include location-specific meteorological modelling to account for localised background air quality levels and the locations of sensitive receptors.

Compliance with the EPP (Air) guidelines is required for all stages of the GFD project and would be monitored as part of an approved EA granted prior to construction.

1.1.1 Sensitive receptors

Sensitive receptors (SRs), defined under the EP Act include, amongst other things, dwellings, agricultural lands, educational institutions and commercial and retail activities. Due to the large size of the GFD project area and quantity of production wells and associated infrastructure required for the project, specific SRs potentially impacted by the project were not identified in the EIS.

The types of SRs expected to be relevant to the GFD project are scattered rural dwellings, agricultural land and protected areas including national parks and 'environmentally sensitive areas', defined under the *Environmental Protection Regulation 2008*. To demonstrate compliance with EPP (Air) objectives, the EIS modelled components of GFD infrastructure to inform buffer distances required between emitting project activities and SRs.

Accommodation villages are not classified as SRs under the EP Act. Occupational exposure to dust is to be managed in accordance with the proponent's workforce health and management plans in accordance with the *Work Health and Safety Act 2011* (Qld).

1.1.2 Impacts and mitigation

Dust emissions

Unmitigated air emissions from the GFD project have the potential to contribute to exceedances of one or more of the EPP (Air) quality objectives for PM₁₀ and PM_{2.5}. Activities which may contribute to air quality exceedances include:

- windblown erosion from land clearing and earthworks
- topsoil removal and creation of stockpiles
- traffic movements on unsealed surfaces
- operation of excavators and mobile machinery
- concrete batching
- construction of various GFD project components
- decommissioning and rehabilitation.

The highest potential for air quality impacts to occur would be during the construction of various GFD project components and pre-clearing works. The EIS air quality assessment concluded that unmitigated construction activities within 500m of SRs may result in exceedances of EPP (Air) objectives for PM₁₀ and PM_{2.5}. However, where activities occur greater than 500m away from SRs, impacts were considered to be low with pollutant levels assessed to be generally compliant with the relevant EPP (Air) objectives.

To reduce the PM₁₀ and PM_{2.5} dust impacts over the life of the GFD project, the EIS stated that the proponent would implement specific management control and mitigation measures under an environmental management framework. These measures include:

- minimising the time period disturbed areas are exposed by progressively rehabilitating land as soon as practicable after the completion of construction
- stabilising disturbed areas, including stockpiles, using mulch, erosion blankets and establishing ground cover
- dust suppression at the locations of dust generating sources to be frequently maintained and reinforced during periods of high risk (e.g. high winds and/or dry weather)

- ÿ rehabilitating disturbed areas to a safe, stable and non-polluting environment suitable for the intended land use
- ÿ consulting nearby landholders (SRs) prior to the commencement of decommissioning and abandonment activities.

Conditions to ensure dust generated by petroleum activities does not cause environmental nuisance to SR's will be applied through EA's for relevant GFD project tenures.

Pollutant emissions

During the operational phase of the GFD project, NO₂ (a component of NO_x) and CO would be predominantly emitted from gas compression facilities which consist of exhaust emissions from gas turbine alternators, gas turbine compressors, triethylene glycol (TEG) re-boilers and emergency flaring events.

Air dispersion assessments using the AUSPLUME model were performed to predict NO₂ and CO impacts downwind of three major emitting sources of the GFD project. The modelling scenarios included:

- ÿ large hub compression facility (240 TJ/day)—normal operations
- ÿ large hub compression facility (240 TJ/day)—major flaring event
- ÿ nodal compression facility (80 TJ/day)—normal operations.

Although the modelling conservatively overestimated the concentration of NO₂ in total NO_x emissions at 40 per cent, downwind concentrations of NO₂ and CO emitted from each scenario remained well within the ambient air quality limits as defined in the EPP (Air). Within 100m of gas compression facilities, NO₂ concentrations are predicted to return to background levels.

The EIS determined that the potential for the GFD project to impact on regional air quality is low. Concentrations of NO₂ and CO were modelled to be minimal and emitting sources of the GFD project are spread over a large area which reduces the potential of the project to produce concentrated air emissions exceeding the EPP (Air).

NO_x pollutants, other than NO₂ emitted from the relevant GFD project activities, would be primarily generated from vehicle movements and as a by-product of activities associated with the operation of gas compression facilities. NO_x emissions were assessed to be emitted at very low concentrations and were calculated to comply with the relevant requirements of the *National Environment Protection Measures*.

The EIS stated that to reduce NO_x, specifically NO₂ and CO emissions, the proponent would avoid the use of power generators at node and hub compression facilities in all available instances. It estimated that by connecting such infrastructure to the national electricity grid, gas compression facility hubs would reduce NO_x emissions by up to 87 per cent.

During the detailed design phase, should the verification of potential impacts determine the need for further impact mitigation, the proponent has identified further measures to reduce NO_x and CO levels. These include:

- ÿ increasing the stack height of key emitting sources
- ÿ investigating alternative sites located further from the locations of SRs or with improved local dispersion characteristics
- ÿ use of low NO_x technology, such as staged combustion systems
- ÿ implementing the chemicals and fuels management plan for the safe handling and storage of chemicals and fuels.

I have stated conditions for inclusion in draft EA's to manage GFD project venting and flaring activities. Subsequent to my evaluation of the GFD project, the proponent must finalise an EA in consultation with the administering authority prior to construction. Once approved, an EA will state conditions authorising the release of contaminants to the air from fuel burning and combustion equipment, and require the proponent to monitor compliance in accordance with relevant standards.

1.1.3 Coordinator-General's conclusions

I am satisfied that, based on the predictive modelling undertaken, dust and pollutant emissions resulting from the GFD project's construction and operation can be suitably managed provided that sufficient distance between the locations of SRs and project activities can be achieved. The proponent has identified the most likely sources of dust and pollutant emissions on the GFD project site and has proposed specific mitigation and management treatments to reduce potential impacts.

Throughout all project stages, the proponent must not cause environmental nuisance to SRs. I am satisfied that, during the detailed design stage, the proponent will be able to refine the air quality modelling and mitigate any impacts through the environmental management framework in consultation with DEHP.

6.5 Noise and vibration

The EIS reported that there is potential for the GFD project noise and vibration levels to have an impact on property or on the health and wellbeing of humans and fauna. In all instances, the severity of impacts would vary across the GFD project site depending on the location, frequency and number of particular project activities occurring in proximity to SRs.

The potential impacts on acoustic values were assessed against the objectives of the Environmental Protection (Noise) Policy 2008 (EPP (Noise)) in conjunction with DEHP's guideline *Prescribing Noise Conditions for Environmental Authorities for Petroleum Activities*. Potential vibration impacts on buildings caused by project activities were assessed in accordance with *Australian Standard 2670.2-1990 Evaluation of Human Exposure to whole-body vibration: Part 2 Continuous and shock induced vibrations in buildings*.

Noise levels emitted from GFD project activities were modelled using the CONCAWE prediction methodology within SoundPLAN (Version 7.2) modelling software. Road traffic noise predictions were performed using the United Kingdom, Department of Transport (1988) procedure, Calculation of Road Traffic Noise 1988 (CoRTN) in

accordance with the Department of Transport and Main Road's *Road Traffic Noise Management Code of Practice* (2013).

In accordance with the relevant guidelines, the proponent's noise and vibration assessment modelled noise from GFD project activities (dB(A) L_{Aeq}), low frequency noise (dB(Z) L_{eq}), road traffic noise (dB(A) L_{A10} (18 hour)) and vibration caused by project activities (mm/s PPV).

6.5.1 Impacts and mitigation

Noise

Predictive noise modelling was performed on the most likely sources of noise during construction, operation and decommissioning to calculate the distances at which unmitigated project activities would comply with the long-term noise emission limits. Under the guideline *Prescribing Noise Conditions for Environmental Authorities for Petroleum Activities*, long-term noise emitting activities should not exceed:

- 40dB(A) (L_{Aeq}) for hours between 7:00 am – 6:00 pm
- 35dB(A) (L_{Aeq}) for hours between 6:00 pm – 10:00 pm
- 28dB(A) (L_{Aeq}) for hours between 10:00 pm – 6:00 am
- 35dB(A) (L_{Aeq}) for hours between 6:00 am – 7:00 am.

Outcomes of the noise modelling over the life of the GFD project are presented in Table 6.12. Any project activities located closer to SRs than the distances shown in Table 6.12 could potentially cause adverse noise impacts.

Table 6.12 Distance from various GFD project activities to predicted noise levels over the life of the GFD project [Predicted noise impact distance from project activities]

Construction and decommissioning scenario	Predicted distances from project activities to achieve long term noise limit (m)		
	40dB(A)	35dB(A)	28dB(A)
Drilling and completion – 24-hour scenario ¹ (with blooie line)	1,300 (2,300)	1,800 (3,100)	2,800 (4,400)
Drilling and completion – nominal daytime construction hours ¹ (with blooie line)	900 (1,600)	1,300 (2,200)	2,000 (3,200)
Facilities	1,000	1,500	2,400
Gathering/ transmission lines	800	1,200	2,000
Borrow pits	1,200	1,700	2,700
Laydown areas	650	1,000	1,700
Communication infrastructure	650	1,000	1,700
Access tracks	550	850	1,500
Operation scenario			
Hub gas compression facility (non-electrified)	2,700	3,700	5,500
Hub gas compression facility (electrified)	1,800	2,600	4,100
Nodal gas compression facility	1,700	2,300	3,500
Water management (desalination) facility	180	300	550
Production well (non-electrified)	180	300	550
Production well (electrified)	<50	60	110
Flaring at gas compression facility	2,200	3,000	4,400
Accommodation camp	600	900	1,600

¹ The blooie line is a surface pipe that discharges air, water and production well cuttings during drilling operations. The higher noise emission from the blooie line is mostly during the primary jet discharge, which lasts for a few minutes when connecting a new drill pipe to the drill string.

Note: Grey shaded cells indicate modelling was performed to account for adverse weather conditions associated with temperature inversion. Temperature inversion is a factor for all project activities occurring on a 24-hour basis.

The highest levels of noise would be experienced at SRs located nearest to gas compression facilities during operation. Although noise emissions are lower during construction and decommissioning, noise from the construction of access tracks, transmission lines and communication infrastructure has the potential to impact SRs that may not otherwise be affected during operations. SRs may also experience increased nuisance levels of noise depending on the simultaneous operation of project equipment.

Prior to construction, further noise modelling would be performed to confirm the validity of the predicted noise modelling in the EIS, and account for location-specific factors

such as topography and land use. This modelling would also inform site-specific EAs to ensure environmental nuisance is limited at SRs.

To reduce potential noise levels, the proponent proposes to implement a range of mitigation strategies, which are outlined in the GFD project's noise management plan. Measures include:

- elimination of the noise source at SRs (where possible GFD project facilities and activities are located at distances greater than those listed in Table 6.12)
- substitution of GFD project equipment with quieter equipment and implementation of enhanced operating procedures
- engineering noise controls at the sources of emitting facilities and structures (noise emissions at SRs could typically be reduced by 10–20dB(A))
- treatment of the noise propagation path such as the installation of noise barriers, orientation and location of plant items (noise levels at SRs could typically be reduced by 5–15dB(A))
- noise mitigation measures performed at SRs negotiated through community liaison.

In accordance with the *Petroleum and Gas Noise Assessment Guideline*, I have set conditions for short, medium and long-term noise emission limits to ensure nuisance levels of noise are not exceeded at the locations of SRs. In instances where a valid complaint is received, my conditions require monitoring at the location of the SR in accordance with the *Environmental Protection Regulation 2008*. If non-compliance with my conditions is established, the proponent is required to apply further noise mitigation measures to reduce noise levels at the location of impacted SRs.

Fauna

Potential noise impacts on fauna include physical damage to hearing, increased energy expenditure or physical injury while responding to noise, interference with normal animal activities and/or impaired communication. Impacts of continuous noise on fauna may include habitat loss through avoidance, reduced reproductive success and increased mortality.

Although no current government policy specifically regulates the effect of noise levels on fauna, a review of current literature conducted by the proponent found that fauna is unlikely to experience adverse impacts when noise levels are less than 65dB(A) L_{Aeq} . Project components were modelled to highlight the distances at which impacts on fauna may occur, with results presented in Table 6.13.

Table 6.13 Distance from various GFD project activities to achieve 65 dB(A) LAeq over the life of the GFD project

Construction and decommissioning scenario	Predicted distances from project activities to achieve 65dB(A) L _{Aeq} (m)
Construction facilities and infrastructure	100–150
Drilling activities (adverse weather)	250
Bloolie line operation (adverse weather)	450
Operation scenario	
Hub gas compression facility (non-electrified)	400
Gathering/ transmission lines	12.5
Borrow pits	4

Low frequency noise

Low frequency noise is not predicted to impact on SRs. In accordance with draft guidance material provided by DEHP, the EIS determined that no exceedances of low frequency noise limits would occur, and the GFD project should comply with the night-time noise criterion of 28dBA LAeq.

I have set low frequency noise limits at Appendix 1 to minimise disturbance to the SRs surrounding project activities.

Road traffic noise

Predicted increases to road traffic noise on state-controlled roads and designated local government roads were assessed in accordance with DTMR's *Transport Noise Management Code of Practice* (2013). For existing state-controlled roads, the guideline notes that 68dB(A) is an acceptable noise level when measured at a SR. For new state-controlled roads as well as existing and new designated local government roads (public roads), 63dB(A) is determined as the acceptable noise criteria.

The proponent's road traffic noise assessment demonstrated that proposed increases to the existing state-controlled road network would constitute insignificant changes to noise and would not warrant further mitigation. According to the guideline, a change in the noise level of 1–2dB(A) is difficult for most people to detect and represents an insignificant change to existing road noise.

For designated local roads, potential impacts were less defined and noise impacts may occur depending on baseline traffic data. Should the proportion of heavy vehicles, traffic speed and road surfaces remain constant, the high level assessment determined that a 50 per cent increase in traffic levels could achieve the noise criterion of 63dB(A) with less than 2dB(A) change. A range of mitigation strategies are available in the proponent's noise management plan to mitigate potential impacts.

Vibration

The dominant sources of vibration are associated with the construction phase of the GFD project. During construction rock breaking, compaction with vibratory rollers and heavy vehicle movements have potential to cosmetically damage buildings and impact

on human comfort at SRs. In accordance with the *British Standard 7385:2:1993, Evaluation and measurement for vibration in buildings*, cosmetic damage may occur when vibration levels exceed 7.5mm/s PPV. Impacts to human comfort may occur if vibration levels exceed 0.6mm/s PPV at SRs.

The EIS concluded that rock-breaking and heavy vehicle movements would not affect human comfort when located at distances greater than 20m from SRs. For vibratory rollers, the modelled impact distance was approximately 50m. It was predicted that cosmetic damage to buildings should not occur when project activities are located greater than 5m from SRs.

There are no anticipated vibration impacts from drilling works and blasting. Piling associated with facility construction was assumed to be conducted using a bored piling technique which generates less vibration compared to rock breaking activities.

Should blasting be required during the life of the GFD project, I have set conditions requiring the proponent to develop a blast management plan for each blasting activity in accordance with *Australian Standard 2187.2:2006, Explosives – Storage and use*. I require that any blasting must not exceed an air blast overpressure level of 120dB and must not exceed a ground-borne vibration PPV of 10mm/s when measured or extrapolated to any SR.

6.5.2 Coordinator-General's conclusions

Based on the results of the predictive modelling undertaken in the EIS, I am satisfied that noise and vibration emissions resulting from the GFD project's construction and operation can be suitably managed for the life of the GFD project. The proponent has identified the most likely sources of noise and vibration emitting GFD project activities and the EIS has identified specific mitigation and management treatments to reduce potential impacts.

Over the life of the GFD project, the proponent must comply with the conditions I have set in this report at Appendix 1 and any additional requirements of an EA subsequent to my decision. During the detailed design stage, the proponent must refine the noise quality modelling and address potential impacts through the identified environmental management framework in consultation with DEHP.

I also expect the proponent to implement its mitigation strategies outlined above in the GFD project's noise management plan. Should an affected person believe the level of environmental nuisance from project activities is excessive, complaints can either be made directly to the proponent or reported to DEHP by calling 1300 130 372. If environmental nuisance is found to exceed the limits of my conditions or those set by the limits of an EA, the proponent must remediate noise impacts as directed by DEHP.

6.6 Waste

The EIS assessed potential waste impacts in the GFD project area. Submissions on the EIS relating to waste matters raised the following issues:

- management of waste to discourage pest animals and avoid the spread of weeds
- burning of waste timber and vegetation
- disposal of GFD project waste at council controlled refuse sites.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

6.6.1 General waste

The EIS identified the legislative and regulatory framework relevant to waste impact management, including the *Waste Reduction and Recycling Act 2011*.

The proponent estimated that several waste streams would be generated during construction, operation and decommissioning of the GFD project. These include but are not limited to the waste products described in Table 6.14 below:

Table 6.14 Description and quantity of wastes generated from construction, operation and decommissioning – tonnes per annum (Tpa)

Classification	Waste	Construction Tpa	Operation Tpa	Decommissioning Tpa
Regulated	Drilling fluid	2,500	1,250	N/A
Regulated	Waste oil	500	100	50
Regulated	Waste chemicals	50	10	1
Regulated	Batteries and electrical	6	6	Minor
Regulated	Grease trap	150	100	50
Regulated	Filters and absorbents	10	2	1
Regulated	Tyres	100	20	10
Regulated	Oily water	2,500	500	250
Standard	Putrescible general waste	18,000	4,500	9,000
Recyclable	Glass, paper, cardboard	1,000	1,000	250
Sewage	Effluent and biosolids	Up to 80ML/day for large camps	Up to 16ML/day for permanent camps	Varies by size of camp
Scrap metal	Scrap metal	100	20	50
Green waste	Vegetation clearing	Minor	Minor	N/A

The EIS reported that GFD project activities would generate up to 40ML of coal seam water per day. Treatment of coal seam water would produce over 700,000 tonnes of brine concentrate and residual salt waste product over the life of the GFD project. The

impacts of coal seam water and proposed mitigation measures are discussed in section 5.5.2 of this report.

6.6.2 Impacts and mitigation

The proponent advised that it has existing licensed waste collection and treatment and disposal facilities to support the current GLNG project operations. These include reverse osmosis plants, drilling fluid recycling centres and a fluid treatment facility. The proponent has also utilised existing commercially operated waste management facilities. The beneficial re-use of water is discussed in more detail in section 5.5.2 Groundwater.

The EIS reported that the proponent's management framework includes Environment Hazard Standard EHS04: Waste. The standard specifies minimum acceptable performance standards for waste management processes and procedures including waste generation, transportation, receiving, storage, recycling, treatment and/or disposal. This standard is in place for the GLNG project and would apply to the GFD project.

Waste management strategies for the GFD project would be consistent with the intent of the waste management hierarchy as defined in Schedule 1 of the Environment Protection (Waste Management) Policy 2000, being:

- waste avoidance
- waste reduction
- waste re-use
- waste recycling
- energy recovery from waste
- waste treatment
- waste disposal.

The proponent has committed to implementing the mitigation measures proposed in its Waste Management Plan (WMP), which shall be reviewed at least every three years. It would include the following mitigation measures:

- apply the waste management hierarchy to:
 - minimise waste volumes and the risk of causing harm to the environment
 - maximise operational efficiency and environmental performance.
- design and plan the GFD project to incorporate less resource-intensive and more efficient waste management processes
- use contracts to encourage waste avoidance and set provisions related to waste targets
- identify and separate waste streams that can be re-used with minimal or no treatment or collected by a licensed waste transporter for recycling
- use engineered waste facilities that are appropriately licensed to accept the type and volume of waste being disposed of

• review and audit waste management practices to investigate improvements in existing processes.

The general waste impact assessment undertaken for the EIS found that after implementing mitigation and management measures, the residual risk of the potential impacts on environmental values and receptors is expected to be very low to low.

6.6.3 Coordinator-General's conclusions

I have conditioned the proponent to manage waste in accordance with the waste and resource management hierarchy and principles. Further conditions are in place to manage the impacts of waste fluids, green waste and residual drilling materials. I conclude that the potential impacts of GFD project waste can be adequately managed through the conditions I have stated and through the proponent's commitments and social impact management plan (SIMP).

I am confident that implementing a WMP will improve waste management practices and reduce the GFD project's potential waste management risks. I am satisfied that monitoring and reporting of waste generation will be undertaken in accordance with the WMP. I am also satisfied that the proponent will integrate waste management activities with existing GLNG project operations where possible.

6.7 Traffic and transport

The EIS assessed potential impacts on intersections, level crossings, road pavement and safety. Submissions on the EIS relating to traffic and transport matters raised issues relating to:

- the assessment methodology for intersection assessments
- adequacy of the road impact assessment
- finalisation of the road-use management plan (RUMP) for the GLNG project
- traffic generated by workforce personnel.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

The EIS identified 11 sealed state-controlled roads (SCRs) in the vicinity of the GFD project area. SCRs expected to be used by GFD project traffic include:

- Leichhardt Highway (Westwood to Miles)
- Carnarvon Highway (Surat to Rolleston)
- Fitzroy Developmental Road (Bauhinia to Duaringa)
- Warrego Highway (Toowoomba to Mitchell)
- Dawson Highway (Banana to Rolleston)
- Blackwater-Rolleston Road
- Jackson-Wandoan Road
- Roma-Condamine Road

- ÿ Roma Southern Road
- ÿ Roma Taroom Road
- ÿ Wallumbilla South Road.

The primary north–south highway corridors are the Leichhardt Highway, Carnarvon Highway and Fitzroy Developmental Road. Key east–west highway corridors are the Warrego Highway and Dawson Highway. These SCRs have varying traffic volumes. The EIS found a minimum of 67 vehicles per day used the Fitzroy Development Road in 2012 while a maximum of 6,497 vehicles per day was recorded on the Warrego Highway between Roma and Mitchell in the same year. Heavy vehicle traffic on these SCRs ranged from 12 per cent of all traffic on the Dawson Highway up to 37 per cent of all traffic on the Leichhardt Highway between Westwood and Taroom.

The EIS found that regional connecting roads are usually sealed and provide access between minor towns in the GFD project area, carrying fewer than 500 vehicles per day. These roads are typically SCRs or controlled by local government.

Rural connecting roads are both sealed and unsealed, and link higher order roads and provide property access, carrying a maximum of 350 vehicles per day. Rural access roads are usually unsealed and generally provide access only to isolated properties, carrying a maximum of 200 vehicles per day.

The Department of Transport and Main Roads (DTMR) *Guidelines for Assessment of Road Impacts of Development* (GARID) was used to assess impacts on SCRs and to consider impacts on local roads. In assessing the GFD project's impacts on SCRs, GARID requires any road with a predicted increase in traffic of more than five per cent caused by a project to be evaluated to determine if the impacts are acceptable and whether mitigation is required.

Heavy vehicle routes in the GFD project area have been identified by DTMR and used to plan the appropriate routes for haulage of equipment and materials. I note the EIS stated that heavy vehicles transporting plant and material over SCRs and local roads would comply with the vehicle mass limit requirements set out in the *Transport Infrastructure Act 1994*.

6.7.1 Impacts and mitigation

The EIS assessed the impact of the maximum development scenario on traffic and transport values. Detailed impact assessments would be undertaken by the proponent as the GFD project progresses and well sites are finalised.

Traffic generated by the GFD project has been forecast based on the trip generation rates, trip origins and trip destinations. The total vehicle kilometres travelled (VKT) over the study road network is forecast to be 68,626 million VKT between 2013 and 2056. The EIS reported that GFD project light vehicles would tally 891 million VKT and heavy vehicles including buses would generate 2,346 million VKT. This adds up to a total GFD project transport task of 3,237 million VKT, which represents 4.7 per cent of future traffic on the study road network between 2013 and 2056.

The proponent assessed the overall impact of the GFD project on the traffic and transport network by creating a geographic-information-system-based traffic model using the traffic generation and distribution assumptions outlined in the EIS.

Preliminary pavement impact assessment—maintenance

Pavement maintenance is the regular maintenance performed by DTMR, consisting of repairing potholes and other minor defects. An increase in traffic on a road results in an increased need for maintenance.

The EIS preliminary pavement impact assessment was undertaken to forecast likely impacts on existing road link capacities. Under GARID, the GFD project would be required to assist DTMR in meeting a funding shortfall for the maintenance of roads impacted by project traffic. Where traffic modelling shows the GFD project traffic to be greater than five per cent of background traffic on SCRs, the proponent would contribute to regular pavement maintenance of roads expected to be significantly impacted by project vehicles. Impacts would be further assessed at the detailed design phase of the GFD project to determine if contributions are necessary. Table 6.15 indicates the sections of road for which the proponent may be required to make a pavement maintenance contribution.

Preliminary pavement impact assessment—rehabilitation

Pavement rehabilitation is the reconstruction of a pavement performed at the end of its structural life (typically approximately 20 years). The GFD project EIS noted that unforeseen increases in vehicular traffic due to major projects in the region could result in roads requiring pavement rehabilitation sooner than forecast. Under GARID, the proponent would be required to assist DTMR in meeting rehabilitation costs in circumstances. Table 6.15 indicates the sections of SCR for which the proponent may be required to contribute to rehabilitation.

Table 6.15 Preliminary SCR pavement impact assessment

State-controlled road	Maintenance contribution payable	Rehabilitation contribution payable
Blackwater-Rolleston road	2021–30	P
Carnarvon Highway – Surat-Roma	2019–29	P
Carnarvon Highway – Roma-Injune	2019–29	P
Carnarvon Highway – Injune-Rolleston	2019–30	P
Dawson Highway – Banana-Rolleston	2019–30	P
Fitzroy Development Road – Bauhinia-Duaringa	0	0
Jackson-Wandoan Road	2013–23	P
Leichhardt Highway – Westwood-Taroom	2019–33	P
Leichhardt Highway – Taroom-Miles	2013–30	P
Roma-Condamine Road	2022–31	0
Roma Southern Road	2021–30	0
Roma Taroom Road	2019–28	P

State-controlled road	Maintenance contribution payable	Rehabilitation contribution payable
Wallumbilla South Road	2019–31	P
Warrego Highway – Toowoomba-Dalby	2019–28	P
Warrego Highway – Dalby-Miles	2013–29	P
Warrego Highway – Miles-Roma	2013–30	P
Warrego Highway – Roma-Mitchell	2021–26	P

Intersection assessment

The EIS reported that a preliminary intersection assessment was undertaken to determine the potential level of impact the GFD project would have on intersections within the GFD project area. The following intersections may require upgrades to ensure appropriate operation during project activities:

- ÿ Leichhardt Highway/Dawson Highway (channelised right turn lanes)
- ÿ Warrego Highway/Duke Street (Roma Southern Road) (auxiliary left turn lane—east–south leg)
- ÿ Warrego Highway/Leichhardt Highway (channelised right turn lanes)
- ÿ Warrego Highway/Yuleba Surat Road (channelised right turn lanes).

Road link volume assessment

The EIS investigated the GFD project's impact on each SCR in the project study area. A review of the baseline traffic volumes plus potential GFD project volumes determined that no SCRs reached capacity threshold because of potential project traffic.

Mitigation measures

The proponent has committed to prepare the following documents to contribute to the protection of traffic and transport values:

- ÿ infrastructure agreements with DTMR and regional councils
- ÿ RUMP prepared in consultation with DTMR and the Queensland Police Service (QPS)
- ÿ road impact assessments
- ÿ social impact management plan
- ÿ contingency plan for emergency environmental incidents
- ÿ emergency response plan.

Infrastructure agreements establish a framework for negotiating road impact mitigation and establish the forward work schedule to confirm costs and timing of road treatments. I have been advised that the GLNG project has a road infrastructure agreement in place for a gas field development in the Maranoa LGA. An infrastructure agreement for a gas field development in the Central Highlands LGA is under negotiation with further infrastructure agreements to be negotiated with Banana Shire Council and Western Downs Regional Council for their LGA's.

I support the proponent's commitment to establishing new or utilising existing infrastructure agreements with DTMR and regional councils relevant to the GFD project. I acknowledge the time and resources invested by all parties in developing infrastructure agreements. I expect infrastructure agreements will be in place prior to GFD project activities generating any unacceptable impacts.

In the event an agreement cannot be reached with a regional council, I recognise that the *Local Government Act 2009* provides councils with the power to control local government roads. This includes the power to create a local law for the maintenance of local roads as well as the power to close local roads.

I am aware that a RUMP was developed for the GLNG project to manage the efficiency of the local road network, ensure the safety of road users and minimise traffic-related complaints. I recognise that the proponent has committed to adapt the RUMP to manage the potential impacts resulting from the GFD project. I expect the RUMP to be prepared in consultation with DTMR and the QPS.

6.7.2 Coordinator-General's conclusions

I am satisfied that the traffic and transport impacts have been adequately assessed in the EIS. I recognise that the GFD project would generate additional traffic on SCRs and local roads that would require the proponent to contribute to the cost of pavement maintenance and rehabilitation. I also note that up to four intersections could potentially require upgrades to mitigate the impacts of GFD project traffic.

I am aware that the proponent's Environment, Health and Safety Management framework includes the application of 'regional rules' which govern the behaviour of proponent employees and contractors working on the GLNG project. Regional rules would also apply to the GFD project. In particular, Rule 5 requires that vehicle movements be planned, monitored and consolidated. Vehicle branding and a toll free 1800 number on vehicles provide an avenue for the community to monitor and comment on drivers' conduct.

6.8 Hazard and risk

The EIS assessed hazard and risk in the GFD project area. Submissions on the EIS relating to hazard and risk matters raised the following issues:

- Y worker health and safety
- Y provision of an emergency response plan
- Y increased fire risk to state forests from overhead power lines
- Y further investigation into the potential for seismic activity.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

Hazards

A hazard and risk assessment was undertaken as part of the EIS, in accordance with principles set out in *Risk Management – Principles and Guidelines* (Australian Standard/New Zealand Standard AS/NZS:ISO 31000:2009). Risks associated with the GFD project were assessed using a risk matrix approach based on this standard, and the level of risk was determined by combining the likelihood and consequence criteria.

The EIS identified 10 potential natural hazards for the life of the GFD project including bushfires, flooding and earthquakes. Six project components were identified as having the potential to cause offsite impacts such as the release of natural gas or failure of water storages. These components include wells, gas compression facilities, pipelines and water management facilities. Project activities which involve materials such as natural gas, triethylene glycol, diesel and chemicals used for treating coal seam water or drilling and well stimulation can pose additional hazards.

The hazards were assessed to rate the consequence, likelihood and outcome that may result should the potential hazards be realised (considering the proposed preventative and protective controls for each hazard).

Risks

The EIS assessed several predicted risks including environmental, community health and safety and worker health and safety. The following risks to people were considered possible medium-risk issues for the GFD project:

- damage to an adjacent gas pipeline during construction of the gas gathering or transmission pipelines
- potential for fires resulting from the release of gas from a well head or equipment/piping at a well lease or gas compression facility
- potential for fires resulting from the release of gas from gas gathering pipelines and gas transmission pipelines
- catastrophic failure of a water storage structure.

With regard to risk to property, the potential catastrophic failure of a water storage structure was considered a possible medium-risk issue for the GFD project.

The risk matrix developed for the hazard and risk assessment noted that a medium risk level may be accepted as tolerable if it can be shown that adopting further risk control measures would incur costs that are grossly disproportionate to the benefits gained or that the only risk control measures available are impracticable. No extreme risks to people or property were identified.

6.8.1 Impacts and mitigation

Mitigation measures were informed by relevant statutory and regulatory obligations including:

- *Petroleum and Gas (Production and Safety) Act 2004* (Qld)
- *Petroleum and Gas (Production and Safety) Regulation 2004* (Qld)

- *Environmental Protection Act 1994* (Qld)
- *Work Health and Safety Act 2011* (Qld)

The GFD project would adopt an environment, health and safety management system that provides a structured framework for effective practices across its activities and operations. The framework has been developed to be consistent with AS/NZS ISO 14001: 2004 Environmental management systems – Specifications with guidance for use and AS/NZS ISO 4801: 2001 Occupational health and safety. The hierarchy of controls for managing environmental health and safety risks includes:

- ÿ elimination (e.g. by eliminating inventories of dangerous goods)
- ÿ substitution (e.g. by using a less hazardous material in place of a more hazardous material)
- ÿ engineering (e.g. compliance with internal and external standards)
- ÿ isolation (e.g. erection of physical barriers)
- ÿ administrative (e.g. emergency procedures)
- ÿ protective (e.g. use of personal protective equipment).

Management plans developed for the GFD project and the GLNG project to minimise and manage hazards and risk include:

- ÿ GFD project environmental protocol for constraints planning and field development
- ÿ Hydraulic fracturing risk assessment
- ÿ Queensland incident management plan
- ÿ emergency response plan
- ÿ contingency plan for emergency environmental incidents
- ÿ social impact management plan
- ÿ chemical and fuel management plan
- ÿ decommissioning and abandonment management plan.

The proponent has made further commitments to mitigate hazard and risk in its commitments register including:

- ÿ managing risks to as low as reasonably practicable throughout the GFD project life cycle
- ÿ considering the potential risks of climate change (e.g. larger and more frequent flood events and bushfires) in siting infrastructure
- ÿ engaging with emergency services concerning joint responsibilities for emergency response.

6.8.2 Coordinator-General's conclusion

I am satisfied that project hazards and risks have been adequately assessed in the EIS. I recognise that comprehensive legislative requirements for hazard and risk are in place to regulate the proponent's business practices at the GFD project site. I consider that the potential hazards and risk for the GFD project can be adequately managed

throughout the life of the project by the implementation of the proponent's commitments and management plans.

6.9 Cultural heritage

The EIS assessed the Indigenous and non-Indigenous cultural heritage of the GFD project area. Submissions on the EIS relating to Indigenous and non-Indigenous cultural heritage matters raised the following issues:

- cultural and spiritual importance of springs
- training and employment opportunities for Indigenous people.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

Indigenous cultural heritage

Indigenous cultural heritage (ICH) values have been identified through a review of registers, available literature and field surveys previously undertaken across the GFD project area for the GLNG project. A review of relevant registers indicated that there are 1,845 registered Indigenous heritage places across the GFD project area, including artefact scatters, paintings and scarred trees.

Field surveys for the GLNG project identified artefact scatters of variable density, open camp sites with grinding plates, top stones and edge ground axes, scarred trees, stone arrangements and hearths. Sources of raw material in the region included ochre, silcrete and sandstone.

Non-Indigenous cultural heritage

The EIS reported that the GFD project area is located in some of the earliest explored and settled areas of the Maranoa and Leichhardt pastoral regions. The non-Indigenous cultural heritage (NICH) values of the GFD project area were identified through a review of statutory and non-statutory registers, and surveys. The following heritage sites were identified throughout the GFD project area:

- explorers' campsites
- pastoral places such as homestead complexes (including homesteads, cattle/sheep dips, meat houses, dairies, holding yards, shearing sheds, storage sheds and refuse dumps), fencing, bores, water storage ponds, bush camps, surveyors marks and terracing
- isolated graves and cemeteries
- historical precincts within towns such as Roma, Surat, Wallumbilla, Old Yulebah and New Yulebah
- roads, railways and stock routes and associated telegraph/telephone lines including old road alignments and roads which reflect specific phases of development (e.g. soldier settler roads), railways, sidings, stations and associated settlement and housing

- forestry industry places
- resource projects and quarry places, including underground and open-cut mines, wells and associated infrastructure
- memorials both to early explorers and soldiers.

This investigation identified over 160 known places of NICH within the GFD project area, ranging from state and local cultural heritage significance, to known places that have not yet been assessed for significance.

6.9.1 Impacts and mitigation

Indigenous cultural heritage

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) protects ICH in Queensland. To comply with the duty of care provisions under section 23 of the ACH Act, proponents of projects requiring an EIS must prepare a Cultural Heritage Management Plan (CHMP) prior to commencing construction. A CHMP is a legally binding agreement between the proponent and native title claimants and details the procedures for identifying and managing potential impacts on ICH.

The proponent finalised CHMPs with the relevant Aboriginal parties (in accordance with Part 7 of the ACH Act) as part of the GLNG project. Those parties are listed in Table 6.16. The CHMPs currently manage any potential impacts to ICH that may result from GLNG project activities. The process would be extended for the new GFD project activities. The proponent intends to consult further with Aboriginal groups in accordance with the existing approved *Santos GLNG Aboriginal Engagement Policy*.

Table 6.16 Cultural heritage management plans in the GFD project area

Aboriginal party	Relevant project area	Commencement date
Mandandanji People (QC08/10)	Southern GFD project tenure	12 April 2010
Iman People (2) (QC97/55)	Eastern and central GFD project tenure	4 February 2009
Karingbal People	Northern and central GFD project tenure	9 February 2009
Gap B endorsed parties	Northern GFD project tenure	24 September 2009
Bidjara People (QC06/019)	Northern and central GFD project tenure	4 February 2009
Ghangalu People (QC97/36)	Northern GFD project tenure	29 June 2010
Kangoulou People	Northern GFD project tenure	7 December 2010

Submissions on the EIS noted that Indigenous heritage places may also include GAB springs cared for by the Aboriginal people. As discussed section 5.5.2 (groundwater) of this report, the proponent has committed to comply with the requirements of the Surat CMA UWIR. The proponent has also committed to implement the Joint Industry Plan for the Monitoring and Protection of the EPBC Springs to protect GAB springs.

An Aboriginal engagement policy and SIMP Action Plan have also been agreed to between the proponent and DATSIP, as discussed in section 6.10 (Social impacts) of this report. The policy would ensure that employment and training opportunities are available to Indigenous people.

Non-Indigenous cultural heritage

The GFD project environmental protocol for constraints planning and field development will enable the proponent to systematically identify, assess and manage potential impacts to significant NICH places.

After the proponent has identified a potential area for development in accordance with the constraints protocol, the overarching mechanism for protecting cultural heritage will be the *Environmental Hazard Standard (EHS) 11 Cultural heritage*. EHS11 defines the processes to avoid, where practicable, or otherwise to minimise impacts to cultural heritage and ensure relevant statutory cultural heritage requirements are complied with. EHS11 is supported by cultural heritage field personnel and a cultural heritage management system which ensures that construction work is undertaken in accordance with the CHMPs and the ACH Act.

The proponent has advised that it would implement EHS11 as the Heritage Management Plan for the GFD project.

6.9.2 Coordinator-General's conclusions

I am satisfied that the proponent is committed to implementing mitigation measures to avoid, or minimise the impacts on Indigenous and non-Indigenous cultural heritage. CHMPs have been signed with all relevant Aboriginal parties and the constraints protocol and EHS11 would be implemented for both Indigenous and non-Indigenous cultural heritage.

6.10 Social impacts

A social impact assessment (SIA) was conducted for the GFD project in accordance with the principles of the Coordinator-General's *Social impact assessment guideline and managing the impacts of major projects in resource communities'* guideline.

The GFD project is an expansion project which is planned to commence construction in 2016. It would run concurrently with the existing GLNG project as that project transitions from construction to operation.

Accordingly, the framework adopted and the mechanisms established as part of the approved SIMP for the GLNG project would continue to be implemented across the GFD project. This has been supplemented by action plans particular to the GFD project that focus on identified impacts and associated mitigation and management strategies. The SIMP and the action plans outline existing as well as new roles and responsibilities, the framework for community engagement, and the strategies proposed to avoid, mitigate or minimise potential impacts.

The study area for the SIA included the Maranoa, Central Highlands, Western Downs Regional Council regions and the Banana Shire area. The SIA summarised the impacts of the GFD project and provided mitigation and management measures to address impacts.

The EIS assessed social impacts in the GFD project area. Submissions on the EIS and consultation for the SIA identified key issues, impacts and opportunities as follows:

- the need to maximise local employment training and development opportunities for construction and operations
- social impacts on local communities requiring upgrades to town amenities and infrastructure
- potential for reduced housing affordability and availability, particularly in the rental market
- differing views on whether accommodation camps should be located near towns or at a distance from existing communities
- health issues associated with workers living in accommodation camps
- access to housing for Indigenous people associated with health issues, housing affordability and availability
- workforce strategies and programs proposed for Indigenous people, women, students, the unemployed and underemployed
- communities feel well informed about the expansion of gas field development as they are familiar with industry
- road impact assessment and investment must be undertaken early in the GFD project development to be effective
- management of weeds and the by-product of coal seam water a key landholder issue.
- beneficial re-use of coal seam water across the region
- sponsorship and financial support provided by the gas companies and the government's royalties initiatives seen as positive opportunities
- the limited impact on health services largely due to gas companies providing on-site medical services
- local content strategies to assist local and regional businesses
- desire for greater integration of the non-resident workforce with town communities in order to capitalise on the economic stimulus opportunities that this population offers.

I have considered each submission and possible impact and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

6.10.1 Community and stakeholder engagement

To inform the SIA, the proponent undertook well-planned, extensive and broad scale stakeholder consultation and community engagement. The proponent's consultation processes and procedures followed the framework and principles adopted as part of

the Santos GLNG project and are incorporated into the Stakeholder and Community Engagement Plan.

Key partnerships and collaborative working relationships established during the GLNG project were utilised and new relationships were developed. Key stakeholders included local governments, state government agencies, local business and industry groups, schools and training providers, landholders, local and regional communities, Indigenous groups, community agencies and service providers. Consultation and engagement activities identified a range of issues and concerns including:

- ÿ changing housing markets following the completion of the construction phases of gas companies' projects
- ÿ workforce demand on public health facilities and services
- ÿ community tension and conflict between those opposing and those supporting gas fields development in the region
- ÿ increase in GFD project traffic on roads across the GFD project area and potential increase in traffic accidents and workload for existing emergency services
- ÿ potential increase in anti-social behaviour, if the workforce is predominately male, in social venues and general town areas
- ÿ potential for increased demand for housing and decreased affordability
- ÿ loss of staff from local industries due to increased wage pressures on local business
- ÿ worker fatigue associated with local workers working extended shift hours and rosters increasing family burden and reducing participation in the local community
- ÿ lack of Indigenous cultural awareness of new construction and operations workforce
- ÿ migration from the region of Indigenous families due to inability to access or afford housing
- ÿ land access including economic and liveability impacts and landholder agreements.

In response to stakeholder and community feedback, the proponent has proposed a detailed consultation, engagement and information process for the GFD project which aims to assist with mitigating and managing impacts. The proponent would ensure the integrated approach to on-going community and stakeholder engagement for the life of the GFD project. Engagement activities would be integrated into the existing Santos GLNG Community Engagement Plan, Land Access Engagement Strategy and SIMP. The proponent has committed to a range of stakeholder engagement mechanisms, which are already established and include:

- ÿ Regional Community Consultative Committees representative of regional council areas
- ÿ community information sessions
- ÿ MP and council briefings
- ÿ community events
- ÿ community shopfronts at Roma and Taroom
- ÿ community perception surveys
- ÿ community relations advisors

- ÿ project newsletter and website
- ÿ complaints management process including 1800 number and project email contact points
- ÿ land access implementation protocols and processes for negotiation
- ÿ landholder advisors case managing landholder mitigation and management strategies
- ÿ one-to-one meetings with particular landowners
- ÿ Aboriginal Engagement Policy and associated targeted engagement measures
- ÿ Water Working Group - agricultural and environmental non-government organisations, local landholders, representatives and local community groups
- ÿ site tours, group briefings for all stakeholders
- ÿ industry forums and expos
- ÿ Roma Training Reference Group and Roma Interagency Group.

Santos has committed to continue to adopt an adaptive management approach to social impact mitigation through comprehensive stakeholder and community engagement and consultation over the life of the GFD project by:

- ÿ understanding the issues and opportunities, targeting a wide range of stakeholders and consulting to identify impacts, needs and opportunities
- ÿ predicting likely impacts and benefits—through engagement and assessment of community investment opportunities with stakeholders
- ÿ mitigation, management and enhancement strategies which are developed collaboratively with stakeholders
- ÿ on-going stakeholder engagement, monitoring and evaluation of programs and outcomes to inform adaptive management strategies
- ÿ implement and integrate engagement and consultation practices into business systems and processes.

Coordinator-General's conclusion

I consider the stakeholder consultation and engagement process, which is proposed to be adopted and maintained for the life of the GFD project, to be well-targeted and comprehensive in identifying community and stakeholder issues. I note the proponent's structured and integrated approach to ensure all stakeholders have access to information, and opportunities to participate and collaborate on developing mitigation and management strategies to influence social outcomes.

To ensure the proponent's stakeholder consultation and engagement plan is effective, I have imposed a condition requiring the proponent to provide to the Coordinator-General a Social Impact Management Report (SIMR) annually for a period of five years from the commencement of construction. The annual report must describe the actions taken to inform the community and stakeholders about the GFD project impacts and demonstrate that community and stakeholder concerns have been taken into account when reaching decisions on mitigation and management of social impacts. The

proponent must make the report publicly available during each year of the reporting period.

6.10.2 Employment and training

Impacts and mitigation

The GFD project would require a construction workforce of approximately 1,980 and an operational workforce of approximately 300 across a 30-year period. The GFD project would create both direct and indirect employment opportunities through the creation of new jobs as well as the continuation of existing jobs from the Santos GLNG project. It would also provide training, skills development and educational opportunities in the gas industry.

The proponent remains committed to providing local and regional employment opportunities through their established GLNG Local Employment Plan and the GFD Workforce Management Action Plan. The workforce management plan for the GFD project includes a minimum recruitment target of 20 per cent local/regional workers during construction and 50 per cent during the operational phase of the GFD project. Based on current workforce figures, this equates to 396 construction workers and over 150 operational workers from local or regional areas. The proponent acknowledges the need to minimise the reliance on fly-in, fly-out (FIFO) operations and maximise local employment opportunities.

This evaluation report was finalised prior to the state government's FIFO policy framework being developed and implemented. Therefore, no specific recommendations have been included in this report. However, to support the government's FIFO commitments, I expect the following seven workforce management principles to be the guiding framework under which the proponent manages its workforce in meeting the local and regional employment targets.

- (1) anyone must be able to apply for a job, regardless of where they live
- (2) provided they can meet the requirements of the job, people must have a choice where they live and be able to apply for jobs on the GFD project
- (3) the percentage of FIFO workers employed must be less than 100 per cent
- (4) an audit of existing housing capacity must be undertaken before the GFD project starts. To support those who wish to live locally, Santos GLNG will ensure the availability of accommodation that is fit for purpose and will make optimal use of existing housing capacity
- (5) the proponent must thoroughly assess its workforce requirements and plan to accommodate the likely number of workers who may live locally
- (6) social impacts associated with the local workforce, in relation to local housing services and infrastructure must be identified and mitigated in consultation with relevant local and state government service providers
- (7) the proponent's social impact mitigation measures should support regional towns in pursuing opportunities to ensure communities are strong and sustainable and that they are attractive places to live and work.

Given the government's focus on minimising FIFO work practices and its desire to monitor targets for local and regional workers, I require the proponent to report annually on its operational workforce arrangements for resident and non-resident workers.

The proponent's established Local Employment Plan and the GFD project's Workforce Management Action Plan align with my workforce management principles and commit to maximise the availability of skilled labour within local and regional communities by implementing the following strategies:

- Y placing no restrictions on the employment of local and regional workers
- Y continuing to support local and regional communities with employment and training opportunities
- Y allowing all workers to apply for employment on the GFD project regardless of where they live
- Y optimising local community participation in the GFD project through direct employment
- Y using collaborative partnerships with government, local service providers and lead contractors and suppliers to share risk and costs associated with employment training and development opportunities
- Y investing in skills development of local and regional residents to meet the needs of the GFD project, which are transferable to other industries and sectors
- Y continuing to support local and regional business to attract staff through the Careers in Gas website
- Y continuing to work through collaborative arrangements with Education Queensland, Queensland Institute of TAFE and other stakeholders on local and regional school-based programs and TAFE traineeships
- Y updating the Santos GLNG project employment programs to include the GFD project including school-based traineeships and full-time traineeships and apprenticeships
- Y continuing to participate in local career days and employment expos highlighting the range of employment opportunities in the communities impacted by the GFD project
- Y enforce established workers code of conduct to manage workforce behaviour impacts on communities
- Y supporting local Indigenous employment and training programs including school-based traineeship and full-time traineeships and apprenticeships
- Y supporting Indigenous capacity building, business development and mainstream and vocational education and school-based employment programs
- Y providing final workforce numbers to state and local government when field development planning is finalised.

The above strategies, partnerships and collaborative arrangements have been implemented as part of the GLNG project and would continue to be utilised for the GFD project.

The proponent also has in place existing employee workforce management practices and procedures. These strategies include:

- ÿ Employee Relations Management Plan
- ÿ Workers Code of Conduct
- ÿ site work rules
- ÿ Employee Induction Program
- ÿ Employee Assistance Programs
- ÿ Maranoa Regional Rules to guide the behaviour of Santos workers and contractors including monitoring compliance, land access and landholder engagement
- ÿ promoting volunteering in the community
- ÿ implementing cultural awareness training across the workforce.

These standards have been developed and implemented for the GLNG project and would be maintained and implemented for the life of the GFD project.

Coordinator-General's conclusion

I acknowledge that the proponent's existing and future workforce management strategies are aligned with my workforce management principles. This is reflected by its commitments to local and regional recruitment targets for construction and operation, providing worker choice, employment and training opportunities, and the ongoing monitoring of the local housing market. Together, the principles and strategies would form the guiding framework for the implementation of workforce planning by the proponent.

I have therefore imposed a condition requiring the proponent to report annually on my principles and the proponent's mitigation and management strategies in relation to operational work practices. Reporting should include the composition of the operational workforce and the percentage of FIFO (non-resident workers) and resident workers.

I have also imposed a condition requiring the proponent to prepare a report describing the proponent's subsequent actions, outcomes and adaptive management strategies to enhance local and regional training and development opportunities. The proponent must report annually for five years from the commencement of construction.

The proponent must make all reports publicly available during each year of the reporting period.

6.10.3 Housing and accommodation

Impacts and mitigation

With the transition of the LNG industry from construction to operation and the resultant downturn in the mining industry, there has been a reduction in housing costs, an increase in supply and a slowing of demand across the GFD project area.

Housing impacts identified during the development of the SIA include:

- ÿ increased demand for housing from workers moving to the region

- Y the fluctuating housing market impacts on cost and availability due to speculation and real estate investment
- Y housing cost increase due to un-met demand and market speculation impacting low-income sections of the community
- Y potential for the housing market to change quickly, particularly in resource towns in response to the changing economic climate and the employment market
- Y Indigenous peoples impacted by increased housing cost and availability
- Y effective implementation of the Housing and Accommodation Action Plan to protect housing choice for tenants and residents on low incomes
- Y Differing views on whether accommodation camps should be located near towns or at a distance from existing communities.

The proponent has committed to utilising and applying the approved GLNG Integrated Project Housing Strategy framework in conjunction with the GFD Housing and Accommodation Plan. This would assess and develop a range of mitigation and management strategies to respond to and monitor housing impacts.

Mitigation strategies include:

- Y applying the Integrated Project Housing Strategy to actively monitor and review the housing market and engage key stakeholders to ensure appropriate housing strategies are in place prior to field development
- Y reporting new or revised housing strategies in response to changing housing market
- Y re-introducing rental assistance subsidies and housing support programs that relieve vulnerability to housing affordability pressures, if required
- Y using six existing GLNG-approved accommodation camps, located outside major communities—five permanent and one temporary across the GFD project footprint
- Y using existing camps for both GFD and GLNG projects during construction and operation phases
- Y proposed development of an additional three accommodation camps, one permanent and two temporary, which would meet all relevant Australian Standards, Queensland Building Code requirements, Local Government planning approvals, Fire Service requirements and Santos standards (that exceed statutory or regulatory requirements)
- Y ensure temporary and permanent accommodation facilities have telecommunication equipment.

Coordinator-General's conclusions

I acknowledge that the proponent has put in place strategies for mitigating housing market impacts and for effectively accommodating their construction and operational workforce. These strategies may include monitoring the housing market, re-introducing housing assistance programs, and providing housing options and choice for resident and non-resident workers.

Given the potential for the housing markets to change over time I have conditioned the proponent to report on current and future housing and accommodation impact

mitigation and management strategies. The report must be provided annually for a period of five years from the commencement of construction. The proponent must make the report publically available during each year of the reporting period.

6.10.4 Health, safety and community infrastructure

Impacts and mitigation

During the course of the consultation and EIS process, the community and associated stakeholders raised a range of potential impacts related to health, safety and community infrastructure. The importance of maintaining community identity and liveability across the GFD project area was also identified. The perceived impacts are:

- ÿ increased workforce demand on public health facilities and services
- ÿ increased GFD project traffic on local roads and in town areas
- ÿ increased demand on public infrastructure
- ÿ local employees working extended shift hours and rosters
- ÿ increased Indigenous employment has the potential to present staffing difficulties for Indigenous organisations
- ÿ resentment at perceived landholder benefit from occupation of traditional land
- ÿ increased potential for antisocial behaviour to affect community values and lifestyle and risk to personal and community safety
- ÿ construction activity deters local tourism and highway trade
- ÿ lack of cultural awareness of new construction and operations workforce
- ÿ landholder impacts relating to land access arrangements including economic and liveability issues and process for agreements.

The proponent has committed to develop and implement an action plan to build on the extensive work already implemented or underway through the existing GLNG SIMP to manage health, safety and community infrastructure impacts. The following impact mitigation and management strategies in place or to be developed include:

- ÿ continue to implement the Santos GLNG Environment Health and Safety Management System
- ÿ continue the established medical field support service, which includes paramedics, occupational health nurses, general practitioners and emergency evacuation arrangements, based at accommodation villages to support the non-resident workforce
- ÿ expansion of health services to include new accommodation villages
- ÿ continued consultation with Queensland Health and other health service providers on emerging impacts on the local health system
- ÿ establish Emergency Response Plan and consultation and engagement protocols with key stakeholders
- ÿ Bushfire Management Plan for GFD and GLNG projects

- ÿ continue to ensure the LNG Aero Medical Helicopter Service is available to the broader community
- ÿ apply the land access and landholder engagement strategy, including the Landholder Ready Reckoner providing information on early engagement activities, property mapping and the compensation framework
- ÿ engage with DTMR and local and regional councils to extend existing road-use management plans and road infrastructure agreements to incorporate GFD project activities
- ÿ In the new regional council area of Central Highlands engage, negotiate and implement road-use management plans and road infrastructure agreements
- ÿ partner with local and regional councils where appropriate to apply for Building our Regions funding for road upgrades
- ÿ continue to implement regional rules and policies relating to road use and driver behaviour including in-vehicle monitoring program, engagement with local schools regarding the school zone safety, shuttle bus services from airports to worksites and accommodation villages and internal driver education campaigns
- ÿ communicate details of heavy and light vehicle movements and road works through local media
- ÿ engage and consult with the Queensland Police Service to respond to issues associated with anti-social behaviour where appropriate
- ÿ continue to implement the Santos community investment program including annual sponsorship and donation programs supporting local events and initiatives to enhance community wellbeing
- ÿ continue to support employee volunteering in the local communities
- ÿ Implement community development initiatives to support Indigenous communities such as school-based community programs.

Coordinator-General's conclusions

I require the proponent to continue to work with key stakeholders and the community to implement strategies to minimise impacts on health, safety and community infrastructure. I also require the proponent to fully develop and implement all commitments, as identified in the SIA, to ensure that all impacts are mitigated and managed during the life of the GFD project.

Given the potential for health, safety and social infrastructure impacts to change over time, I have imposed a condition requiring the proponent to report on its subsequent actions, outcomes and adaptive management strategies to avoid, manage and mitigate GFD project-related impacts on health, safety and community infrastructure. The report must be provided annually for five years from the commencement of construction and will be made publicly available by the proponent during each year of the reporting period.

6.10.5 Local business and industry content

The GFD project is expected to generate significant positive economic impacts in the Surat Basin Region following on from the established supply chain opportunities generated by the GLNG project. Local content strategies have been developed and implemented and would be further enhanced to build business capacity and capability to ensure economic opportunities and benefits across the footprint of the GFD project.

Impacts and mitigation

The proponent has implemented the Queensland Resources and Energy Sector Code of Practice for Local Content (Queensland Resources Council [QRC] Code) and associated implementation and reporting guidelines as part of the GLNG project and has committed to continue to adopt and implement the requirements of the code for the GFD project.

A Local Content Plan has been developed, which commits to a range of strategies to provide business opportunities for local, regional and Queensland-wide businesses. These include the following requirements:

- maximise opportunities for local business and industry to participate in the GFD project including:
 - continue to adopt the voluntary QRC Code providing full, fair and reasonable opportunity for capable local business
 - improving local industry participation, capability and competitiveness
 - continue to engage with local businesses, holding procurement sessions to assist in understanding supply chain opportunities
 - continue to support initiatives, such as the Roma Shop Local and Invest Local campaign, which promote main street business within the community
 - continue to report local procurement performance to key stakeholders and communities
 - assist state government in developing capacity-building programs for local business and industry
 - continuing to hold information and procurement sessions throughout the regions the proponent is operating in
 - creating contract and supply opportunities for Indigenous businesses
 - engaging with the Industry Capability Network to contribute to business and employment growth and foster innovation by identifying procurement opportunities for local industry
 - continue to operate the local business development program.

Development and implementation of local and regional business expertise, capacity and capability during the Santos GLNG project has resulted in them being well-placed to be competitive as part of the GFD supply chain business opportunities.

Coordinator-General's conclusions

I acknowledge the framework already implemented for the existing GLNG project and I require the proponent to continue to be a signatory to the QRC Code and ensure that Queensland suppliers, contractors and manufacturers are given full, fair and reasonable opportunity to tender for GFD project-related business activities.

Proponents adopting the QRC Code will submit an annual Code Industry Report to QRC demonstrating how the principles and framework of the code have been applied.

It is my expectation that the proponent commitments, along with any other initiatives adopted as a result of ongoing engagement with local and regional business, will be reflected in these reports.

6.11 Economic impacts

The EIS assessed the potential economic impacts of the GFD project. Submissions on the EIS, relating to economic impact matters raised the following issues:

- economic impact on agricultural production
- consideration of the economic value of private timber resources
- the proponent's local content and local buy strategy.

I have considered each submission and how the information provided by the proponent has responded to submitter issues as part of my evaluation.

The proponent's existing GLNG project has generated significant economic benefits throughout the region, Queensland and Australia. In June 2015, the proponent provided me with their GLNG project Social Impact Management Report 2014 which noted that 80 per cent of the project's expenditure had been in Australia. Of that expenditure, more than half was allocated to suppliers based in Queensland. \$409 million was spent in the Toowoomba LGA, \$266 million was spent in the Maranoa LGA and \$31 million in the Western Downs LGA.

The GFD project also has the potential to generate economic benefits throughout the region, Queensland and Australia. These include:

- employment opportunities during the construction and operational phases of the GFD project
- significant capital investment and an increase in Queensland's gross state product (GSP) during construction and operation
- increased local expenditure
- taxes and royalty payments to the Queensland Government.

As the GFD project follows an incremental field development process, the final quantity, size and location of production wells, gas compression facilities and associated infrastructure is yet to be determined. The proponent's economic impact modelling was therefore conducted for two different production scenarios:

- a moderate development scenario that would result in fewer production wells

ÿ a maximum development scenario based upon the development of 6,100 production wells.

6.11.1 Impacts and mitigation

Employment

The EIS estimates a 30-year construction period from 2016 would be required for the maximum development scenario. The construction workforce is expected to peak in 2021 at 1,980 full-time equivalent (FTE) workers. This would be maintained until 2025 when it would drop to an estimated 1,750 FTE workers and continue to decline until 2038 when it would stabilise at approximately 70 FTE workers until 2041. A graph showing the workforce numbers over the construction period including a breakdown by gas field can be seen in Figure 6.4.

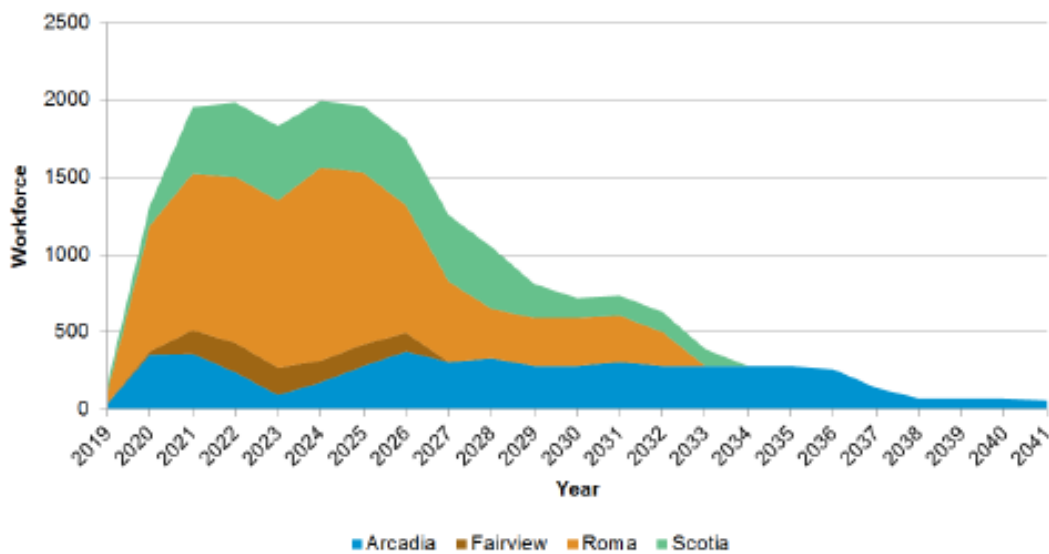


Figure 6.4 Preliminary estimate of construction workforce

For the 30-year operational phase, the GFD project operations workforce is expected to peak at just over 300 FTE workers. The operational workforce includes personnel involved in decommissioning and rehabilitation activities that would occur throughout the GFD project. A graph detailing the workforce numbers over the operations period including a breakdown by gas field can be seen in Figure 6.5.

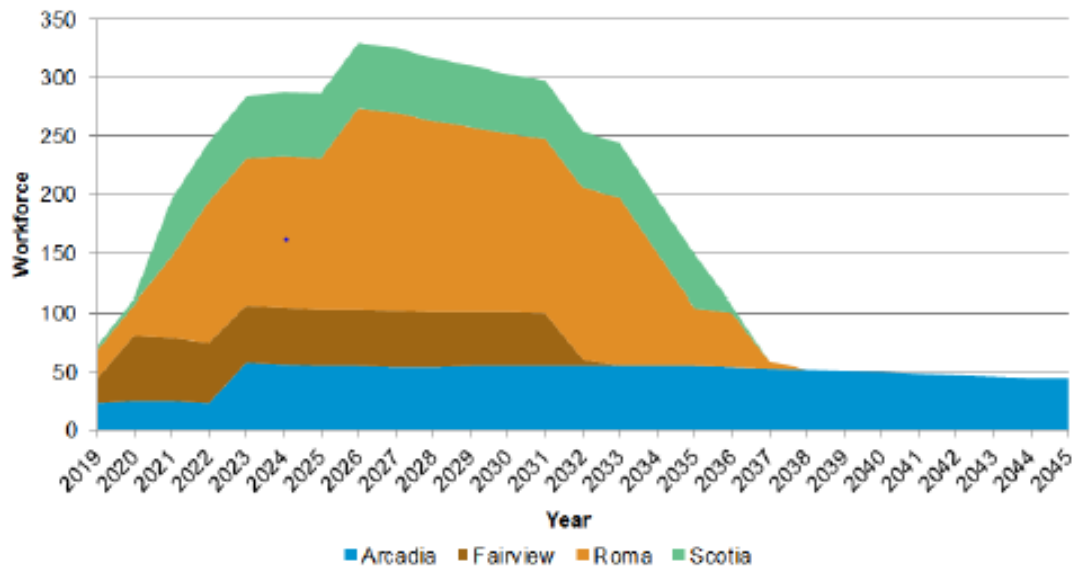


Figure 6.5 Preliminary estimate of operations workforce

Under the maximum development scenario, employment resulting from the GFD project peaks in 2022 when an additional 4,368 FTE jobs would be added to the Queensland economy. This includes direct employment by the proponent and jobs indirectly created in related industries. At a regional level, 1,950 indirect FTE jobs are expected to be generated in the Maranoa local government area. Other local government areas benefitting from the GFD project include Central Highlands (551 FTE jobs), Banana (479 FTE jobs) and Western Downs (166 FTE jobs).

The proponent has made the following commitments to enhance workforce opportunities:

- maximise the availability of skilled labour within regional communities
- enhance liveability in rural communities by maximising employment, training and apprenticeship programs
- develop effective employment, training and enterprise outcomes for Indigenous people.

Local economy

The proponent has committed to:

- improve local industry participation and capability
- adhering to the QRC Code, providing full, fair and reasonable opportunity for capable local businesses
- engaging with local businesses, including holding procurement sessions to assist understanding of supply chain opportunities
- reporting local procurement performance to key stakeholders and communities
- supporting initiatives such as the 'Roma Shop Local, Invest Local' campaign which promote main street businesses within the community.

General equilibrium whole-of-economy modelling was used to assess the indirect economic impacts of the GFD project on the local, State and national economies. The EIS found that direct economic benefits would be achieved by the proponent's intention to source approximately 85 per cent of the goods and services (including contractors) required for the GFD project from domestic markets, half of which would be procured within the local region.

Once project activities cease, there would also be opportunities for regional stakeholders to derive economic benefits from utilising Santos infrastructure. The EIS identified that, where practicable, pipelines, water storages, roads and access tracks may be transferred to a third party for ongoing beneficial use.

Gross regional product

Gross regional product (GRP) represents the value of economic activity in a region during a period of time. The proponent's economic impact modelling determined that in the moderate development scenario, impacts on GRP are highest around 2025-2030. Specifically, GRP would be 14.2 per cent above the baseline in 2025—this is the equivalent of an additional \$1.5 billion in output to the GFD project area. The maximum development scenario would result in an additional \$2.9 billion in output to the GFD project area, up to a 20.6 per cent increase in GRP above the baseline. Modelling forecasts to 2040 have projected that the GFD project would contribute between \$9.8 billion and \$16.9 billion to the GFD project area under the moderate and maximum scenarios respectively.

Gross state product

Gross state product (GSP) represents the value of economic activity in a state during a period of time. GSP under the moderate scenario in 2040 is estimated to add a further \$221 million to the Queensland economy (above the \$1.3 billion added to GRP in the GFD project area in 2040). The maximum development scenario forecasts that the GFD project would contribute an additional \$643 million to the state economy in 2040, with a total contribution of \$3.6 billion to GSP. Modelling forecasts to 2040 have estimated that the GFD project would contribute between \$12.1 billion and \$20 billion to the State of Queensland under the moderate and maximum scenarios respectively.

6.11.2 Coordinator-General's conclusions

I am satisfied that the proponent's use of general equilibrium modelling to estimate the economic impacts of the GFD project allowed for a robust assessment of the potential impacts on the local, regional, state and national economies. I requested that the proponent's EIS disaggregate the economic modelling outputs. This information was subsequently provided and I am satisfied that the proponent has adequately considered potential sector impacts within the local, state and national economies.

To maximise the economic benefits of the GFD project, the proponent has committed to working with government, industry and the community to manage economic impacts with a specific focus on addressing issues around its workforce and housing through its

SIMP. The proponent has also committed to increasing local industry participation through its adoption of the QRC Code.

I have imposed a condition requiring the proponent to prepare a report describing the proponent's actions, outcomes and adaptive management strategies to enhance local and regional training and development opportunities. The proponent must report annually for five years from the commencement of construction. All reports must be made publicly available during each year of the reporting period.

7. Conclusion

The GFD project has undergone a comprehensive environmental impact assessment. In undertaking my evaluation, I have considered the final EIS in accordance with the SDPWO Act. My evaluation has included consideration of the draft EIS, submissions on the draft EIS, the revised draft EIS, agency advice and additional documentation provided by the proponent as requested.

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the evaluation of potential impacts, development of mitigation strategies and determination of conditions of approval. I consider that the mitigation measures, commitments and the conditions stated in this report would result in acceptable overall outcomes.

In accordance with the Assessment Bilateral, section 5 of this report describes the extent to which the material supplied by the proponent addresses potential impacts on MNES. I am satisfied that ongoing field development planning will further reduce the modelled impacts and where significant residual impacts remain, the values will be offset.

Based on the information provided by the proponent and outlined in section 6.11, I conclude that the GFD project would deliver direct and indirect benefits for to the local, State and national economies. Direct economic benefits would be enhanced by the proponent's intention to source approximately 85 per cent of the goods and services required for the GFD project from domestic markets, half of which would be procured within the local region. The GFD project has the potential to generate substantial economic impacts throughout the region, Queensland and Australia. These include an increase in Queensland's GSP of up to \$20 billion under the maximum development scenario and increased taxes and royalties payable to the Queensland Government.

Accordingly, I approve the Santos GLNG Gas Field Development project, subject to the conditions and recommendations in Appendices 1-3. In addition, that the proponent's commitments must be fully implemented as presented in Appendix 4 of this report.

To proceed further, the proponent will be required to:

- Y obtain EPBC Act approval
- Y obtain a range of state government approvals, including EAs for all GFD project components
- Y implement all the management plans provided in the EIS

ÿ finalise an environmental offsets plan which considers both MNES and MSES.

If there are any inconsistencies between the GFD project (as described in the EIS documentation) and the conditions in this report, the conditions shall prevail. The proponent must implement all the conditions of this report and their commitments.

Copies of this report will be issued to DE, DEHP, DNRM, DTMR, Banana Shire Council, Central Highlands Regional Council, Maranoa Regional Council and Western Downs Regional Council.

A copy of this report will also be available on the Department of State Development website at **www.statedevelopment.qld.gov.au/gasfield**

Appendix 1. Stated conditions

Draft Environmental Authority

This appendix includes the Coordinator-General's stated conditions for the draft environmental authority for the Santos GLNG Gas Field Development project under the *Environmental Protection Act 1994* and are stated pursuant to section 47C of the *State Development and Public Works Organisation Act 1971*.

These conditions do not form a complete draft EA for the project.

Jurisdiction – Department of Environment and Heritage Protection

Schedule A General

Scoping table conditions

- A1** *[To be determined following an assessment for each EA. Condition General 1 will clearly identify the activities authorised under the environmental authority and specify the scale and intensity of the activity, where relevant.]*
- A2** The resources in condition (A1) are authorised subject to the conditions of this environmental authority.
- A3** This environmental authority authorises a relevant act¹ to occur only to the extent that:
- (a) the relevant act is an ordinary consequence of carrying out the resource activities authorised by this environmental authority in accordance with its conditions; or
 - (b) the relevant act is specifically authorised by the conditions of this environmental authority and carrying out an activity which results in the relevant act does not contravene the conditions of this authority.

Monitoring

- A4** All monitoring required must be undertaken by a **suitably qualified person**.
- A5** If requested by the **administering authority** in relation to investigating a complaint, monitoring must be commenced within 10 business days.
- A6** All laboratory analyses and tests required must be undertaken by a laboratory that has **NATA accreditation** for such analyses and tests.
- A7** Notwithstanding condition (A6), where there are no NATA accredited laboratories for a specific analyte or substance, then duplicate samples must be sent to at least two separate laboratories for independent testing or evaluation.
- A8** Monitoring and sampling must be carried out in accordance with the requirements of the following documents (as relevant to the sampling being undertaken), as amended from time to time:
- (a) for **waters** and aquatic environments, the Queensland Government's Monitoring and Sampling Manual 2009 – Environmental Protection (Water) Policy 2009
 - (b) for groundwater, Groundwater Sampling and Analysis – A Field Guide (2009:27 GeoCat #6890.1)
 - (c) for noise, the *Environmental Protection Regulation 2008*

¹ See section 493A of the *Environmental Protection Act 1994*

- (d) for air, the Queensland Air Quality Sampling Manual and/or Australian Standard 4323.1:1995 Stationary source emissions method 1: Selection of sampling positions, as appropriate for the relevant measurement
- (e) for soil, the Guidelines for Surveying Soil and Land Resources, 2nd edition (McKenzie et al. 2008), and/or the Australian Soil and Land Survey Handbook, 3rd edition (National Committee on Soil and Terrain, 2009)
- (f) for dust, **Australian Standard AS3580**.

Financial assurance

- A9** Petroleum activities that cause significant disturbance to land must not be carried out until financial assurance has been given to the administering authority as security for compliance with the environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the *Environmental Protection Act 1994*.
- A10** Prior to any changes in petroleum activities which would result in an increase to the maximum significant disturbance since financial assurance was last given to the administering authority, the holder of the environmental authority must amend the financial assurance and give the administering authority the increased amount of financial assurance.
- A11** If the amount of financial assurance held by the administering authority has been discounted and either the nominated period of financial assurance has ended, or an event or change in circumstance has resulted in the holder of the environmental authority no longer being able to meet one or more of the mandatory pre-requisites or applicable discount criteria, the holder of the environmental authority must amend the financial assurance and give the administering authority the increased amount of financial assurance as soon as practicable.

Contingency procedures for emergency environmental incidents

- A12** Petroleum activities involving significant disturbance to land cannot commence until the development of written contingency procedures for emergency environmental incidents which include, but are not necessarily limited to:
- (a) A clear definition of what constitutes an environmental emergency incident or near miss for the petroleum activity.
 - (b) Consideration of the risks caused by the petroleum activity including the impact of flooding and other natural events on the petroleum activity.
 - (c) Response procedures to be implemented to prevent or minimise the risks of **environmental harm** occurring.
 - (d) The practices and procedures to be employed to restore the environment or mitigate any environmental harm caused.
 - (e) Procedures to investigate causes and impacts including impact monitoring programs for releases to waters and/or land.
 - (f) Training of staff to enable them to effectively respond.
 - (g) Procedures to notify the administering authority, local government and any potentially impacted landholder.

Maintenance of plant and equipment

- A13** All plant and equipment must be maintained and operated in their proper and effective condition.
- A14** The following infrastructure must be signed with a unique reference name or number in such a way that it is clearly observable:

- (a) regulated dams and low consequence dams
- (b) **exploration, appraisal and development wells**
- (c) water treatment facilities
- (d) sewage treatment facilities
- (e) specifically authorised discharge points to air and waters
- (f) any chemical storage facility associated with the environmentally relevant activity of chemical storage
- (g) field compressor stations
- (h) central compressor stations
- (i) gas processing facilities; and
- (j) pipeline compressor stations.

A15 Measures to prevent fauna being harmed from entrapment must be implemented during the construction and operation of well infrastructure, dams and pipeline trenches.

Complaints

A16 Petroleum activities must not cause **environmental nuisance** at a **sensitive place**, other than where an **alternative arrangement** is in place.

Documentation

A17 A **certification** must be prepared by a suitably qualified person within 30 business days of completing every plan, procedure, program and report required to be developed under this environmental authority, which demonstrates that:

- (a) relevant material, including current published guidelines (where available) have been considered in the written document
- (b) the content of the written document is accurate and true; and
- (c) the document meets the requirements of the relevant conditions of the environmental authority.

A18 All plans, procedures, programs, reports and methodologies required under this environmental authority must be written and implemented.

A19 All **documents** required to be developed under this environmental authority must be kept for five (5) years.

A20 All documents required to be prepared, held or kept under this environmental authority must be provided to the administering authority upon written request within the requested timeframe.

A21 A record of all complaints must be kept including the date, complainant's details, source, reason for the complaint, description of investigations and actions undertaken in resolving the complaint.

Third Part Audit

[Note: Third party audit conditions (A22 to A27 inclusive) are required for all environmental authorities, except for an environmental authority that only authorises an authority to prospect tenure, which is not part of a resource project. A resource project has the meaning given by section 112 of the Environmental Protection Act 1994.]

A22 A **third party auditor**, nominated by the holder of this environmental authority and accepted by the administering authority, must audit compliance with the conditions of this environmental authority at a minimum frequency of every three (3) years.

A23 Notwithstanding condition (A22), and prior to undertaking the third party audit, the scope and content of the third party audit can be negotiated with the administering authority.

- A24** An audit report must be prepared and **certified** by the third party auditor presenting the findings of each audit carried out.
- A25** Any recommendations arising from the audit report must be acted upon by:
- (a) investigating any non-compliance issues identified; and
 - (b) as soon as reasonably practicable, implementing measures or taking necessary action to ensure compliance with the requirements of this environmental authority.
- A26** A written response must be attached to the audit report detailing the actions taken or to be taken on stated dates:
- (a) by the holder to ensure compliance with this environmental authority; and
 - (b) to prevent a recurrence of any non-compliance issues identified.
- A27** The audit report required by condition (A24) and the written response to the audit report required by condition (A26) must be submitted with the subsequent annual return.

Schedule B Water

General

- B1** Contaminants must not be directly or indirectly released to any waters except as permitted under this environmental authority.
- B2** The extraction of groundwater as part of the petroleum activities from underground aquifers must not directly or indirectly cause environmental harm to any **watercourse** or **wetland**.

Works in watercourses and wetlands

- B3** Only construction or maintenance of **linear infrastructure** is permitted in or within a general ecologically significant wetland or in a watercourse.
- B4** The construction and/or maintenance of linear infrastructure that will result in significant disturbance in or on the **bed and banks** of a watercourse or within a **general ecological significant wetland** must be conducted in accordance with the following order of preference:
- (a) conducting works in times when there is no water present;
 - (b) conducting works in times of no flow;
 - (c) conducting works in times of flow but in a way that does not impede low flow.
- B5** The construction and maintenance of linear infrastructure authorised under condition (B3) must comply with the water quality limits specified in *Schedule B, Table 1 – Water release limits for Construction or Maintenance of Linear Infrastructure*.

Schedule B, Table 1 – Water Release limits for Construction or Maintenance of Linear Infrastructure.

Water Quality Parameters	Units	Water Quality Limits
Turbidity	NTU	<p>For a general ecologically significant wetland, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within a 50m radius of the construction or maintenance activity.</p> <p>For a watercourse, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within 50m downstream of the construction or maintenance activity.</p>
		<p>For a general ecologically significant wetland, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within a 50m radius of the construction or maintenance activity.</p> <p>For a watercourse, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within 50m downstream of the construction or maintenance activity.</p>
Hydrocarbons	-	No visible sheen

- B6** Monitoring must be undertaken at a reasonable frequency to ensure compliance with condition (B5).
- B7** A register must be kept of all linear infrastructure construction and maintenance activities in a wetland of other environmental value and watercourses, which must include:
- (a) location of the activity (e.g. GPS coordinates (**GDA94**) and watercourse name)
 - (b) estimated flow rate or surface water at the time of the activity
 - (c) duration of work
 - (d) results of impact monitoring carried out under condition (B6).
- B8** Petroleum activities must occur outside a **wetland of high ecological significance**.
- B9** Petroleum activities must not negatively impact a wetland of high ecological significance.
- B10** Linear infrastructure activities, other than linear infrastructure construction and/or maintenance activities, must not change the existing surface water hydrological regime of any general ecologically significant wetland.
- B11** The construction and/or maintenance of linear infrastructure in any general ecologically significant wetland must not:
- (a) prohibit the flow of surface water in or out of the wetland;
 - (b) impact surface water quality in the wetland unless specifically authorised by this environmental authority;
 - (c) drain the wetland;
 - (d) fill the wetland;
 - (e) impact bank stability; or
 - (f) result in the clearing of riparian vegetation outside of the required footprint.

Floodplains

B12 Where the petroleum activity is carried out on **floodplains** the petroleum activity must be carried out in a way that does not:

- (a) concentrate flood flows in a way that will or may cause or threaten an adverse environmental impact; or
- (b) divert flood flows from natural drainage paths and alter flow distribution; or
- (c) increase the local duration of floods; or
- (d) increase the risk of detaining flood flows.

Seepage monitoring program

B13 A seepage monitoring program must be developed by a suitably qualified person which is commensurate with the site-specific risks of contaminant seepage from containment facilities, and which requires and plans for detection of any seepage of contaminants to groundwater as a result of storing contaminants by << Date to be inserted, no longer than 3 months from date of grant of the environmental authority>>.

B14 The seepage monitoring program required by condition (B13) must include but not necessarily be limited to:

- (a) identification of the containment facilities for which seepage will be monitored
- (b) identification of trigger parameters that are associated with the potential or actual contaminants held in the containment facilities as provided for in condition (B15).
- (c) identification of trigger concentration levels that are suitable for early detection of contaminant releases at the containment facilities
- (d) installation of background seepage monitoring bores where groundwater quality will not have been affected by the petroleum activities authorised under this environmental authority to use as reference sites for determining impacts
- (e) installation of seepage monitoring bores that:
 - (i) are within formations potentially affected by the containment facilities authorised under this environmental authority (i.e. within the potential area of impact)
 - (ii) provide for the early detection of negative impacts prior to reaching **groundwater dependent ecosystems**, landholder's active groundwater bores, or water supply bores
 - (iii) provide for the early detection of negative impacts prior to reaching migration pathways to other formations (i.e. faults, areas of unconformities known to connect two or more formations)
- (f) monitoring of groundwater at each background and seepage monitoring bore at least quarterly for the trigger parameters identified in condition (B15)
- (g) seepage trigger action response procedures for when trigger parameters and trigger levels identified in conditions (B15) and (B14)(c) trigger the early detection of seepage, or upon becoming aware of any monitoring results that indicate potential groundwater contamination
- (h) a rationale detailing the program conceptualisation including assumptions, determinations, monitoring equipment, sampling methods and data analysis; and
- (i) provides for annual updates to the program for new containment facilities constructed in each annual return period.

B15 Seepage monitoring bores identified in (B14)(b) must be monitored quarterly for the trigger parameter(s) specified in *Schedule B – Table 2 Seepage Monitoring Trigger Parameters*.

Schedule B, Table 2 – Seepage Monitoring Trigger Parameters

Parameter	Units	Untreated Coal Seam Water	Permeate	Brine
Static Water Level	m	monitor	monitor	monitor
pH	pH unit	monitor	monitor	monitor
EC	µS/cm	monitor	monitor	monitor
Major Anions (sulphate, chloride)	mg/L	monitor	-	-
Major Cations (calcium, magnesium, sodium and potassium)	mg/L	monitor	-	-

Seepage monitoring bore drill log

B16 A bore drill log must be completed for each seepage monitoring bore in condition (B14) which must include:

- (a) bore identification reference and geographical coordinate location
- (b) specific construction information including but not limited to depth of bore, depth and length of casing, depth and length of screening and bore sealing details
- (c) standing groundwater level and water quality parameters including physical parameter and results of laboratory analysis for the possible trigger parameters
- (d) lithological data, preferably a stratigraphic interpretation to identify the important features including the identification of any aquifers; and
- (e) target formation of the bore.

Well testing

B17 Subject to condition (B18) and condition (B19), the injection of CSG water or better quality groundwater is authorised in wells that are not exploration, appraisal or development wells, for the purposes of hydraulic testing, where such hydraulic tests are undertaken for no more than two (2) consecutive days.

B18 The maximum volume of CSG water or better quality groundwater injected for the purposes of hydraulic testing identified in condition (B17) must not exceed 1ML per hydraulic test.

B19 Written notification detailing the type and location (GPS coordinates) of any hydraulic testing undertaken in accordance with condition (B17) must be provided to the administering authority at least 10 business days prior to the commencement of the hydraulic test.

Schedule C Land

General

- C1** Contaminants must not be directly or indirectly released to land except as permitted under this environmental authority.

Top soil management

- C2** Top soil must be managed in a manner that preserves its biological and chemical properties.

Erosion and sediment control

- C3** For activities involving significant disturbance to land, **control measures** that are commensurate to the site-specific risk of erosion, and risk of sediment release to waters must be implemented to:
- (a) preferentially divert stormwater around significantly disturbed land, or allow stormwater to pass through the site in a controlled manner and at non-erosive flow velocities;
 - (b) minimise soil erosion resulting from wind, rain, and flowing water;
 - (c) minimise the duration that disturbed soils are exposed to the erosive forces of wind, rain, and flowing water;
 - (d) minimise work-related soil erosion and sediment runoff; and
 - (e) minimise negative impacts to land or properties adjacent to the activities (including roads).

Land management

- C4** Land that has been significantly disturbed by the pipeline activities must be managed to ensure that gully erosion or subsidence do not occur on that land.

Chemical storage

- C5** Chemicals and fuels stored, must be effectively contained and where relevant, meet Australian Standards, where such a standard is applicable.

Pipeline operation and maintenance

- C6** Contaminants authorised to be released to land under conditions (C7), (C9), and (C15) must be carried out in a manner that ensures:
- (a) vegetation is not damaged;
 - (b) soil quality is not adversely impacted;
 - (c) there is no surface ponding or runoff beyond the designated release area;
 - (d) there is no aerosols or odours;
 - (e) deep drainage below the root zone of any vegetation is minimised;
 - (f) the quality of shallow aquifers is not adversely affected.

Pipeline wastewater

- C7** Contaminants that are hydrostatic test water from pipelines and contaminants from low point drains, may be released to land in accordance with condition (C6).
- C8** **Produced water** may be re-used in:
- (a) drilling and well hole activities; or
 - (b) **stimulation** activities.
- C9** Produced water may be released to land for the following purposes:
- (a) dust suppression;

- (b) construction and operational purposes for the petroleum activity authorised by this environmental authority; and
- (c) irrigation.

C10 Produced water irrigated to land must:

- (a) not exceed the release limits specified in *Schedule C, Table 1a— Irrigation water quality monitoring*; and
- (b) be monitored at the frequency and for the quality characteristics at the monitoring point specified in *Schedule C, Table 1a - Irrigation water quality monitoring*; or
- (c) the process under (C11) has been completed.

C11 Produced water for irrigation which does not meet criteria in condition (C10) (a) and (b) may be used for irrigation provided a report has been completed which:

- (a) determines soil structure, stability and productive capacity will be maintained or improved;
- (b) determines there are no toxic effects to crops;
- (c) determines yields and produce quality are maintained or improved;
- (d) states water quality criteria, which has been determined in accordance with the assessment procedures outlined in *Schedule C, Table 1b—Assessment procedures for water quality criteria*; and
- (e) includes a water monitoring program to ensure that condition (C11) (a)(b) and (c) are being achieved.

Schedule C, Table 1a— Irrigation water quality monitoring

Quality Characteristic	Release Limit	Limit Type	Frequency	Monitoring Point
Electrical conductivity (EC)	<950us/cm3	95 th percentile over a one-year period	Fortnightly	At a location following final treatment and prior to release.
Sodium adsorption ratio (SAR) for heavy soils	≤6			
SAR for light soils	≤12			
pH	6.0-8.5			
Aluminium	20mg/L	Maximum	Bi-annually	
Arsenic	2.0mg/L	Refer to Table 9.2.18 of ANZECC		
Boron	Refer to table 9.2.18 of ANZECC			
Cadmium	0.05mg/L	Maximum		
Chromium	1mg/L			
Cobalt	0.1mg/L			
Copper	5mg/L			
Fluoride	2mg/L			
Iron	10mg/L			
Lithium	2.5 mg/L			
Lead	5 mg/L			
Manganese	10 mg/L			
Mercury	0.002 mg/L			
Molybdenum	0.05mg/L			
Nickel	2 mg/L			
Zinc	5 mg/L			

Schedule C, Table 1b—Assessment procedures for water quality criteria

Water quality criteria	Assessment procedure
electrical conductivity sodium adsorption ratio pH	Salinity Management Handbook, with reference to Chapter 11; and/or Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapter 4 and Volume 3 Chapter 9. The assessment should consider: <ul style="list-style-type: none"> · soil properties within the root zone to be irrigated (e.g. clay content, cation exchange capacity, exchangeable sodium percentage) · water quality of the proposed resource (e.g. salinity, sodicity) · climate conditions (e.g. rainfall) · leaching fractions · average root zone salinity (calculated) · crop salt tolerance (e.g. impact threshold and yield decline) · management practices and objectives (e.g. irrigation application rate, amelioration techniques) · broader landscape issues (e.g. land use, depth to groundwater) · any additional modelling and tests undertaken to support the varied water quality parameters.
heavy metals	Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapters 3 and 4 and Volume 3 Chapter 9. The assessment should aim to derive site specific trigger values (e.g. cumulative contaminant loading limit) based on the methodology provided in the above mentioned procedure.

C12 Produced water may be used for domestic or stock purposes provided the water quality complies with the criteria specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ 2000).

C13 Produced water may be transferred to a third party to be used for the following purposes, subject to condition (C14):

- (a) dust suppression;
- (b) construction and operational purposes; or
- (c) domestic or stock purposes provided the water quality complies with criteria specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ 2000).

C14 If the responsibility of produced water is given or transferred to a third party in accordance with condition (C13), the holder of the environmental authority must ensure:

- (a) the responsibility of the produced water is given or transferred in accordance with a written agreement (third party agreement);
- (b) the third party is made aware of the General Environmental Duty under section 319 of the *Environmental Protection Act 1994*.

Sewage treatment works

C15 Greywater or treated sewage effluent from a treatment system with a daily peak design capacity of up to 450 EP may be:

- (a) released to land by sub-surface or spray irrigation provided it is to a fenced and signed contaminant release area that is:

- (i) a minimum distance of 50 metres from any watercourse, wetland or protected area; and
 - (ii) a minimum distance of 100 metres from any potable water supply or stock drinking water supply; and
 - (iii) kept vegetated with groundcover that is not a declared plant pest species; or
- (b) used for dust suppression, construction or operational purposes subject to condition (C22).

C16 When circumstances prevent the irrigation of treated sewage effluent to land, the contaminants must be directed to on-site storage or lawfully disposed of off-site.

Sewage treatment works between 100 EP and 450 EP

C17 Prior to construction of a sewage treatment works with a **daily peak design capacity** of greater than 100EP, the minimum area of land and location to be utilised for irrigation of treated sewage effluent, excluding any necessary buffer zones, must be nominated.

C18 All nominated locations and minimum areas of land in condition (C17) for sewage treatment works with a daily peak design capacity of greater than 100EP, must be determined using the Model for Effluent Disposal using Land Irrigation (MEDLI) program or recognised equivalent and use model inputs representative of the activity and release location including but not limited to effluent quality, soil and vegetation types, and climatic conditions.

C19 Treated sewage effluent must only be released to the nominated locations and minimum areas of land determined by the MEDLI program or recognised equivalent identified in condition (C18).

C20 Treated sewage effluent released to land must comply, at the monitoring point(s), with each of the release limits specified in *Schedule C, Table 2 – Treated sewage effluent standards for release to land from sewage treatment works with a daily peak design capacity of greater than 100EP* for each quality characteristic.

C21 Treated sewage effluent released to land must be monitored at the frequency and for the quality characteristics specified in *Schedule C, Table 2 – Treated sewage effluent standards for release to land from sewage treatment works with a daily peak design capacity of greater than 100EP* for each quality characteristic.

Schedule C, Table 2 – Treated sewage effluent standards for release to land from sewage treatment works with a daily peak design capacity of greater than 100EP

Quality Characteristic	Monitoring Point Location	Limit Type	Release Limit	Frequency	
5-day Biochemical oxygen demand (BOD)	Release pipe from sewage treatment works	Maximum	20 mg/L	Quarterly	
E. coli		80 th percentile based on at least 5 samples with not less than 30 minutes between samples	1000 cfu per 100 mL		
		Maximum	10,000 cfu per 100 mL		
pH			Range	6.0–8.5	Monthly
Dissolved Oxygen			Minimum	2 mg/L	
Electrical Conductivity			Monitor only		

Treated sewage effluent use for the purposes of dust suppression, construction and operational purposes

C22 Treated sewage effluent may only be used for dust suppression, construction and operational purposes provided that:

- (a) the treated sewage effluent has not been stored in a dam or tank prior to use;
- (b) on local government controlled roads, written approval from the relevant Local Government has been given to the holder of this environmental authority; and
- (c) the treated sewage effluent quality:
 - (i) is monitored at the location and frequency specified in *Schedule C, Table 3 –Treated Sewage Effluent Standards for Dust Suppression, Construction and Operational Purposes*; and
 - (ii) meets the release limits for each quality characteristic specified in *Schedule C, Table 3 –Treated Sewage Effluent Standards for Dust Suppression, Construction and Operational Purposes*.

Schedule C, Table 3 – Treated Sewage Effluent Standards for Dust Suppression, Construction and Operational Purposes

Quality Characteristic	Sampling and <i>In situ</i> Measurement Point Location	Limit type	Release Limit	Frequency
pH	Treated sewage effluent storage	Range	6.0 to 8.5	Weekly ¹ until 12 months of monitoring demonstrates no exceedances of the release limits. Monthly monitoring can occur thereafter.
5-day Biochemical Oxygen Demand (BOD)		Median	20 mg/L	
Electrical Conductivity		Maximum	1600 uS/cm	
Turbidity		95%ile (max)	2 (5) NTU	
Total Suspended Solids		Median	5 mg/L	
E. coli		Median	<10 cfu per 100 mL	Weekly

Schedule D Biodiversity Values

Confirming biodiversity values

- D1** Prior to undertaking activities that result in significant disturbance to land in areas of native vegetation, confirmation of on-the-ground environmentally sensitive areas and wetlands at that location must be undertaken by a suitably qualified person.
- D2** A suitably qualified person must develop and certify a methodology so that condition (D1) can be complied with and which is appropriate to confirm on-the-ground environmentally sensitive areas and wetlands.
- D3** Where areas mapped as environmentally sensitive areas and wetlands differ from those confirmed under conditions (D1) and (D2), petroleum activities may proceed in accordance with the conditions of the environmental authority based on the confirmed on-the-ground values.
- D4** All documentation survey information photographs, field data or any material associated with the field validation requirements in (D1) must be maintained for the life of the environmental authority to demonstrate to the administering authority that surveys were conducted in a manner consistent with requirements contained in (D2).
- D5** The location of the petroleum activity must be selected in accordance with the following site planning principles:
- maximise the use of **areas of pre-existing disturbance**
 - in order of preference, avoid, minimise or mitigate any impacts, including cumulative impacts, on areas of native vegetation or other areas of ecological value
 - minimise disturbance to land that may result in **land degradation**
 - in order of preference, avoid then minimise isolation, fragmentation, edge effects or dissection of tracts of native vegetation; and

(e) in order of preference, avoid then minimise **clearing** of native mature trees.

Disturbance to land – Environmentally sensitive areas

D6 Petroleum activities must be carried out in accordance with *Schedule D, Table 1 – Petroleum Activities in Environmentally Sensitive Areas, Schedule D, Table 2 – Authorised Disturbance* and any other relevant conditions of this environmental authority.

Schedule D, Table 1 – Petroleum Activities in Environmentally Sensitive Areas

ESA Category	Within the ESA	Primary protection zone of the ESA	Secondary protection zone of the ESA
Category A ESAs	No petroleum activities permitted	Only low impact petroleum activities permitted.	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to condition (D10) Limited impact petroleum activities permitted subject to condition (D10)
Category B ESAs excluding 'Endangered' Regional Ecosystems	Only low impact petroleum activities permitted	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to condition (D10) Limited impact petroleum activities permitted subject to condition (D10)	N/A
Category C ESAs that are Nature Refuges, Koala Habitat and/or Declared Catchment Areas	Only low impact petroleum activities permitted	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to conditions (D7) and (D10) Limited impact petroleum activities permitted subject to condition (D10)	N/A

ESA Category	Within the ESA	Primary protection zone of the ESA	Secondary protection zone of the ESA
Category B ESAs that are 'Endangered' Regional Ecosystems	Only limited petroleum activities permitted subject to condition (D11)	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to condition (D10) Limited impact petroleum activities permitted subject to condition (D10)	N/A
Category C ESAs that are Essential Habitat, Essential Regrowth Habitat and/or 'Of Concern' Regional Ecosystems	Only limited petroleum activities permitted subject to condition (D11)	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to conditions (D7) and (D10) Limited impact petroleum activities permitted subject to condition (D10)	N/A
Category C ESAs that are Regional Parks (Resource Use Area)	Only limited petroleum activities permitted subject to condition (D11)	Limited petroleum activities permitted subject to condition (D10) Limited impact camps permitted subject to condition (D10) Limited impact petroleum activities permitted subject to condition (D10)	N/A

ESA Category	Within the ESA	Primary protection zone of the ESA	Secondary protection zone of the ESA
Category C ESAs that are State Forests and/or Timber Reserves	Limited petroleum activities permitted subject to condition (D11) Petroleum activities that are extraction activities and screening activities permitted. Limited impact camps permitted. Limited impact petroleum activities permitted subject to conditions (D8) and (D11)	N/A	N/A

Note: Approvals may be required under the Forestry Act 1959 where the petroleum activity is proposed to be carried out in ESAs that are State Forests or Timber Reserves.

Schedule D, Table 2 – Authorised Disturbances

Authorised Activity	Authorised Activity Section	Location of Development (GDA94)		Size of Development		ESA
		Latitude	Longitude	Length (m)	Area of Disturbance (ha)	
TBA	TBA	TBA	TBA	TBA	TBA	TBA

- D7 Limited impact camps** must not be located within a primary protection zone of Category C ESA (Essential Habitat) or Category C ESA (Nature Refuges).
- D8 Limited impact petroleum activities** must not be located within areas that contain commercial species.
- D9** Despite condition (D6) decommissioning petroleum activities are authorised within all ESAs other than Category A ESAs, and within all ESA protection zones when conducted in accordance with the land disturbance planning principles provided in condition (D5).
- D10 Limited petroleum activities**, limited impact camps or limited impact petroleum activities located within a primary protection zone or secondary protection zone of an environmentally sensitive area in accordance with Schedule E, Table 1 – Petroleum Activities in Environmentally Sensitive Areas must not negatively affect the adjacent environmentally sensitive area.
- D11** Prior to carrying out limited petroleum activities or limited impact petroleum activities undertaken within environmentally sensitive areas in accordance with *Schedule D, Table 1 – Petroleum Activities in Environmentally Sensitive Areas*, it must be demonstrated, in the following order of preference that:
- no reasonable or practicable alternative exists for carrying out the limited petroleum activities within the environmentally sensitive area;

- (b) the limited petroleum activities are preferentially located in pre-existing areas of clearing or significant disturbance;
- (c) clearance widths for linear infrastructure is minimised to the maximum extent possible, taking into account the following matters:
 - (i) safe vehicle movement;
 - (ii) drainage devices installed are of a type that is appropriate for the track type and location;
 - (iii) erosion and sediment control measures installed are in accordance condition (B2); and
 - (iv) power line stays have been preferentially located within the pipeline right of way where possible.
- (d) the maximum clearance widths specified in *Schedule D, Table 3 – Authorised Disturbance for Linear Infrastructure* are not exceeded.

Schedule D, Table 3 – Authorised Disturbance for Linear Infrastructure

Type of Linear Infrastructure	Clearance width (m)
(A) Access track(s) not associated with a pipeline(s), communication lines(s) or power line(s):	
(a) single carriage access tracks	18
(b) dual carriage access tracks	21
(c) single or dual carriage access track and associated turnaround bay	35
(B) Access track(s) associated with a pipeline(s), communication line(s) or power line(s):	
(a) single carriage access tracks with a single pipeline, communication line or power line	24
(b) dual carriage access track with a single pipeline, communication line or power line.	27
(c) single or dual carriage access track and associated turnaround bay with a single pipeline, communication line or power line.	41
(d) additional clearing for any additional parallel pipeline, communication line or power line associated with (B)(a), (b) or (c)	7 ¹
(C) Additional clearing for take-off drains, power line stays or turnaround bays or other work areas:	
(a) Additional clearing for power line stays associated with (B)	10
(b) additional clearing for take-off drains associated with (A) or (B)	10

¹ Maximum total disturbance for (B) is 62m.

Offset Delivery

D12 An Offset Plan must be prepared in accordance with section 5 of the Offset Strategy at Appendix AB of the final environmental impact statement (EIS) decided by the Coordinator-General on 3 September 2015.

After a decision under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and three (3) months prior to any construction activities, the proponent must submit the Offset Plan to the Department of the Environment and Heritage Protection.

The Offset Plan must consider offsets for any significant residual impacts to the following ecological receptors:

- (i) regional ecosystems listed as endangered (biodiversity status)
- (ii) regional ecosystems listed as of concern (biodiversity status)
- (iii) essential habitat
- (iv) wetlands of general ecological significance.

The Offset Plan must:

- (a) detail how the specific offset requirements conditioned by the Commonwealth Minister for the Environment in any approval for the project under the EPBC Act will be delivered
- (b) detail proposed offsets to address any significant residual impacts for the ecological receptors at condition (D12) (i)-(iv)
- (c) include, but not necessarily be limited to:
 - (i) a detailed description of the land to which the plan relates, the values affected and the extent and likely timing of impact on each value
 - (ii) evidence that values impacted can be offset
 - (iii) the method for delivering the offset, including consideration of land-based offsets, direct benefit management plans, offset transfers and/or offset payments and other tenure activities
- (d) ensure a legally binding mechanism to protect and manage offset areas
- (e) include a staging plan to demonstrate how offsets will be delivered and managed over the life of the project
- (f) consider existing, proposed and future offsets prepared and/or planned under the existing environmental authorities pertaining to the project area.

Maximum Disturbance

D13 Disturbance to ecological receptors listed in *Schedule D, Table 1 – Maximum disturbance limits to ecological receptors*, must not exceed the relevant maximum disturbance limits.

Schedule D, Table 1 – Maximum disturbance limits to ecological receptors

Ecological receptor	GFD project maximum disturbance area (ha)
Endangered vegetation (REs and high value regrowth) (biodiversity status)	
Of-concern vegetation (REs and high value regrowth) (biodiversity status)	
Essential habitat	
Wetlands (general ecological significance)	
Resource reserves	
State forest and timber reserves	

Schedule E Waste

Brine and salt management

[Note: Conditions identifying brine and salt management requirements will be included by the administering authority at the EA application stage.]

General waste management

- E1** Measures must be implemented so that waste is managed in accordance with the **waste and resource management hierarchy** and the **waste and resource management principles**.
- E2** Waste, including waste fluids, but excluding waste used in **closed-loop systems**, must be transported off-site for lawful re-use, remediation, recycling or disposal, unless the waste is specifically authorised by conditions (E3), (E5), (E6), (C7), (C9) and (C15) to be disposed of or used on site.
- E3** Unless otherwise authorised by the conditions of this EA to be released to land, **Waste fluids**, other than **flare precipitant** stored in **flare pits**, or **residual drilling material**, or drilling fluids stored in **sumps**, must be contained in either:
- an above ground container; or
 - a structure which contains the wetting front.
- E4** Vegetation waste may be burned if it relates to a state forest, timber reserve or forest entitlement area administered by the *Forestry Act 1959* and a permit has been obtained under the *Fire and Rescue Service Act 1990*.

Residual Drilling Materials

- E5** If sumps are used to store **residual drilling material** or drilling fluids, they must only be used for the duration of drilling activities.
- E6** Residual drilling material can only be disposed of on-site:
- by **mix-bury-cover method** if the residual drilling material meets the **approved quality criteria**; or
 - if it is certified by a **suitably qualified third party** as being of acceptable quality for disposal to land by the proposed method and that environmental harm will not result from the proposed disposal.

E7 Records must be kept to demonstrate compliance with condition (E5) and condition (E6).

Schedule F Noise

F1 Notwithstanding condition (A16), emission of noise from the petroleum activity at levels less than those specified in *Schedule F, Table 1—Noise nuisance limits* are not considered to be environmental nuisance.

Schedule F, Table 1—Noise nuisance limits

Time period	Metric	<u>Short term noise event</u>	<u>Medium term noise event</u>	<u>Long term noise event</u>
7:00am—6:00pm	L _{Aeq,adj,15 min}	45 dBA	43 dBA	40 dBA
6:00pm—10:00pm	L _{Aeq,adj,15 min}	40 dBA	38 dBA	35 dBA
10:00pm—6:00am	L _{Aeq,adj,15 min}	28 dBA	28 dBA	28 dBA
	Max L _{pA, 15 mins}	55 dBA	55 dBA	55 dBA
6:00am—7:00am	L _{Aeq,adj,15 min}	40 dBA	38 dBA	35 dBA

¹The noise limits in Table 1 have been set based on the following deemed **background noise levels** (L_{ABG}):

7:00am - 6:00 pm: 35 dBA

6:00pm - 10:00 pm: 30 dBA

10:00pm - 6:00 am: 25 dBA

6:00am - 7:00 am: 30 dBA

F2 If the noise subject to a **valid complaint** is tonal or **impulsive**, the adjustments detailed in *Schedule F, Table 2—Adjustments to be added to noise levels at sensitive receptors* are to be added to the measured noise level(s) to derive L_{Aeq, adj, 15 min}.

Schedule F, Table 2—Adjustments to be added to noise levels at sensitive receptors

Noise characteristic	Adjustment to noise
Tonal characteristic is just audible	+ 2 dBA
Tonal characteristic is clearly audible	+ 5 dBA
Impulsive characteristic is detectable	+ 2 to + 5 dBA

F3 Notwithstanding condition (F1), emission of any low frequency noise must not exceed either (F3(a)) and (F3(b)), or (F3(c)) and (F3(d)) in the event of a valid complaint about low frequency noise being made to the administering authority:

- 60 dB(C) measured outside the sensitive receptor; and
- the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or
- 50 dB(Z) measured inside the sensitive receptor; and

- (d) the difference between the internal A-weighted and Z-weighted (**Max L_{pZ, 15 min}**) noise levels is no greater than 15 dB.

- F4** A Blast Management Plan must be developed for each blasting activity in accordance with Australian Standard 2187.
- F5** Blasting operations must be designed to not exceed an airblast overpressure level of 120 dB (linear peak) at any time, when measured at or extrapolated to any sensitive place.
- F6** Blasting operations must be designed to not exceed a ground-borne vibration peak particle velocity of 10mm/s at any time, when measured at or extrapolated to any sensitive place.

Schedule G Air

Fuel burning and combustion facilities

[Note: Conditions identifying requirements for the release of contaminants to air will be included by the administering authority at the EA application stage.]

Venting and flaring

- G1** Unless venting is authorised under the *Petroleum and Gas (Production and Safety) Act 2004* or the *Petroleum Act 1923*, waste gas must be flared in a manner that complies with all of (G1(a)) and (G1(b)) and (G1(c)), or with (G1(d)):
 - (a) an automatic ignition system is used, and
 - (b) a flame is visible at all times while the waste gas is being flared, and
 - (c) there are no visible smoke emissions other than for a total period of no more than 5 minutes in any 2 hours, or
 - (d) it uses an **enclosed flare**.

Schedule H Regulated structures

*[Note: Conditions for **regulated structures** requirements (schedule H) will be included by the administering authority at the EA application stage.]*

Schedule I Well construction, maintenance and stimulation activities

Drilling activities

- I1** Oil based or **synthetic based drilling muds** must not be used in the carrying out of the petroleum activity(ies).
- I2** Drilling activities must not result in the connection of the target gas producing formation and another aquifer.
- I3** Practices and procedures must be in place to detect, as soon as practicable, any fractures that have or may result in the connection of a target gas producing formation and another aquifer as a result of drilling activities.

Stimulation activities

- I4** Polycyclic aromatic hydrocarbons or products that contain polycyclic aromatic hydrocarbons must not be used in stimulation fluids in concentrations above the **reporting limit**.
- I5** Stimulation activities must not negatively affect water quality, other than that within the **stimulation impact zone** of the target gas producing formation.

- I6 Stimulation activities must not cause the connection of the target gas producing formation and another aquifer.
- I7 The internal and external mechanical integrity of the well system prior to and during well stimulation must be ensured such that there is:
 - (a) no significant leakage in the casing, tubing, or packer; and
 - (b) there is no significant fluid movement into another aquifer through vertical channels adjacent to the well bore hole.
- I8 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.

Stimulation risk assessment

- I9 Prior to undertaking well stimulation activities, a risk assessment must be developed to ensure that stimulation activities are managed to prevent environmental harm.
- I10 The stimulation risk assessment must be carried out for every well to be stimulated prior to stimulation activities 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:
 - (a) a process description of the stimulation activity to be applied, including equipment and a comparison to best international practice;
 - (b) provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority;
 - (c) a geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s);
 - (d) naturally occurring geological faults;
 - (e) seismic history of the region (e.g. earth tremors, earthquakes);
 - (f) proximity of overlying and underlying aquifers;
 - (g) description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation.
 - (h) identification and proximity of **landholders' active groundwater bores** in the area where stimulation activities are to be carried out;
 - (i) the environmental values of groundwater in the area;
 - (j) 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;
 - (k) description of overlying and underlying formations in respect of porosity, permeability, hydraulic conductivity, faulting and fracture propensity;
 - (l) consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers;
 - (m) a description of the well mechanical integrity testing program;
 - (n) process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling etc);
 - (o) practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation;
 - (p) groundwater **transmissivity**, flow rate, hydraulic conductivity and direction(s) of flow;

- (q) a description of the chemicals 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;
- (r) a mass balance estimating the concentrations and absolute masses of chemicals that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation;
- (s) an environmental hazard assessment of the chemicals used including their mixtures and the resultant chemicals that are formed after stimulation including:
 - (i) toxicological and ecotoxicological information of chemicals used;
 - (ii) information on the persistence and bioaccumulation potential of the chemicals used;
 - (iii) identification of the stimulation fluid chemicals of potential concern derived from the risk assessment;
- (t) an environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities;
- (u) if used, identification and an environmental hazard assessment of using radioactive tracer beads in stimulation activities
- (v) an environmental hazard assessment of leaving stimulation chemicals in the target gas producing formation for extended periods subsequent to stimulation;
- (w) human health exposure pathways to operators and the regional 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) the determination of the likelihood of causing interconnectivity and/or negative water quality as a result of stimulation activities undertaken in close proximity or each other; 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.

Water Quality Baseline Monitoring

- I11** Prior to undertaking any stimulation activity, a baseline bore assessment must be undertaken of the water quality of:
- (a) all landholders' active groundwater bores (subject to access being permitted by the landholder) that are spatially within a two (2) kilometre horizontal radius from the location of the stimulation initiation point within the target gas producing formation; and
 - (b) all active landholders' groundwater bores (subject to access being permitted by the landholder) in any aquifer that is within 200 metres above or below the target gas producing formation and is spatially located with 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 activity(ies) in accordance with the findings of the risk assessment required by conditions (I9) and (I10).

- I12** Prior to undertaking stimulation activities at a well, there must have 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 (I13).
- I13** 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 [$\mu\text{S}/\text{m}$]
 - (c) turbidity [NTU]
 - (d) total dissolved solids [mg/L]
 - (e) temperature [$^{\circ}\text{C}$]
 - (f) dissolved oxygen [mg/L]
 - (g) dissolved gases (methane, chlorine, carbon dioxide, hydrogen sulfide) [mg/L]
 - (h) alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO_3) [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) [$\mu\text{g}/\text{L}$]
 - (m) total petroleum hydrocarbons [mg/L]
 - (n) **BTEX** (as benzene, toluene, ethylbenzene, ortho-xylene, para- and meta-xylene, and total xylene) [mg/L]
 - (o) polycyclic aromatic hydrocarbons (including but not necessarily being limited to: naphthalene, phenanthrene, benzo[a]pyrene) [mg/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 spectroscopy [Bq/L].

Stimulation Impact Monitoring Program

- I14** 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 (I9) and (I10) 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; and
 - (b) flow back waters from stimulation activities at sufficient frequency and which sufficiently represents the quality of that flow back water; and
 - (c) flow back waters from stimulation activities at sufficient frequency and accuracy to demonstrate that 150 per cent of the volume used in stimulation activities has been extracted from the stimulated well; and

- (d) all bores in accordance with condition (I11) at the following minimum frequency:
 - (i) monthly for the first six (6) months subsequent to the stimulation activities being undertaken; then
 - (ii) annually for the first five (5) years subsequent to the stimulation activities being undertaken or until analytes and physico-chemical parameters listed in condition (I13) are not detected in concentrations above baseline bore monitoring data on two (2) consecutive monitoring occasions.

I15 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 being limited to the analytes and physico-chemical parameters in condition (I13); 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.

I16 The results of the Stimulation Impact Monitoring Program must be made available to any potentially affected landholders upon request by that landholder.

Schedule J Rehabilitation

Rehabilitation Planning

J1 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 (J2) to << insert condition numbers relating to final acceptance criteria >> inclusive; and
 - (ii) provide for appropriate monitoring and maintenance.

Transitional Rehabilitation

J2 **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 surrounding landform
- (c) surface drainage lines are re-established;
- (d) top soil is reinstated; and
- (e) either:
 - (i) groundcover, that is not a **declared plant pest species**, is growing; or

- (ii) an alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained.

Rehabilitation reporting for relinquishment of part of an authority to prospect area under the Petroleum and Gas (Production and Safety Act 2004

< Conditions (J3) to (J4), inclusive are only required on environmental authorities that authorise authority to prospect tenures.>

- J3** 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 <<insert condition numbers relating to final acceptance criteria >> has been met.
- J4** The report required under condition (Rehabilitation 3) must be submitted to the administering authority at least 40 business days prior to the relinquishment notice being lodged with the administering authority for the *Petroleum and Gas (Production and Safety) Act 2004*.

Remaining Dams

- J5** Where there is a dam, (including a low consequence dam) that is **being or intended to be used by the landholder or overlapping tenure holder**, the dam must be decommissioned to no longer accept inflow from the petroleum activity(ies) and the contained water must be of a quality suitable for the intended on-going uses(s) by the landholder or overlapping tenure holder.

Pipeline Activities

- J6** Pipeline trenches must be backfilled and **topsoils** reinstated within three **months** after pipe laying.
- J7** **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.
- J8** 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) re-profiled to original contours and established drainage lines; and
 - (d) vegetated with groundcover which is not a declared plant pest species, and which is established and **growing**.

Final Rehabilitation Acceptance Criteria in Environmentally Sensitive Areas

- J9** 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**:
 - (a) greater than or equal to 70 per cent of native ground cover **species richness**
 - (b) greater than or equal to the total per cent ground cover
 - (c) less than or equal to the per cent species richness of declared plant pest species
 - (d) where the adjacent land use contains, or the pre-clearing land use contained, one or more regional ecosystem(s), then:
 - (i) at least one Regional Ecosystem(s) from the same broad vegetation group, as demonstrated by the **predominant species** in the **ecologically dominant layer**, must be present; and,

-
- (ii) the Regional Ecosystem present in (J9)(d)(i) must possess an equivalent or higher conservation value (biodiversity status) than the Regional Ecosystem(s) in either the adjacent land or pre-disturbed land.

J10 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 (J1) and (J2)) must be met:

- (a) greater than or equal to 70% of native ground cover species richness
- (b) greater than or equal to the total per cent ground cover
- (c) less than or equal to the per cent species richness of declared plant pest species
- (d) greater than or equal to 50% of organic litter cover
- (e) greater than or equal to 50% of **total density of coarse woody material**; and
- (f) all predominant species in the ecologically dominant layer, that define the pre-disturbance regional ecosystem(s) are present.

Schedule K Notification

*[Note: Condition (K1) will reflect the activities authorised in each environmental authority. Therefore, if **stimulation activities** and / or regulated dams are not authorised in the environmental authority, condition Notification 1 will be revised accordingly by the administering authority at the EA application stage.]*

- K1** The administering authority must be notified through the Pollution Hotline as soon as reasonably practicable, but within 48 hours after becoming aware of:
- (a) any unauthorised significant disturbance to land; or
 - (b) any unauthorised release of contaminants greater than:
 - (i) 200 L of hydrocarbons; or
 - (ii) 200 L of stimulation additives; or
 - (iii) 500 L of **stimulation fluids**; or
 - (iv) 1 000 L of brine; or
 - (v) 5 000 L of **coal seam gas water**; or
 - (vi) 10 000 L of sewage effluent;
 - (vii) 100,000 L of irrigation-quality coal seam gas water, released inside a designated irrigation area authorised by condition (C9)(c).
 - (c) a potential or actual loss of structural or hydraulic integrity of a dam; or
 - (d) when the level of the contents of any regulated dam reaches the mandatory reporting level; or
 - (e) when a regulated dam will not have available storage to meet the design storage allowance on the 1 November of any year; or
 - (f) any incident where there is a potential or actual loss of **well integrity** (e.g. when the annulus pressure during stimulation increases by more than 3.5 MPa from the pressure immediately preceding stimulation); or
 - (g) any detection of **restricted stimulation fluids** from stimulation fluid monitoring; or
 - (h) any analyses result from baseline bore, well or stimulation impact monitoring that exceeds a water quality objective for the protection of an environmental value of that water resource; or
 - (i) any analyses result from groundwater monitoring that exceeds trigger action investigation levels, if provided in this environmental authority.
- K2** The notification of emergencies or incidents as required by condition (K1) must include but not be limited to the following information:
- (a) the environmental authority number and name of the holder;
 - (b) the tenure type and number where the emergency or incident occurred;
 - (c) the name and telephone number of the designated contact person;
 - (d) the location of the emergency or incident (**GDA94**);
 - (e) the date and time that the emergency or incident occurred;
 - (f) the date and time the holder of this environmental authority became aware of the emergency or incident;
 - (g) details of the nature of the event and the circumstances in which it occurred;
 - (h) the estimated quantity and type of any contaminants involved in the incident;
 - (i) the actual or potential suspected cause of the emergency or incident;

- (j) a description of the land use at the site of the emergency or incident (e.g. grazing, pasture, forest etc.) and/or the name of any relevant waters and other environmentally sensitive features;
- (k) a description of the possible impacts from the emergency or incident;
- (l) a description of whether stock and/or wildlife were exposed to any contaminants released and measures taken to prevent access for the duration of the emergency or incident;
- (m) any sampling conducted or proposed, relevant to the emergency or incident;
- (n) landholder details and details of landholder consultation;
- (o) immediate actions taken to control the impacts of the emergency or incident and how environmental harm was mitigated at the time of the emergency or incident; and
- (p) whether further examination/root cause analysis is required and if so, the expected date by when this examination will be completed and reported to the administering authority.

K3 Within 10 business days following the initial notification under conditions (K1) and (K2) unless a longer time is agreed to by the administering authority, a written report must be provided to the administering authority, including the following (where relevant to the emergency or incident):

- (a) the root cause of the emergency or incident;
- (b) the confirmed quantities and types of any contaminants involved in the incident;
- (c) results and interpretation of any analysis of samples taken at the time of the emergency or incident (including the analysis results of any impact monitoring);
- (d) a final assessment of the impacts from the emergency or incident including any actual or potential environmental harm that has occurred or may occur in the longer term as a result of the release;
- (e) the success or otherwise of actions taken at the time of the incident to prevent or minimise environmental harm;
- (f) results and current status of landholder consultation, including commitment to resolve any outstanding issues / concerns; and
- (g) actions and / or procedural changes to prevent a recurrence of the emergency or incident.

Schedule L Definitions

*[Note: Terms which are defined for schedules A –K are **bolded** at the beginning of each schedule and/or within schedule L. Additional definitions will be required at the EA application stage]*

“adjacent land use(s)” means the **ecosystem function** adjacent to an area of significant disturbance, or where there is no ecosystem function, the use of the land. An adjacent land use does not include an adjacent area that shows evidence of edge effect.

“administering authority” means:

- (a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994*—the local government; or
- (b) for all other matters—the Chief Executive of the Department of Environment and Heritage Protection; or

(c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.

“**alternative arrangement**” means a written agreement about the way in which a particular environmental nuisance impact will be dealt with at a sensitive place, and may include an agreed period of time for which the arrangement is in place. An alternative arrangement may include, but is not limited to, a range of nuisance abatement measures to be installed at the sensitive place, or provision of alternative accommodation for the duration of the relevant nuisance impact.

“**analogue site**” means an area of land which contains values and characteristics representative of an area to be rehabilitated prior to disturbance. Such values must encompass land use, topographic, soil, vegetation, vegetation community attributes and other ecological characteristics. Analogue sites can be the pre-disturbed site of interest where significant surveying effort has been undertaken to establish benchmark parameters.

“**appraisal well**” means a petroleum well to test the potential of one (1) or more natural underground reservoirs for producing or storing petroleum. For clarity, an appraisal well does not include an exploration well.

“**approved quality criteria**” for the purposes of residual drilling materials, means the residual drilling material meet the following quality standards:

Part A In all cases:

Parameter	Maximum concentration
pH	6-10.5 (range)
Electrical Conductivity	20dS/m (20,000µS/cm)
Chloride*	8000mg/L

*Chloride analysis is only required if an additive containing chloride was used in the drilling process.

The limits in Part A must be measured in the clarified filtrate of oversaturated solids prior to mixing.

Part B If any of the following metals are a component of the drilling fluids, then for that metal:

Parameter	Maximum concentration
Arsenic	20mg/kg
Selenium	5mg/kg
Boron	100mg/kg
Cadmium	3mg/kg
Chromium	400mg/kg
Copper	100mg/kg
Lead	600mg/kg

The limits in Part B and Part C refer to the post soil/by-product mix. Part C If a hydrocarbon sheen is visible, the following hydrocarbon fractions:

TPH	Maximum concentration
C6-C10	170mg/kg
C10-C16	150mg/kg
C16-C34	1300mg/kg
C34-C40	5600mg/kg
Total Polycyclic Aromatic Hydrocarbons (PAHs)	20mg/kg
Phenols (halogenated)	1mg/kg
Phenols (non-halogenated)	60mg/kg
Monocyclic aromatic hydrocarbons (Total sum of benzene, toluene, ethyl benzene, xylenes (including ortho, para and meta xylenes) and styrene)	7mg/kg
Benzene	1mg/kg

“**areas of pre-existing disturbance**” means areas where environmental values have been negatively impacted as a result of anthropogenic activity and these impacts are still evident. Areas of pre-disturbance may include areas where legal clearing, logging, timber harvesting, or grazing activities have previously occurred, where high densities of weed or pest species are present which have inhibited re-colonisation of native regrowth, or where there is existing infrastructure (regardless of whether the infrastructure is associated with the authorised petroleum activities). The term ‘areas of pre-disturbance’ does not include areas that have been impacted by wildfire/s, controlled burning, flood or natural vegetation die-back.

“**associated water**” means underground water taken or interfered with, if the taking or interference happens during the course of, or results from, the carrying out of another authorised activity under a petroleum authority, such as a petroleum well, and includes waters also known as produced formation water. The term includes all contaminants suspended or dissolved within the water.

“**Australian Standard 3580**” means any of the following publications:

- AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter—Gravimetric method.
- AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet—Gravimetric method
- AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter— PM10 low volume sampler—Gravimetric sampler.

“**background noise level**” means the sound pressure level, measured in the absence of the noise under investigation, as the $L_{A90,T}$ being the A-weighted sound pressure level exceeded for 90 per cent of the measurement time period T of not less than 15 minutes, using Fast response.

“**bed and banks**” for a watercourse or wetland means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.

“**being or intended to be utilised by the landholder or overlapping tenure holder**” for significantly disturbed land, means there is a written agreement (e.g. land and compensation agreement) between the landholder or the overlapping tenure holder and the holder of the environmental authority identifying that the landholder or the overlapping tenure holder has a

preferred use of the land such that rehabilitation standards for revegetation by the holder of the environmental authority are not required.

For dams, means there is a written agreement (e.g. land and compensation agreement) between the landholder or the overlapping tenure holder and the holder of the environmental authority identifying that the landholder or the overlapping tenure holder has a preferred use for the dam such that rehabilitation standards for revegetation by the holder of the environmental authority are not required. “**BTEX**” means benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene.

“**certified or certification**” in relation to any matter other than a design plan, ‘as constructed’ drawings or an annual report regarding dams means, a Statutory Declaration by a suitably qualified person or suitably qualified third party accompanying the written document stating:

- the person’s qualifications and experience relevant to the function
- that the person has not knowingly included false, misleading or incomplete information in the document
- that the person has not knowingly failed to reveal any relevant information or document to the administering authority
- that the document addresses the relevant matters for the function and is factually correct; and
- that the opinions expressed in the document are honestly and reasonably held.

“**clearing**” for vegetation:

(a) means remove, cut down, ringbark, push over, poison or destroy in any way including by burning, flooding or draining; but

(b) does not include destroying standing vegetation by stock, or lopping a tree.

“**closed-loop systems**” means using waste on site in a way that does not release waste or contaminants in the waste to the environment.

“**coal seam gas water**” means underground water brought to the surface of the earth, or moved underground in connection with exploring for, or producing coal seam gas.

“**control measure**” has the meaning in section 47 of the Environmental Protection Regulation 2008 and means a device, equipment, structure, or management strategy used to prevent or control the release of a contaminant or waste to the environment.

“**daily peak design capacity**” for sewage treatment works, has the meaning in Schedule 2, section 63(4) of the *Environmental Protection Regulation 2008* as the higher **equivalent person (EP)** for the works calculated using each of the formulae found in the definition for EP.

“**declared plant pest species**” has the meaning in *the Land Protection (Pest and Stock Route Management) Regulation 2003* and is a plant declared to be a declared pest under section 36 (Declaring Pests by Regulation) or section 37(2) (Declaring Pest under Emergency Pest Notice) of that Act and includes reproductive material of the plant.

“**development well**” means a petroleum well which produces or stores petroleum. For clarity, a development well does not include an appraisal well.

“**document**” has the meaning in the *Acts Interpretation Act 1954* and means:

- any paper or other material on which there is writing; and
- any paper or other material on which there are marks; and
- figures, symbols or perforations having a meaning for a person qualified to interpret them; and

- any disc, tape or other article or any material from which sounds, images, writings or messages are capable of being produced or reproduced (with or without the aid of another article or device).

“ecologically dominant layer” has the meaning in the Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012) and means the layer making the greatest contribution to the overall biomass of the site and the vegetation community (NLWRA 2001). This is also referred to as the ecologically dominant stratum or the predominant canopy in woody ecosystems.

“ecosystem function” means the interactions between and within living and nonliving components of an ecosystem and generally correlates with the size, shape and location of the vegetation community.

“enclosed flare” means a device where the residual gas is burned in a cylindrical or rectilinear enclosure that includes a burning system and a damper where air for the combustion reaction is admitted.

“environmental harm” has the meaning in section 14 of the *Environmental Protection Act 1994* and means any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.

Environmental harm may be caused by an activity—

- (a) whether the harm is a direct or indirect result of the activity; or
- (b) whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors.

“environmental nuisance” has the meaning in section 15 of the *Environmental Protection Act 1994* and means unreasonable interference or likely interference with an environmental value caused by—

- (a) aerosols, fumes, light, noise, odour, particles or smoke; or
- (b) an unhealthy, offensive or unsightly condition because of contamination; or
- (c) another way prescribed by regulation.

“equivalent person” or **“EP”** has the meaning under section 3 of the Planning Guidelines For Water Supply and Sewerage, 2005, published by the Queensland Government. It is calculated in accordance with Schedule 2, Section 63(4) of the Environmental Protection Regulation 2008 where:

- $EP = V/200$ where V is the volume, in litres, of the average dry weather flow of sewage that can be treated at the works in a day; or
- $EP = M/2.5$ where M is the mass, in grams, of phosphorus in the influent that the works are designed to treat as the inlet load in a day.

“exploration well” means a petroleum well that is drilled to:

- explore for the presence of petroleum or natural underground reservoirs suitable for storing petroleum; or
- obtain stratigraphic information for the purpose of exploring for petroleum.

For clarity, an exploration well does not include an appraisal or development well.

“flare pits” has the meaning in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, and means containment area where any hydrocarbon that is discovered in an over-pressured reservoir during a drilling operation is diverted to, and combusted, The flare pit is only used during the drilling and work over process on a petroleum well.

“flare precipitant” means waste fluids which result from the operation of a flare.

“floodplains” has the meaning in the *Water Act 2000* and means an area of reasonably flat land adjacent to a watercourse that—

- is covered from time to time by floodwater overflowing from the watercourse; and
- does not, other than in an upper valley reach, confine floodwater to generally follow the path of the watercourse; and
- has finer sediment deposits than the sediment deposits of any bench, bar or in-stream island of the watercourse.

“fuel burning or combustion facility” means a permanent fuel burning or combustion equipment which in isolation, or combined in operation, or which are interconnected, is, or are capable of burning more than 500 kg of fuel in an hour.

“GDA” means Geocentric Datum of Australia.

“general ecologically significant wetland” otherwise known as “wetlands of other environmental value”, is a wetland that meets the definition of a wetland and that is shown as a general ecologically significant wetland or “wetlands of other environmental value” on the map of referable wetlands.

“Great Artesian Basin (GAB) spring” means an area protected under the *Environment Protection and Biodiversity Conservation Act 1999* because it is considered to be a Matter of National Environmental Significance and identified as a:

- community of native species dependent on natural discharge of groundwater from the Great Artesian Basin; or
- Great Artesian Basin spring; or
- Great Artesian Basin discharge spring wetland.

A GAB spring includes a spring vent, spring complex or watercourse spring and includes the land to which water rises naturally from below the ground and the land over which the water then flows.

Note: The Australian Government’s Protected Matters Search Tool should be used to get an indication of whether the area of interest may contain an MNES spring.

Note: The GAB springs dataset can be requested from the Queensland Government Herbarium

“greywater” means wastewater generated from domestic activities such as laundry, dishwashing, and bathing. Greywater does not include sewage.

“groundwater dependent ecosystems (GDE)” means ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services.

For the purposes of the environmental authority, groundwater dependent ecosystems do not include those mapped as “unknown”.

“growing” means to increase by natural development, as any living organism or part thereof by assimilation of nutriment; increase in size or substance.

“impulsive (for noise)” means sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the background sound pressure. The duration of a single impulsive sound is usually less than one second.

“ $L_{A 90, adj, 15mins}$ ” means the A-weighted sound pressure level, adjusted for tonal character that is equal to or exceeded for 90% of any 15 minutes sample period equal, using Fast response.

“ $L_{Aeq,adj, 15mins}$ ” means the A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within any 15 minute period has the same square sound pressure as a sound level that varies with time.

“land degradation” has the meaning in the *Vegetation Management Act 1999* and means the following:

- soil erosion
- rising water tables
- the expression of salinity
- mass movement by gravity of soil or rock
- stream bank instability
- a process that results in declining water quality.

“landholders’ active groundwater bores” means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use. This term does not include monitoring bores owned by the administering authority of the *Water Act 2000*.

“limited impact camps” mean accommodation camps that:

- are temporary (no more than 6 months);
- are located within pre-existing areas of clearing or significant disturbance;
- are up to 2 ha or located within well sites; and
- may involve sewage treatment works that are no release works or release works that involve an irrigation release within pre-existing areas of clearing or significant disturbance.

“limited impact petroleum activities” means petroleum activities that are located within areas that are not a regional ecosystem and:

- are single well sites (includes observation, pilot, injection and production wells) greater than 1.25 ha; or
- are multi-well sites greater than 3 ha; and
- may involve construction of new access tracks that are required as part of the construction or servicing a petroleum activity that can be lawfully carried out within an ESA or its protection zone; and
- may involve upgrading or maintenance of existing roads or tracks; and
- may include power and communication lines; and
- may include gas gathering lines from a well site to the initial compression facility; and
- may include water gathering lines from a well site to the initial water storage or dam.

“limited petroleum activities” mean any low impact petroleum activity, and:

- single well sites (includes observation, pilot, injection and production wells) up to 1 ha and associated infrastructure (water pumps and generators, sumps, flare pits or dams) located on the well site or up to 1.25 ha if the well pad includes the use of a tank (minimum 1ML) for above ground fluid storage,
- multi-well sites up to an additional (in addition to single well site above) 0.25 ha per additional well and associated infrastructure (water pumps and generators, sumps, flare pits, dams or tanks) located on the well site to a maximum of 3 ha,
- construction of new access tracks that are required as part of the construction or servicing a petroleum activity that can be lawfully carried out within an ESA or its protection zone
- upgrading or maintenance of existing roads or tracks,
- power and communication lines,

- gas gathering lines from a well site to the initial compression facility,
- water gathering lines from a well site to the initial water storage or dam,
- camps within well site that may involve sewage treatment works that are a no release works.

“linear infrastructure” means powerlines, pipelines, flowlines, roads and access tracks.

“long term noise event” means a noise exposure, when perceived at a sensitive receptor, persists for a period of greater than five (5) days, even when there are respite periods when the noise is inaudible within those five (5) days.

“low impact petroleum activities” means petroleum activities which do not result in the clearing of native vegetation, earthworks or excavation work that cause either, a significant disruption to the soil profile or permanent damage to vegetation that cannot be easily rehabilitated immediately after the activity is completed. Examples of such activities include but are not necessarily limited to:

- chipholes
- coreholes
- geophysical surveys
- seismic surveys
- soil surveys
- topographic surveys
- cadastral surveys
- ecological surveys
- installation of environmental monitoring equipment (including surface water)

“map of referable wetlands” has the meaning in Schedule 12 of the Environmental Protection Regulation 2008 and means the ‘Map of referable wetlands’, a document approved by the chief executive on 4 November 2011 and published by the department, as amended from time to time by the chief executive under section 144D.

“Max $L_{pA, 15 \text{ min}}$ ” means the absolute maximum instantaneous A-weighted sound pressure level, measured over 15 minutes.

“Max $L_{pZ, 15 \text{ min}}$ ” means the maximum value of the Z-weighted sound pressure level measured over 15 minutes.

“medium term noise event” is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than five (5) days and does not re-occur for a period of at least four (4) weeks. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.

“methodology” means the science of method, especially dealing with the logical principles underlying the organisation of the various special sciences, and the conduct of scientific inquiry.

“mix-bury-cover method” means the stabilisation of residual drilling solids in the bottom of a sump by mixing with subsoil and which occurs in accordance with the following methodology:

- the base of the subsoil and residual solid mixture must be separated from the groundwater table by at least one metre of a continuous layer of impermeable subsoil material ($k_w=10-8\text{m/s}$) or subsoil with a clay content of greater than 20%; and
- the residual solids is mixed with subsoil in the sump and cover; and
- the subsoil and residual solids is mixed at least three parts subsoil to one part waste (v/v);

and

- a minimum of one metre of clean subsoil must be placed over the subsoil and residual solids mixture; and
- topsoil is replaced.

“**month**” has the meaning in the *Acts Interpretation Act 1954* and means a calendar month and is a period starting at the beginning of any day of one (1) of the 12 named months and ending—

- immediately before the beginning of the corresponding day of the next named month; or
- if there is no such corresponding day—at the end of the next named month.

“**NATA accreditation**” means accreditation by the National Association of Testing Authorities Australia.

“**pipeline waste water**” means hydrostatic testing water, flush water or water from low point drains.

“**pre-disturbed land use**” means the function or use of the land as documented prior to significant disturbance occurring at that location.

“**predominant species**” has the meaning in the Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012) and means a species that contributes most to the overall above-ground biomass of a particular stratum.

“**produced water**” has the meaning in Section 15A of the *Petroleum and Gas (Production and Safety) Act 2004* and means CSG water or **associated water** for a petroleum tenure.

“**regulated structure**” is defined in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (2013).

“The term regulated structures includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity. Structures may be assessed using this Manual as being in one of three consequence categories: low, significant or high. Where categorised as a significant or high consequence, the structure is referred to as a regulated structure.”

“**rehabilitation or rehabilitated**” means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with acceptance criteria and, where relevant, includes remediation of contaminated land. For the purposes of pipeline rehabilitation, rehabilitation includes reinstatement, revegetation and **restoration**.

“**reinstate or reinstatement**” for pipelines, means the process of bulk earth works and structural replacement of pre-existing conditions of a site (i.e. soil surface topography, watercourses, culverts, fences and gates and other landscape(d) features) and is detailed in the Australian Pipeline Industry Association (APIA) Code of Environmental Practice: Onshore Pipelines (2013).

“**reporting limit**” means the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes, the reporting limit is selected as the lowest non-zero standard in the calibration curve. Results that fall below the reporting limit will be reported as “less than” the value of the reporting limit. The reporting limit is also referred to as the practical quantitation limit or the limit of quantitation. For polycyclic aromatic hydrocarbons, the reporting limit must be based on super-ultra trace methods and, depending on the specific polycyclic aromatic hydrocarbon, will range between 0.005 ug/L–0.02 ug/L.

“**residual drilling material**” means waste drilling materials including muds and cuttings or cement returns from well holes and which have been left behind after the drilling fluids are pumped out.

“**restoration**” means the replacement of structural habitat complexity, ecosystem processes, services and function from a disturbed or degraded site to that of a pre-determined or **analogue** site. For the purposes of pipelines, restoration applies to final rehabilitation after pipeline decommissioning.

“**restricted stimulation fluids**” has the meaning in section 206 of the *Environmental Protection Act 1994* and means fluids used for the purpose of stimulation, including fracturing, that contain the following chemicals in more than the maximum amount prescribed under a regulation—

- (a) petroleum hydrocarbons containing benzene, ethylbenzene, toluene or xylene
- (b) chemicals that produce, or are likely to produce, benzene, ethylbenzene, toluene or xylene as the chemical breaks down in the environment.

“**revegetation or revegetating or revegetate**” means to actively re-establish vegetation through seeding or planting techniques in accordance with site specific management plans.

“**sensitive place**” means:

- a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel)
- a library, childcare centre, kindergarten, school, university or other educational institution
- a medical centre, surgery or hospital
- a protected area
- a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment
- a work place used as an office or for business or commercial purposes, which is not part of the petroleum activity(ies) and does not include employees accommodation or public roads
- for noise, a place defined as a sensitive receptor for the purposes of the Environmental Protection (Noise) Policy 2008.

“**sensitive receptor**” is defined in Schedule 2 of the Environmental Protection (Noise) Policy 2008, and means an area or place where noise is measured.

“**short term noise event**” is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than eight hours and does not re-occur for a period of at least seven (7) days. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.

“**significantly disturbed or significant disturbance or significant disturbance to land or areas**” has the meaning in Schedule 12, section 4 of the Environmental Protection Regulation 2008. Land is significantly disturbed if—

- (a) it is contaminated land; or
- (b) it has been disturbed and human intervention is needed to rehabilitate it—
 - (i) to a condition required under the relevant environmental authority; or
 - (ii) if the environmental authority does not require the land to be rehabilitated to a particular condition—to the condition it was in immediately before the disturbance.

“**species richness**” means the number of different species in a given area.

“**spillway**” means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

“**stable**” has the meaning in Schedule 5 of the Environmental Protection Regulation 2008 and, for a site, means the rehabilitation and **restoration** of the site is enduring or permanent so that the site is unlikely to collapse, erode or subside.

“stimulation” means a technique used to increase the permeability of a natural underground reservoir that is undertaken above the formation pressure and involves the addition of chemicals. It includes hydraulic fracturing / hydrofracturing, fracture acidizing and the use of proppant treatments.

“stimulation fluid” means the fluid injected underground to increase permeability. For clarity, the term stimulation fluid only applies to fluid injected down well post-perforation.

“stimulation impact zone” means a 100m maximum radial distance from the stimulation target location within a gas producing formation.

“suitably qualified person” means a person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis to performance relative to the subject matters using the relevant protocols, standards, methods or literature.

“suitably qualified third party” means a person who:

- (a) has qualifications and experience relevant to performing the function including but not limited to:
 - i. a bachelor's degree in science or engineering; and
 - ii. 3 years' experience in undertaking soil contamination assessments; and
- (b) is a member of at least one organisation prescribed in Schedule 8 of the Environmental Protection Regulation 2008; and
- (c) not be an employee of, nor have a financial interest or any involvement which would lead to a conflict of interest with the holder(s) of the environmental authority.

“sump” means a pit in which waste residual drilling material or drilling fluids are stored only for the duration of drilling activities.

“synthetic based drilling mud” means a mud where the base fluid is a synthetic oil, consisting of chemical compounds which are artificially made or synthesised by chemically modifying petroleum components or other raw materials rather than the whole crude oil.

“system design plan” means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

“third party auditor” means a suitably qualified person who is either a certified third party auditor or an internal auditor employed by the holder of the environmental authority and the person is independent of the day to day management and operation of the petroleum activity(ies) covered by this environmental authority.

“top soil” means the surface (top) layer of a soil profile, which is more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from the natural surface.

“total density of coarse woody material” means the total length of logs on the ground greater than or equal to 10cm diameter per hectare and number of logs on the ground greater than or equal to 10cm diameter per hectare.

“transmissivity” means the rate of flow of water through a vertical strip of aquifer which is one unit wide and which extends the full saturated depth of the aquifer.

“valid complaint” means all complaints unless considered by the administering authority to be frivolous, vexatious or based on mistaken belief.

“waste and resource management hierarchy” has the meaning provided in section 9 of the *Waste Reduction and Recycling Act 2011* and is the following precepts, listed in the preferred order in which waste and resource management options should be considered—

- (a) AVOID unnecessary resource consumption

- (b) REDUCE waste generation and disposal
- (c) RE-USE waste resources without further manufacturing
- (d) RECYCLE waste resources to make the same or different products
- (e) RECOVER waste resources, including the recovery of energy
- (f) TREAT waste before disposal, including reducing the hazardous nature of waste
- (g) DISPOSE of waste only if there is no viable alternative.

“**waste and resource management principles**” has the meaning provided in section 4(2)(b) of the *Waste Reduction and Recycling Act 2011* and means the:

- (a) polluter pays principle
- (b) user pays principle
- (c) proximity principle
- (d) product stewardship principle.

“**waste fluids**” has the meaning in section 13 of the *Environmental Protection Act 1994* in conjunction with the common meaning of “fluid” which is “a substance which is capable of flowing and offers no permanent resistance to changes of shape”. Accordingly, to be a waste fluid, the waste must be a substance which is capable of flowing and offers no permanent resistance to changes of shape.

“**watercourse**” has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means:

- 1) a river, creek or stream in which water flows permanently or intermittently—
 - (a) in a natural channel, whether artificially improved or not; or
 - (b) in an artificial channel that has changed the course of the watercourse.
- 2) Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.

“**waters**” includes all or any part of a creek, river, stream, lake, lagoon, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and underground water.

“**well integrity**” means the ability of a well to contain the substances flowing through it.

“**wetland**” for the purpose of this environmental authority, wetland means:

- areas shown on the **Map of referable wetlands** which is a document approved by the chief executive on 4 November 2011 and published by the department, as amended from time to time by the chief executive under section 144D of the Environmental Protection Regulation 2008; and
- areas defined under the Queensland Wetlands Program as permanent or periodic / intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six (6) metres, and possess one or more of the following attributes:
 - at least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
 - the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
 - the substratum is not soil and is saturated with water, or covered by water at some time.

The term wetland includes riverine, lacustrine, estuarine, marine and palustrine wetlands; and it does not include a **Great Artesian Basin Spring** or a subterranean wetland that is a cave or aquifer.

“wetland of high ecological significance” otherwise known as “high conservation value wetland”, is a wetland that meets the definition of a wetland and that is shown as a wetland of high ecological significance or high conservation value wetland on the map of referable wetlands.

Appendix 2. Coordinator-General's recommendations

This appendix includes recommendations, made under section 52 of the SDPWO Act. The recommendations relate to approvals under Acts other than the *Sustainable Planning Act 2009*, or the *Environmental Protection Act 1994*, which require the preparation of an EIS or a similar statement to address environmental effects for the project.

While the recommendations guide the assessment and approval for managers in assessing the applications, they do not limit their ability to seek additional information nor power to impose conditions on any development approval required for the project.

Each recommendation nominates the entity responsible for implementing the recommendation.

In accordance with Item 21 of the Bilateral Agreement between the Commonwealth and the State of Queensland, this section recommends conditions for consideration by the Commonwealth Minister for the Environment in making a decision on the proposed action under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Recommendation 1. Offset Management Plan

- (a) To compensate for authorised unavoidable impact on MNES, the **approval holder** must submit an offset management plan to the **Minister** for approval which demonstrates that proposed offsets are in accordance with the EPBC Act Environmental Offsets Policy and Offsets Assessment Guide. The offset management plan must:
 - (i) be consistent with relevant recovery plans, threat abatement plans and conservation advices
 - (ii) ensure that MNES impacts to be offset do not exceed potential unmitigated disturbance areas identified in the project EIS
 - (iii) be in accordance with the approved Adverse Impact Assessment Methodology
 - (iv) identify a modelled impact for the first stage of the gas field development.
- (b) Once approved, the offset management plan must be implemented by the **approval holder** prior to commencement of the action.

Note: An approved offset plan is also required by the State government. The offset management plan should be prepared to address both State and EPBC Act approval conditions.

Recommendation 2. Protection of Water Resources

- (a) The **approval holder** must not release CSG water to any receiving water body prior to obtaining approval from the Queensland State Government's Department of Environment and Heritage Protection, whereby:
 - (i) water release limits and downstream water quality standards will be established in accordance with the *Environmental Protection Regulation 2008* in conjunction with the *Environmental Protection (Water) Policy 2009*
 - (ii) water release limits would be consistent with the coal seam gas water management policy and would consider the hierarchy for managing and using coal seam gas water and for managing saline waste.
- (b) Where there is risk of potential impacts to MNES surface water and groundwater resources which are not regulated under State legislation, the **Minister** should impose additional conditions for the **approval holder** to address these impacts.

Note: Impacts to water resources are addressed in section 5.5 of this report. The relevant State legislation for protection for water resources includes the *Water Act 2000* and the *Environmental Protection Act 1994*. The Underground Water Impact Report UWIR for the Surat Cumulative Management Area (CMA) coordinates assessment on the impacts of underground water resources from extraction by petroleum tenure holders and allocates management arrangements to petroleum tenure holders in the Surat CMA.

Appendix 3. Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the SDPWO Act. All of the conditions imposed in this appendix take effect from the date of this Coordinator-General's report.

These conditions do not relieve the proponent of the obligation to obtain all approvals and licences from all relevant authorities required under any other Act.

In accordance with section 54B(3) of the SDPWO Act, I have nominated the entity to have jurisdiction for the conditions in this schedule.

General notification

Condition 1. Project milestone commencement dates

The proponent must notify the Coordinator-General and all nominated entities in writing of the commencement of the construction phase and the commencement of the operation phase at least four weeks prior to the relevant commencement date.

The Coordinator-General is to have jurisdiction for this condition.

Social impacts

Condition 2. Annual reporting on social impact assessment

- A1** From the commencement of construction, the proponent is to provide to the Coordinator-General an annual Social Impact Management Report (SIMR) for a period of five years.
- A2** The SIMR will describe the mitigation and management actions taken and the outcomes implemented to:
- (a) inform the community about GFD project impacts and demonstrate that community concerns have been considered in making relevant decisions on mitigation and management of social impacts
 - (b) enhance local and regional training and development opportunities
 - (c) avoid, manage or mitigate GFD project-related impacts on the capacity of local and regional housing markets
 - (d) avoid, manage and mitigate GFD project-related impacts on community health, safety and social infrastructure.
- A3** Six months prior to the commencement of operations, the proponent must prepare and include in the annual SIMR how operational workforce management and mitigation strategies and workforce management principles have been implemented. The revised annual SIMR must include:
- (a) the total number of operational workers, identifying all direct hire, contract, casual workers and apprentices
 - (b) details of the principal place of residence for each worker
 - (c) the percentage of FIFO and resident workers
 - (d) information about the mode of transport for commuting from principal place of residence to the workplace
 - (e) the type of accommodation workers will use during roster

-
- (f) data about the number of workers who identify as having a disability, or are Indigenous, or are female.

A4 The proponent must make the annual SIMR publicly available on its website during each year of the reporting period.

The Coordinator-General is to have jurisdiction for this condition.

Appendix 4. Proponent commitments

This appendix includes commitments made by the proponent in the EIS and additional information to the EIS.

#	Proponent commitment	EIS reference
Project approvals		
1.	The proponent will discuss water requirements for the project under the Water Resource (Fitzroy Basin) Plan 2011 with the administering authority.	Section 2
Project description		
2.	To transport the gas and/or water from the production wells to the gas compression facilities/water management facilities, Santos GLNG will utilise existing gathering lines and transmission pipelines where practicable.	Section 4.4.2
3.	Where practicable, Santos GLNG will utilise existing pipelines, water storage and water management facilities to assist in the management of water produced by the GFD Project.	Section 4.4.4
4.	To accommodate the projected workforce generated during the construction and operations phases, Santos GLNG will develop camps within the GFD Project area to supplement the existing accommodation, services and amenities.	Section 4.6.1.1
5.	Rail transportation may be possible and will be considered in the planning stages.	Section 4.6.6.1
6.	Where available, the GFD Project will use existing communications services developed for the GLNG Project.	Section 4.6.6.5
Management framework		
7.	The established work procedures that Santos GLNG has developed and implemented for the GLNG Project will also be used for the GFD Project.	Section 6.3.5.1
8.	Work instructions will be prepared for operations staff and contractors working on a specific activity or at a specific location with environmental and /or safety risk and provide detail of how the project-wide plans and strategies are implemented at an asset level.	Section 6.3.5.2
Climate and natural disaster management		
9.	Santos GLNG has previously undertaken flood risk modelling for the GLNG Project. Flood levels for both the 50 and 100 year ARI (average recurrence interval) event were investigated along waterways within a 5 km radius of proposed hub and longer term campsite areas as appropriate. The siting of infrastructure will consider the potential risks of atmospheric and climate factors (storms events / cyclones, duration and ranges of temperature and rainfall). This same procedure will be applied to the GFD Project prior to final siting of camps or permanent infrastructure.	Section 7.4.3.2 Section 7.6.3
10.	The following mitigation measures will be implemented. They consider the range of atmospheric and climatic factors: <ul style="list-style-type: none"> • Engineering design specifications • Inspection and maintenance programs • Procedures, control strategies and awareness training on the 	Section 7.6.3

#	Proponent commitment	EIS reference
	management of potential risks associated atmospheric and climate factors.	
Land resources		
11.	It is not expected that significant fossil specimens (such as dinosaur tracks) will be encountered during construction or operational activities on the project area. However if there is a significant find the Queensland Museum will be notified.	Appendix K - Section 4.3.3
12.	Santos GLNG will review local government's pest and weed management plans and apply measures from these to the PWMP where it is appropriate.	Section 8.6 Section 12.6.2 Section 18.6 Appendix J Appendix K – Section 5.4
Landscape and visual amenity		
13.	Night lighting will be provided for safety and security within the accommodation facilities and possibly at gas compression and water management facilities for operational reasons. Exterior night lights are typically hooded or pointed inwards where required to minimise glare escaping beyond the immediate area.	Appendix L – Section 5.1.4 Appendix L – Section 5.2.1.1
Traffic and transport		
14.	Santos GLNG will continue to engage with DTMR and regional councils in the application of new and existing infrastructure agreements to the GFD Project.	Section 11.6.1
15.	If airports other than Roma are to be considered for use they will be assessed accordingly and the relevant approvals process will be applied.	Appendix M – Section 3.11
16.	Rail transportation may be possible and will be considered in the planning stages. The use of ports will be required for the importation of equipment and construction materials.	Appendix M – Section 6.2.1
17.	The Road-use Management Plan was developed to manage the impact associated with the implementation of the Santos GLNG Project. It will be adapted to manage the potential impacts resulting from the GFD Project. The objectives of the plan include: <ul style="list-style-type: none"> · Manage the efficiency of the road network impacted including State-controlled roads and local government roads · Ensure user safety and safe operation of vehicles · Minimise impacts on road infrastructure condition · Minimise traffic related complaints and incidents to maintain community amenity. <p>The Road-use management plan will be prepared in consultation with government agencies as required including DTMR and QPS.</p>	Section 8.6 Section 11.6.3 Appendix J – Section 7 Appendix K – Section 5.3 Appendix M – Section 10.4
Waste		
18.	Allowable annual capacity for a licenced landfill will be confirmed in consultation with the relevant operator once actual location and timing for development of GFD Project components are known.	Section 12.4
19.	Where new gas field infrastructure is developed, Santos GLNG will design and engineer infrastructure (e.g. gas compression and water	Section 12.5.1

#	Proponent commitment	EIS reference
	management facilities) with consideration for energy efficiency and to minimise losses (e.g. gas, water, materials, etc.).	
Surface water		
20.	Santos GLNG will continuously seek to find new ways to minimise our environmental impact across the lifecycle of our activities.	Appendix N – Section 2.5
21.	As outlined in the [Environmental Protocol for Constraints Planning and Field Development for the GFD Project (the Constraints protocol)], prior to final siting of longer term campsite areas or permanent infrastructure (that are not pipelines or roads), flood levels for the 50 and/or 100 year ARI (average recurrence interval) event will be investigated along waterways and within a 5 km radius of proposed location.	Appendix N – Section 5.4
Groundwater		
22.	Santos GLNG will continue to take into account naturally occurring geological faults as part of the stimulation risk assessment process and continue to supply information to enable ongoing OGIA research into naturally occurring faults	Appendix F
Terrestrial ecology		
23.	Where required, Santos GLNG will provide suitable offsets for activities that result in an unavoidable significant adverse impact. The offsets will be submitted for approval in accordance with State and Commonwealth Government requirements. Santos GLNG will not exceed the stated maximum impact for each value.	Appendix R – Section 5.3.1 Appendix A of Appendix AB
Aquatic ecology		
24.	Once the exact nature and location of the impacting processes has been identified, location-specific aquatic ecology surveys may be undertaken to refine the proposed controls to avoid, minimise and mitigate potential impacts to aquatic ecology as required.	Appendix S – Section 3.2.1
25.	Where practical, baseline (pre-discharge) surveys will be undertaken to provide a basis for future impact assessment.	Appendix S – Section 5.7.3.1
Social		
26.	Santos GLNG will work with the Department of Education and Training during the EIS consultation period and during field planning to provide further detail on workforce requirements, including occupational breakdown.	Section 21.4
27.	Santos GLNG will implement the SIMP and social issues action plans.	Appendix AC
Economics		
28.	Santos GLNG has adopted Code of Practice for Local Content and it will implement it for the GFD Project.	Section 22.6
29.	Santos GLNG is committed to working with government, industry and the community to manage economic impacts with specific focus on addressing issues around workforce and housing through its social impact management plan and on increasing local industry participation through its adoption of the QRC Code of Practice for Local Content.	Sections 22.5.5, 22.6 and 22.7
Health and safety		
30.	The GFD Project will adopt a systematic health and safety management approach that provides for risk identification and	Section 23.2.1

#	Proponent commitment	EIS reference
	assessment, hazard analysis, management and control, and reporting to protect workers in accordance with regulatory requirements. In this way, Santos GLNG will ensure, so far as is reasonably practicable, the health and safety of workers at the workplace.	
31.	Santos GLNG will engage with Queensland Ambulance Service and Queensland Fire and Emergency Services across the life of the GFD Project concerning joint responsibilities for emergency response.	Section 23.6.2
Preliminary hazard and risk		
32.	Risks will be managed to as low as reasonably practicable throughout the GFD Project's lifecycle using existing controls as documented in Santos GLNG Environment, Health, and Safety Management Standard EHSMS09: Managing Environment, Health and Safety Risks (EHSMS09) and supporting process (e.g. planning and engineering design).	Section 24.7 Appendix X – Sections 1.3.1, 1.3.2, 11.1.1 and 11.1.2
33.	Ongoing management of the risk and demonstration of ALARP will be achieved by the GFD Project through the implementation of EHSMS09 and supporting processes including: <ul style="list-style-type: none"> • the development of the Significant Hazards Risk Register (SHRR) for the GFD Project • update of the SHRR as the GFD Project matures • implementation of Integrity Management Plans to assure the asset integrity and risk controls remain effective over the life of the GFD Project. 	Appendix X - Sections 1.4, 10.1 and 11.2
34.	Hazards and risks associated with the GFD Project will be managed by implementation of measures based on best engineering practices through each phase of the GFD Project. The measures applied have been based on the existing measures that Santos GLNG has already developed and implemented for the GLNG Project. Applying the same measures from the GLNG Project to the GFD Project will ensure a consistent approach by construction and operational personnel and a common understanding for both regulators and the community of the measures to be applied.	Appendix X – Section 4.5
35.	Santos GLNG will engage with Queensland Ambulance Service and Queensland Fire and Emergency Services across the life of the GFD Project concerning joint responsibilities for emergency response.	Section 24.6 Appendix X – Section 4.6
Cumulative impacts		
36.	Santos GLNG will explore opportunities for collaboration in cumulative impact management through existing arrangements in consultation with State and local governments, industry and communities.	Section 26.5.14.6
Ecologically sustainable development		
37.	The sustainability performance of the GFD Project will be incorporated into the annual corporate sustainability scorecard report.	Section H.4

Appendix 5. MNES cross reference tables

As part of the GLNG GFD EIS, assessment of potential project impacts to flora, fauna and migratory species subject to the provisions of the *Environment Protection and Biodiversity Act 1999* (EPBC Act) was conducted. The description of threatened and migratory species and associated habitat, habitat mapping and impact assessment presented in the GLNG GFD EIS provided consideration to the Conservation Listing Advices, Conservation Advice and Recovery Plan documentation relevant for the target species.

The following document presents a series of cross reference tables for EPBC Act listed Flora, Fauna and Migratory species which were subject to the GLNG GFD EIS. The first cross reference table, 'Conservation Advice Cross Reference Table', provides for an assessment of Conservation Listing Advices, Conservation Advice and Recovery Plan documentation relevant for the target species and details where in the GLNG GFD EIS the key themes of the documents are considered.

The second cross reference table, 'Impact and Management Cross Reference Table', details the species specific threats identified in the relevant Conservation Listing Advices, Conservation Advice and Recovery Plan documentation. The Impact and Management Cross Reference Table provides reference to those impacts which may be relevant to the project and details the associated project management measures proposed in the GLNG GFD EIS.

This document seeks to provide further clarity that the GLNG GFD EIS has provided for a comprehensive assessment of potential project impacts to EPBC Act listed threatened and migratory species and has proposed suitable and appropriate management measures.

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1.0 EPBC Act EVNT Flora Species subject to the Santos GLNG GFD EIS

1.1 Conservation Advice Cross Reference Table

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
<p><i>Acacia curranii</i> (Curly bark wattle) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Acacia curranii</i> (Curly-bark Wattle)” (TSSC 2008)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Acacia curranii</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Habitat erosion - Grazing - Browsing and honing of adult and seedling plants by feral goats - Grazing by stock, rabbits and macropods - Clearing of vegetation for fire trail widening - Quarrying activities at the Shepard’s Hill and Gurulmundi sites - Predation of seeds by insects, causing seeds to be non-viable - Lack of suitable fire disturbance for seedling establishment ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Conservation information, raising species awareness - Recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Acacia curranii</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>A.curranii</i> in the species Conservation Advice (TSSC 2008) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the <i>A.curranii</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>A.curranii</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>A.curranii</i> in the species Conservation Advice (TSSC 2008) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel 	<ul style="list-style-type: none"> ▪ Section 9.1 provides a species profile for <i>Acacia curranii</i> (Curly-bark Wattle). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the Department of the Environment (DotE) Species Profile and Threat Database (SPRAT) and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area</p> <ul style="list-style-type: none"> - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
	<p>“Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) is to minimise the impact of unmanaged goat competition and land degradation on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected native species and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives including: <ul style="list-style-type: none"> - Prevent unmanaged goats occupying new areas in Australia and eradicate them from high conservation value ‘islands’ - Promote the maintenance and recovery of native species and ecological communities that are affected by competition and land degradation by unmanaged goats - Improve knowledge and understanding of unmanaged goat impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity and humaneness of control options for unmanaged goats - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control unmanaged goats 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent or in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP)</p> <ul style="list-style-type: none"> ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the Threat Abatement Plan regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<p>typically be ongoing measures to reduce the risk of further spreading the pest or weed.</p> <ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats are a Class 2 declared pest under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Acacia grandifolia</i> EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Acacia grandifolia</i>” (TSSC 2014)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Acacia grandifolia</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Habitat modification through timber harvesting, inappropriate fire regimes and inappropriate grazing regimes ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Appropriate fire management 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Acacia grandifolia</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>A. grandifolia</i> in the species Conservation Advice (TSSC 2014) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the <i>A. grandifolia</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>A. grandifolia</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>A. grandifolia</i> in the species Conservation Advice (TSSC 2014) include: 	<ul style="list-style-type: none"> ▪ Section 9.2 provides a species profile for <i>Acacia grandifolia</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities 		
<p><i>Aristida annua</i> EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Aristida annua</i>” (TSSC 2014a)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014a) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Aristida annua</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Habitat modification, resulting in the conversion of natural grassland to exotic pastures and <i>Leucaena</i> (<i>Leucaena leucocephala</i>) paddocks - Clearing for agriculture - Overgrazing - Development and operation of mines and associated infrastructure ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Conservation information, raising species awareness 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Aristida annua</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>A.annua</i> in the species Conservation Advice (TSSC 2014a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>A.annua</i> were assessed 	<ul style="list-style-type: none"> ▪ Section 9.3 provides a species profile for <i>Aristida annua</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ <i>Leucaena</i> (<i>Leucaena leucocephala</i>), a weed species identified in the <i>A.annua</i> Conservation Advice (TSSC 2014a) as a threat to <i>A.annua</i> habitat, is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A Leucaena Management Procedure has been developed as part of the PWMP to further support the PWMP to minimise the potential for the introduction and spread of the species within the Project area ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>A.annuai</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>A.annua</i> in the species Conservation Advice (TSSC 2014a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		<p>prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species
<p><i>Amphibromus whitei</i> EPBC Act Status: Extinct</p>	<p>As <i>Amphibromus whitei</i> is listed as an extinct species, the DotE SPRAT profile does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Arthraxon hispidus</i> (Hairy-joint grass) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Conservation Advice on <i>Arthraxon hispidus</i> (Hairy-joint grass)" (TSSC 2008a)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008a) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Arthraxon hispidus</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Weed invasion, in particular from the Mist flower (<i>Ageratina riparia</i>), Crofton weed (<i>Ageratina adenophora</i>) and Lantana (<i>Lantana camara</i>) - Trampling by stock - Clearing for agriculture and development - Inappropriate fire regimes - Over-grazing by domestic stock 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Arthraxon hispidus</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats 	<ul style="list-style-type: none"> ▪ Section 9.4 provides a species profile for <i>Arthraxon hispidus</i> (Hairy-joint Grass). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ Lantana (<i>Lantana camara</i>) is identified in Appendix 1 as a weed species present within the Santos GLNG

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		<ul style="list-style-type: none"> - Competition from introduced grasses such as Paspalum (<i>Paspalum dilatatum</i>) and Kikuyu (<i>Pennisetum clandestinum</i>) - Slashing or mowing of habitat ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: - Habitat loss, disturbance and modification - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations - Invasive weed management - Trampling, browsing or grazing - Fire management 	<p>identified to <i>A.hispidus</i> in the species Conservation Advice (TSSC 2008a) include:</p> <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>A.hispidus</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>A.hispidus</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>A.hispidus</i> in the species Conservation Advice (TSSC 2008a) include: - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 	<p>result of the project</p> <ul style="list-style-type: none"> ▪ Section 6.2.1 provides management measures for significant flora species 	<p>Upstream Project area and thus subject to the PWMP</p> <ul style="list-style-type: none"> ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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<p><i>Bertya opposens</i></p> <p>EPBC Act Status: Vulnerable</p>	<p>"Recovery Plan for the <i>Bertya</i> sp. (Cobar-Coolabah)" (NPWS 2002)</p>	<ul style="list-style-type: none"> ▪ The DotE SPRAT profile for <i>Bertya opposens</i> references the "Recovery Plan for the <i>Bertya</i> sp. (Cobar-Coolabah)" (NPWS 2002). The identity of the taxon <i>Bertya</i> sp. (Cobar-Coolabah) is unresolved but is believed to be either <i>B. opposens</i> or <i>B. oppositifolia</i> ▪ The Recovery Plan (NPWS 2002) provides information relevant to the management of <i>Bertya opposens</i>, including data pertaining to the species: <ul style="list-style-type: none"> - Taxonomic description - Distribution - Biology and ecology - Habitat requirements ▪ The principle objectives of the Recovery Plan include: <ul style="list-style-type: none"> - Limit grazing impacts - Survey potential habitat for further populations - Ensure there is recruitment at senescent populations - Raise awareness of the conservation significance of the species and involve the community in the recovery program ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Grazing by feral goats - Seedling viability - Inappropriate fire regimes - Clearing - Drought ▪ Recovery criteria identified to achieve the objectives of the species recovery plan include: <ul style="list-style-type: none"> - Coolabah population is protected from grazing - The distribution is better understood in the Cobar-Coolabah and coastal areas - Viability, dormancy and germination cues of seed understood - Management strategies to encourage recruitment at Gibraltar Range and Coolabah implemented - Educational material is disseminated and the community is involved in the implementation of the recovery plan 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Bertya opposens</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>B. opposens</i> in the species recovery plan (NPWS 2002) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>B. opposens</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>B. opposens</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>B. opposens</i> in the species recovery plan (NPWS 2002) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. 	<ul style="list-style-type: none"> ▪ Section 9.5 provides a species profile for <i>Bertya opposens</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<ul style="list-style-type: none"> - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
	<p>“Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) is to minimise the impact of unmanaged goat competition and land degradation on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected native species and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives including: <ul style="list-style-type: none"> - Prevent unmanaged goats occupying new areas in Australia and eradicate them from high conservation value ‘islands’ - Promote the maintenance and recovery of native species and ecological communities that are affected by competition and land degradation by unmanaged goats - Improve knowledge and understanding of unmanaged goat impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity and humaneness of control options for unmanaged goats - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control unmanaged goats 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent or in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the Threat Abatement Plan regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats are a Class 2 declared pest under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<ul style="list-style-type: none"> - precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Cadellia pentastylis</i> (Ooline) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Cadellia pentastylis</i> (Ooline)” (TSSC 2008b)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008b) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Cadellia pentastylis</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Localised extinction due to small and scattered populations - Inbreeding which threatens genetic diversity in small populations - Low seed viability which threatens breeding success - Clearing for agriculture - Grazing and soil compaction by domestic stock including feral goats (<i>Capra hircus</i>) and pigs (<i>Sus scrofa</i>) - Invasion of habitat by weeds, such as Tiger Pear (<i>Opuntia aurantiaca</i>) - Frequent fires - Tunnel and sheet erosion - Damage to roadside populations during roadworks - High insect attack ▪ Regional priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Conservation information, raising species awareness within the local community, particularly landowners - Fire management - Tamplng, browsing or grazing - Enable recovery of additional sites and/or populations - Invasive weed management 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species. The habitat description provided for <i>Cadellia pentastylis</i> (Ooline) has been sourced from the species Conservation Advice (TSSC 2008) ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>C.pentastylis</i> in the species Conservation Advice (TSSC 2008) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Noise, dust and light impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>C.pentastylis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>C.pentastylis</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>C.pentastylis</i> in the species Conservation Advice (TSSC 2008) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive 	<ul style="list-style-type: none"> ▪ Section 9.6 provides a species profile for <i>Cadellia pentastylis</i> (Ooline). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ <i>Opuntia aurantiaca</i> (Tiger pear), a weed species identified in the <i>C.pentastylis</i> Conservation Advice (TSSC 2008) as a threat to <i>C.pentastylis</i> habitat, is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ Feral goats and pigs, exotic pest species identified in the <i>C.pentastylis</i> Conservation Advice (TSSC 2008) as a threat to <i>C.pentastylis</i> habitat, are identified in Appendix 2 as pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>environs, including threatened flora species present in the area</p> <ul style="list-style-type: none"> - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties ▪ Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Calytrix gurlmundensis</i> EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Calytrix gurlmundensis</i>” (TSSC 2008c)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008c) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Calytrix gurlmundensis</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Vegetation clearing - Habitat fragmentation and loss of remnants - Changed fire regimes - Quarrying - Inappropriate timber harvesting ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Fire management - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Calytrix gurlmundensis</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>C.gurlmundensis</i> in the species Conservation Advice (TSSC 2008c) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>C.gurlmundensis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>C.gurlmundensis</i>. Management measures with similar intent to the recovery and threat 	<ul style="list-style-type: none"> ▪ Section 9.7 provides a species profile for <i>Calytrix gurlmundensis</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>abatement actions identified for the <i>C.gurulumundensis</i> in the species Conservation Advice (TSSC 2008c) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities 		
<p><i>Daviesia discolor</i> EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Daviesia discolor</i>” (TSSC 2008d)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008d) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Daviesia discolor</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - High frequency fires, including deliberate fuel reduction burns or wildlife - Cattle grazing ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weed management - Trampling, browsing or grazing - Fire management - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Daviesia discolor</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>D. discolor</i> in the species Conservation Advice (TSSC 2008d) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential 	<ul style="list-style-type: none"> ▪ Section 9.8 provides a species profile for <i>Daviesia discolor</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>D. discolor</i> were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>D. discolor</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>D. discolor</i> in the species Conservation Advice (TSSC 2008d) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Dichanthium queenslandicum</i> (King bluegrass) EPBC Act Status: Endangered</p>	<p>"Commonwealth Conservation Advice on <i>Dichanthium queenslandicum</i> (King bluegrass)" (TSSC 2013)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2013) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Dichanthium queenslandicum</i> identified in the Conservation Advice include: 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Dichanthium queenslandicum</i>. The likelihood of occurrence assessment includes a description 	<ul style="list-style-type: none"> ▪ Section 9.9 provides a species profile for <i>Dichanthium queenslandicum</i> (King bluegrass). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
	<p>“Commonwealth Listing Advice on <i>Dichanthium queenslandicum</i> (King Bluegrass)” (TSSC 2013a)</p>	<ul style="list-style-type: none"> - Habitat loss - Cultivation and crop production - Grazing - Weed invasion, in particular by <i>Parthenium (Parthenium hysterophorus)</i> and <i>Parkinsonia (Parkinsonia aculeate)</i> ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: - Habitat loss, disturbance and modification - Invasive weed management - Trampling, browsing or grazing - Conservation information, raising species awareness <ul style="list-style-type: none"> ▪ A conservation assessment for <i>Dichanthium queenslandicum</i> (TSSC 2013a) was conducted by the TSSC due to the provision of new information ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ Key threats identified for the species include: <ul style="list-style-type: none"> - Loss of habitat through agricultural and mining activities - Road construction and other infrastructure developments - Cultivation and crop production - Unsustainable grazing - Invasive weeds ▪ Potential threats to the species include: <ul style="list-style-type: none"> - Expansion of mining activities - Habitat disturbance due to weed invasion ▪ The conservation assessment concluded that the species triggered assessment criterion 2; that is the species geographical distribution is precarious for the survival of the species and is very restricted, restricted or limited ▪ The TSSC noted that the species has a restricted and fragmented distribution and is subject to ongoing threats. The TSSC recommended transferring species from the Vulnerable category to the Endangered category and that a recovery program for the species 	<p>of the species distribution and habitat requirements</p> <ul style="list-style-type: none"> ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>D.queenslandicum</i> in the species Conservation Advice and Listing Advice (TSSC 2013; TSSC 2013a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>D.queenslandicum</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>D.queenslandicum</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>D.queenslandicum</i> in the species Conservation Advice and Listing Advice (TSSC 2013; TSSC 2013a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. 	<p>the species profile was predominately sourced from the DotE SPRAT and source documents</p> <ul style="list-style-type: none"> ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<p>and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements</p> <ul style="list-style-type: none"> ▪ <i>Parthenium (Parthenium hysterophorus)</i> and <i>Parkinsonia (Parkinsonia aculeate)</i> are identified in Section 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Dichanthium setosum</i> (Bluegrass) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Dichanthium setosum</i> (Bluegrass)” (TSSC 2008e)</p> <p>“Commonwealth Listing Advice on <i>Dichanthium setosum</i> (Bluegrass)” (TSSC 2010)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008e) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Dichanthium setosum</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Heavy grazing by domestic stock - Habitat loss due to clearing for pasture improvement and cropping - Frequent fires - Invasion by introduced grasses, such as Coolatai grass (<i>Hyparrhenia hirta</i>), Lippa (<i>Phyla canescens</i>) and African lovegrass (<i>Eragrostis curvula</i>) - Road widening ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weed management - Trampling, browsing or grazing - Fire management - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations ▪ A conservation assessment for <i>Dichanthium setosum</i> (TSSC 2010) was conducted by the TSSC due to the provision of new information ▪ Listing advice found that although there was insufficient data to assess the species against the conservation listing criteria, no amendment is required to the species vulnerable listing status ▪ Key threats identified for the species include: <ul style="list-style-type: none"> - Heavy grazing by domestic stock - Loss of habitat through clearing for pasture improvement and cropping - Frequent fires - Invasion by introduced grasses such as <i>Hyparrhenia hirta</i> (Coolatai grass), <i>Phyla canescens</i> (Lippia) and <i>Eragrostis curvula</i> (African lovegrass) - Road widening 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Dichanthium setosum</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>D.setosum</i> in the species Conservation Advice and Listing Advice (TSSC 2008e;TSSC 2010) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>D.setosum</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>D.setosum</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>D.setosum</i> in the species Conservation Advice and Listing Advice (TSSC 2008e;TSSC 2010) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel 	<ul style="list-style-type: none"> ▪ Section 9.10 provides a species profile for <i>Dichanthium setosum</i> (Bluegrass). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ Lippa (<i>Phyla canescens</i>) and African lovegrass (<i>Eragrostis curvula</i>), weed species identified in the <i>D.setosum</i> Conservation Advice (TSSC 2008e) as a threat to habitat, are identified in Appendix 1 of the PWMP as weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ African lovegrass is identified in Section 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area</p> <ul style="list-style-type: none"> - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
	<p>“Threat Abatement Plan for competition and land degradation by Rabbits” (DEWHA 2008a)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by Rabbits” (DEWHA 2008a) is to minimise the impact of Rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives: <ul style="list-style-type: none"> - Prevent Rabbits from occupying new areas in Australia and eradicate Rabbits from high conservation value islands - Promote the maintenance and recovery of native species and ecological communities that are affected by Rabbit competition and land degradation - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for Rabbits - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage Rabbits 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for competition and land degradation by Rabbits’ (DEWHA 2008a) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>and management framework' references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP)</p> <ul style="list-style-type: none"> ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the 'Threat Abatement Plan for competition and land degradation by unmanaged goats' regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<p>reduce the risk of further spreading the pest or weed.</p> <ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Rabbits are a Class 2 declared pest under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The Rabbit is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Eriocaulon carsonii</i> (Salt pipewort)</p> <p>EPBC Act Status: Endangered</p>	<p>"Recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin" (Fensham et al 2010)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (Fensham et al 2010) provides information relevant to the management of the listed community, including data pertaining to the community's: <ul style="list-style-type: none"> - Conservation status - Habitat description - Distribution summary ▪ The overall objective of the Recovery Plan is to maintain or enhance groundwater supplies to the Great Artesian Basin (GAB) discharge spring wetlands, maintain or increase habitat area and health, and increase all populations of endemic organisms ▪ The Recovery Plan identifies <i>Eriocaulon carsonii</i> as a species associated with GAB discharge spring wetlands ▪ The Recovery Plan provides information on the description, conservation status, life history, ecology, critical habitat and important populations of <i>E.carsonii</i> ▪ Threats and recommended management actions are identified in the recovery plan for <i>E.carsonii</i>. Threat types identified include: <ul style="list-style-type: none"> - Aquifer draw-down - Excavation of springs - Poned pastures - Stock and feral animal disturbance - Pig disturbance - Managing woody vegetation around springs 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Eriocaulon carsonii</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>E. carsonii</i> in the Recovery Plan (Fensham et al 2010) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>E.carsonii</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>E.carsonii</i>. Management measures with similar intent to the recovery and threat abatement 	<ul style="list-style-type: none"> ▪ Section 9.21 provides a species profile for <i>Eriocaulon carsonii</i> (Salt pipewort). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ The Feral pig is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ The feral pig is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>actions identified to <i>E. carsonii</i> in the Recovery Plan (Fensham et al 2010) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties ▪ Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
	<p>“Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) is to minimise the impact of unmanaged goat competition and land degradation on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected native species and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives including: <ul style="list-style-type: none"> - Prevent unmanaged goats occupying new areas in Australia and eradicate them from high conservation value ‘islands’ - Promote the maintenance and recovery of native species and ecological communities that are affected by competition and land degradation by unmanaged goats 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<ul style="list-style-type: none"> - Improve knowledge and understanding of unmanaged goat impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity and humaneness of control options for unmanaged goats ▪ Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control unmanaged goats 	<p>Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent or in low numbers</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the Threat Abatement Plan regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<p>assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats are a Class 2 declared pest under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Eucalyptus beaniana</i> (Bean's ironbark) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Conservation Advice on <i>Eucalyptus beaniana</i> (Bean's ironbark)" (TSSC 2008f)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008f) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Eucalyptus beaniana</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Destruction of trees for timber - Road widening and maintenance activity ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Eucalyptus beaniana</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>E.beauiana</i> in the species Conservation Advice (TSSC 2008f) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The 	<ul style="list-style-type: none"> ▪ Section 9.11 provides a species profile for <i>Eucalyptus beaniana</i> (Bean's Ironbark). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DoE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>aforementioned impacts relevant to the threats identified to <i>E.beaniana</i> were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>E.beaniana</i>. Management measures with similar intent to the recovery and threat abatement actions identified to <i>E.beaniana</i> in the species Conservation Advice (TSSC 2008f) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. 		<p>pest and weed species</p>
<p><i>Hakea fraseri</i> (Fraser’s hakea) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Hakea fraseri</i> (Gnarled corkbark)” (TSSC 2008g)</p> <p>“Northern Rivers Regional Biodiversity Management</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008g) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Hakea fraseri</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Browsing by feral goats - Inappropriate fire regimes ▪ Potential threats to the species include vulnerability due to low numbers in populations and the effects of erosion ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing and grazing - Fire management - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations ▪ The Management Plan (DECCW 2010) covers the Northern Rivers Region, an area from 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Hakea fraseri</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>H.fraseri</i> in the species Conservation Advice (TSSC 2008g) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
	Plan” (DECCW 2010)	<p>Tweed Heads in the north, south to Laurieton, and west to Walcha and the Queensland border north-east of Tenterfield. The Management Plan constitutes the national regional recovery plan for federally-listed threatened species and ecological communities</p> <ul style="list-style-type: none"> ▪ <i>Hakea fraseri</i> is a threatened species addressed by the Management Plan ▪ <i>H. fraseri</i> is identified by the Management Plan as a threatened entity under threat from feral goats ▪ Management objectives for <i>H. fraseri</i> were identified by the Plan for the following themes: <ul style="list-style-type: none"> - Decision making - Fire regimes - Pests - Human disturbance - Demographic effects 	<ul style="list-style-type: none"> - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>H. fraseri</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>H. fraseri</i>. Management measures with similar intent to the recovery and threat abatement actions identified to <i>H. fraseri</i> in the species Conservation Advice (TSSC 2008g) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		<p>as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species
<p><i>Homopholis belsonii</i> (Belson's panic) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Homopholis belsonii</i> (Belson's panic)” (TSSC 2008h)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008h) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Homopholis belsonii</i> identified in the Conservation Advice include: 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Homopholis belsonii</i>. The likelihood of occurrence assessment includes a description 	<ul style="list-style-type: none"> ▪ Section 9.12 provides a species profile for <i>Homopholis belsonii</i> (Belson's panic). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<ul style="list-style-type: none"> - Clearing of habitat for agriculture, development or pasture improvement - Overgrazing of habitat by domestic stock - Invasion of habitat by introduced weeds - Clearing of habitat for mining ▪ Regional and local priority recovery actions and threat abatement actions were identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weeds - Trampling, browsing or grazing - Conservation information, raising species awareness - Recovery of additional sites and/or populations 	<p>of the species distribution and habitat requirements</p> <ul style="list-style-type: none"> ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>H.belsonii</i> in the species Conservation Advice (TSSC 2008h) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>H.belsonii</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>H.belsonii</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>H.belsonii</i> in the species Conservation Advice (TSSC 2008h) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant 	<p>profile was predominately sourced from the DotE SPRAT and source documents</p> <ul style="list-style-type: none"> ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<p>and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements</p> <ul style="list-style-type: none"> ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities</p> <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Homoranthus decumbens</i> EPBC Act Status: Endangered</p>	<p>“Commonwealth Conservation Advice on <i>Homopholis decumbens</i> (a shrub)” (TSSC 2013b)</p> <p>“Commonwealth Listing Advice on <i>Homoranthus decumbens</i> (a shrub)” (TSSC 2013c)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2013b) provides information on the species description, conservation status, distribution and habitat ▪ There are no known current threats to <i>Homopholis decumbens</i> identified in the Conservation Advice. The main potential threats to the species identified in the Conservation Advice include: <ul style="list-style-type: none"> - Inappropriate legal collection practices (seeds and cuttings for cultivation) - Habitat disturbance by road maintenance - Inappropriate fire regimes ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Fire management - Road maintenance - Conservation information, raising species awareness <hr/> <ul style="list-style-type: none"> ▪ A conservation assessment for <i>Homoranthus decumbens</i> was conducted by the TSSC due to the provision of new information ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ The listing advice notes that there are no known threats to the species ▪ Potential threats identified include: <ul style="list-style-type: none"> - Inappropriate legal collection practices (seeds and cutting for cultivation) - Habitat disturbance by road maintenance - Inappropriate fire regimes ▪ The conservation assessment found that the species triggered conservation assessment criterion 4, that is the estimated total number of mature individuals is extremely low, very low or low ▪ The TSSC concluded that the species is eligible for listing as endangered due to an estimated very low number of mature individuals 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Homopholis decumbens</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>H. decumbens</i> in the species Conservation Advice (TSSC 2013b) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>H. decumbens</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>H. decumbens</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>H. decumbens</i> in the species Conservation Advice (TSSC 2013b) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel 	<ul style="list-style-type: none"> ▪ Section 9.13 provides a species profile for <i>Homoranthus decumbens</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area</p> <ul style="list-style-type: none"> - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities 		
<p><i>Macrozamia platyrhachis</i> (Cycad) EPBC Act Status: Endangered</p>	<p>“National Multi-species Recovery Plan for the cycads, <i>Cycas megacarpa</i>, <i>Cycas ophiolitica</i>, <i>Macrozamia cranei</i>, <i>Macrozamia lomandroides</i>, <i>Macrozamia pauli-guilielmi</i> and <i>Macrozamia platyrhachis</i>” (Queensland Herbarium 2007)</p>	<ul style="list-style-type: none"> ▪ The recovery plan (Queensland Herbarium 2007) has been prepared for six species; two Cycad species and four Macrozamia species, including <i>Macrozamia platyrhachis</i> ▪ The recovery plan presents maps which show known locations of <i>M.platyrhachis</i> ▪ Threats identified to the species include: <ul style="list-style-type: none"> - Destruction of habitat and individuals due to land clearing, predominately from road corridors and quarrying in the vicinity of Blackdown Tableland National Park and State Forest 28 - Legal harvesting and commercial salvage - Illegal destruction and harvesting - Loss of genetic variation and insect pollinators - Land management practices ▪ The objectives of the recovery plan are: <ul style="list-style-type: none"> - To prevent further loss of individuals, populations, pollinator species and habitat critical to the species survival - To recover existing populations to normal reproductive capacity to ensure viability in the long-term, prevent extinction, maintain genetic viability, and improve conservation status ▪ Key management practices presented in the recovery plan to ensure long-term species survival include: <ul style="list-style-type: none"> - Halt clearing of habitat in the vicinity of significant populations - Prevent illegal destruction or removal of individuals - Fence populations where grazing animals are likely to be affected - Translocate immediately threatened individual plants under authorised permits - Manage road verge and land maintenance activities such as mowing or grading so that individuals and especially seedlings are not 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>M.platyrhachis</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>M.platyrhachis</i> in the species recovery plan (Queensland Herbarium 2007) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>M.platyrhachis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>M.platyrhachis</i>. Management measures with similar intent to the recovery and threat abatement actions identified to <i>M.platyrhachis</i> in the species recovery plan (Queensland Herbarium 2007) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints 	<ul style="list-style-type: none"> ▪ Section 9.14 provides a species profile for <i>Macrozamia platyrhachis</i> (Cycad). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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		<p>damaged</p> <ul style="list-style-type: none"> - Manage timber harvesting in the vicinity of significant populations to minimise damage - Manage fire frequency, timing and intensity so that coning events and seedling survival are not affected 	<p>Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable</p> <ul style="list-style-type: none"> - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only 		
<p><i>Phaius australis</i> (Swamp orchid) EPBC Act Status: Endangered</p>	<p>“Approved Conservation Advice for <i>Phaius australis</i> (Common swamp-orchid) (TSSC 2014b)”</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014b) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Phaius australis</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Illegal collection for horticulture or cut flowers - Habitat loss through clearing and fragmentation and drainage for development, agriculture and road works - Invasion by weeds, in particular Lantana (<i>Lantana camara</i>), Umbrella tree (<i>Schefflera actinophylla</i>), Groundsel (<i>Baccharis halmifolia</i>) and Brazilian cherry (<i>Eugenia uniflora</i>) - Timber harvesting - Mining - Trampling and browsing by feral pigs and domestic livestock - Inappropriate fire regimes ▪ Regional and local priority recovery actions and threat abatement actions were identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weeds - Trampling, browsing or grazing - Fire management - Conservation information - Recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>P.australis</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>P.australis</i> in the species Conservation Advice (TSSC 2014b) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>P.australis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>P.australis</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>P.australis</i> in the species Conservation Advice (TSSC 2014b) include: 	<ul style="list-style-type: none"> ▪ Section 9.15 provides a species profile for <i>Phaius australis</i> (Swamp Orchid). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ Feral pigs is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ The feral pig is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ Lantana (<i>Lantana camara</i>) and Groundsel bush (<i>Baccharis halmifolia</i>) are identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Pterostylis cobarensis</i> (Cobar greenhood orchid)</p> <p>EPBC Act Status: Not listed</p>	<p>“Commonwealth Listing Advice on <i>Pterostylis cobarensis</i> (Cobar Greenhood Orchid)” (TSSC 2013d)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment was conducted for <i>Pterostylis cobarensis</i> (TSSC 2013d) due to provision of new information ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ Key threats identified for the species include: <ul style="list-style-type: none"> - Feral goats - Broad-scale vegetation clearing - Grazing pressure - Changed hydrology and salinity - Habitat fragmentation ▪ Potential threats identified for the species include: <ul style="list-style-type: none"> - Habitat degradation (granite ridge and rocky slope habitat are vulnerable to erosion caused by feral goats) - Weed invasion ▪ Based on available information on the species population size and geographic distribution, 	<ul style="list-style-type: none"> ▪ Although <i>Pterostylis cobarensis</i> has been delisted and is no longer considered a EVNT species under the provisions of the EPBC Act, the species was captured in the GLNG GFD EIS and associated technical reports ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>P.cobarensis</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements. ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>P.cobarensis</i> in the species Listing Advice (TSSC 2013d) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction 	<ul style="list-style-type: none"> ▪ The SSMP was prepared to minimise Project related impacts to significant species and TECs listed under the provisions of the EPBC Act. As <i>Pterostylis cobarensis</i> was delisted from the EPBC Act in 2013, the species is not covered by the SSMP 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>including no evidence of population decline, the TSSC found that the species did not meet any of the required criteria for listing in any conservation category. The TSSC recommended that the species be deleted from the listing in the vulnerable category</p>	<p>(Section 5.2.3)</p> <ul style="list-style-type: none"> - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>P.cobarensis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>P.cobarensis</i>. Management measures with similar intent to the recovery and threat abatement actions identified to <i>P.cobarensis</i> in the species Listing Advice (TSSC 2013d) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		<p>control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
<p><i>Swainsona murrayana</i> (Slender darling-pea) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Swainsona murrayana</i>” (TSSC 2008i)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008i) provides information on the species description, conservation status, distribution and habitat ▪ Threats identified in the Conservation Advice include: <ul style="list-style-type: none"> - Grazing from domestic stock and Rabbits (<i>Oryctolagus cuniculus</i>) - Weed invasion - Cultivation - Roadside maintenance activities - Habitat destruction by goats (<i>Capra hircus</i>) and Feral pigs (<i>Sus scrofa</i>) - Salinisation of habitat - Urban development in grassland habitat - Inappropriate fire regimes, <i>S.murrayana</i> should not be burnt more frequently than once every ten years ▪ Regional and local priority recovery actions and threat abatement actions were identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Fire management - Conservation information - Enable recovery of additional sites and/or populations - Invasive weeds 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Swainsona murrayana</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>S.murrayana</i> in the species Conservation Advice (TSSC 2008i) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>S.murrayana</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>S.murrayana</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>S.murrayana</i> in the species Conservation Advice (TSSC 2008i) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants 	<ul style="list-style-type: none"> ▪ Section 9.16 provides a species profile for <i>Swainsona murrayana</i> (Slender darling-pea). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ Feral goats, feral pigs and rabbits are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ The rabbit and feral pig are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
	<p>“Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) is to minimise the impact of unmanaged goat competition and land degradation on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected native species and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives including: <ul style="list-style-type: none"> - Prevent unmanaged goats occupying new areas in Australia and eradicate them from high conservation value ‘islands’ - Promote the maintenance and recovery of native species and ecological communities that are affected by competition and land degradation by unmanaged goats - Improve knowledge and understanding of unmanaged goat impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity and humaneness of control options for unmanaged goats - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control unmanaged goats 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent or in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the Threat Abatement Plan regarding the promotion of 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for competition and land degradation by unmanaged goats” (DEWHA 2008) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats are a Class 2

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			<p>maintenance and recovery of native species and ecological communities include the following:</p> <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<p>declared pest under the LP Act</p> <ul style="list-style-type: none"> - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
	<p>“Threat Abatement Plan for competition and land degradation by Rabbits” (DEWHA 2008a)</p>	<ul style="list-style-type: none"> ▪ The goal of the “Threat Abatement Plan for competition and land degradation by Rabbits” (DEWHA 2008a) is to minimise the impact of Rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has five main objectives: <ul style="list-style-type: none"> - Prevent Rabbits from occupying new areas in Australia and eradicate Rabbits from high conservation value islands - Promote the maintenance and recovery of native species and ecological communities that are affected by Rabbit competition and land degradation - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for Rabbits - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage Rabbits 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from the invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the ‘Threat Abatement Plan for competition and land degradation by unmanaged goats’ regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.1 provides management measures for significant flora species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for competition and land degradation by Rabbits’ (DEWHA 2008a) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Rabbits are a Class 2 declared pest under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their

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			<ul style="list-style-type: none"> indirect impacts to MNES and environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules 		<ul style="list-style-type: none"> spread - Closely monitor controlled infestations for response to controls ▪ The Rabbit is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Thesium australe</i> (Toad flax) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice for <i>Thesium australe</i> (Austral Toadflax)” (TSSC 2013e)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2013e) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Thesium australe</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Lack of fire/disturbance - Existing and intensified grazing by livestock - Native and feral herbivores - Residential, infrastructure and agricultural development - Weed invasion - Infrastructure (road and rail) maintenance, particularly road widening and re-routing ▪ Regional and local priority recovery actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Fire management - Conservation information - Population recruitment and translocation 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Thesium australe</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>T.australe</i> in the species Conservation Advice (TSSC 2013e) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>T.australe</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including <i>T.australe</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>T.australe</i> in the species Conservation Advice (TSSC 2013e) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive 	<ul style="list-style-type: none"> ▪ Section 9.17 provides a species profile for <i>Thesium australe</i> (Toad flax). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>environs, including threatened flora species present in the area</p> <ul style="list-style-type: none"> - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Tylophora linearis</i> EPBC Act Status: Endangered</p>	<p>“Commonwealth Conservation Advice on <i>Tylophora linearis</i>” (TSSC 2008j)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008j) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Tylophora linearis</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Forestry activities - Disturbances such as grazing and fire - Invasion of habitat by introduced weeds such as Lantana (<i>Lantana camara</i>) ▪ Regional and local priority recovery actions and threat abatement actions were identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Fire management - Trampling, Browsing or Grazing - Invasive weeds - Conservation information, raising species awareness within the local community and liaising with local indigenous groups to determine the cultural importance or relevance of the species - Enable recovery of additional sites and/or populations 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Tylophora linearis</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to <i>T. linearis</i> in the species Conservation Advice (TSSC 2008j) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>T. linearis</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures 	<ul style="list-style-type: none"> ▪ Section 9.18 provides a species profile for <i>Tylophora linearis</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.1 provides management measures for significant flora species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ Lantana (<i>Lantana camara</i>) is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>T.linearis</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>T.linearis</i> in the species Conservation Advice (TSSC 2008j) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities 		
<p><i>Westringia parvifolia</i> EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Conservation Advice on <i>Westringia parvifolia</i>" (TSSC 2008k)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008k) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Westringia parvifolia</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Broad-scale to vegetation clearing - Increasing fragmentation and loss of remnants - Hydrological change - Pollution ▪ Regional and local priority recovery actions were identified for the following themes: 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Westringia parvifolia</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts 	<ul style="list-style-type: none"> ▪ Section 9.19 provides a species profile for <i>Westringia parvifolia</i>. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Conservation information, raising awareness of the species within the local community - Enable recovery of additional sites and/or populations 	<p>assessed which are relevant to the threats identified to <i>W.parvifolia</i> in the species Conservation Advice (TSSC 2008k) include:</p> <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>W.parvifolia</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>W.parvifolia</i>. Management measures with similar intent to the recovery and threat abatement actions identified for <i>W.parvifolia</i> in the species Conservation Advice (TSSC 2008k) include: - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only 	<p>potential impacts to significant species as a result of the project</p> <ul style="list-style-type: none"> ▪ Section 6.2.1 provides management measures for significant flora species 	<p>measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species
<p><i>Xerothamnella herbacea</i> (Xerothamnella) EPBC Act Status: Endangered</p>	<p>"Commonwealth Conservation Advice on <i>Xerothamnella herbacea</i>" (TSSC 2008I)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008I) provides information on the species description, conservation status, distribution and habitat ▪ Threats to <i>Xerothamnella herbacea</i> identified in the Conservation Advice include: <ul style="list-style-type: none"> - Competition from invasive plant species (primary species threat) - Road widening and maintenance activities - Surface erosion - Grazing and trampling by cattle and native macropods ▪ Regional and local priority recovery and threat 	<ul style="list-style-type: none"> ▪ Appendix F of the Terrestrial Ecology Report and Appendix H of the MNES Report provides a likelihood of occurrence assessment for conservation significant flora species, including <i>Xerothamnella herbacea</i>. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts 	<ul style="list-style-type: none"> ▪ Section 9.20 provides a species profile for <i>Xerothamnella herbacea</i> (Xerothamnella). The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>abatement actions were identified for the following themes:</p> <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weeds - Trampling, browsing and grazing - Fire management - Conservation information, raising awareness of the species within the local community - Enable recovery of additional sites and/or populations 	<p>assessed which are relevant to the threats identified to <i>X.herbacea</i> in the species Conservation Advice (TSSC 2008) include:</p> <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Reduction in biological viability of soil to support plant growth due to soil compaction (Section 5.2.3) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to <i>X.herbacea</i> were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including <i>X.herbacea</i>. Management measures with similar intent to the recovery and threat abatement actions identified for the <i>X.herbacea</i> in the species Conservation Advice (TSSC 2008) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable - Where a significant residual adverse impact is to occur to threatened flora, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened flora species present in the area - Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants - Access to and from the Project location is to occur along designated access tracks only - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos 	<p>potential impacts to significant species as a result of the project</p> <ul style="list-style-type: none"> ▪ Section 6.2.1 provides management measures for significant flora species 	<p>measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities		

1.2 Impact and Management Cross Reference Table

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p><i>Acacia curranii</i> (Curly bark wattle)</p> <p>EPBC Act Status: Vulnerable</p>	Habitat erosion	<ul style="list-style-type: none"> Clearing and construction activities have the potential to result in localised erosion and thereby sediment transport, particularly where activity occurs on slopes or in the vicinity of landform features such as gullies, outcrops and drainage lines Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible Many surface waterways in the region have naturally high turbidity after significant rain events and under normal flow conditions, due to the nature of the soils and the existing disturbed nature of landscapes. Therefore, significant impacts are not anticipated 	<ul style="list-style-type: none"> Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan
	Grazing	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Browsing and horning of adult and seedling plants by feral goats	<ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species Impacts as a result of natural processes and influences, ie grazing pressure from macropods, are not subject to the GFD Project impact assessments 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats and rabbits are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls
	Grazing by stock, rabbits and macropods		
	Clearing of vegetation for fire trail widening	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
Quarrying activities at the Shepard's Hill and	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-	

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Gurulmundi sites		
	Predation of seeds by insects, causing seeds to be non-viable	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Lack of suitable fire disturbance for seedling establishment	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<i>Acacia grandifolia</i> EPBC Act Status: Vulnerable	Habitat modification through timber harvesting	<ul style="list-style-type: none"> The nature of project works does not involve timber harvesting The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Inappropriate fire regimes	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Inappropriate grazing regimes	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
<i>Aristida annua</i> EPBC Act Status: Vulnerable	Habitat modification, resulting in the conversion of natural grassland to exotic pastures and <i>Leucaena (Leucaena leucocephala)</i> paddocks	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> <i>Leucaena (Leucaena leucocephala)</i>, a weed species identified in the <i>A.annua</i> Conservation Advice (TSSC 2014a) as a threat to <i>A.annua</i> habitat, is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP A <i>Leucaena</i> Management Procedure has been developed as part of the PWMP to further support the PWMP to minimise the potential for the introduction and spread of the species within the Project area All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental
	Clearing for agriculture		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Development and operation of mines and associated infrastructure	<ul style="list-style-type: none"> ▪ Prolonged deposition of dust on foliage can impact on a plant's ability to photosynthesise, thereby inducing stress in the plant and the potential for death. Potential impacts associated with dust are most likely to occur during the construction phase where there is significant vehicle movement and earth-breaking activities. Dust from operational activities is envisaged to be minimal ▪ Clearing and construction activities have the potential to result in localised erosion and thereby sediment transport, particularly where activity occurs on slopes or in the vicinity of landform features such as gullies, outcrops and drainage lines ▪ Soil contamination has the potential to occur during the construction and operational Project phases as result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<p>Representative</p> <ul style="list-style-type: none"> ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ▪ Hazardous substances will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan ▪ To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat ▪ Access to and from Project locations is to occur along designated access tracks only
	Overgrazing	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
<p><i>Amphibromus whitei</i></p> <p>EPBC Act Status: Extinct</p>	<ul style="list-style-type: none"> ▪ As <i>Amphibromus whitei</i> is listed as an extinct species, the DotE SPRAT profile does not identify any approved or adopted recovery plans for the species 		
<p><i>Arthraxon hispidus</i> (Hairy-joint grass)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Weed invasion, in particular from the Mist flower (<i>Ageratina riparia</i>), Crofton weed (<i>Ageratina adenophora</i>) and Lantana (<i>Lantana camara</i>)</p> <p>Competition from introduced grasses such as Paspalum (<i>Paspalum dilatatum</i>) and Kikuyu (<i>Pennisetum clandestinum</i>)</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ Lantana (<i>Lantana camara</i>) is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species
	Trampling by stock	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project 	-
	Clearing for agriculture and development	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals)
	Slashing or mowing of habitat	<ul style="list-style-type: none"> ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			clearing activities ■ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Inappropriate fire regimes	■ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ■ The risk of fire associated with Project activities is considered unlikely	■ A buffer will be maintained around ignition sources ■ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Over-grazing by domestic stock	■ Not relevant to the nature of the project	-
<i>Bertya opposens</i> EPBC Act Status: Vulnerable	Grazing by feral goats	■ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ■ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ■ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species	■ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Seedling viability	■ Not relevant to the nature of the project	-
	Inappropriate fire regimes	■ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ■ The risk of fire associated with Project activities is considered unlikely	■ A buffer will be maintained around ignition sources ■ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Clearing	■ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ■ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ■ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access)	■ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) ■ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ■ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ■ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ■ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ■ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ■ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ■ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Drought	<ul style="list-style-type: none"> ▪ Impacts as a result of natural processes and influences are not subject to the GFD Project impact assessments ▪ With respect to global climate change, the major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
<p><i>Cadellia pentastylis</i> (Ooline)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Clearing for agriculture</p> <p>Localised extinction due to small and scattered populations</p> <p>Inbreeding which threatens genetic diversity in small populations</p> <p>Damage to roadside populations during roadworks</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	<p>Grazing and soil compaction by domestic stock including feral goats (<i>Capra hircus</i>) and pigs (<i>Sus scrofa</i>)</p> <p>Invasion of habitat by weeds, such as Tiger Pear (<i>Opuntia aurantiaca</i>)</p>	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - <i>Opuntia aurantiaca</i> (Tiger pear), a weed species identified in the <i>C.pentastylis</i> Conservation Advice (TSSC 2008) as a threat to <i>C.pentastylis</i> habitat, is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - Feral goats and pigs, exotic pest species identified in the <i>C.pentastylis</i> Conservation Advice (TSSC 2008) as a threat to <i>C.pentastylis</i> habitat, are identified in Appendix 2 as pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
	Frequent fires	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Tunnel and sheet erosion	<ul style="list-style-type: none"> Clearing and construction activities have the potential to result in localised erosion and thereby sediment transport, particularly where activity occurs on slopes or in the vicinity of landform features such as gullies, outcrops and drainage lines Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible Many surface waterways in the region have naturally high turbidity after significant rain events and under normal flow conditions, due to the nature of the soils and the existing disturbed nature of landscapes. Therefore, significant impacts are not anticipated 	<ul style="list-style-type: none"> Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan
	Low seed viability which threatens breeding success	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	High insect attack	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
<i>Calytrix gurlmundensis</i> EPBC Act Status: Vulnerable	Vegetation clearing	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Habitat fragmentation and loss of remnants		
	Changed fire regimes	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Quarrying	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Inappropriate timber harvesting	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	<i>Daviesia discolor</i>	High frequency fires, including deliberate fuel	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
EPBC Act Status: Vulnerable	reduction burns or wildlife	<p>may over time also result in vegetation changes, further equating to the loss of habitat</p> <ul style="list-style-type: none"> The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Cattle grazing	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
<i>Dichanthium queenslandicum</i> (King bluegrass) EPBC Act Status: Endangered	Habitat loss	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Road construction and other infrastructure developments		
	Cultivation and crop production	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Grazing	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Weed invasion, in particular by <i>Parthenium</i> (<i>Parthenium hysterophorus</i>) and <i>Parkinsonia</i> (<i>Parkinsonia aculeate</i>)	<ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls <i>Parthenium</i> (<i>Parthenium hysterophorus</i>) and <i>Parkinsonia</i> (<i>Parkinsonia aculeate</i>) are identified in Section 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP
<i>Dichanthium setosum</i> (Bluegrass) EPBC Act Status: Vulnerable	Heavy grazing by domestic stock	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Habitat loss due to clearing for pasture improvement and cropping	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<ul style="list-style-type: none"> ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Frequent fires	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Invasion by introduced grasses, such as Coolatai grass (<i>Hyparrhenia hirta</i>), Lippa (<i>Phyla canescens</i>) and African lovegrass (<i>Eragrostis curvula</i>)	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> - The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Lippa (<i>Phyla canescens</i>) and African lovegrass (<i>Eragrostis curvula</i>), weed species identified in the <i>D.setosum</i> Conservation Advice (TSSC 2008e) as a threat to habitat, are identified in Appendix 1 of the PWMP as weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - African lovegrass is identified in Section 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP
	Road widening	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure, including roads and access tracks, has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure, including roads and access tracks, will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants. Areas of exclusion will remain appropriately marked for the duration of the activity ▪ All vegetation clearing within identified threatened flora must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p><i>Eriocaulon carsonii</i> (Salt pipewort)</p> <p>EPBC Act Status: Endangered</p>	<p>Aquifer draw-down</p> <p>Excavation of springs</p> <p>Ponded pastures</p> <p>Managing woody vegetation around springs</p>	<ul style="list-style-type: none"> ▪ Potential project impacts to aquatic environmental values that may result from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Sediment to water – May temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses. Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible - Chemicals to water – May temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity - Disturbance of stream channel and associated habitat (eg pools, riffles etc) – Localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time - Loss of abundance and diversity of riparian vegetation and aquatic biota, including groundwater dependent ecosystems – Generally localised impact associated with clearing and traffic movement, which may be long-term due to time required to restore pre-disturbance species composition/abundance before dependent fauna return - Contamination of shallow groundwater - Has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination – Has the potential to occur as result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing in and around wetlands will be avoided, where possible ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Blasting should be avoided, where practicable, around areas with congregations of birds, such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened fauna habitat ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the <i>Santos GLNG Upstream Erosion and Sediment Control Plan</i> ▪ To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
	<p>Stock and feral animal disturbance, particularly by the feral pig</p>	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<ul style="list-style-type: none"> There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<p>identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls The feral pigs is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP The feral pig is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Eucalyptus beaniana</i> (Bean's ironbark)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Destruction of trees for timber</p>	<ul style="list-style-type: none"> The nature of project works does not involve selective timber harvesting The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
<p><i>Hakea fraseri</i> (Fraser's hakea)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Browsing by feral goats</p>	<ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities
<p>Road widening and maintenance activity</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure, including roads and access tracks, has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> Siting infrastructure, including roads and access tracks, will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values Access to and from Project locations is to occur along designated access tracks only Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants. Areas of exclusion will remain appropriately marked for the duration of the activity All vegetation clearing within identified threatened flora must comply with clearing related approval conditions (both statutory and internal approvals) Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative. 	

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		<p>allowing the species to survive more readily, and potentially at the expense of native species</p>	<ul style="list-style-type: none"> - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
	Inappropriate fire regimes	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<p><i>Homopholis belsonii</i> (Belson's panic)</p> <p>EPBC Act Status: Vulnerable</p>	Clearing of habitat for agriculture, development or pasture improvement	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals)
	Clearing of habitat for mining	<ul style="list-style-type: none"> ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Overgrazing of habitat by domestic stock	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
	Invasion of habitat by introduced weeds	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls

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<p><i>Homoranthus decumbens</i></p> <p>EPBC Act Status: Endangered</p>	<p>There are no known current threats to <i>Homopholis decumbens</i> identified in the species Conservation Advice</p>		
	<p>Potential threat - Inappropriate legal collection practices (seeds and cuttings for cultivation)</p>	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project ▪ Any plant samples collected during pre-clearance field surveys to confirm species identify will be collected by suitably qualified and experienced ecologists who hold the appropriate scientific purposes permit to endorse the activity 	<p>-</p>
	<p>Potential threat - Habitat disturbance by road maintenance</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
<p><i>Macrozamia platyrhachis</i> (Cycad)</p> <p>EPBC Act Status: Endangered</p>	<p>Destruction of habitat and individuals due to land clearing, predominately from road corridors and quarrying in the vicinity of Blackdown Tableland National Park and State Forest 28</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development
	<p>Loss of genetic variation and insect pollinators</p>	<ul style="list-style-type: none"> ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable
	<p>Land management practices</p>	<ul style="list-style-type: none"> ▪ Compaction of soil as a result of GFD Project activities may result in direct impacts to soil consistence (ie the strength and coherence of a soil) and soil structure (ie the arrangement of soil particles). The most direct effect of soil compaction is an increase in the bulk density of soil which can restrict root growth and function of conservation significant flora species 	<ul style="list-style-type: none"> ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened flora and associated habitat ▪ Hazardous substances with the potential to impact threatened flora or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i>

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	<p>Legal harvesting and commercial salvage</p> <p>Illegal destruction and harvesting</p>	<ul style="list-style-type: none"> Not relevant to the nature of the project Any plant samples collected during pre-clearance field surveys to confirm species identify will be collected by suitably qualified and experienced ecologists who hold the appropriate scientific purposes permit to endorse the activity 	-
<p><i>Phaius australis</i> (Swamp orchid)</p> <p>EPBC Act Status: Endangered</p>	<p>Illegal collection for horticulture or cut flowers</p>	<ul style="list-style-type: none"> Not relevant to the nature of the project Any plant samples collected during pre-clearance field surveys to confirm species identify will be collected by suitably qualified and experienced ecologists who hold the appropriate scientific purposes permit to endorse the activity 	-
	<p>Habitat loss through clearing and fragmentation and drainage for development, agriculture and road works</p> <p>Timber harvesting</p> <p>Mining</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) The nature of project works does not involve timber harvesting Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity Disturbance of stream channel and associated habitat (eg pools, riffles etc) due to localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time Contamination of shallow groundwater has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone Surface development exclusion areas apply to Ramsar sites High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources Clearing in and around wetlands will be avoided, where possible
	<p>Trampling and browsing by feral pigs and domestic livestock</p> <p>Invasion by weeds, in particular Lantana (<i>Lantana camara</i>), Umbrella tree (<i>Schefflera actinophylla</i>), Groundsel (<i>Baccharis halmifolia</i>) and Brazilian cherry (<i>Eugenia uniflora</i>)</p>	<ul style="list-style-type: none"> Domestic stock grazing activities are not relevant to the nature of the project Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will

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	Inappropriate fire regimes	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<p>typically be ongoing measures to reduce the risk of further spreading the pest or weed.</p> <ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Lantana (<i>Lantana camara</i>) and Groundsel bush (<i>Baccharis halmifolia</i>) are identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - The feral pigs is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - The feral pig is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Pterostylis cobarensis</i> (Cobar greenhood orchid)</p> <p>EPBC Act Status: Not listed</p>	Feral goats	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
	Broad-scale vegetation clearing	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals)
	Habitat fragmentation	<ul style="list-style-type: none"> ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Grazing pressure	<ul style="list-style-type: none"> Not relevant to the nature of the project 	<ul style="list-style-type: none"> clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Changed hydrology and salinity	<ul style="list-style-type: none"> Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity Disturbance of stream channel and associated habitat (eg pools, riffles etc) due to localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time Contamination of shallow groundwater has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) 	<ul style="list-style-type: none"> Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone Surface development exclusion areas apply to Ramsar sites High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources Clearing in and around wetlands will be avoided, where possible
<p><i>Swainsona murrayana</i> (Slender darling-pea)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Grazing from domestic stock and rabbits (<i>Oryctolagus cuniculus</i>)</p> <p>Habitat destruction by goats (<i>Capra hircus</i>) and Feral pigs (<i>Sus scrofa</i>)</p> <p>Weed invasion</p>	<ul style="list-style-type: none"> Domestic stock grazing activities are not relevant to the nature of the project Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral rabbits and feral pigs are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls Feral goats, feral pigs and rabbits are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP The rabbit and feral pig are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest and weed management procedures as required during the GFD

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			<p>Project lifetime</p> <ul style="list-style-type: none"> - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Cultivation	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
	Roadside maintenance activities	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) ▪ An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Salinisation of habitat		
	Urban development in grassland habitat		
	Inappropriate fire regimes, <i>S.murrayana</i> should not be burnt more frequently than once every ten years	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<i>Thesium australe</i> (Toad flax) EPBC Act Status: Vulnerable	Lack of fire/disturbance	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Existing and intensified grazing by livestock	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
	Native and feral herbivores	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species ▪ Impacts as a result of natural processes and influences, ie grazing pressure from native herbivores, are not subject to the GFD Project impact assessments 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats and rabbits are Class 2 declared pests under the LP Act
	Weed invasion		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Residential, infrastructure and agricultural development</p> <p>Infrastructure (road and rail) maintenance, particularly road widening and re-routing</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
<p><i>Tylophora linearis</i></p> <p>EPBC Act Status: Endangered</p>	<p>Forestry activities</p> <p>Disturbances such as grazing and fire</p> <p>Invasion of habitat by introduced weeds such as Lantana (<i>Lantana camara</i>)</p>	<ul style="list-style-type: none"> Not relevant to the nature of the project Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely The nature of the project works does not include grazing activities Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> - A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls Lantana (<i>Lantana camara</i>) is identified in Appendix 1 as a weed species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Westringia parvifolia</i></p> <p>EPBC Act Status:</p>	<p>Broad-scale vegetation clearing</p> <p>Increasing fragmentation and loss of remnants</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and 	<ul style="list-style-type: none"> All vegetation clearing works must comply with clearing related approval conditions (both statutory and internal approvals) An evaluation of the presence of threatened flora will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
Vulnerable		<p>the creation of edge effects</p> <ul style="list-style-type: none"> ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>and Field Development</p> <ul style="list-style-type: none"> ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ The extent of disturbance within the vicinity of threatened flora will be demarcated using flagging tape, barricade webbing or similar ▪ Any exclusion zones surrounding individual plants and or patches of multiple plants in areas immediately adjacent to the disturbance will also be appropriately marked out ▪ The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative
	Hydrological change	<ul style="list-style-type: none"> ▪ Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity ▪ Disturbance of stream channel and associated habitat (eg pools, riffles etc) due to localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time ▪ Contamination of shallow groundwater has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) 	<ul style="list-style-type: none"> ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ Where impacts to threatened flora cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ Clearing in and around wetlands will be avoided, where possible
	Pollution	<ul style="list-style-type: none"> ▪ Potential project impacts in relation to pollution which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses - Release of chemicals to water which may temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
<i>Xerothamnella herbacea</i>	Competition from invasive plant species (primary	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p>(Xerothamnella)</p> <p>EPBC Act Status: Endangered</p>	<p>species threat)</p>	<p>mechanisms</p> <ul style="list-style-type: none"> ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<p>Santos GLNG activities. Key measures within the PWMP include:</p> <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	<p>Road widening and maintenance activities</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure, including roads and access tracks, has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure, including roads and access tracks, will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Where threatened flora is present in areas adjacent to the disturbance, exclusion zones are to be established around identified individual plants and or patches of multiple plants. Areas of exclusion will remain appropriately marked for the duration of the activity ▪ All vegetation clearing within identified threatened flora must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing activities within and adjacent to threatened flora will be supervised by an Environmental Representative.
	<p>Surface erosion</p>	<ul style="list-style-type: none"> ▪ Clearing and construction activities have the potential to result in localised erosion and thereby sediment transport, particularly where activity occurs on slopes or in the vicinity of landform features such as gullies, outcrops and drainage lines ▪ Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible ▪ Many surface waterways in the region have naturally high turbidity after significant rain events and under normal flow conditions, due to the nature of the soils and the existing disturbed nature of landscapes. Therefore, significant impacts are not anticipated 	<ul style="list-style-type: none"> ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan ▪ To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan
	<p>Grazing and trampling by cattle and native macropods</p>	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Impacts as a result of natural processes and influences, ie grazing pressure from macropods, are not subject to the GFD Project impact assessments 	<p>-</p>

2.0 EPBC Act EVNT Fauna Species subject to the Santos GLNG GFD EIS

2.1 Conservation Advice Cross Reference Table

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
<p><i>Botaurus poiciloptilus</i> (Australasian bittern)</p> <p>EPBC Act Status: Endangered</p>	<p>“Commonwealth Listing Advice on <i>Botaurus poiciloptilus</i> (Australasian Bittern)” (TSSC 2011)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Australasian bittern (TSSC 2011) was conducted by the TSSC due to information provided by a public nomination for the species to be listed as Endangered ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ Key threats to the species include: <ul style="list-style-type: none"> - Reduction in the extent and quality of habitat due to the diversion of water away from wetlands, peat mining and the drainage of swamps - Clearing of wetlands for urban development or agriculture - Reduction of water quality - Overgrazing by livestock - Inappropriate fire regimes - Predation of eggs and juveniles by foxes and cats ▪ The Committee considers that the species is suspected to have undergone a severe reduction in population numbers as a result of the reduction in the species’ area of occupancy and the loss of habitat and breeding grounds ▪ The Committee recommends that the Australasian bittern is listed as endangered and that a recovery plan is prepared for this species 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Australasian bittern has been sourced from the DotE Species Profile and Threats Database (SPRAT). The DotE species SPRAT profile references the species conservation advice, listing advice and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Australasian bittern in the species Conservation Advice and Listing Advice (TSSC 2011 and TSSC 2011a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Australasian bittern were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Australasian bittern. Management measures with similar intent to the recovery and threat abatement actions identified for the Australasian bittern in the species Listing Advice (TSSC 2011) and Conservation Advice (TSSC 2011a) include: <ul style="list-style-type: none"> - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas 	<ul style="list-style-type: none"> ▪ Section 9.23 provides a species profile for the Australasian bittern. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and are subject to the PWMP
	<p>“Commonwealth Conservation Advice on <i>Botaurus poiciloptilus</i> (Australasian Bittern)” (TSSC) (2011a)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2011a) provides information on the species description, conservation status, distribution and habitat ▪ Threats identified in the Conservation Advice include: <ul style="list-style-type: none"> - Reduction in extent and quality of habitat due to division of water away from wetlands - Loss and alteration of wetland habitats due to clearing for urban and agricultural development - Peat mining - Predation by introduced pests such as foxes and feral cats - Reduced water quality - Overgrazing by livestock - Inappropriate fire regimes ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat Loss, Disturbance and Modification - Animal predation - Fire 			

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Trampling, browsing and grazing - Conservation information, raising awareness of the species within the local community 	<ul style="list-style-type: none"> - containing deep pools and river sandbanks likely to be suitable for breeding places - Blasting should be avoided, where practicable, around areas such as wetlands, watercourses and around sandstone ridges containing many microhabitat features such as caves and overhangs - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance ▪ The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Australasian bittern as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: - Protecting affected threatened species 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the Threat Abatement Plans include: - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> - Preventing further species and ecological communities from becoming threatened ▪ The ‘Threat Abatement Plan for predation by feral cats’ has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 	<p>pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers.</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<p>species</p> <ul style="list-style-type: none"> ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<p>threat to, Santos GLNG assets and/or activities</p> <ul style="list-style-type: none"> - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Anomalopus mackayi</i> (Five-clawed worm-skink) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Anomalopus mackayi</i> (Five-clawed worm-skink)” (TSSC 2008aaa)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008aaa) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Biology and ecology - Conservation status - Distribution - Habitat requirements ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Clearing and fragmentation of habitat for agriculture and development - Habitat degradation from overgrazing - Removal of refuge sites and ground litter - Predation by foxes and feral cats - Soil and water pollution 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Five-clawed worm-skink has been sourced from the DotE Species Profile and Threats Database (SPRAT). The DotE species SPRAT profile references the species conservation advice plan and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Five-clawed worm-skink in the species Conservation Advice 	<ul style="list-style-type: none"> ▪ Section 9.33 provides a species profile for the Five-clawed worm-skink. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE Species Profile and Threats Database (SPRAT). The DotE species SPRAT profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> ▪ The Conservation Advice identifies research priorities to inform future regional and local priority actions ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Animal predation or competition - Conservation information, raising species awareness within the local community - Enable recovery of additional sites and/or populations - Animal predation or competition 	<p>(TSSC 2008aaa) include:</p> <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Five-clawed worm-skink were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Five-clawed worm-skink. Management measures with similar intent to the recovery and threat abatement actions identified for the Five-clawed worm-skink in the species Conservation Advice (TSSC 2008aaa) include: <ul style="list-style-type: none"> - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders 	<p>potential impacts to significant species as a result of the project</p> <ul style="list-style-type: none"> ▪ Section 6.2.4 provides management measures for significant reptile species 	<p>pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and are subject to the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Five-clawed worm-skink as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.4 provides management measures for significant threatened reptile species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the
	<p>"Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox 	<ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the 		<ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species management	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		management	resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species		responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Chalinolobus dwyeri</i> (Large-eared pied bat)</p> <p>EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Listing Advice on ten species of Bats” (TSSC 2001)</p> <p>“Commonwealth Listing Advice on <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)” (TSSC 2010a)</p> <p>“National recovery plan for the large-eared pied bat <i>Chalinolobus dwyeri</i>” (DERM 2011)</p>	<ul style="list-style-type: none"> ▪ Based on evidence presented in the Action Plan for Australian Bats, the Committee determined that the Large-eared Pied Bat is eligible for listing as Vulnerable under the EPBC Act ▪ The species meets two conservation listing criteria: <ul style="list-style-type: none"> - Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a substantial reduction in numbers - Criterion 3: The estimated total number of mature individuals is limited and evidence suggests that the number will continue to decline at a substantial rate ▪ A conservation assessment for the Large-eared pied bat (TSSC 2010a) was conducted by the TSSC due to the provision of new information ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ The only confirmed threats to the species identified in the listing advice is the disturbance and damage at primary nursery roosts, particular by goats ▪ Potential threats to the species include: <ul style="list-style-type: none"> - Long wall coal mining - Loss of foraging habitat - Predation by foxes and other predators ▪ The TSSC found that although there was insufficient information to assess the species against the conservation listing criteria, the TSC recommended a precautionary approach and that no amendment be made to the species conservation listing. The species is eligible for vulnerable listing due to its very restricted distribution and the very low number of nursery roosts ▪ The Recovery Plan (DERM 2011) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Conservation status - Species description 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Large-eared pied bat has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Large-eared pied bat in the species Conservation Advice and Listing Advice (TSSC 2011 and TSSC 2011a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Large-eared pied bat were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Large-eared pied bat. Management measures with similar intent to the recovery and threat abatement actions identified for the Large-eared pied bat in the species Listing Advice (TSSC 2011) and Conservation Advice 	<ul style="list-style-type: none"> ▪ Section 9.38 provides a species profile for the Large-eared pied bat. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species ▪ The European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and are subject to the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Life history and ecology - Distribution - Habitat critical to species survival - Important populations ▪ Known threat to the species is the destruction of, or interference with, subterranean roosts and maternity sites ▪ Recovery plan notes that an increased knowledge on the species roosting and foraging requirements is required to provide a basis for management ▪ Potential threats to the species include: <ul style="list-style-type: none"> - Destruction of and interference with maternity and other roosts - Mining of roosts - Mine induced subsidence of cliff lines - Disturbance from human recreational activities - Habitat disturbance by other animals, including livestock and feral animals - Predation by introduced predators - Vegetation clearance in the proximity of roosts - Fire in the proximity of roosts - Loss of genetic diversity ▪ The overall objective of the recovery plan is to ensure the persistence of viable populations of the large-eared pied bat throughout its geographic range. The Recovery Plan identifies the following key objectives: <ul style="list-style-type: none"> - Identify priority roost and maternity sites for protection - Implement conservation and management strategies for priority sites - Educate the community and industry to understand and participate in the conservation of the large-eared pied bat - Research the large-eared pied bat to augment biological and ecological data to enable conservation management - Determine the meta-population dynamics throughout the distribution of the large-eared pied bat ▪ Management practices identified to protect species populations include: <ul style="list-style-type: none"> - Regulation of underground or open cut mining in the vicinity of known or potential roosts; - Management of recreational activities such as bushwalking, caving and abseiling in the vicinity of known or potential roosts; - Management practices aimed at reducing the impacts of grazing by sheep, cattle or goats in the vicinity of known or potential roosts; - Regulation of vegetation clearing or logging within the vicinity of known or potential roosts; - Feral animal control - Fire management regimes designed to maintain a variety of habitat types within mosaics. ▪ Development proposals and management programs should be assessed with due regard 	<p>(TSSC 2011a) include:</p> <ul style="list-style-type: none"> - Blasting should be avoided, where practicable, around areas such as sandstone ridges containing many microhabitat features such as caves and overhangs - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The species resilience assessments consider potential project impact to the predation vulnerability of the target species - The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
<p><i>Dasyurus hallucatus</i> (Northern quoll) EPBC Act Status: Endangered</p>	<p>“Commonwealth Listing Advice on Northern Quoll (<i>Dasyurus hallucatus</i>)” (TSSC 2005)</p> <p>“National Recovery Plan For the Northern Quoll <i>Dasyurus hallucatus</i>” (Hill and Ward 2010)</p>	<p>for the potential impact of the above activities on local large-eared pied bat populations</p> <ul style="list-style-type: none"> ▪ A conservation assessment for the Northern quoll was conducted by the TSSC (TSSC 2005). Listing advice states that the species satisfies conservation listing criterion 1; that is the species has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers, and conservation listing criterion 2; that is the species has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers’ ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology ▪ Threats to the Northern quoll identified in the listing advice (TSSC 2005) include: <ul style="list-style-type: none"> - Inappropriate fire regimes - Predation following fire - Lethal toxic ingestion of Cane toad toxin ▪ Poisoning as a result of the ingestion of Cane toad toxin is considered to have had a catastrophic impact on a number of Northern quoll populations ▪ The priority recovery and threat abatement actions required for this species are to: <ul style="list-style-type: none"> - Minimise the impact of colonising Cane toads on the species by: <ul style="list-style-type: none"> - Identifying areas of critical habitat (e.g. island populations) - Investigate the need to establish a captive breeding program for the species - Investigate the status of the species in Queensland, including the reasons for its survival following Cane toad invasion 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Northern quoll has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Northern quoll in the species Conservation Advice and Listing Advice (TSSC 2011 and TSSC 2011a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Northern quoll were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Northern quoll ▪ Management measures with similar intent to the recovery and threat abatement actions identified for the Northern quoll in the species Listing Advice (TSSC 2011) and Conservation Advice (TSSC 2011a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species 	<ul style="list-style-type: none"> ▪ Section 9.40 provides a species profile for the Northern quoll. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>minimise the rate of decline of the Northern quoll in Australia, and ensure that viable populations remain in each of the major regions of distribution into the future. Specific objectives identified in the recovery plan include:</p> <ul style="list-style-type: none"> - Protect Northern quoll populations on offshore islands from invasion and establishment of cane toads, cats and other potential invasive species - Foster the recovery of northern quoll sub-populations in areas where the species has survived alongside cane toads - Halt northern quoll declines in areas not yet colonised by cane toads - Halt declines in areas recently colonised by cane toads - Maintain secure populations and source animals for future reintroductions/introductions, if they become appropriate - Reduce the risk of Northern quoll populations being impacted by disease - Reduce the impact of feral predators on Northern quolls - Raise public awareness of the plight of northern quolls and the need for biosecurity of islands and WA ▪ Management practices identified to protect species populations include: <ul style="list-style-type: none"> - Cane toad control. The National Cane Toad Taskforce are developing a national strategy for cane toad control in Australia - Fire management on provide land and in conservation protected areas to ensure appropriate fire regimes - Feral cat control 	<p>potentially present in the area</p> <ul style="list-style-type: none"> - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The species resilience assessments consider potential project impact to the predation vulnerability of the target species - The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
	<p>“Threat Abatement Plan to reduce the impacts on northern Australia’s biodiversity by the five listed grasses” (DSEWPAC 2012)</p>	<ul style="list-style-type: none"> ▪ The ‘Threat Abatement Plan to reduce the impacts on northern Australia’s biodiversity by the five listed grasses’ (DSEWPAC 2012) has been developed to address the key threatening process; ‘Ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced Gamba grass (<i>Andropogon gayanus</i>), Para grass (<i>Urochloa mutica</i>), Olive hymenachne (<i>Hymenachne amplexicaulis</i>), Mission grass (<i>Pennisetum polystachion</i>) and Annual mission grass (<i>Pennisetum pedicellatum</i>)’ ▪ The five listed grasses are highly invasive, high-biomass species which can increase fuel loads and/or alter nitrogen cycling and water availability within systems; resulting in ecosystem degradation, habitat loss and biodiversity decline ▪ The overarching goal of threat abatement plan is to minimise the adverse impacts of the five listed grasses on affected native species and ecological communities. The six main objectives of the threat abatement plan include: <ul style="list-style-type: none"> - Develop an understanding of the extent and 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.5 provides management measures for significant mammal species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for predation by feral cats’ include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for the biological effects, including lethal toxic ingestion, caused by cane toads” (DSEWPAC 2011)</p>	<ul style="list-style-type: none"> - spread pathways of infestation by the five listed grasses - Support and facilitate coordinated management strategies through the design of tools, systems and guidelines - Identify and prioritise key assets and areas for strategic management - Build capacity and raise awareness among stakeholders - Implement coordinated, cost-effective on-ground management strategies in high-priority areas - Monitor, evaluate and report on the effectiveness of management programs ▪ The Northern quoll is listed in the Table A of the recovery plan as a threatened species listed under the EPBC Act which is under immediate threat from the five listed grasses <ul style="list-style-type: none"> ▪ The Threat Abatement Plan (DSEWPAC 2011) has three objectives: <ul style="list-style-type: none"> - To identify priority native species and ecological communities at risk from the impact of Cane toads - To reduce the impact of Cane toads on populations of priority native species and ecological communities - To communicate information about Cane toads and their impacts ▪ Priority native species and ecological communities are those that have been determined through peer-reviewed research to be highly vulnerable at population level to negative impacts from the presence of Cane toads ▪ The Northern quoll is identified in the plan as a species for which negative population level impacts on a national scale are caused by Cane toads ▪ The Cane toad has a high degree of negative impact on the Northern quoll. The identified pathway of impact is lethal toxic ingestion ▪ The EPBC listed community ‘Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions’ is within the range of the Cane toad. The presence of Cane toads within this listed community is considered responsible for a recent abrupt decline in observations of the Northern quoll ▪ Management actions identified in the document include the following: <ul style="list-style-type: none"> - Identify priority native species, ecological communities and off-shore islands currently known to be at high to moderate risk due to the Cane toad - Identify the ways in which Cane toads impact priority native species and ecological communities - Where impact is unknown but may be high, establish and support research to further understand the impact of Cane toads on native species and ecological communities. Where appropriate, research ways to assist with the 	<p>numbers.</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<ul style="list-style-type: none"> - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ Olive hymenachne (<i>Hymenachne amplexicaulis</i>) is identified in Section 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ The Cane toad is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for predation by feral cats” (DOTE 2015)</p> <p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> recovery of priority native species and ecological communities ▪ Develop a prioritisation tool to guide allocation of resources for protection of native species and communities ▪ The ‘Threat Abatement Plan for predation by feral cats’ (DotE 2015) identifies the overall threat rating of feral cat predation to the Northern quoll as ‘high’ ▪ The goal of the ‘Threat Abatement Plan for predation by feral cats’ is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The ‘Threat Abatement Plan for predation by feral cats’ has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 			
<p><i>Delma torquata</i> (Collared delma)</p> <p>EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Listing Advice on Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)” (TSSC 2001a)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Brigalow (<i>Acacia harpophylla</i>) community was conducted by the TSSC (TSSC 2001a) following seven nominations for the communities listing ▪ Listing advice provides information on the vegetation communities which satisfy the description of the threatened ecological community ‘Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)’ ▪ Listing advice states that the community satisfies conservation listing criterion 1; decline in geographic distribution ▪ The community has undergone a severe decline in extent following clearance for agricultural use. Nationally, the community has declines to approximately 10% of its former 	<ul style="list-style-type: none"> ▪ Section 5.2 provides a description of potential project impacts to MNES, including threatened communities. Impacts assessed which are relevant to the threats identified to the Brigalow threatened community in the listing advice (TSSC 2001a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Invasion of weed and pest species (Section 5.2.4) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES, including threatened 	<ul style="list-style-type: none"> ▪ Section 9.68 presents a community profile for Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant). The profile provides information on the status, ecology, distribution, anticipated threats and project impacts and recommended management practices and methods for the threatened community. The information used to develop the community profile was predominately sourced from the DotE SPRAT. The DotE SPRAT profile references the community listing advice and source documents ▪ The community profile was used to define a series of assumptions which informed the community occurrence mapping conducted for the project area. The community mapping was used in constrains planning and impact 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>area</p> <ul style="list-style-type: none"> ▪ The communities primary threat is clearing for cropping and pasture ▪ The TSSC considered the community to be eligible for listing as Endangered 	<p>communities. The aforementioned impacts relevant to the threats identified to the Brigalow community were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES, including threatened communities. Management measures with similar intent to the recovery and threat abatement actions identified for the community in its listing advice (TSSC 2001a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES, including threatened communities - Where a significant residual adverse impact is to occur to a MNES threatened community, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they work - The extent of disturbance within the vicinity of threatened community's will be demarcated using flagging tape, barricade webbing or similar - Where threatened communities are present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened communities in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities - Hazardous substances with the potential to impact threatened communities will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan - Where appropriate and with the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened community where required by the Santos GLNG Upstream, Rehabilitation Management Plan 	<p>assessments</p> <ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impacts to threatened communities as a result of the project ▪ Section 6.2.8 provides management measures for threatened communities 	<p>measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species
	"Commonwealth Conservation	▪ The Conservation Advice (TSSC 2008n)	▪ Appendix G of the Terrestrial Ecology Report	▪ Section 9.33 provides a species profile for the	

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>Advice on <i>Delma torquata</i> (Collared Delma)" (TSSC 2008n)</p>	<p>provides species information relevant to its management including data pertaining to the species:</p> <ul style="list-style-type: none"> - Biology and ecology - Conservation status - Distribution - Habitat requirements ▪ Species specific threats identified include: - Loss and modification of habitat from urban and agricultural development - Removal of surface rocks during the development process or landscaping activities - Fire - Invasive weeds, particularly <i>Lantana montividentis</i> ▪ The Conservation Advice identifies research priorities to inform future regional and local priority actions ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: - Habitat loss, disturbance and modification - Fire management - Conservation information, raising species awareness within the local community, among landowners, developers and landscape suppliers - Establishing additional species populations; investigating options for linking, enhancing or establishing additional populations 	<p>and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Collared delma has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents</p> <ul style="list-style-type: none"> ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Collared delma in the species Conservation Advice (TSSC 2008n) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Collared delma were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Collared delma. Management measures with similar intent to the recovery and threat abatement actions identified for the Collared delma in the species Conservation Advice (TSSC 2008n) include: <ul style="list-style-type: none"> - Where practicable, microhabitat such as logs and rocks, will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in 	<p>Collared delma. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents</p> <ul style="list-style-type: none"> ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.4 provides management measures for significant reptile species 	

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>areas adjacent to disturbances will be regularly checked to ensure no disturbances</p> <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
<p><i>Denisonia maculata</i> (Ornamental snake) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice for <i>Denisonia maculata</i> (Ornamental Snake)” (TSSC 2014c)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014c) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Biology and ecology - Conservation status - Distribution - Habitat requirements ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Legacy of broadscale land clearing and habitat degradation - Destruction of wetland habitat by Feral pigs and the associated destruction of frog habitat - Direct competition for food source (frogs) ▪ Potential threats to the Ornamental snake include: <ul style="list-style-type: none"> - Poisoning resulting from the ingestion of Cane toads ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Impacts associated with feral animals including Pigs and Cane toads - Conservation information, raising species awareness within the local community, among landowners, developers and landscape suppliers 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Ornamental snake has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Ornamental snake in the species Conservation Advice (TSSC 2014c) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The 	<ul style="list-style-type: none"> ▪ Section 9.35 provides a species profile for the Ornamental snake. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.4 provides management measures for significant reptile species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species ▪ Feral pigs, exotic pest species identified in the Ornamental snake Conservation Advice (TSSC 2014c) as a threat to Ornamental snake habitat, are identified in Appendix 2 as

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>aforementioned impacts relevant to the threats identified to the Ornamental snake were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Ornamental snake. Management measures with similar intent to the recovery and threat abatement actions identified for the Ornamental snake in the species Conservation Advice (TSSC 2014c) include: <ul style="list-style-type: none"> - Clearing in and around wetlands will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Blasting should be avoided, where practicable, around areas such as wetlands and watercourses - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the 		<p>pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP</p>

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>resilience of the species and its habitat to disturbance.</p> <ul style="list-style-type: none"> - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.4 provides management measures for significant threatened reptile species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for Predation by the European Red Fox’ include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The European red fox is a class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The European red fox is identified in Section 4.2.2, Table 6 of the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
<p><i>Egernia rugosa</i> (Yakka skink) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice for <i>Egernia rugosa</i> (Yakka Skink)” (TSSC 2014d)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014d) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Biology and ecology - Conservation status - Distribution - Habitat requirements ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Continued legacy of past broadscale land clearing and habitat degradation - Inappropriate roadside management - Removal of wood debris and rock microhabitat features - Ripping of rabbit warrens - Predation by feral animals, in particular by feral cats and foxes ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Animal predation or competition - Fire management - Conservation information, raising species awareness within the local community, among landowners, developers and landscape suppliers 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Yakka skink has been sourced from the DotE SPRAT. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Five-clawed worm-skink in the species Conservation Advice (TSSC 2014d) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Yakka skink were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Yakka skink. Management measures with similar intent to the recovery and threat abatement actions identified for the Yakka skink in the species Conservation Advice (TSSC 2014d) include: <ul style="list-style-type: none"> - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species 	<ul style="list-style-type: none"> ▪ Section 9.37 provides a species profile for the Yakka skink. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.4 provides management measures for significant reptile species 	<p>as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP</p> <ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species ▪ The European red fox, feral cat and rabbit is identified in Section 4.2.2, Table 6 of the PWMP as high priority pest species present within the Santos GLNG Upstream Project area and are subject to the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>potentially present in the area</p> <ul style="list-style-type: none"> - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
<p><i>Erythrotriorchis radiatus</i> (Red goshawk) EPBC Act Status: Vulnerable</p>	<p>"National recovery plan for the red goshawk <i>Erythrotriorchis radiates</i>" (DERM 2012)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (DERM 2012) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Taxonomy and description - Breeding and diet - Distribution - Habitat critical to the species survival - Important populations ▪ Threats to the Red goshawk identified in the recovery plan include: <ul style="list-style-type: none"> - Habitat loss and fragmentation - Threats to nest sites ie by egg collectors, clearing of mature trees, fires - Threats to the prey base and prey availability ie via the degradation of rivers and wetlands utilised by potential prey species, burning, heavy grazing - Information and communication gaps ▪ The overall objective of the recovery plan is to maintain populations of the Red goshawk across their range and implement measures to promote recovery of the species. Specific objectives identified in the recovery plan include: <ul style="list-style-type: none"> - Identify and map important Red goshawk 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Red goshawk has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Red goshawk in the species recovery plan (DERM 2012) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance 	<ul style="list-style-type: none"> ▪ Section 9.24 provides a species profile for the Red goshawk. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>habitat</p> <ul style="list-style-type: none"> - Protect and appropriately manage important habitat areas to ensure long-term survival of the Red goshawk - Increase knowledge about the Red goshawks productive success and its survival - Identify important populations of Red goshawks - Increase community awareness about Red goshawks and the conservation of the species ▪ Management practices identified as necessary to protect the Red goshawk are primarily those related to surveys, monitoring and habitat protection. They also include vegetation management (forestry and land clearing), fire management, and implementing appropriate grazing regimes. 	<p>assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Red goshawk were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Red goshawk. Management measures with similar intent to the recovery and threat abatement actions identified for the Red goshawk in the species recovery plan (DERM 2012) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The AIAM considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		<p>pest species</p>

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
<p><i>Furina dunmalli</i> (Dunmall's snake)</p> <p>EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Conservation Advice for <i>Furina dunmallii</i> (Dunmall's Snake)" (TSSC 2014e)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2014e) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Conservation status - Distribution - Habitat requirements ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Past legacy of broadscale land clearing and habitat modification - Overgrazing of habitat - Modification of habitat due to agriculture and urban development ▪ Potential threats to the species include the drainage of swamps which provide habitat value to the species food source (ie frogs) and predation by feral animals ▪ Regional and local priority recovery and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Conservation information, raising species awareness within the local community, among landowners, developers and landscape suppliers - Trampling, browsing or grazing - Animal predation or competition 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Dunmall's snake has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Dunmall's snake in the species Conservation Advice (TSSC 2014e) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Dunmall's snake were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Dunmall's snake. Management measures with similar intent to the recovery and threat abatement actions identified for the Dunmall's snake in the species Conservation Advice (TSSC 2014e) include: <ul style="list-style-type: none"> - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately 	<ul style="list-style-type: none"> ▪ Section 9.34 provides a species profile for the Dunmall's snake. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.4 provides management measures for significant reptile species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area</p> <ul style="list-style-type: none"> - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
<p><i>Geophaps scripta scripta</i> (Squatter pigeon [southern]) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Conservation Advice on <i>Geophaps scripta scripta</i> (Squatter pigeon [southern])" (TSSC 2008o)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008o) provides information on the species description, conservation status, distribution and habitat ▪ Threats to the Squatter pigeon identified in the Conservation Advice include: <ul style="list-style-type: none"> - Clearance of habitat - Grazing of habitat by livestock and feral herbivores - Predation, in particular by Feral cats and foxes ▪ Regional priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Animal predation or competition - Conservation information, raising species awareness 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Squatter pigeon has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Dunmall's snake in the species Conservation Advice (TSSC 2014e) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) 	<ul style="list-style-type: none"> ▪ Section 9.25 provides a species profile for the Squatter pigeon. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<ul style="list-style-type: none"> - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Squatter pigeon were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Squatter pigeon. Management measures with similar intent to the recovery and threat abatement actions identified for the Squatter pigeon in the species Conservation Advice (TSSC 2014e) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 		<p>landholders and local communities, in the identification and management of pest species</p>
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Squatter pigeon as a threatened species that may be 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>adversely affected by feral cats</p> <ul style="list-style-type: none"> ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<p>EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers.</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species 	<p>of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species</p> <ul style="list-style-type: none"> ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<p>activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include:</p> <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed.
	<p>"Threat Abatement Plan for Reduction in Impacts of Tramp Ants on Biodiversity in Australia and its Territories" (Commonwealth of Australia 2006)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan (Commonwealth of Australia 2006) has been developed to minimise the impact of invasive tramp ants on biodiversity in Australia ▪ The plan identifies six national priority tramp ant species. These include: <ul style="list-style-type: none"> - Red imported fire ant (<i>Solenopsis invicta</i>) - Tropical fire ant (<i>S. geminata</i>) - Little fire ant (<i>Wasmannia auropunctata</i>), - African big-headed ant (<i>Pheidole megacephala</i>) - Yellow crazy ant (<i>Anoplolepis gracilipes</i>), - Argentine ant (<i>Linepithema humile</i>) ▪ Impacts of tramp ants include predation on and competition with native species, modification of habitat structure and altering ecosystem processes ▪ The Squatter pigeon is identified in the plan as a listed threatened species that may be adversely affected and could become listed at a higher threatened category due to the Red imported fire ant 	<ul style="list-style-type: none"> ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat, rabbit and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	<p>"Threat Abatement Plan for competition and land degradation by rabbits" (DEWHA 2008a)</p>	<ul style="list-style-type: none"> ▪ The goal of the Threat Abatement Plan for competition and land degradation by rabbits is to minimise the impact of rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities, and - Preventing further species and ecological communities from becoming threatened. ▪ The Threat Abatement Plan for competition and land degradation by rabbits has five main objectives including: <ul style="list-style-type: none"> - Prevent rabbits from occupying new areas in Australia and eradicate rabbits from high-conservation-value 'islands' - Promote the maintenance and recovery of 			<ul style="list-style-type: none"> ▪ The feral cat, rabbit and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<p>native species and ecological communities that are affected by rabbit competition and land degradation</p> <ul style="list-style-type: none"> - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for rabbits, and - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage rabbits. <ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 			
<p><i>Lathamus discolor</i> (Swift parrot) EPBC Act Status: Endangered</p>	<p>“Commonwealth Listing Advice on <i>Lathamus discolor</i> (Swift Parrot)” (TSSC 2012)</p> <p>“National Recovery Plan for the Swift Parrot (<i>Lathamus discolor</i>)” (Saunders and Tzaros 2011)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Swift parrot (TSSC 2012) was conducted by the TSSC due to information provided by a public nomination for the species to be listed as Critically Endangered ▪ Listing advice provides information on the species description, distribution, relevant biology and ecology, and threats ▪ Key threats to the species include: <ul style="list-style-type: none"> - Habitat removal, degradation and fragmentation - Collisions - <i>Psittacine circoviral</i> disease (beak and feather disease) - Competition - Poaching (illegal collection and trade) - Climate change ▪ The Committee considers that no amendment is required to the species conservation status, and that the species remains eligible for listing as Endangered <ul style="list-style-type: none"> ▪ The Recovery Plan (Saunders and Tzaros 2011) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Distribution - Habitat requirements - Population characteristics ▪ Threats to the Swift parrot identified in the recovery plan include: 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Swift parrot has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Swift parrot in the species Conservation Advice (TSSC 2012) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Swift parrot were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management 	<ul style="list-style-type: none"> ▪ Section 9.26 provides a species profile for the Swift parrot. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Habitat loss and alteration - Climate change - Collision mortality - Competition - Psittacine Beak and Feather Disease - Illegal wildlife capture and trading - Listed threatening processes - Cumulative impacts ▪ The overall objective of the recovery plan is to prevent further population decline and to achieve a demonstrable sustained improvement in the quality and quantity of Swift parrot habitat to increase carrying capacity. Specific objectives identified in the recovery plan include: <ul style="list-style-type: none"> - To identify and prioritise habits and sites used by the species across its range, on all land tenures - To implement management strategies to protect and improve habitats and sites on all land tenures - To monitor and manage the incidence of collisions, competition and Beak and Feather Disease - To monitoring population trends and distribution through the range ▪ The key management practice identified to protect populations of the Swift parrot is the provision of logging prescriptions within areas of species foraging habitat 	<p>measures are considered in the assessment of residual impacts on MNES species, including the Swift parrot. Management measures with similar intent to the recovery and threat abatement actions identified for the Swift parrot in the species Conservation Advice (TSSC 2012) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Swift parrot as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>landscapes</p> <ul style="list-style-type: none"> - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<p>Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers.</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<p>neighbouring properties</p> <ul style="list-style-type: none"> - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act, The feral cat is a class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Maccullochella peelii peelii</i> (Murray cod) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Listing Advice on <i>Maccullochella peelii peelii</i> (Murray Cod, Cod, Goodoo)" (TSSC 2003)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Murray cod (TSSC 2003) was conducted by the TSSC ▪ Listing advice provides information on the species description, distribution, conservation status and habitat requirements ▪ Key threats to the species include: <ul style="list-style-type: none"> - Habitat loss due to de-snagging - Habitat degradation due to physical fragmentation - Habitat degradation due to cold water discharges from dams - Impact of fishing on the number of mature individuals - Impact of regulated flows on recruitment - The contribution of hatchery bred Murray cod ▪ The TSSC found that the Murray cod satisfies conservation assessment criterion 1; decline in number, criterion 2; geographic distribution, and criterion 3; population size and decline in numbers or distribution ▪ The TSSC considered the Murray cod to be eligible for listing as vulnerable 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Murray cod has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Murray cod in the species listing advice (TSSC 2003) and recovery plan (National Murray Code Recovery Team 2010) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity 	<ul style="list-style-type: none"> ▪ Section 9.45 provides a species profile for the Murray cod. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.6 provides management measures for aquatic fauna 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“National Recovery Plan for the Murray Cod <i>Maccullochella peelii peelii</i>” (National Murray Cod Recovery Team 2010)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (National Murray Cod Recovery Team 2010) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Distribution - Habitat requirements - Key ecological characteristics - Important populations ▪ Threats to the Murray cod identified in the recovery plan include: <ul style="list-style-type: none"> - Flow regulation - Habitat degradation - Lowered water quality - Barriers - Invasive fish species - Commercial, recreational and illegal fishing - Stocking and translocations - Genetic issues and diseases - Climate change ▪ The overall objective of the recovery plan is to have self-sustaining Murray cod populations managed for conservation. Specific objectives identified in the recovery plan include: <ul style="list-style-type: none"> - Determine the distribution, structure and dynamics of Murray code populations across the Murray Darling Basin - Manage river flows to enhance recruitment to Murray cod populations - Evaluate the risks of threats and benefits of recovery options on the Murray cod populations for each management unit - Determine habitat requirements of Murray cod life stages and populations - Manage the recreational fishery for Murray cod in a sustainable manner while recognising the social, economic and recreational value of the fishery - Encourage community ownership for Murray cod conservation - Manage recovery plan implementation ▪ The recovery plan identifies priority actions for the following themes: <ul style="list-style-type: none"> - Population structure and management - Recruitment - Habitat use, protection and repair - Sustainable take - Community ownership 	<ul style="list-style-type: none"> corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Murray cod were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Murray cod. Management measures with similar intent to the recovery and threat abatement actions identified for the Murray cod in the species listing advice (TSSC 2003) and recovery plan (National Murray Cod Recovery Team 2010) include: <ul style="list-style-type: none"> - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Blasting should be avoided, where practicable, around areas such as wetlands and watercourses - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level 		<ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>assessment of impact, by assessing the resilience of the species and its habitat to disturbance.</p> <ul style="list-style-type: none"> - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The habitat resilience assessments which form part of the AIAM provides for an assessment of the anticipated time required for an area of species habitat to naturally regenerate to a point where the appropriate microhabitat features to support the target species are re-established 		
<p><i>Neochmia ruficauda ruficauda</i> (Star finch) EPBC Act Status: Endangered</p>	<p>“Commonwealth Conservation Advice on <i>Neochmia ruficauda ruficauda</i> (Star Finch (eastern))” (TSSC 2008p)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008p) provides information on the species description, conservation status, distribution and habitat ▪ Threats to the Star finch identified in the Conservation Advice include: <ul style="list-style-type: none"> - Habitat degradation caused by over-grazing and trampling of habitat by livestock - Predation by introduced species including feral cats and foxes - Invasive weeds - Poisoning by contaminants such as cyanide ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weeds - Trampling, browsing or grazing - Animal predation or competition - Conservation information, raising species awareness 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Star finch has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Star finch in the species Conservation Advice (TSSC 2008p) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Star finch were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Star finch. Management measures with similar intent to the recovery and threat abatement actions identified for the Star finch in the species Conservation Advice (TSSC 2008p) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate 	<ul style="list-style-type: none"> ▪ Section 9.27 provides a species profile for the Star finch. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>offset must be considered in accordance with the Santos GLNG Offsets Strategy</p> <ul style="list-style-type: none"> - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Star finch as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage
	<p>"Threat Abatement Plan for Reduction in Impacts of Tramp</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan (Commonwealth of Australia 2006) has been developed to 			

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>Ants on Biodiversity in Australia and its Territories" (Commonwealth of Australia 2006)</p>	<ul style="list-style-type: none"> minimise the impact of invasive tramp ants on biodiversity in Australia ▪ The plan identifies six national priority tramp ant species. These include: <ul style="list-style-type: none"> - Red imported fire ant (<i>Solenopsis invicta</i>) - Tropical fire ant (<i>S. geminata</i>) - Little fire ant (<i>Wasmannia auropunctata</i>), - African big-headed ant (<i>Pheidole megacephala</i>) - Yellow crazy ant (<i>Anoplolepis gracilipes</i>), - Argentine ant (<i>Linepithema humile</i>) ▪ Impacts of tramp ants include predation on and competition with native species, modification of habitat structure and altering ecosystem processes ▪ The Star finch is identified in the plan as a listed threatened species that may be adversely affected and could become listed at a higher threatened category due to the Red imported fire ant 	<ul style="list-style-type: none"> displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<p>and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed.</p> <ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat is a class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Nyctophilus corbeni</i> (South-eastern long-eared bat) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Listing Advice on ten species of Bats" (TSSC 2001)</p> <p>"Approved Conservation Advice for <i>Nyctophilus corbeni</i> (South-eastern long-eared bat)" (TSSC 2015)</p>	<ul style="list-style-type: none"> ▪ The Commonwealth listing advice was prepared prior to the species taxonomic revision. For the purposes of the listing advice, <i>Nyctophilus corbeni</i> is referred to as <i>N.timoriensis</i> ▪ Based on evidence presented in the Action Plan for Australian Bats, the Committee determined that the Eastern Long-eared Bat is eligible for listing as Vulnerable under the EPBC Act. ▪ The species meets Criterion 1, that is the species has undergone, is suspected to have undergone or is likely to undergo in the immediate future a substantial reduction in numbers ▪ The Conservation Advice (TSSC 2015) provides information on the species description, conservation status, distribution, biology, ecology and habitat ▪ Due to a lack of available data pertaining to the population decline of the species, assessment of current threats is difficult ▪ Known threats to the South-eastern long-eared bat include: <ul style="list-style-type: none"> - Habitat loss and fragmentation - Fire - Reduction in hollow availability - Exposure to agricultural chemicals - Grazing - Predation by feral animals ▪ The following conservation and management actions have been identified for the species: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive species - Impacts of domestic species 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the South-eastern long-eared bat has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the South-eastern long-eared bat in the species Conservation Advice and Listing Advice (TSSC 2001 and TSSC 2015) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Large-eared pied bat were assessed 	<ul style="list-style-type: none"> ▪ Section 9.39 provides a species profile for the South-eastern long-eared bat. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Fire management - Stakeholder engagement ▪ A key research priorities identified for the species is to identify important populations of the South-eastern long-eared bat based on densities of occurrence and genetic qualities 	<ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the South-eastern long-eared bat. Management measures with similar intent to the recovery and threat abatement actions identified for the South-eastern long-eared bat in the species Listing Advice (TSSC 2001) and Conservation Advice (TSSC 2015) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
<p><i>Onychogalea fraenata</i> (Bridled nailtail wallaby) EPBC Act Status: Endangered</p>	<p>"National Recovery plan for the Bridled nailtail wallaby (<i>Onychogalea fraenata</i>)" (Lundie-Jenkins and Lowry 2005)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (Lundie-Jenkins and Lowry 2005) provides species information relevant to its management including data pertaining to the species: - Biology and ecology 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Bridled nailtail wallaby has been sourced from the 	<ul style="list-style-type: none"> ▪ Section 9.41 provides a species profile for the Bridled nail-tail wallaby. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Habitat requirements - Important populations. The recovery plan notes that there are no known important populations for the Brush-tailed rock-wallaby in Queensland ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Hunting - Habitat degradation - Predation - Competition - Genetic decline - Areas under threat - Populations under threat ▪ Items identified as key to the species recovery include: <ul style="list-style-type: none"> - Effective recovery planning - Species surveys and monitoring - Predator and competitor control - Captive breeding - Reintroduction/translocation - Genetic research ▪ The Recovery Plan identifies the following key objectives: <ul style="list-style-type: none"> - Managing threats to species habitat - Determine distribution, abundance, population trends and viability for the species - Manage viable captive populations - Undertake translocations to improve genetic and demographic robustness - Investigate key aspects of species biology - Increase community awareness and support for species conservation ▪ Management practices identified as necessary to avoid further significant adverse impact on the Brush-tailed Rock-wallaby include: <ul style="list-style-type: none"> - Policies and processes to avoid further clearing or fragmentation of habitat - Landscape-scale predator control - Controlling potential competitors (both introduced and native) with Brush-tailed Rock-wallaby for food and shelter ▪ Any developments that are likely to exacerbate any of the following issues will need to be carefully assessed. This would include: <ul style="list-style-type: none"> - Wild dog/dingo control programs that resulted in greater populations of foxes or cats in areas surrounding rock-wallaby colonies - Habitat disturbance within several kilometres of a rock wallaby site that could result in increased access by foxes - Increased population densities of sheep, goats or other macropods in areas where rock-wallabies forage - Reduction in control of introduced herbivores adjacent to rock-wallaby colonies 	<p>DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents</p> <ul style="list-style-type: none"> ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to Bridle naittail wallaby in the species Recovery Plan (Lundie-Jenkins and Lowry 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Bridle naittail wallaby were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Bridle naittail wallaby. Management measures with similar intent to the recovery and threat abatement actions identified for the Bridle naittail wallaby in the species Recovery Plan (Lundie-Jenkins and Lowry 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos 	<p>profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents</p> <ul style="list-style-type: none"> ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<p>species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements</p> <ul style="list-style-type: none"> ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>GLNG locations and neighbouring properties</p> <ul style="list-style-type: none"> - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the overall threat rating of feral cat predation to the Bridled nailtail wallaby as 'very high' ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.5 provides management measures for significant mammal species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the
	<p>"Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox 	<ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the 		<ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species management	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		management	resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species		responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread <ul style="list-style-type: none"> - Closely monitor controlled infestations for response to controls ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Pedionomus torquatus</i> (Plains wanderer)</p> <p>EPBC Act Status: Critically endangered</p>	<p>“Approved Conservation Advice for <i>Pedionomus torquatus</i> (Plains-wanderer)” (TSSC 2015a)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2015a) provides information on the species description, conservation status, distribution, cultural significance, biology, ecology and habitat ▪ Known threats to the Plains-wanderer include: <ul style="list-style-type: none"> - Cultivation of native grassland - Overgrazing of habitat - Indirect species motility due to use of the insecticide Fenitrothion which is used to spray Australian plague locusts (<i>Chortoivetes terminifera</i>) - Predation by exotic species (such as the fox and feral cat) and native species (such as the Spotter harrier [<i>Circus assimilis</i>] and Black falcon [<i>Falco subniger</i>]) - Extinction threat due to low population size - Inappropriate fire regimes - Habitat disturbance by rabbits - Introduced trees within areas of species habitat ▪ Primary conservation objectives identified for the Plains-wanderer in the Conservation Advice (TSSC 2015bb) include: <ul style="list-style-type: none"> - Reverse the long-term trend of population decline and increase numbers to a level where there is a viable, wild breeding population of plains-wanderers, even in poor breeding years - Maintain key plains-wanderer habitat in a condition that maximises survival and reproductive success, and provides refugia during periods of extreme environmental fluctuation ▪ The TSSC recommends that the species conservation status is upgraded from Vulnerable to Critically Endangered 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Plains wanderer has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to Plains wanderer in the species conservation advice (TSSC 2015a) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Plains wanderer were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Plains wanderer. Management measures with similar intent to the recovery and threat abatement actions identified for the Plains wanderer in the species conservation advice (TSSC 2015a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to 	<ul style="list-style-type: none"> ▪ Section 9.28 provides a species profile for the Plains-wanderer. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable</p> <ul style="list-style-type: none"> - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
	<p>"Threat Abatement Plan for Reduction in Impacts of Tramp Ants on Biodiversity in Australia and its Territories" (Commonwealth of Australia 2006)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan (Commonwealth of Australia 2006) has been developed to minimise the impact of invasive tramp ants on biodiversity in Australia ▪ The plan identifies six national priority tramp ant species. These include: <ul style="list-style-type: none"> - Red imported fire ant (<i>Solenopsis invicta</i>) - Tropical fire ant (<i>S. geminata</i>) - Little fire ant (<i>Wasmannia auropunctata</i>), - African big-headed ant (<i>Pheidole megacephala</i>) - Yellow crazy ant (<i>Anoplolepis gracilipes</i>), - Argentine ant (<i>Linepithema humile</i>) ▪ Impacts of tramp ants include predation on and competition with native species, modification of habitat structure and altering ecosystem processes 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for competition and land degradation by rabbits' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for competition and land degradation by rabbits” (DEWHA 2008a)</p> <p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Plains wanderer is identified in the plan as a listed threatened species that may be adversely affected and could become listed at a higher threatened category due to the Red imported fire ant ▪ The goal of the Threat Abatement Plan for competition and land degradation by rabbits is to minimise the impact of rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities, and - Preventing further species and ecological communities from becoming threatened. ▪ The Threat Abatement Plan for competition and land degradation by rabbits has five main objectives including: <ul style="list-style-type: none"> - Prevent rabbits from occupying new areas in Australia and eradicate rabbits from high-conservation-value ‘islands’ - Promote the maintenance and recovery of native species and ecological communities that are affected by rabbit competition and land degradation - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for rabbits, and - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage rabbits. ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 	<p>surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the ‘Threat Abatement Plan for competition and land degradation by unmanaged goats’ regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and Environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules ▪ Note that the RMP is in regards to land disturbed by gas field activities and not specifically to land affected by competition and land degradation by rabbits ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 	<p>some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species</p> <ul style="list-style-type: none"> ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<p>landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The rabbit and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The rabbit and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Petrogale penicillata</i> (Brush-tailed rock-wallaby)</p> <p>EPBC Act Status: Vulnerable</p>	<p>“National Recovery Plan for the Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>” (Menkhorst and Hynes 2010)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (Menkhorst and Hynes 2010) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Biology and ecology - Habitat requirements - Important populations. The recovery plan notes that there are no known important populations for the Brush-tailed rock-wallaby in Queensland ▪ Species specific threats identified include: 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Brush-tailed rock-wallaby has been sourced from the DotE Brush-tailed rock-wallaby Species Profile and Threats Database (SPRAT). The DotE species SPRAT profile references the species recovery plan and source documents ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure 	<ul style="list-style-type: none"> ▪ Section 9.42 provides a species profile for the Brush-tailed rock-wallaby. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Hunting - Habitat degradation - Predation - Competition - Genetic decline - Areas under threat - Populations under threat ▪ Items identified as key to the species recovery include: <ul style="list-style-type: none"> - Effective recovery planning - Species surveys and monitoring - Predator and competitor control - Captive breeding - Reintroduction/translocation - Genetic research ▪ The Recovery Plan identifies the following key objectives: <ul style="list-style-type: none"> - Managing threats to species habitat - Determine distribution, abundance, population trends and viability for the species - Manage viable captive populations - Undertake translocations to improve genetic and demographic robustness - Investigate key aspects of species biology - Increase community awareness and support for species conservation ▪ Management practices identified as necessary to avoid further significant adverse impact on the Brush-tailed Rock-wallaby include: <ul style="list-style-type: none"> - Policies and processes to avoid further clearing or fragmentation of habitat - Landscape-scale predator control - Controlling potential competitors (both introduced and native) with Brush-tailed Rock-wallaby for food and shelter ▪ Any developments that are likely to exacerbate any of the following issues will need to be carefully assessed. This would include: <ul style="list-style-type: none"> - Wild dog/dingo control programs that resulted in greater populations of foxes or cats in areas surrounding rock-wallaby colonies. - Habitat disturbance within several kilometres of a rock wallaby site that could result in increased access by foxes - Increased population densities of sheep, goats or other macropods in areas where rock-wallabies forage. - Reduction in control of introduced herbivores adjacent to rock-wallaby colonies 	<ul style="list-style-type: none"> ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to Brush-tailed rock-wallaby in the species Recovery Plan (Menkhorst and Hynes 2010) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Brush-tailed rock-wallaby were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Brush-tailed rock-wallaby. Management measures with similar intent to the recovery and threat abatement actions identified for the Brush-tailed rock-wallaby in the species Recovery Plan (Menkhorst and Hynes 2010) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos 	<p>project area. The habitat mapping was used in constrains planning and impact assessments</p> <ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<p>strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>GLNG locations and neighbouring properties</p> <ul style="list-style-type: none"> - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the overall threat rating of feral cat predation to the Brush-tailed rock-wallaby as 'minor' ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the 'Threat Abatement Plan for competition and land 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.5 provides management measures for significant mammal species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat, rabbit, European red fox and goat are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos
	<p>"Threat Abatement Plan for competition and land degradation by unmanaged goats" (DEWHA 2008)</p>	<ul style="list-style-type: none"> ▪ The Feral Cat Threat Abatement Plan (DotE 2015) identifies the overall threat rating to the Brush-tailed rock-wallaby as a result of habitat change due to livestock and feral herbivores to be high ▪ The goal of the Threat Abatement Plan for competition and land degradation by unmanaged goats is to minimise the impact of unmanaged goat competition and land degradation on biodiversity in Australia and its territories by: <ul style="list-style-type: none"> - Protecting affected native species and ecological communities, and - Preventing further species and ecological 	<ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the 'Threat Abatement Plan for competition and land 		<ul style="list-style-type: none"> - On private property where Santos

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>communities from becoming threatened.</p> <ul style="list-style-type: none"> ▪ The Threat Abatement Plan for competition and land degradation by unmanaged goats has five main objectives including: <ul style="list-style-type: none"> - Prevent unmanaged goats occupying new areas in Australia and eradicate them from high-conservation-value 'islands' - Promote the maintenance and recovery of native species and ecological communities that are affected by competition and land degradation by unmanaged goats - Improve knowledge and understanding of unmanaged goat impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity and humaneness of control options for unmanaged goats - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control unmanaged goats 	<p>degradation by unmanaged goats' regarding the promotion of maintenance and recovery of native species and ecological communities include the following:</p> <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and Environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules ▪ Note that the RMP is in regards to land disturbed by gas field activities and not specifically to land affected by competition and land degradation by unmanaged goats ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<p>GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread</p> <ul style="list-style-type: none"> - Closely monitor controlled infestations for response to controls ▪ The feral cat, rabbit and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
	<p>"Threat Abatement Plan for competition and land degradation by rabbits" (DEWHA 2008a)</p>	<ul style="list-style-type: none"> ▪ The Feral Cat Threat Abatement Plan (DotE 2015) identifies the overall threat rating to the Brush-tailed rock-wallaby as a result of habitat change due to livestock and feral herbivores to be high ▪ The goal of the Threat Abatement Plan for competition and land degradation by rabbits is to minimise the impact of rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities, and - Preventing further species and ecological communities from becoming threatened. ▪ The Threat Abatement Plan for competition and land degradation by rabbits has five main objectives including: <ul style="list-style-type: none"> - Prevent rabbits from occupying new areas in Australia and eradicate rabbits from high-conservation-value 'islands' - Promote the maintenance and recovery of native species and ecological communities that are affected by rabbit competition and land degradation - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for rabbits, and - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage rabbits. 			
	<p>"Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Feral Cat Threat Abatement Plan (DotE 2015) identifies the overall threat rating of European Red Fox predation on the Brush-tailed rock-wallaby to be very high ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on 			

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties</p> <ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 			
<p><i>Phascolarctos cinereus</i> (Koala) EPBC Act Status: Vulnerable</p>	<p>“Commonwealth Conservation Advice on <i>Phascolarctos cinereus</i> (combined population in Queensland, New South Wales and the Australian Capital Territory)” (TSSC 2012a)</p> <p>“Listing advice for <i>Phascolarctos cinereus</i> (Koala)” (TSSC 2012b)</p>	<ul style="list-style-type: none"> ▪ The conservation advice (TSSC 2012a) provides information on the species description, conservation status, distribution and habitat ▪ Known threats to the Koala identified in the conservation advice (TSSC 2012a) include: <ul style="list-style-type: none"> - Loss and fragmentation of habitat - Vehicle strike - Disease - Predation by dogs ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Animal predation - Conservation information, raising species awareness ▪ A conservation assessment for the Koala (TSSC 2012b) was conducted by the TSSC following a request from the Minister to obtain the TSSC advice on key recommendations presented in the Senate enquiry report ▪ Listing advice provides information on the taxonomy, species description, distribution, national context, relevant biology and ecology, and threats ▪ Key threats to the species include: <ul style="list-style-type: none"> - Habitat loss, fragmentation and/or degradation - Encounter mortality – Dogs and cars - Disease ▪ The TSSC found that at the national level the species is not eligible for EPBC listing. The TSSC found that combined Koala populations in Queensland, New South Wales and the ACT satisfy conservation assessment criterion 1 and thus eligible for listing as Vulnerable 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Koala has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to Koala in the species conservation advice (TSSC 2012a) and listing advice (TSSC 2012b) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Koala were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Koala. Management measures with similar intent to the recovery and threat abatement actions identified for the Koala in the species conservation advice (TSSC 2012a) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is 	<ul style="list-style-type: none"> ▪ Section 9.44 provides a species profile for the Koala. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species ▪ Section 9.44 provides a species profile for the Koala. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species ▪ The Wild dog is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP

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			<p>to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy</p> <ul style="list-style-type: none"> - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
<p>2.19 <i>Poephila cincta cincta</i> (Black-throated finch) EPBC Act Status: Endangered</p>	<p>“Commonwealth Listing Advice on Southern Black-throated Finch (<i>Poephila cincta cincta</i>)” (TSSC 2005a)</p> <p>“National recovery plan for the black-throated finch southern subspecies <i>Poephila cincta</i>”</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Black-throated finch (TSSC 2005a) was conducted by the TSSC ▪ Listing advice provides information on the species description, distribution, habitat, national context and relevant biology and ecology ▪ Greatest known threat to the species is the loss and degradation of its preferred riparian grassland habitat, mainly due to the spread of pastoralism and associated changes in land management practices ▪ The TSSC noted that the species is expected to undergo a severe reduction in numbers as there has been a observed decline in extent of occurrence of up to 50% in the last 10 years ▪ The TSSC recommended that the Black-throated finch’s conservation listing is changed from vulnerable to endangered ▪ The Recovery Plan (Black-throated Finch Recovery Team 2007) provides species information relevant to its management 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Black-throated finch has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, recovery plan and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to Black-throated finch in the species listing advice (TSSC 2005a) and recovery plan (Black-Throated Finch Recovery Team TSSC 2007) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity 	<ul style="list-style-type: none"> ▪ Section 9.30 provides a species profile for the Black-throated finch. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p><i>cincta</i>. Report to the Department of the Environment and Water Resources, Canberra” (Black-throated Finch Recovery Team 2007)</p>	<p>including data pertaining to the species:</p> <ul style="list-style-type: none"> - Distribution - Habitat requirements - Population characteristics ▪ Possible threats to the Black-throated finch identified in the recovery plan include: <ul style="list-style-type: none"> - Clearing and fragmentation of woodland, riverside habitats and wattle shrubland - Degradation of habitat by domestic stock and rabbits, including alterations to fuel load, vegetation structure and wet season food availability - Alteration of habitat by changes in fire regime - Invasion of habitat by exotic weed species, including exotic grasses - Illegal trapping of birds - Predation by introduced predators - Hybridisation with escapees of the northern subspecies ▪ The overall objective of the recovery plan is to manage and protect the Black-throated finch and its habitat, and to promote the recovery of the southern subspecies. Specific objectives identified in the recovery plan include: <ul style="list-style-type: none"> - Identify and quantify threats - Quantify distribution and abundance - Protect and enhance habitat - Investigate the potential for captive birds contributing to a re-introduction project - Increase public awareness ▪ The key management practice identified to protect populations of the Black-throated finch is the proper management of habitat. Guidelines for habitat management include: <ul style="list-style-type: none"> - Management of overgrazing of the riparian grassland that is the main habitat of the species - Management of clearing and fragmentation of woodland, riverside habitats and wattle shrubland - Management practices aimed at minimising impacts on habitat by domestic stock and rabbits, including alterations to fuel load, vegetation structure and wet season food availability - Fire management - Weed management strategies to minimise invasion of habitat by exotic weed species, including exotic grasses 	<ul style="list-style-type: none"> - corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Black-throated finch were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Black-throated finch. Management measures with similar intent to the recovery and threat abatement actions identified for the Black-throated finch in the species listing advice (TSSC 2005a) and recovery plan (Black-Throated Finch Recovery Team TSSC 2007) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM 		<p>species)</p> <ul style="list-style-type: none"> ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan to reduce the impacts on northern Australia’s biodiversity by the five listed grasses” (DSEWPAC 2012)</p> <p>“Threat Abatement Plan for competition and land degradation by rabbits” (DEWHA 2008a)</p>	<ul style="list-style-type: none"> ▪ The ‘Threat Abatement Plan to reduce the impacts on northern Australia’s biodiversity by the five listed grasses’ (DSEWPAC 2012) has been developed to address the key threatening process; ‘Ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced Gamba grass (<i>Andropogon gayanus</i>), Para grass (<i>Urochloa mutica</i>), Olive hymenachne (<i>Hymenachne amplexicaulis</i>), Mission grass (<i>Pennisetum polystachion</i>) and Annual mission grass (<i>Pennisetum pedicellatum</i>)’ ▪ The five listed grasses are highly invasive, high-biomass species which can increase fuel loads and/or alter nitrogen cycling and water availability within systems; resulting in ecosystem degradation, habitat loss and biodiversity decline ▪ The overarching goal of threat abatement plan is to minimise the adverse impacts of the five listed grasses on affected native species and ecological communities. The six main objectives of the threat abatement plan include: <ul style="list-style-type: none"> - Develop an understanding of the extent and spread pathways of infestation by the five listed grasses - Support and facilitate coordinated management strategies through the design of tools, systems and guidelines - Identify and prioritise key assets and areas for strategic management - Build capacity and raise awareness among stakeholders - Implement coordinated, cost-effective on-ground management strategies in high-priority areas - Monitor, evaluate and report on the effectiveness of management programs ▪ The Black-throated finch is listed in the Table A of the recovery plan as a threatened species listed under the EPBC Act which is under immediate threat from the five listed grasses <ul style="list-style-type: none"> ▪ The goal of the Threat Abatement Plan for competition and land degradation by rabbits is to minimise the impact of rabbit competition and land degradation on biodiversity by: <ul style="list-style-type: none"> - Protecting affected native species, broadscale vegetation and ecological communities, and - Preventing further species and ecological communities from becoming threatened. ▪ The Threat Abatement Plan for competition and land degradation by rabbits has five main objectives including: <ul style="list-style-type: none"> - Prevent rabbits from occupying new areas in 	<p>consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data</p> <ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) and the Rehabilitation Management Plan (RMP) ▪ The RMP provides the framework for rehabilitating land that has been disturbed as part of gas field activities. Measures within the RMP relevant to the objectives of the ‘Threat Abatement Plan for competition and land degradation by unmanaged goats’ regarding the promotion of maintenance and recovery of native species and ecological communities include the following: <ul style="list-style-type: none"> - Standardised remediation and rehabilitation procedures in line with current best practice - Principles to mitigate and manage direct and indirect impacts to MNES and Environmentally sensitive areas - Remediation, rehabilitation and recovery management actions for a range of land uses and disturbance levels including benchmark guidelines and rehabilitation schedules ▪ Note that the RMP is in regards to land disturbed by gas field activities and not specifically to land affected by competition and 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for competition and land degradation by rabbits’ include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The rabbit is a class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The Rabbit is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ Olive hymenachne (<i>Hymenachne amplexicaulis</i>) is identified in Section

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Australia and eradicate rabbits from high-conservation-value 'islands' - Promote the maintenance and recovery of native species and ecological communities that are affected by rabbit competition and land degradation - Improve knowledge and understanding of rabbit impacts and interactions with other species and other ecological processes - Improve the effectiveness, target specificity, integration and humaneness of control options for rabbits, and - Increase awareness of all stakeholders of the objectives and actions of the Threat Abatement Plan, and of the need to control and manage rabbits 	<ul style="list-style-type: none"> - land degradation by rabbits - Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 		<ul style="list-style-type: none"> - 4.2.1, Table 4 of the PWMP as a high priority weed species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Polytelis swainsonii</i> (Superb parrot) EPBC Act Status: Vulnerable</p>	<p>"National Recovery Plan for the Superb Parrot <i>Polytelis swainsonii</i>" (Baker-Gabb 2011)</p>	<ul style="list-style-type: none"> - The Recovery Plan (Baker-Gabb 2011) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Description - Biology and ecology - Distribution - Habitat requirements - Population characteristics - Major recognised threats to the Superb parrot include: <ul style="list-style-type: none"> - Loss and degradation of habitat - Irrigation and regulated flows - Firewood collection - Timber production - Disturbance - Illegal removal of wild birds - Road-kills - Poisoning - Competition for nest hollows - The overall objective of the recovery plan is to minimise the probability of extinction of the Superb parrot in the wild and to increase the probability of important populations becoming self-sustaining in the long term, ideally to meet the IUCN Red List criteria for conservation assessment as Least Concern. Specific objectives identified in the recovery plan include: <ul style="list-style-type: none"> - Determine population trends in the Superb parrot - Increase the level of knowledge of the Superb parrot's ecological requirements - Develop and implement threat abatement strategies - Increase community involvement in and awareness of the Superb parrot recovery program - Management practices identified to protect populations of the Superb parrot include: <ul style="list-style-type: none"> - Improved conservation of large trees, both dead and alive - Control of grazing in areas of important local 	<ul style="list-style-type: none"> - Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Superb parrot has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice and source documents - Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to potential threats to the Superb parrot include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to potential threats to the Superb parrot were assessed - Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures considered in the assessment of residual impacts on MNES species, including the Superb parrot, include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel 	<ul style="list-style-type: none"> - Section 9.29 provides a species profile for the Superb parrot. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents - The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments - Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project - Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> - The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species - The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements - A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) - The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>Superb parrot foraging habitat</p> <ul style="list-style-type: none"> - Maintenance of current and potential nest sites 	<p>including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area</p> <ul style="list-style-type: none"> - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
<p><i>Pteropus poliocephalus</i> (Grey-headed flying-fox) EPBC Act Status: Vulnerable</p>	<p>"Commonwealth Listing Advice on <i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)" (TSSC 2001b)</p> <p>"Draft National Recovery Plan for the Grey-headed Flying-fox <i>Pteropus poliocephalus</i>" (DECCW 2009)</p>	<ul style="list-style-type: none"> ▪ The robustness of data presented to support the vulnerable listing for the Grey-headed flying-fox has been challenged by some scientists. The TSSC undertook a thorough investigation of survey methodologies, data and expert discussion in order to verify data and estimates of population decline. TSSC found the species to be eligible for listing as vulnerable under the EPBC Act ▪ The estimates of species abundance indicated a rate of decline in abundance of 30% over the monitoring period ▪ Given the limitations of species population data available, research into both accurate estimates of abundance and mortality associated with human activities is encouraged ▪ TSSC advised that priority should be given to the generation of more data and that this matter be revisited in 2004 or when significant new data becomes available. However, this review should only be initiated if substantial work is undertaken which significantly clarifies the conservation status of the species ▪ The Draft Recovery Plan (DECCW 2009) provides species information relevant to its management including data pertaining to the species: 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Grey-headed flying-fox has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to potential threats to the Grey-headed flying-fox include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential 	<ul style="list-style-type: none"> ▪ Section 9.43 provides a species profile for the Grey-headed flying-fox. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.5 provides management measures for significant mammal species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Conservation status - Taxonomy - Distribution and location - Habitat critical to the species survival, including foraging habitat and roosting habitat - Species biology and ecology relevant to threatening processes ▪ Species specific threats identified include: <ul style="list-style-type: none"> - Habitat loss - Deliberate destruction associated with commercial horticulture - Competition with Black flying-foxes - Negative public attitudes and conflict with humans - Electrocution on powerlines, entanglement in netting and on barbed-wire - Climate change - Disease ▪ The overall objectives of the Recovery Plan are: <ul style="list-style-type: none"> - To reduce the impact of threatening processes on Grey-headed Flying-foxes and arrest decline throughout the species' range - To conserve the functional roles of Grey-headed Flying-foxes in seed dispersal and pollination - To improve the standard of information available to guide recovery of the Grey-headed Flying-fox, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species - Determine distribution, abundance, population trends and viability for the species - Manage viable captive populations - Undertake translocations to improve genetic and demographic robustness - Investigate key aspects of species biology - Increase community awareness and support for species conservation 	<p>project impacts on MNES species. The aforementioned impacts relevant to potential threats to the Grey-headed flying-fox were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures considered in the assessment of residual impacts on MNES species, including the Grey-headed flying-fox, include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		<p>the identification and management of pest species</p>
<p><i>Rheodytes leukops</i> (Fitzroy River turtle) EPBC Act Status: Vulnerable</p>	<p>"Approved Conservation Advice on <i>Rheodytes leukops</i> (Fitzroy Tortoise)" (TSSC 2008q)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2008q) provides information on the species description, distribution, biology and ecology and habitat requirements ▪ Threats to the Fitzroy River turtle identified in the Conservation Advice include: 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Fitzroy River turtle has been sourced from the DotE 	<ul style="list-style-type: none"> ▪ Section 9.46 provides a species profile for the Fitzroy river turtle. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<ul style="list-style-type: none"> - Loss and disturbance of habitat from agriculture - Damming of rivers - Pollution and siltation of river and creek habitats - Predation of eggs by Foxes, Pigs, Dingos, Feral Cats, Goannas and Water rats ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Trampling, browsing or grazing - Animal predation - Conservation information, raising species awareness - Enable recovery of additional sites and/or populations 	<p>SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents</p> <ul style="list-style-type: none"> ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Fitzroy River turtle in the species conservation advice (TSSC 2008q) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Fitzroy River turtle were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Fitzroy River turtle. Management measures with similar intent to the recovery and threat abatement actions identified for the Fitzroy River turtle in the species conservation advice (TSSC 2008q) include: <ul style="list-style-type: none"> - 500 metre exclusion zones are to be created around Fitzroy River turtle nests identified by an approved Ecologist during pre-clearance survey work during infrastructure planning - Clearing in and around wetlands will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Blasting should be avoided, where practicable, around areas such as wetlands and watercourses - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever 	<p>profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice and source documents</p> <ul style="list-style-type: none"> ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.4 provides management measures for significant reptile species 	<p>species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements</p> <ul style="list-style-type: none"> ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>practicable</p> <ul style="list-style-type: none"> - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DotE 2015) identifies the Fitzroy River turtle as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.4 provides management measures for significant reptile species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 	<p>numbers.</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<ul style="list-style-type: none"> - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Rostratula australis</i> (Australian painted snipe) EPBC Act Status: Endangered</p>	<p>“Commonwealth Listing Advice on <i>Rostratula australis</i> (Australian painted snipe)” (TSSC 2013f)</p> <p>“Commonwealth Conservation Advice on <i>Rostratula australis</i> (Australian painted snipe)” (TSSC 2013g)</p>	<ul style="list-style-type: none"> ▪ A conservation assessment for the Australian painted snipe (TSSC 2013f) was conducted by the TSSC due to information provided by a public nomination for the species to be listed as Endangered ▪ Listing advice provides information on the species description, distribution, national context, relevant biology and ecology, and threats ▪ Key threats to the species include: <ul style="list-style-type: none"> - Loss and degradation of wetlands through drainage and diversion of water - Grazing and trampling of species habitat ▪ Potential threats to the species include: <ul style="list-style-type: none"> - Climate change - Weed invasion ▪ The Committee notes that the species has undergone a severe decline (more than 50%) in the number of mature individuals over the last three generations ▪ The Committee recommends that the Australian painted snipe is listed as endangered and that a recovery plan is prepared for this species <p>▪ The Conservation Advice (TSSC 2013g) provides information on the species description, conservation status, cultural significance, distribution and habitat</p> <ul style="list-style-type: none"> ▪ Key threats to the species include: <ul style="list-style-type: none"> - Loss and degradation of wetlands through 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Australian painted snipe has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Australian painted snipe in the species listing advice (TSSC 2013f) and conservation advice (TSSC 2013g) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and light impacts (Section 5.2.9) - Increase in litter (waste) (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance 	<ul style="list-style-type: none"> ▪ Section 9.31 provides a species profile for the Australian painted snipe. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species listing advice, conservation advice and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
		<p>drainage and diversion of water</p> <ul style="list-style-type: none"> - Grazing and trampling, nutrient enrichment and disturbance by livestock to species habitat ▪ Potential threats to the species include: <ul style="list-style-type: none"> - Climate change - Weed invasion - Predation by feral animals - Coastal port and infrastructure development - Shale oil mining ▪ Regional and local priority recovery actions and threat abatement actions have been identified for the following themes: <ul style="list-style-type: none"> - Habitat loss, disturbance and modification - Invasive weeds - Trampling, browsing or grazing - Animal predation or competition - Inappropriate fire regimes - Conservation information, raising species awareness 	<p>assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Australian painted snipe were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including the Australian painted snipe. Management measures with similar intent to the recovery and threat abatement actions identified for the Australian painted snipe in the species listing advice (TSSC 2013f) and conservation advice (TSSC 2013g) include: <ul style="list-style-type: none"> - Clearing in and around wetlands will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Blasting should be avoided, where practicable, around areas such as wetlands and watercourses - Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species</p>		
<p><i>Turnix melanogaster</i> (Black-breasted button-quail) EPBC Act Status: Vulnerable</p>	<p>“National recovery plan for the black-breasted button-quail <i>Turnix melanogaster</i>” (Mathieson and Smith 2009)</p>	<ul style="list-style-type: none"> ▪ The Recovery Plan (Mathieson and Smith 2009) provides species information relevant to its management including data pertaining to the species: <ul style="list-style-type: none"> - Description - Life history and ecology - Distribution - Habitat critical to species survival - Important populations ▪ Key threats to the Black-breasted button quail include: <ul style="list-style-type: none"> - Loss of habitat and habitat fragmentation due to clearing for a range of purposes (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development) - Habitat degradation as a result of domestic stock and feral pigs utilising Black-breasted button-quail habitat - Habitat loss or degradation due to inappropriate fire regimes - Predation by feral animals ▪ The overall objective of the recovery plan is to improve the status of Black-breasted button-quail from its current threatened status under State and Commonwealth legislation through protection and management of habitat for extant populations (to secure survival of existing birds), increasing availability and condition of habitat (to provide opportunity for population increase) and pursuit of actions to minimise threats (to protect existing and expanding populations and prevent further loss) ▪ Management items identified to protect populations of the Black-breasted button-quail include: <ul style="list-style-type: none"> - Identification of habitat and populations - Protection of species preferred habitat - Protection of habitat from inappropriate fire regimes, stock trampling and invasive species - Retention of habitat patch size and connectivity - Improved conservation of large trees, both dead and alive - Control of grazing in areas of important local Superb parrot foraging habitat - Maintenance of current and potential nest sites 	<ul style="list-style-type: none"> ▪ Appendix G of the Terrestrial Ecology Report and Appendix I of the MNES Report provides a likelihood of occurrence assessment for conservation significant fauna species. The habitat description provided for the Black-breasted button-quail has been sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species conservation advice, listing advice and source documents ▪ Section 5.2 provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the Black-breasted button-quail in the species recovery plan (Mathieson and Smith 2009) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (Section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in the connectivity of biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Black-breasted button-quail were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including the Black-breasted button-quail. Management measures with similar intent to the recovery and threat abatement actions identified for the Black-breasted button-quail in the species recovery plan (Mathieson and Smith 2009) include: <ul style="list-style-type: none"> - Where practicable, microhabitat will be relocated to an adjacent undisturbed area - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened fauna and habitat wherever practicable - Where a significant residual adverse impact is 	<ul style="list-style-type: none"> ▪ Section 9.32 provides a species profile for the Black-breasted button-quail. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT species profile. The DotE SPRAT species profile references the species recovery plan and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.3 provides management measures for significant threatened bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest species ▪ The PWMP identifies high priority pest species. Priority placed on individual pest species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest management strategy is presented which includes measures to prevent and minimise the spread of pest species. Table 8 of the PWMP contains general principles and measures of pest management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
			<p>to occur to threatened fauna, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy</p> <ul style="list-style-type: none"> - Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs, including threatened fauna species potentially present in the area - Where threatened fauna is present in areas adjacent to the disturbance, exclusion zones are to be established - Known threatened fauna and fauna habitat in areas adjacent to disturbances will be regularly checked to ensure no disturbances - Identify, monitor and prioritise the appropriate management of pest and weed species - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests and weeds at Santos GLNG assets and activities ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance - The species resilience assessments which form part of the AIAM consider key threatening processes to the target species - The species resilience assessments consider potential project impact to the predation vulnerability of the target species - The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		
	<p>"Threat Abatement Plan for predation by feral cats" (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The 'Threat Abatement Plan for predation by feral cats' (DOTE 2015) identifies the Black-breasted button-quail as a threatened species that may be adversely affected by feral cats ▪ The goal of the 'Threat Abatement Plan for predation by feral cats' is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The 'Threat Abatement Plan for predation by feral cats' has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact, captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the 'Threat Abatement Plan for predation by feral cats' include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GTP EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GTP EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GTP EIS)
	<p>"Threat Abatement Plan for Reduction in Impacts of Tramp Ants on Biodiversity in Australia and its Territories" (Commonwealth of Australia 2006)</p> <p>"Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b)</p>	<ul style="list-style-type: none"> - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership <ul style="list-style-type: none"> ▪ The Threat Abatement Plan (Commonwealth of Australia 2006) has been developed to minimise the impact of invasive tramp ants on biodiversity in Australia ▪ The plan identifies six national priority tramp ant species. These include: <ul style="list-style-type: none"> - Red imported fire ant (<i>Solenopsis invicta</i>) - Tropical fire ant (<i>S. geminata</i>) - Little fire ant (<i>Wasmannia auropunctata</i>), - African big-headed ant (<i>Pheidole megacephala</i>) - Yellow crazy ant (<i>Anoplolepis gracilipes</i>), - Argentine ant (<i>Linepithema humile</i>) ▪ Impacts of tramp ants include predation on and competition with native species, modification of habitat structure and altering ecosystem processes ▪ The Black-breasted button-quail is identified in the plan as a listed threatened species that may be adversely affected and could become listed at a higher threatened category due to the Red imported fire ant <ul style="list-style-type: none"> ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan for Predation by the European Red Fox discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan for Predation by the European Red Fox provides information on developing a national approach to fox management 	<p>surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers</p> <ul style="list-style-type: none"> ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<p>of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species</p> <ul style="list-style-type: none"> ▪ Section 6.2.3 provides management measures for significant threatened bird species, including commitment to pest management via the implementation of the PWMP 	<p>assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat and European red fox are Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP

2.2 Impact and Management Cross Reference Table

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p><i>Botaurus poiciloptilus</i> (Australasian bittern)</p> <p>EPBC Act Status: Endangered</p>	<p>Reduction in the extent and quality of habitat due to the diversion of water away from wetlands</p> <hr/> <p>Clearing of wetlands for urban development or agriculture</p> <hr/> <p>Reduction of water quality</p> <hr/> <p>Peat mining impacts on habitat</p> <hr/> <p>Overgrazing by livestock</p>	<p>Potential project impacts to aquatic environmental values that may result from construction, operations and decommissioning activities of the GFD Project include:</p> <ul style="list-style-type: none"> - Sediment to water – May temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses. Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible - Chemicals to water – May temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity - Disturbance of stream channel and associated habitat (eg pools, riffles etc) – Localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time - Loss of abundance and diversity of riparian vegetation and aquatic biota, including groundwater dependent ecosystems – Generally localised impact associated with clearing and traffic movement, which may be long-term due to time required to restore pre-disturbance species composition/abundance before dependent fauna return - Contamination of shallow groundwater - Has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination – Has the potential to occur as result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks <p>Not relevant to the nature of the project</p> <p>Not relevant to the nature of the project</p>	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing in and around wetlands will be avoided, where possible ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Blasting should be avoided, where practicable, around areas with congregations of birds, such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened fauna habitat ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the <i>Santos GLNG Upstream Erosion and Sediment Control Plan</i> ▪ To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the Santos GLNG Upstream, Rehabilitation Management Plan ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields <p>-</p> <p>-</p>

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Inappropriate fire regimes</p> <p>Predation of eggs and juveniles by foxes and cats</p>	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Anomalopus mackayi</i> (Five-clawed worm-skink)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Clearing and fragmentation of habitat for agriculture and development</p> <p>Removal of refuge sites and ground litter</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Where clearing occurs within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Habitat degradation from overgrazing	<ul style="list-style-type: none"> Domestic stock grazing activities are not relevant to the nature of the project 	-
	Predation by foxes and feral cats	<ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
	Soil and water pollution	<ul style="list-style-type: none"> Potential project impacts in relation to pollution which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> Uncontrolled release of waste and inefficient use of resources Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses Release of chemicals to water which may temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
<p><i>Chalinolobus dwyeri</i> (Large-eared pied bat)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Disturbance and damage at primary nursery roosts, particularly by goats</p> <p>Potential threat - Loss of foraging habitat</p> <p>Potential threat - Vegetation clearance in the proximity of roosts</p> <p>Potential threat - Loss of genetic diversity</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Feral goats are identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral goats are a Class 2 declared pest under the LP Act Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<ul style="list-style-type: none"> ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>known environmental values</p> <ul style="list-style-type: none"> ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative ▪ Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented
	Potential threat - Mine induced subsidence of cliff lines	Not relevant to the nature of the project	-
	Potential threat - Disturbance from human recreational activities	Not relevant to the nature of the project	-
	Potential threat - Habitat disturbance by other animals, including livestock and feral animals	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Potential threat - Predation by introduced predators	<ul style="list-style-type: none"> ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	
	Potential threat - Fire in the proximity of roosts	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<p><i>Dasyurus hallucatus</i> (Northern quoll)</p> <p>EPBC Act Status: Endangered</p>	Lethal toxic ingestion of Cane toad toxin	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already 	<ul style="list-style-type: none"> - The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the
	Feral predators		
	Weeds		
	Disease		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species</p>	<p>identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Ac) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - The Cane toad is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - The feral cat and European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
	Inappropriate fire regimes	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	<p>Habitat degradation</p> <p>Population isolation</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Hunting and persecution	Not relevant to the nature of the project	-
<i>Delma torquata</i> (Collared delma)	Loss and modification of habitat from urban and agricultural development	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p>EPBC Act Status: Vulnerable</p>	<p>Removal of surface rocks during the development process or landscaping activities</p>	<ul style="list-style-type: none"> ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development</p> <ul style="list-style-type: none"> ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Where clearing occurs within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	<p>Fire</p>	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	<p>Invasive weeds, particularly <i>Lantana montividentis</i></p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> - The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Denisonia maculata</i> (Ornamental snake) EPBC Act Status:</p>	<p>Legacy of broadscale land clearing and habitat degradation</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
Vulnerable		<p>the creation of edge effects</p> <ul style="list-style-type: none"> ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	<p>Destruction of wetland habitat by Feral pigs and the associated destruction of frog habitat</p> <p>Potential threats – Poisoning resulting from the ingestion of Cane toads</p> <p>Direct competition for food source (frogs)</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species ▪ Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact assessments 	<ul style="list-style-type: none"> - The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls - Feral pigs, exotic pest species identified in the Ornamental snake Conservation Advice (TSSC 2014c) as a threat to Ornamental snake habitat, are identified in Appendix 2 as pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP - The Cane toad is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Egernia rugosa</i> (Yakka skink)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Continued legacy of past broadscale land clearing and habitat degradation</p> <p>Removal of wood debris and rock microhabitat features</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Inappropriate roadside management</p> <hr/> <p>Ripping of rabbit warrens</p>	<p>fragmentation</p> <ul style="list-style-type: none"> ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>known environmental values</p> <ul style="list-style-type: none"> ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Where clearing occurs within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative ▪ Access to and from Project locations is to occur along designated access tracks only
	<p>Predation by feral animals, in particular by feral cats and foxes</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Erythroriorchis radiatus</i> (Red goshawk)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Habitat loss and fragmentation</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance</p> <ul style="list-style-type: none"> ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>monitor all clearing works in areas of habitat</p> <ul style="list-style-type: none"> ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative ▪ Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented
	<p>Threats to nest sites ie by egg collectors, clearing of mature trees, fires</p>	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely ▪ The threat to nest sites from egg collectors is not relevant to the nature of project works 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	<p>Threats to the prey base and prey availability ie via the degradation of rivers and wetlands utilised by potential prey species, burning, heavy grazing</p>	<ul style="list-style-type: none"> ▪ Domestic grazing activities are not subject to the nature of project works ▪ Potential project impacts to aquatic environmental values that may result from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Sediment to water – May temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses. Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible - Chemicals to water – May temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity - Disturbance of stream channel and associated habitat (eg pools, riffles etc) – Localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time - Loss of abundance and diversity of riparian vegetation and aquatic biota, including groundwater dependent ecosystems – Generally localised impact associated with clearing and traffic movement, which may be long-term due to time required to restore pre-disturbance species composition/abundance before dependent fauna return - Contamination of shallow groundwater - Has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination – Has the potential to occur as result of spillage of 	<ul style="list-style-type: none"> ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing in and around wetlands will be avoided, where possible ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Blasting should be avoided, where practicable, around areas with congregations of birds, such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened fauna habitat ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the

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		hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks	<p><i>Santos GLNG Upstream Erosion and Sediment Control Plan</i></p> <ul style="list-style-type: none"> To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the <i>Santos GLNG Upstream, Rehabilitation Management Plan</i> The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
	Information and communication gaps	-	<ul style="list-style-type: none"> Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, threatened species or threatened species habitat
<p><i>Furina dunmalli</i> (Dunmall's snake)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Past legacy of broadscale land clearing and habitat modification</p> <p>Modification of habitat due to agriculture and urban development</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken Any exclusion zones such as breeding places will also be appropriately marked out 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Overgrazing of habitat	<ul style="list-style-type: none"> Domestic stock grazing activities are not relevant to the nature of the project Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral

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			<p>goats and rabbits are Class 2 declared pests under the LP Act</p> <ul style="list-style-type: none"> - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Geophaps scripta scripta</i> (Squatter pigeon [southern])</p> <p>EPBC Act Status: Vulnerable</p>	<p>Clearance of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	<p>Grazing of habitat by livestock and feral herbivores</p>	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats and rabbits are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Predation, in particular by Feral cats and foxes</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Lathamus discolor</i> (Swift parrot) EPBC Act Status: Endangered</p>	<p>Habitat removal, degradation and fragmentation</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative ▪ Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented
	<p>Collision mortality</p>	<ul style="list-style-type: none"> ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, threatened species or threatened species habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around breeding places that become active after

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			<p>construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic</p> <ul style="list-style-type: none"> ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities ▪ To reduce noise and vibration, equipment including vehicles will be regularly maintained and is in good working order
	<i>Psittacine circoviral disease (beak and feather disease)</i>	Not relevant to the nature of the project	-
	Competition	Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact assessments	-
	Poaching (illegal collection and trade)	Not relevant to the nature of the project	-
	Climate change	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
<p><i>Maccullochella peelii peelii</i> (Murray cod)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Habitat degradation due to physical fragmentation and cold water discharges from dams</p> <p>Habitat loss due to de-snagging</p> <p>Barriers</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition 	<ul style="list-style-type: none"> ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Blasting should be avoided, where practicable, around areas such as wetlands and watercourses ▪ Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements)</p> <ul style="list-style-type: none"> ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat</p> <ul style="list-style-type: none"> ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Impact of regulated flows on recruitment	<ul style="list-style-type: none"> ▪ Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity ▪ Disturbance of stream channel and associated habitat (eg pools, riffles etc) due to localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time 	<ul style="list-style-type: none"> ▪ Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ Clearing in and around wetlands will be avoided, where possible
	<p>Lowered water quality</p> <p>Genetic issues and diseases</p>	<ul style="list-style-type: none"> ▪ Potential project impacts in relation to lowered water quality which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses - Release of chemicals to water which may temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields

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	<p>Invasive fish species</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	<p>Commercial, recreational and illegal fishing</p>	<p>Not relevant to the nature of the project</p>	<p>-</p>
	<p>Stocking and translocations, ie the contribution of hatchery bred Murray cod</p>	<p>Not relevant to the nature of the project</p>	<p>-</p>
	<p>Climate change</p>	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
<p><i>Neochmia ruficauda</i> <i>ruficauda</i> (Star finch)</p> <p>EPBC Act Status: Endangered</p>	<p>Poisoning by contaminants such as cyanide</p>	<ul style="list-style-type: none"> ▪ Potential project impacts in relation to the uncontrolled release of contaminants which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Release of chemicals to water which may temporally increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction 	<ul style="list-style-type: none"> ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields. Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		activities, however this is considered to localised and limited) <ul style="list-style-type: none"> - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses 	generated by Santos GLNG activities <ul style="list-style-type: none"> ▪
	Habitat degradation caused by over-grazing and trampling of habitat by livestock	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act). Feral goats and rabbits are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Predation by introduced species including feral cats and foxes	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties
	Invasive weeds	<ul style="list-style-type: none"> ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<i>Nyctophilus corbeni</i> (South-eastern long-	Habitat loss and fragmentation	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat 	<ul style="list-style-type: none"> ▪ Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
eared bat) EPBC Act Status: Vulnerable	Reduction in hollow availability	<p>where the construction of infrastructure has resulted in fragmentation and the creation of edge effects</p> <ul style="list-style-type: none"> ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development</p> <ul style="list-style-type: none"> ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Exposure to agrichemicals	<ul style="list-style-type: none"> ▪ Potential project impacts in relation to the uncontrolled release of contaminants which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Release of chemicals to water which may temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses 	<ul style="list-style-type: none"> ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields. Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities
	Grazing	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project 	<ul style="list-style-type: none"> ▪ -
	Predation by feral animals	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest and weed species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest and weed species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>allowing the species to survive more readily, and potentially at the expense of native species</p>	<p>identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> - Develop asset/activity specific pest and weed management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest and weed outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests and weeds rests with the landowner. Whilst not required to remove the pest or weed, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Fire	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<p><i>Onychogalea fraenata</i> (Bridled nailtail wallaby)</p> <p>EPBC Act Status: Endangered</p>	Hunting	Not relevant to the nature of the project	-
	Habitat degradation	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Genetic decline		
	Predation	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include:
	Competition	<ul style="list-style-type: none"> ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, 	<ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>allowing the species to survive more readily, and potentially at the expense of native species</p> <ul style="list-style-type: none"> Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact assessments 	<p>identification and management of pests at Santos GLNG assets and activities</p> <ul style="list-style-type: none"> Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Pedionomus torquatus</i> (Plains wanderer)</p> <p>EPBC Act Status: Critically endangered</p>	<p>Cultivation of native grassland</p> <p>Extinction threat due to low population size</p> <p>Overgrazing of habitat</p> <p>Inappropriate fire regimes</p> <p>Indirect species motility due to use of the insecticide Fenitrothion which is used to spray</p>	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) Domestic stock grazing activities are not relevant to the nature of the project Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely The Australian Plague Locust is identified in Appendix 2 of the PWMP as a pest species present within the Santos GLNG Upstream Project area and 	<ul style="list-style-type: none"> Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken Any exclusion zones such as breeding places will also be appropriately marked out 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative - A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities Any use of insecticides by Santos would be done so in accordance with label requirements or permit conditions, applied by personnel trained in chemical application methods and used in

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Australian plague locusts (<i>Chortoivetes terminifera</i>)</p> <p>Predation by exotic species (such as the fox and feral cat) and native species (such as the Spotter harrier [<i>Circus assimilis</i>] and Black falcon [<i>Falco subniger</i>])</p> <p>Habitat disturbance by rabbits</p> <p>Introduced trees within areas of species habitat</p>	<p>thus is subject to the plan</p> <ul style="list-style-type: none"> On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Australian Plague Locusts are a Class 2 declared pest under the provisions of the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread There is the potential that areas of species habitat could become contaminated through the use of insecticides <ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<p>accordance with Santos HSHS 08 – Chemical Management and Dangerous Goods</p> <ul style="list-style-type: none"> Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan <ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Rabbits, Feral cats and the European red fox are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls The rabbit, feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Petrogale penicillata</i> (Brush-tailed rock-wallaby)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Hunting</p> <p>Habitat degradation</p> <p>Genetic decline</p>	<p>Not relevant to the nature of the project</p> <ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<p>-</p> <ul style="list-style-type: none"> Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken Any exclusion zones such as breeding places will also be appropriately marked out 100 metre exclusion zones are to be created around identified active breeding places. Active

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Predation</p> <p>Competition</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species ▪ Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact assessments 	<p>breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed.</p> <ul style="list-style-type: none"> ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative <ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Phascolarctos cinereus</i> (Koala)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Loss and fragmentation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative

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	Vehicle strike	<ul style="list-style-type: none"> The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna 	<ul style="list-style-type: none"> Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, threatened species or threatened species habitat Access to and from Project locations is to occur along designated access tracks only Restricted zones of 50 m are to be established around breeding places that become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities To reduce noise and vibration, equipment including vehicles will be regularly maintained and is in good working order
	Predation by dogs	<ul style="list-style-type: none"> Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Wild dogs are Class 2 declared pests under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls The Wild dog is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
	Disease		
<p><i>Poephila cincta cincta</i> (Black-throated finch)</p> <p>EPBC Act Status: Endangered</p>	Loss and degradation of its preferred riparian grassland habitat, mainly due to the spread of pastoralism and associated changes in land management practices	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and 	<ul style="list-style-type: none"> Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar Where clearing within fauna habitat, all efforts to retain microhabitat such as logs and rocks will be taken. Where microhabitat features are removed they will be utilised in areas adjacent the clearing activities Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken
	Potential threat – Clearing and fragmentation of woodland, riverside habitats and wattle shrubland		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		operations (e.g. trees may be lopped and not felled to allow construction vehicle access)	<ul style="list-style-type: none"> Any exclusion zones such as breeding places will also be appropriately marked out 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented
	Potential threat – Degradation of habitat by domestic stock and rabbits, including alterations to fuel load, vegetation structure and wet season food availability	<ul style="list-style-type: none"> Domestic grazing activities are not subject to the nature of project works Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities Develop asset/activity specific pest management procedures as required during the GFD Project lifetime Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread Closely monitor controlled infestations for response to controls
	Potential threat – Invasion of habitat by exotic weed species, including exotic grasses		
	Potential threat – Predation by introduced predators		
	Potential threat – Illegal trapping of birds	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Potential threat – Hybridisation with escapees of the northern subspecies	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Potential threat – Alteration of habitat by changes in fire regime	<ul style="list-style-type: none"> Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> A buffer will be maintained around ignition sources Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
<p><i>Polytelis swainsonii</i> (Superb parrot)</p> <p>EPBC Act Status: Vulnerable</p>	Loss and degradation of habitat	<ul style="list-style-type: none"> The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or 	<ul style="list-style-type: none"> Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar
	Firewood collection		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements)</p> <ul style="list-style-type: none"> Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken Any exclusion zones such as breeding places will also be appropriately marked out 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented Where practicable, microhabitat will be relocated to adjacent areas of undisturbed vegetation prior to vegetation clearing
	Irrigation and regulated flows	<ul style="list-style-type: none"> Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity Disturbance of stream channel and associated habitat (eg pools, riffles etc) due to localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time Contamination of shallow groundwater has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) 	<ul style="list-style-type: none"> Infrastructure will be sited in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to identified threatened flora wherever practicable The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone Surface development exclusion areas apply to Ramsar sites High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources Clearing in and around wetlands will be avoided, where possible
	Timber production	<ul style="list-style-type: none"> Not relevant to the nature of the project 	
	Illegal removal of wild birds	<ul style="list-style-type: none"> Not relevant to the nature of the project 	-
	Road-kills	<ul style="list-style-type: none"> The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna 	<ul style="list-style-type: none"> Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, threatened species or threatened species habitat Access to and from Project locations is to occur along designated access tracks only Restricted zones of 50 m are to be established around breeding places that become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities To reduce noise and vibration, equipment including vehicles will be regularly maintained and is in good working order
	Poisoning	<ul style="list-style-type: none"> Potential project impacts in relation to the uncontrolled release of contaminants which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> Release of chemicals to water which may temporally increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) Contamination of shallow groundwater which has the potential to occur 	<ul style="list-style-type: none"> Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with

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		<p>during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited)</p> <ul style="list-style-type: none"> - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses 	<p>excessive dust deposition</p> <ul style="list-style-type: none"> ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities
<p><i>Pteropus poliocephalus</i> (Grey-headed flying-fox)</p> <p>EPBC Act Status: Vulnerable</p>	<p>Habitat loss</p>	<p>Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact assessments</p>	<ul style="list-style-type: none"> ▪ Where habitat trees need to be removed, the procedures for removing habitat trees detailed in the Upstream SSMP will be implemented
	<p>Disease</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	<p>Electrocution on powerlines, entanglement in netting and on barbed-wire</p>	<ul style="list-style-type: none"> ▪ The development of project infrastructure has the potential to result in injury/mortality of fauna ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term 	<ul style="list-style-type: none"> ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order
	<p>Deliberate destruction associated with commercial horticulture</p>	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	<p>-</p>
	<p>Negative public attitudes and conflict with humans</p>	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, threatened species or threatened species habitat
<p>Competition with Black flying-foxes</p>	<ul style="list-style-type: none"> ▪ Impacts as a result of natural processes and influences, ie competition with native animals, are not subject to the GFD Project impact 	<p>-</p>	

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	Climate change	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
<p><i>Rheodytes leukops</i> (Fitzroy River turtle)</p> <p>EPBC Act Status: Vulnerable</p>	Loss and disturbance of habitat from agriculture	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ 500 metre exclusion zones are to be created around Fitzroy River turtle nests identified by an approved Ecologist during pre-clearance survey work during infrastructure planning ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Blasting should be avoided, where practicable, around areas such as wetlands and watercourses ▪ Where practicable, microhabitat such as logs and rocks, semi-submerged logs and snags will be relocated to an adjacent undisturbed area ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Damming of rivers	<ul style="list-style-type: none"> ▪ Potential project impacts to aquatic environmental values that may result 	<ul style="list-style-type: none"> ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the

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		<p>from construction, operations and decommissioning activities of the GFD Project include:</p> <ul style="list-style-type: none"> - Disturbance of stream channel and associated habitat (eg pools, riffles etc) – Localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity - Loss of abundance and diversity of riparian vegetation and aquatic biota, including groundwater dependent ecosystems – Generally localised impact associated with clearing and traffic movement, which may be long-term due to time required to restore pre-disturbance species composition/abundance before dependent fauna return 	<p>protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows:</p> <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ■ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ■ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ■ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ■ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ■ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
	<p>Pollution and siltation of river and creek habitats</p>	<ul style="list-style-type: none"> ■ Potential project impacts in relation to pollution which may arise from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Uncontrolled release of waste and inefficient use of resources - Release of sediment to water which may temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses - Release of chemicals to water which may temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Contamination of shallow groundwater which has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination as a result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ■ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working ■ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ■ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition ■ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities ■ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ■ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields

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	<p>Predation of eggs by Foxes, Pigs, Dingos, Feral Cats, Goannas and Water rats</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species ▪ Impacts as a result of natural processes and influences, ie predation of eggs from native animals, are not subject to the GFD Project impact assessments 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats, feral pigs and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ The feral pig is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Rostratula australis</i> (Australian painted snipe)</p> <p>EPBC Act Status: Endangered</p>	<p>Loss and degradation of wetlands through drainage and diversion of water</p>	<ul style="list-style-type: none"> ▪ Potential project impacts to aquatic environmental values that may result from construction, operations and decommissioning activities of the GFD Project include: <ul style="list-style-type: none"> - Sediment to water – May temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses. Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible - Chemicals to water – May temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity - Disturbance of stream channel and associated habitat (eg pools, riffles etc) – Localised change associated with GFD infrastructure (eg waterway crossings) or activities (eg stream discharge) may apply for the life of the infrastructure activity, however change can generally be reversed by natural flows over time - Loss of abundance and diversity of riparian vegetation and aquatic biota, including groundwater dependent ecosystems – Generally localised impact associated with clearing and traffic movement, which may be long-term due to time required to restore pre-disturbance species composition/abundance before dependent fauna return - Contamination of shallow groundwater - Has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination – Has the potential to occur as result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows: <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Clearing in and around wetlands will be avoided, where possible ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Blasting should be avoided, where practicable, around areas with congregations of birds, such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened fauna habitat ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored

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			<p>within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i></p> <ul style="list-style-type: none"> ▪ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the <i>Santos GLNG Upstream Erosion and Sediment Control Plan</i> ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the <i>Santos GLNG Upstream, Rehabilitation Management Plan</i> ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
	Grazing and trampling, nutrient enrichment and disturbance by livestock to species habitat	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project 	-
	Potential threat - Climate change	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
	Potential threat – Weed invasion	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act
	Potential threat – Predation by feral animals		

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			<ul style="list-style-type: none"> - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
	Potential threat – Coastal port and infrastructure development	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
	Potential threat – Shale oil mining	<ul style="list-style-type: none"> ▪ Not relevant to the nature of the project 	-
<p><i>Turnix melanogaster</i> (Black-breasted button-quail)</p> <p>EPBC Act Status: Vulnerable</p>	Loss of habitat and habitat fragmentation due to clearing for a range of purposes (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development)	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of significant fauna habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Threatened fauna habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken ▪ Any exclusion zones such as breeding places will also be appropriately marked out ▪ 100 metre exclusion zones are to be created around identified active breeding places. Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed. ▪ Clearing activities within and adjacent to threatened fauna habitat will be supervised by an Environmental Representative
	Habitat loss or degradation due to inappropriate fire regimes	<ul style="list-style-type: none"> ▪ Altered fire regimes (i.e. increased frequency) caused by Project activities may over time also result in vegetation changes, further equating to the loss of habitat ▪ The risk of fire associated with Project activities is considered unlikely 	<ul style="list-style-type: none"> ▪ A buffer will be maintained around ignition sources ▪ Fire management and response will be conducted in accordance with the relevant Santos GLNG Bushfire Management Plan, the Contingency Plan for Emergency Environmental Incidents, and in consultation with local regulatory authorities
	Habitat degradation as a result of domestic stock and feral pigs utilising Black-breasted button-quail habitat	<ul style="list-style-type: none"> ▪ Domestic stock grazing activities are not relevant to the nature of the project ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing
	Predation by feral animals	<ul style="list-style-type: none"> ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			<p>measures to reduce the risk of further spreading the pest or weed.</p> <ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats, feral pigs and the European red fox are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat and the European red fox are identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ The feral pig is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP

3.0 EPBC Act Migratory Species subject to the Santos GLNG GFD EIS

3.1 Conservation Advice Cross Reference Table

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
<p><i>Apus pacificus</i> (Fork-tailed swift)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>“Threat Abatement Plan for predation by feral cats” (DOTE 2015)</p>	<ul style="list-style-type: none"> ▪ The “Threat Abatement Plan for predation by feral cats” (DotE 2015) identifies the Fork-tailed swift as a threatened species that may be adversely affected by feral cats ▪ The goal of the Threat Abatement Plan is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for predation by feral cats” (DotE 2015) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The feral cat is a Class 2 declared species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Ardea ibis</i> (Cattle egret)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Cattle egret does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Ardea modesta</i> (Eastern great egret)</p>	<p>The DotE SPRAT profile for the Eastern great egret does not identify any approved or adopted recovery plans for the species</p>				

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
EPBC Act Status: Migratory, Marine					
<p><i>Calidris acuminata</i> (Sharp-tailed sandpiper)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>“Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The “Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for the Sharp-tailed sandpiper are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbances - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Sharp-tailed sandpiper. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report documents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the “Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Sharp-tailed sandpiper were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the “Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005) include: 	<ul style="list-style-type: none"> ▪ Section 9.50 provides a species profile for the Sharp-tailed sandpiper. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>“Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Sharp-tailed sandpiper is covered by the “Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in ‘A Directory of Important Wetlands in Australia’ which were included for their 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia'			
<p><i>Calidris ferruginea</i> (Curlew sandpiper)</p> <p>EPBC Act Status: Critically Endangered, Migratory, Marine</p>	<p>"Approved Conservation Advice for <i>Calidris ferruginea</i> (Curlew Sandpiper)" (TSSC 2015b)</p>	<ul style="list-style-type: none"> ▪ The Conservation Advice (TSSC 2015b) provides information on the species description, distribution, biology and ecology and habitat requirements ▪ Threats to the Curlew sandpiper identified in the Conservation Advice include: <ul style="list-style-type: none"> - Anthropogenic disturbances - Habitat loss and degradation from pollution, changes to water regimes and invasive plants ▪ The Curlew sandpiper triggers conservation assessment criteria 1 'Population size reduction' for listing as Critically Endangered. The TSSC considers that the species has undergone a very severe reduction in numbers over three generation lengths (23 years for this assessment), equivalent to at least 80.8% and the reduction has not ceased ▪ Conservation and management actions identified in the Conservation Advice include: <ul style="list-style-type: none"> - Work with governments along the East Asian – Australasian Flyway to prevent destruction of key migratory staging sites - Support initiatives to protect and manage key staging sites of Curlew sandpiper - Maintain and improve protection of roosting and feeding sites in Australia - Incorporate requirements for curlew sandpiper into coastal planning and management - Manage important sites to identify, control and reduce the spread of invasive species - Manage disturbance at important sites when Curlew sandpipers are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary beach closures - Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Curlew sandpiper. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Curlew sandpiper were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for the Curlew sandpiper are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbances - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Curlew sandpiper. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Curlew sandpiper were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Curlew sandpiper is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>shorebirds across Australia to ensure that healthy populations remain viable into the future</p> <ul style="list-style-type: none"> - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 	<p>The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data</p>		
<p><i>Gallinago hardwickii</i> (Latham's snipe) EPBC Act Status: Migratory, Marine</p>	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for Latham's snipe are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbances - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Latham's snipe. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) 	<ul style="list-style-type: none"> ▪ Section 9.51 provides a species profile for Latham's snipe. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Latham's snipe were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Latham's snipe is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>shorebirds across Australia to ensure that healthy populations remain viable into the future</p> <ul style="list-style-type: none"> - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 	<p>The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data</p>		
	<p>"Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The "Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008b) provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan provides information on developing a national approach to fox management 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the "Threat Abatement Plan for Predation by the European Red Fox" (DEWHA 2008a) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The European red fox is a Class 2 declared species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species</p> <ul style="list-style-type: none"> Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<p>declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread</p> <ul style="list-style-type: none"> Closely monitor controlled infestations for response to controls The European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Haliaeetus leucogaster</i> (White-bellied sea-eagle) EPBC Act Status: Marine</p>	<p>"Threatened Tasmanian Eagles Recovery Plan 2006-2010" (Threatened Species Section 2006)</p>	<ul style="list-style-type: none"> The Recovery Plan (Threatened Species Section 2006) provides information on the White-bellied sea-eagles description, life history, biology and ecology and distribution The Recovery Plan defines habitat critical to the species survival as nesting habitat Threats to the White-bellied sea-eagle identified in the Recovery Plan include: <ul style="list-style-type: none"> Loss of habitat, specifically nesting habitat Nest disturbance Unnatural mortality (ie shooting, poisoning, trapping, collision with powerlines, vehicles, fences etc) Decline in mean age of the population Decline in recruitment The overall objective of the Recovery Plan is to increase the breeding success of the species by protecting nesting habitat from destruction, modification and disturbance and by minimising both the modification of foraging habitat and the occurrence of human-related mortality Recovery actions presented in the Recovery Plan include: <ul style="list-style-type: none"> Strategic planning, using predictive habitat models Habitat protection Monitoring species and breeding success Mitigation measures to reduce bird mortality and injuries Education to promote eagle conservation Research to assess effectiveness of current management measures and investigate eagle breeding dynamics 	<ul style="list-style-type: none"> Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the White-bellied sea-eagle. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to the White-bellied sea-eagle in the Recovery Plan (Threatened Species Section 2006) include: <ul style="list-style-type: none"> Habitat loss from vegetation clearing/removal (section 5.2.1) Fauna species injury or mortality (section 5.2.2) Noise, dust and artificial lighting impacts (Section 5.2.9) Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Latham's snipe were assessed Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory 	<ul style="list-style-type: none"> Section 9.52 provides a species profile for White-bellied sea-eagle. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>Shorebirds” (AGDEH 2005) include:</p> <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - 100 metre exclusion zones are to be created around identified active threatened breeding places, including MNES species - Active breeding places are to be monitored by a suitably qualified person to ensure the breeding site has been vacated prior to the buffer being removed - Where practicable, construction works should be timed so as to avoid threatened bird breeding periods, including MNES species - Where clearing within vegetated fauna habitat, all efforts to retain mature trees will be taken - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals 		
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The “Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b) provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan provides information on developing a national approach to fox management 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008a) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The European red fox is a Class 2 declared species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>management of pest species</p> <ul style="list-style-type: none"> Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 		<p>must take the practical precautions to prevent furthering their spread</p> <ul style="list-style-type: none"> Closely monitor controlled infestations for response to controls The European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Hirundapus caudacutus</i> (White-throated needle tail)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the White-throated needle tail does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Hydroprogne caspia</i> (Caspian tern)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Caspian tern does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Limosa limosa</i> (Black-tailed godwit)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, their population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures Information regarding the breeding area, habitat preferences and population numbers for Black-tailed godwit are presented in the document Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> Loss of habitat Modification and degradation of habitat Anthropogenic disturbances Global climate change Introduced flora and fauna pest species 	<ul style="list-style-type: none"> Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Black-tailed godwit. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> Habitat loss from vegetation clearing/removal (section 5.2.1) Fauna species injury or mortality (section 5.2.2) Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) Reduction in connectivity in biodiversity corridors (Section 5.2.5) Edge effects (Section 5.2.6) 	<ul style="list-style-type: none"> Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Black-tailed godwit were assessed ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Black-tailed godwit is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>future</p> <ul style="list-style-type: none"> - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 	<p>disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data</p>		
<p><i>Merops ornatus</i> (Rainbow bee-eater) EPBC Act Status: Migratory, Marine</p>	<p>"Threat Abatement Plan for the biological effects, including lethal toxic ingestion, caused by cane toads" (DSEWPAC 2011)</p>	<ul style="list-style-type: none"> ▪ The Threat Abatement Plan (DSEWPAC 2011) has three objectives: <ul style="list-style-type: none"> - To identify priority native species and ecological communities at risk from the impact of Cane toads - To reduce the impact of Cane toads on populations of priority native species and ecological communities - To communicate information about Cane toads and their impacts ▪ Priority native species and ecological communities are those that have been determined through peer-reviewed research to be highly vulnerable at population level to negative impacts from the presence of Cane toads ▪ The Rainbow bee-eater is identified in the Threat Abatement Plan as a species for which there is suspicion, but not scientific certainty, of negative population level impacts on a national scale caused by Cane toads ▪ The Cane toad is suspected to have a negative impact on the Rainbow bee-eater via the usurpation of burrows. The degree of impact is unknown ▪ Management actions identified in the document include the following: <ul style="list-style-type: none"> - Identify priority native species, ecological communities and off-shore islands currently known to be at high to moderate risk due to the Cane toad - Identify the ways in which Cane toads impact priority native species and ecological communities 	<ul style="list-style-type: none"> ▪ Section 5.2 of the Terrestrial ecology and MNES Reports provide a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 'Mitigation measures and management framework' references the Santos Pest and Weed Management Plan 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the 'introduction of pests and weeds' to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ The Cane toad is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<ul style="list-style-type: none"> - Where impact is unknown but may be high, establish and support research to further understand the impact of Cane toads on native species and ecological communities. Where appropriate, research ways to assist with the recovery of priority native species and ecological communities - Develop a prioritisation tool to guide allocation of resources for protection of native species and communities 	<p>(PWMP) as a key mechanism in the management of pest species</p> <ul style="list-style-type: none"> ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species 		
	<p>“Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b)</p>	<ul style="list-style-type: none"> ▪ The “Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008b) provides information on controlling foxes including baiting, biological control, barriers, habitat management, shooting and bounties ▪ The Threat Abatement Plan discusses factors affecting fox control including impacts on non-target species, effects of wild rabbits, dingoes and feral cats, animal welfare concerns and cultural issues ▪ The Threat Abatement Plan provides information on developing a national approach to fox management 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through the habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the “Threat Abatement Plan for Predation by the European Red Fox” (DEWHA 2008a) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The European red fox is a Class 2 declared species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Myiagra cyanoleuca</i> (Satin)</p>	<p>The DotE SPRAT profile for the Satin flycatcher does not identify any approved or adopted recovery plans for the species</p>				

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
flycatcher) EPBC Act Status: Migratory, Marine					
<i>Monarcha melanopsis</i> (Black faced monarch) EPBC Act Status: Migratory, Marine	“Threat Abatement Plan for predation by feral cats” (DOTE 2015)	<ul style="list-style-type: none"> ▪ The ‘Threat Abatement Plan for predation by feral cats’ (DotE 2015) identifies the Black faced monarch as a threatened species that may be adversely affected by feral cats ▪ The goal of the Threat Abatement Plan is to minimise the impact of feral cats on biodiversity in Australia by: <ul style="list-style-type: none"> - Protecting affected threatened species - Preventing further species and ecological communities from becoming threatened ▪ The Threat Abatement Plan has four objectives: <ul style="list-style-type: none"> - Effectively control feral cats in different landscapes - Improve effectiveness of existing control options for feral cats - Develop or maintain alternative strategies for threatened species recovery - Increase public support for feral cat management and promote responsible cat ownership 	<ul style="list-style-type: none"> ▪ Section 5.2 of the reports provides a description of potential project impacts which are considered and assessed as part of the EIS. Section 5.2.4 provides for specific reference to the displacement of MNES species from the invasion of weed and pest species as a potential impact captured in the EIS impact assessment. The section acknowledges potential for the proliferation of pest fauna species as an indirect project impact, which may have cumulative effects to increase pest proliferation. The impact description accounts for the impacts of pest proliferation occurring over a long time period, with potential impacts likely to be long term and affect all MNES receptors in the project area. Specific reference is made that unmitigated, the project activities have the potential to encourage pest fauna dispersal across the surrounding landscape due to habitat removal, noise disturbance and human presence. Construction of access tracks and other linear infrastructure through large patches of intact vegetation may result in the establishment of pest species (particularly foxes and cats) into areas where they are currently absent of in low numbers. ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of the displacement of MNES species from invasion of pest species ▪ Section 5.4.2, Table 5.5 ‘Mitigation measures and management framework’ references the Santos Pest and Weed Management Plan (PWMP) as a key mechanism in the management of pest species ▪ Section 7.2 discusses the ‘Adverse Impact Assessment Methodology’ which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species and the potential project impact to the predation vulnerability of the target species 	<ul style="list-style-type: none"> ▪ Section 5.0 provides a discussion of the potential impact of the ‘introduction of pests and weeds’ to significant species as a result of the project. The section notes that there is some potential for increased movement of pest fauna which are already present in the CSG fields through habitat modification which allows pest species to survive more readily, and potentially at the expense of native species ▪ Section 6.2.7 provides management measures for significant migratory bird species, including commitment to pest management via the implementation of the PWMP 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Measures within the PWMP relevant to the key objectives of the ‘Threat Abatement Plan for predation by feral cats’ (DotE 2015) include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The Feral cat is a Class 2 declared pest species under the provisions of the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<i>Monarcha trivirgatus</i> (Spectacled monarch) EPBC Act Status: Migratory, Marine	The DotE SPRAT profile for the Spectacled monarch does not identify any approved or adopted recovery plans for the species				
<i>Pandion haliaetus</i> (Osprey) EPBC Act Status: Migratory,	The DotE SPRAT profile for the Osprey does not identify any approved or adopted recovery plans for the species				

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
Marine					
<p><i>Phaethon lepturus</i> (White-tailed tropic bird)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the White-tailed tropic bird does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Plegadis falcinellus</i> (Glossy ibis)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Glossy ibis does not identify any approved or adopted recovery plans for the species</p>				
<p><i>Pluvialis fulva</i> (Pacific golden plover)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>“Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The “Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for Pacific golden plover are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbance - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Pacific golden plover. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the “Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds” (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 ‘Significance assessment of potential ecological impacts’ provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Pacific golden plover were assessed 	<ul style="list-style-type: none"> ▪ Section 9.63 provides a species profile for the Pacific golden plover. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Pacific golden plover is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
		<p>population</p> <ul style="list-style-type: none"> - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 			
<p><i>Tringa glareola</i> (Wood sandpiper) EPBC Act Status: Migratory, Marine</p>	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds is presented including species biological and ecological characteristics, their population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for Wood sandpiper are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbance - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Wood sandpiper. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Wood sandpiper were 	<ul style="list-style-type: none"> ▪ Section 9.64 provides a species profile for the Wood sandpiper. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plans, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Wood sandpiper is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to limited available population data 		

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		<ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 			
<p><i>Tringa nebularia</i> (Common greenshank)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information is presented on the species biological and ecological characteristics, their population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for Common greenshank are presented in the Conservation Plan ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbance - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Common greenshank. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The 	<ul style="list-style-type: none"> ▪ Section 9.61 provides a species profile for the Common greenshank. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

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			<p>aforementioned impacts relevant to the threats identified to the Common greenshank were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Common greenshank is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the target species. Important habitat is used as a surrogate for important populations due to 		

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		identifying important habitat. <ul style="list-style-type: none"> ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 	limited available population data		
<p><i>Tringa stagnatilis</i> (Marsh sandpiper)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>"Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005)</p>	<ul style="list-style-type: none"> ▪ The "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) provides information on the migratory shorebirds subject to the Wildlife Conservation Plan (AGDEH 2006). Information on migratory shorebirds presented including species biological and ecological characteristics, population status within Australia and the East Asian – Australasian Flyway, current and potential species threats and conservation measures ▪ Information regarding the breeding area, habitat preferences and population numbers for Marsh sandpiper are presented in the document ▪ Threats to migratory shorebirds identified in the document include: <ul style="list-style-type: none"> - Loss of habitat - Modification and degradation of habitat - Anthropogenic disturbances - Global climate change - Introduced flora and fauna pest species 	<ul style="list-style-type: none"> ▪ Section 4.2.4 and Appendix I of the MNES Report describes a likelihood of occurrence assessment which was conducted for migratory fauna species, including the Marsh sandpiper. The likelihood of occurrence assessment includes a description of the species distribution and habitat requirements ▪ Table 4.18 of the MNES Report presents the presence and relevance (including habitat) of MNES receptors per GFD project tenure ▪ Discussed in Section 4.3 of the MNES Report, the outcomes of the likelihood of occurrence assessment were used to identify receptors to the EIS impact assessment. Table 4.17 presents the MNES values present within the project area and their assigned value and vulnerability. Habitat for internationally important species was found to have low sensitivity and high exposure to project impact ▪ Section 5.2 of the reports provides a description of potential project impacts to conservation significant species. Impacts assessed which are relevant to the threats identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Habitat loss from vegetation clearing/removal (section 5.2.1) - Fauna species injury or mortality (section 5.2.2) - Displacement of MNES species from invasion of weed and pest species (Section 5.2.4) - Reduction in connectivity in biodiversity corridors (Section 5.2.5) - Edge effects (Section 5.2.6) - Habitat fragmentation (Section 5.2.7) - Barrier effects (Section 5.2.8) - Noise, dust and artificial lighting impacts (Section 5.2.9) - Increase in litter (Section 5.2.10) ▪ Section 5.4.3, Table 5.6 'Significance 	<ul style="list-style-type: none"> ▪ Section 9.62 provides a species profile for the Marsh sandpiper. The profile provides information on the biology, ecology, distribution, reproduction and habitat characteristics for the species. The information used to develop the species profile was predominately sourced from the DotE SPRAT and source documents ▪ The species profile was used to define habitat assumptions which informed the species habitat mapping conducted for the project area. The habitat mapping was used in constrains planning and impact assessments ▪ Section 5.0 provides a discussion of the potential impacts to significant species as a result of the project ▪ Section 6.2.7 provides management measures for significant migratory bird species 	<ul style="list-style-type: none"> ▪ The Pest and Weed Management Plan (PWMP) provides a framework for Santos GLNG to prevent and minimise the introduction and dispersal of pest and weed species ▪ The PWMP identifies high priority pest and weed species. Priority placed on individual pest and weed species is consistent with the recommendations and emphasis of Local Government pest and weed management plants, strategies and legislative requirements ▪ A pest and weed management strategy is presented which includes measures to prevent and minimise the spread of pest and weed species. Table 8 of the PWMP contains general principles and measures of pest and weed management control, including prioritising control programs based on considerations of risk to factors such as areas of environmental value (which would encompass habitat areas for MNES species) ▪ The PWMP provides provision to engage stakeholders, including landholders and local communities, in the identification and management of pest and weed species

Species	Relevant conservation advices and threat abatement plans	Key points relevant to the target species	Reference in the GLNG GFD EIS Terrestrial Ecology and MNES Technical Assessment Reports	Reference in the GLNG Upstream SSMP (Appendix to the GLNG GFD EIS)	Reference in the GLNG Upstream PWMP (Appendix to the GLNG GFD EIS)
			<p>assessment of potential ecological impacts' provides for an impact assessment of potential project impacts on MNES species. The aforementioned impacts relevant to the threats identified to the Marsh sandpiper were assessed</p> <ul style="list-style-type: none"> ▪ Management measures are discussed in Section 5.4.2, Table 5.5 'Mitigation measures and management framework'. Management measures are considered in the assessment of residual impacts on MNES species, including migratory species. Management measures with similar intent to the recovery and threat abatement actions identified to migratory species in the "Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2005) include: <ul style="list-style-type: none"> - Siting infrastructure in accordance with the Environmental Protocol for Constraints Planning and Field Development, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable - Where a significant residual adverse impact is to occur to MNES species, including migratory species, an appropriate offset must be considered in accordance with the Santos GLNG Offsets Strategy - During migratory periods, known populations in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals - Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible - Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places - Erosion and sediment control for Project disturbances will be implemented in accordance with the Santos GLNG Upstream Erosion and Sediment Control Plan. - Identify, monitor and prioritise the appropriate management of pest and weed species 		
	<p>"Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006)</p>	<ul style="list-style-type: none"> ▪ The Marsh sandpiper is covered by the "Wildlife Conservation Plan for Migratory Shorebirds" (AGDEH 2006) ▪ The objectives of the Conservation Plan (AGDEH 2006) are to: <ul style="list-style-type: none"> - Increase international co-operation for the conservation of migratory shorebirds and their habitat - Identify, protect and sustainably manage a network of important habitats for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future - Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management measures 	<ul style="list-style-type: none"> ▪ Section 3.2 of the Terrestrial Ecology and MNES Reports detail the ecological field assessments which were undertaken within the Project area. The survey results informed habitat mapping for MNES species, including migratory species ▪ Section 7.2 discusses the 'Adverse Impact Assessment Methodology' which is used to determine the nature and extent of impact on a MNES fauna species as a result of the project. The AIAM provides for a species level assessment of impact, by assessing the resilience of the species and its habitat to disturbance. The species resilience assessments which form part of the AIAM consider key threatening processes to the target species. The AIAM also considers impacts to important populations by assessing impacts to areas of important habitat for the 		

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		<ul style="list-style-type: none"> - Raise awareness of migratory shorebirds and the importance of conserving them ▪ The Conservation Plan specifies criteria for identifying important habitat ▪ Criteria for determining sites of international importance include: <ul style="list-style-type: none"> - Sites which regularly support 1% of the flyway population - Sites which regularly support 20,000 or more shorebirds ▪ Criteria for determining habitat of national importance are to be established as an action of the Conservation Plan. Until criteria are established, information on sites of national importance can be found from the following: <ul style="list-style-type: none"> - Sites in 'A Directory of Important Wetlands in Australia' which were included for their importance to migratory shorebirds. - Nationally important sites for migratory shorebirds as identified in the Watkins 1993 Report, 'A National Plan for Shorebird Conservation in Australia' 	<p>target species. Important habitat is used as a surrogate for important populations due to limited available population data</p>		

3.2 Impact and Management Cross Reference Table

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
<p><i>Apus pacificus</i> (Fork-tailed swift)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Predation by feral cats</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP
<p><i>Ardea ibis</i> (Cattle egret)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Cattle egret does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Ardea modesta</i> (Eastern great egret)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Eastern great egret does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Calidris acuminata</i> (Sharp-tailed sandpiper)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) <p>Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations</p>	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	<p>Anthropogenic disturbances</p>	<p>(e.g. trees may be lopped and not felled to allow construction vehicle access)</p> <ul style="list-style-type: none"> ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna ▪ Construction and operations have the potential to disturb the behaviour and movements of some fauna. Disturbances may include some disruption of breeding activities. Most Project related disturbances are expected to be short-term and occur predominantly during construction. ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term 	<p>Environmental Representative</p> <ul style="list-style-type: none"> ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around nests that have become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities ▪ Blasting should be avoided, where possible, around areas with large congregations of migratory birds such as wetlands. ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on migratory birds habitat. ▪ Hazardous substances with the potential to impact migratory birds will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan. ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order
	<p>Global climate change</p>	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
	<p>Introduced flora and fauna pest species</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>species across the region</p> <ul style="list-style-type: none"> ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Calidris ferruginea</i> (Curlew sandpiper)</p> <p>EPBC Act Status: Critically Endangered, Migratory, Marine</p>	<p>Anthropogenic disturbances</p> <p>Habitat loss and degradation from pollution and changes to water regimes</p>	<ul style="list-style-type: none"> ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna ▪ Construction and operations have the potential to disturb the behaviour and movements of some fauna. Disturbances may include some disruption of breeding activities. Most Project related disturbances are expected to be short-term and occur predominantly during construction. ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term <p>Potential project impacts to aquatic environmental values that may result from construction, operations and decommissioning activities of the GFD Project include:</p> <ul style="list-style-type: none"> - Sediment to water – May temporarily increase turbidity levels in the vicinity of the contamination source and downstream as the plume disperses. Following significant rain events, run-off from disturbed areas may result in the build-up of sediment in watercourses and waterholes. Sediment deposition to land or waterways has the potential to have an impact on flora, with some potential impact on aquatic fauna possible - Chemicals to water – May temporarily increase toxicity (depending on the properties of the chemical and rate of processes such as biodegradation) in the vicinity of the source and downstream as the plume disperses, however some toxins may accumulate in the environment over time (eg substrate, vegetation etc) - Altered flow regime – Increased or changed flow regimes as a result of GFD Project activities (eg stream discharge) may disrupt seasonal 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around nests that have become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities. ▪ Blasting should be avoided, where possible, around areas with large congregations of migratory birds such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on migratory birds habitat. ▪ Hazardous substances with the potential to impact migratory birds will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan. ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order <p>The <i>Environmental Protocol for Constraints Planning and Field Development</i> identifies the protection of surface water resources (wetlands, lakes, watercourses and flood prone areas) as a planning constraint for the placement and design of GFD Project infrastructure. The constraints protocol applies as follows:</p> <ul style="list-style-type: none"> - No-go area constraint applies to spring vents and/or spring complexes protected under the EPBC Act plus a 200 m buffer zone, wetlands of high ecological significance, and wetlands of national importance plus a 200 m buffer zone - Surface development exclusion areas apply to Ramsar sites - High constraint areas include watercourses plus a 100 m buffer, general ecologically significant wetlands and wetlands of other environmental value, and all other spring vents and spring complexes plus a 200 m primary buffer - Moderate constraint areas include a 100 m secondary buffer around spring vents and spring complexes protected under the EPBC Act and the 200 m primary buffers <p>A <i>Water Resource Management Plan</i> has been developed to proactively detail how Santos GLNG manages and monitors potential adverse impacts to water resources</p>

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		<p>patterns and affect dependent riparian vegetation and fauna, resulting in long-term changes to species diversity</p> <ul style="list-style-type: none"> - Contamination of shallow groundwater - Has the potential to occur during the construction phase as result of prolonged spillage of hydrocarbons (fuels, hydraulic oils and lubricants) from construction activities, however this is considered to localised and limited) - Soil contamination – Has the potential to occur as result of spillage of hydrocarbons from construction machinery, particularly during refuelling, or from fuel or chemical storage tanks 	<ul style="list-style-type: none"> ▪ All vegetation clearing within identified threatened fauna habitat must comply with clearing related approval conditions (both statutory and internal approvals) ▪ Blasting should be avoided, where practicable, around areas with congregations of birds, such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on threatened fauna habitat ▪ Hazardous substances with the potential to impact threatened fauna or their habitat will be stored within contained areas and managed in accordance with the <i>Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan</i> ▪ Where land disturbances occur in aquatic fauna habitats, all efforts to retain mature trees and maintain water quality will be taken ▪ Where possible watercourse and wetland crossings will be selected to avoid areas containing deep pools and river sandbanks likely to be suitable for breeding places ▪ Erosion and sediment control for Project disturbances will be implemented in accordance with the <i>Santos GLNG Upstream Erosion and Sediment Control Plan</i> ▪ To minimise erosion and restore natural functions as far as possible, areas where threatened flora habitat was cleared or impacted during construction will be graded and contoured to ensure that the area is safe, stable and non-polluting as far as practicable ▪ With the exception of areas subject to operational or maintenance requirements, revegetation will commence to achieve consistency with the floristic composition of the adjacent threatened flora habitat where required by the <i>Santos GLNG Upstream, Rehabilitation Management Plan</i> ▪ The <i>Waste Management Plan</i> details the strategy, methods and controls for managing waste generated by Santos GLNG activities ▪ The <i>Chemical and Fuel Management Plan</i> details the appropriate storage and handling procedures of chemicals and fuels ▪ The <i>Land Release Management Plan</i> addresses the management of releases of water to land in Santos GLNG gas fields
	Loss, modification and degradation of habitat	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of ‘islands’ and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a ‘barrier’. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an Environmental Representative ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with
	Global climate change	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy

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	<p>Habitat loss and degradation from invasive plants</p> <p>Introduced fauna pest species</p>	<ul style="list-style-type: none"> - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year <ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<p>efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to:</p> <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board <ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Gallinago hardwickii</i> (Latham's snipe)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat

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Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
	Introduced flora and fauna pest species	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Haliaeetus leucogaster</i> (White-bellied sea-eagle)</p> <p>EPBC Act Status: Marine</p>	<p>Loss of habitat, specifically nesting habitat</p> <p>Nest disturbance</p> <p>Unnatural mortality (ie shooting, poisoning, trapping, collision with powerlines, vehicles, fences etc)</p> <p>Decline in mean age of the population</p> <p>Decline in recruitment</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna ▪ Construction and operations have the potential to disturb the behaviour and movements of some fauna. Disturbances may include some disruption of breeding activities. Most Project related disturbances are expected to be short-term and occur predominantly during construction. ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an Environmental Representative ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around nests that have become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid

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			<p>fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging</p> <ul style="list-style-type: none"> ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities. ▪ Blasting should be avoided, where possible, around areas with large congregations of migratory birds such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on migratory birds habitat. ▪ Hazardous substances with the potential to impact migratory birds will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan. ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order
<p><i>Hirundapus caudacutus</i> (White-throated needle tail)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the White-throated needle tail does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Hydroprogne caspia</i> (Caspian tern)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Caspian tern does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Limosa limosa</i> (Black-tailed godwit)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an Environmental Representative ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with
	<p>Anthropogenic disturbances</p>	<ul style="list-style-type: none"> ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna ▪ Construction and operations have the potential to disturb the behaviour 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
		<p>and movements of some fauna. Disturbances may include some disruption of breeding activities. Most Project related disturbances are expected to be short-term and occur predominantly during construction.</p> <ul style="list-style-type: none"> ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term 	<ul style="list-style-type: none"> ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around nests that have become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and utilised for all other Project traffic ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities. ▪ Blasting should be avoided, where possible, around areas with large congregations of migratory birds such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on migratory birds habitat. ▪ Hazardous substances with the potential to impact migratory birds will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan. ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order
	<p>Global climate change</p>	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
	<p>Introduced flora and fauna pest species</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed.

Species	Species threats identified in relevant conservation advices and threat abatement plans	GLNG GFD Project impacts	GLNG GFD Project management measure
			<ul style="list-style-type: none"> - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the <i>Land protection (Pest and Stock Route Management) Act 2002</i> (Qld) (LP Act) - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls
<p><i>Merops ornatus</i> (Rainbow bee-eater)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The Cane toad is suspected to have a negative impact on the Rainbow bee-eater via the usurpation of burrows. The degree of impact is unknown</p> <p>Predation by the European red fox</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> ▪ Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities ▪ Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties ▪ Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities ▪ Develop asset/activity specific pest management procedures as required during the GFD Project lifetime ▪ Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. ▪ On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. The European red fox is a Class 2 declared pests under the LP Act ▪ On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread ▪ Closely monitor controlled infestations for response to controls ▪ The European red fox is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP ▪ The Cane toad is identified in Appendix 2 as a pest species present within the Santos GLNG Upstream Project area and thus subject to the PWMP
<p><i>Myiagra cyanoleuca</i> (Satin flycatcher)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Satin flycatcher does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Monarcha melanopsis</i> (Black faced monarch)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Predation by feral cats</p>	<ul style="list-style-type: none"> ▪ Pests and weeds can be spread very easily across a landscape either intentionally or unintentionally via both man-made and natural mechanisms ▪ Activities conducted throughout the Santos GLNG Upstream Project Area have the potential to inadvertently introduce and spread pest and weed species across the region ▪ There is potential for increased movement of pest fauna which are already present in the CSG fields through the changing to habitat modification, allowing the species to survive more readily, and potentially at the expense of native species 	<ul style="list-style-type: none"> ▪ The PWMP details how to minimise the potential spread of pest and weed species as a result of Santos GLNG activities. Key measures within the PWMP include: <ul style="list-style-type: none"> - Identify, monitor and prioritise the appropriate management of pest species present at, or that pose a threat to, Santos GLNG assets and/or activities - Prevent and minimise the introduction and dispersal of pest species into Santos GLNG locations and neighbouring properties - Engage stakeholders including landholders and local communities in assisting Santos GLNG in the identification and management of pests at Santos GLNG assets and activities - Develop asset/activity specific pest management procedures as required during the GFD Project lifetime - Where eradication is not a practicable option for pest outbreaks, containment and treatment are the most appropriate measures to manage and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the pest or weed. - On Santos GLNG property, Santos GLNG is legally required to manage pests declared as Class 1 or 2 under the LP Act. Feral cats are Class 2 declared pests under the LP Act - On private property where Santos GLNG is not the landholder, the responsibility to manage declared pests rests with the landowner. Whilst not required to remove the pest, Santos GLNG must take the practical precautions to prevent furthering their spread - Closely monitor controlled infestations for response to controls ▪ The feral cat is identified in Section 4.2.2, Table 6 of the PWMP as a high priority pest species present within the Santos GLNG Upstream Project area and subject to the PWMP

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<p><i>Monarcha trivirgatus</i> (Spectacled monarch)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Spectacled monarch does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Pandion haliaetus</i> (Osprey)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Osprey does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Phaethon lepturus</i> (White-tailed tropic bird)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the White-tailed tropic bird does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Plegadis falcinellus</i> (Glossy ibis)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>The DotE SPRAT profile for the Glossy ibis does not identify any approved or adopted recovery plans for the species</p>		
<p><i>Pluvialis fulva</i> (Pacific golden plover)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an Environmental Representative ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with
	<p>Anthropogenic disturbances</p>	<ul style="list-style-type: none"> ▪ The development of track and road networks during the construction phase and their continued use throughout operation phase has the potential to result in injury/mortality of fauna ▪ Construction and operations have the potential to disturb the behaviour and movements of some fauna. Disturbances may include some disruption of breeding activities. Most Project related disturbances are expected to be short-term and occur predominantly during construction. ▪ Excessive noise, bright lighting and vibration have the potential to disturb 	<ul style="list-style-type: none"> ▪ Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the sensitive environs in which they will be working and be advised of any specific limitations appropriate to the construction works being conducted within, or in proximity to, migratory birds or migratory birds habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Restricted zones of 50 m are to be established around nests that have become active after construction has commenced. In restricted zones, vehicles must reduce speed and thoroughfare is to be limited to critical site specific construction activities. Alternative routes are to be sought and

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		<p>fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term</p>	<p>utilised for all other Project traffic</p> <ul style="list-style-type: none"> ▪ The use of barb wire will be avoided where possible when erecting Project related fencing. Where barb wire fencing is unavoidable, the top strand will be high tensile steel (non-barbed wire) to avoid fauna getting caught and tangled in the barbs or the top strand will be made visible to fauna through the use of tagging ▪ Night works within restricted zones are to be avoided. Where they are required to occur, activities will be restricted to critical site specific construction activities. ▪ Blasting should be avoided, where possible, around areas with large congregations of migratory birds such as wetlands ▪ Dust suppression strategies will be deployed to manage the risk of adverse impacts associated with excessive dust deposition on migratory birds habitat. ▪ Hazardous substances with the potential to impact migratory birds will be stored within contained areas and managed in accordance with the Santos GLNG Upstream Waste Management Plan and Chemical and Fuel Management Plan. ▪ Lighting disturbances will be reduced especially near threatened habitat areas and active nests. Where practicable, lighting will be directed away from sensitive areas or engineering solutions will be used to limit light spillage. ▪ To reduce noise and vibration, equipment will be regularly maintained and is in good working order
	<p>Global climate change</p>	<ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: <ul style="list-style-type: none"> - Combustion of diesel fuel for drilling, equipment, transportation, power generation and rehabilitation - Land clearing - Well completion flaring - Combustion of gas for self-generated electricity production - Combustion of gas for compression - Flaring during abnormal conditions at facilities - Fugitive emissions (other than flaring and venting) - Generation of electricity purchased from grid for pumps, gas compression, water management and camps ▪ The contribution of the GFD Project to cumulative annual greenhouse gas emissions is estimated to be 2.6 Mt CO₂-e per year. This is smaller than other gas projects in Queensland which range from 3.1 to 7.2 MtCO₂-e per year 	<ul style="list-style-type: none"> ▪ Santos GLNG has a strong record working with government, industry and the community to address greenhouse gas emissions with specific focus on addressing energy efficiency, the transition to lower emission technologies and reporting transparency ▪ Santos GLNG has its own corporate climate change policy which reflects a commitment to energy efficiency and reducing emissions across its operations, including the GFD Project. The policy includes commitments to: <ul style="list-style-type: none"> - Continue to reduce the carbon intensity of its products by focusing on energy efficiency, technology development and by embedding a carbon price in all activities - Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress - Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term emission reduction targets - Pursue no flaring or venting of associated gas, unless there are no feasible alternatives - Continue to publicly disclose GHG emissions profile and carefully examine forecast emissions - Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for Santos GLNG activities - Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy - Inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented - Report progress against these commitments to the Board
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<p><i>Tringa glareola</i> (Wood sandpiper)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p> <p>Anthropogenic disturbances</p> <p>Global climate change</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of ‘islands’ and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a ‘barrier’. 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Most Project related disturbances are expected to be short-term and occur predominantly during construction. ▪ Excessive noise, bright lighting and vibration have the potential to disturb fauna inhabiting the immediate vicinity of construction activity, particularly whilst breeding or preparing to breed. Potential impacts of noise, lighting and vibration will be more prevalent during the construction phase and will therefore be relatively short-term <ul style="list-style-type: none"> ▪ The major sources of greenhouse gases from the GFD Project include: 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. 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<p><i>Tringa nebularia</i> (Common greenshank)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ■ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ■ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ■ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ■ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ■ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ■ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition 	<ul style="list-style-type: none"> ■ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ■ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ■ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ■ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ■ 100 metre exclusion zones are to be created around identified active nests ■ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ■ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed

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<p><i>Tringa stagnatilis</i> (Marsh sandpiper)</p> <p>EPBC Act Status: Migratory, Marine</p>	<p>Loss, modification and degradation of habitat</p>	<ul style="list-style-type: none"> ▪ The clearing of vegetation for the construction of project infrastructure has the potential to result in a direct loss of significant species habitats ▪ Clearing also has the potential to degrade the quality of existing habitat where the construction of infrastructure has resulted in fragmentation and the creation of edge effects ▪ Clearing leading to habitat fragmentation can interrupt species movements and result in the formation of 'islands' and thereby population fragmentation ▪ Much of the Santos GLNG Upstream Project Area is already highly fragmented due to clearing associated with historic grazing practices, however intact stands of contiguous vegetation remain ▪ Edge effects have the potential to impact on conservation significant flora and fauna species, especially upon the species with specific micro-habitat requirements that are less tolerant to disturbance ▪ Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a 'barrier'. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Various GFD Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (eg access tracks, pipeline easements) ▪ Clearing will predominantly occur during the construction phases and is to be limited to the extent essential to allow for safe construction and operations (e.g. trees may be lopped and not felled to allow construction vehicle access) 	<ul style="list-style-type: none"> ▪ Siting infrastructure will occur in accordance with the <i>Environmental Protocol for Constraints Planning and Field Development</i>, so as to avoid potential adverse impacts to MNES species and habitat wherever practicable. An evaluation of the presence of migratory birds and migratory bird habitat will be undertaken using data obtained from desktop and ground truthing studies, as per the Environmental Protocol for Constraints Planning and Field Development. ▪ Planning and management of disturbances are to be assessed with consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate impacts to known environmental values ▪ During migratory periods, known populations of migratory species in areas adjacent to disturbances will be regularly checked in a way that does not risk abandonment by individuals ▪ Clearing in and around wetlands, cave structures and rocky outcrops will be avoided, where possible ▪ 100 metre exclusion zones are to be created around identified active nests ▪ Migratory bird habitat features or any associated buffer in proximity to the disturbance is to be demarcated using flagging tape, barricade webbing or similar ▪ A licensed spotter-catcher qualified to handle all types of wildlife will survey the area to be disturbed for the presence of fauna species, immediately prior to the commencement of disturbance and will monitor all clearing works in areas of habitat ▪ Access to and from Project locations is to occur along designated access tracks only ▪ Clearing will be conducted in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas ▪ Clearing activities within and adjacent to migratory bird habitat will be supervised by an Environmental Representative ▪ Where impacts to migratory birds or migratory bird habitat cannot be avoided, EPBC approval conditions and the internal approval processes outlined in the Environmental Protocol for Constraints Planning and Field Development will be complied with
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4.0 References

Australian Government Department of the Environment and Heritage (AGDEH) (2005). *Background Paper to the Wildlife Conservation Plan for Migratory Shorebirds*, Accessed [online] 13/10/15 at: <http://www.environment.gov.au/system/files/resources/3a6805dc-0f3b-4669-bb3d-ab0843f5517d/files/shorebird-plan-background.pdf>

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Acronyms and abbreviations

Acronym	Definition
µS/cm	micro Siemens per centimetre
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
ANZECC	Australian and New Zealand Environment Conservation Council
APLNG	Australia Pacific LNG project
AS/NZS	Australian Standard/New Zealand Standard
ATP	authority to prospect
CAMBA	China–Australia Migratory Bird Agreement
CHMP	cultural heritage management plan
CMA	cumulative management area
CO	carbon monoxide
CO ₂ -e	carbon dioxide equivalent
CSG	coal seam gas
DAMP	decommissioning and abandonment management plan
dB(A)	decibels measured at the ‘A’ frequency weighting network
DE	Australian Government Department of the Environment
DEHP	Department of Environment and Heritage Protection
DNRM	Department of Natural Resources and Mines
DTMR	Department of Transport and Main Roads
EA	environmental authority
EC	electrical conductivity
EHS	environmental hazard standard
EIS	environmental impact statement
EO Act	<i>Environmental Offsets Act 2014</i>
EP	equivalent persons
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPP	Environmental Protection Policy (water, air, waste, noise)
EPP (Air)	Environmental Protection (Air) Policy 2008
EPP (Noise)	Environmental Protection (Noise) Policy 2008
EPP (Water)	Environmental Protection (Water) Policy 2009
ERA	environmentally relevant activity
ESA	environmentally sensitive area
EV	environmental value
FIFO	fly-in fly-out
FTE	full-time equivalent
GAB	Great Artesian Basin
GARID	guidelines for assessment of road impacts of development

Acronym	Definition
GDE	groundwater dependent ecosystem
GFD	Santos GLNG Gas Field Development project
GHG	greenhouse gas
GL	gigalitre
GMA	groundwater management area
GRP	gross regional product
GSP	gross state product
HDPE	high density polyethylene
HEV	high ecological value
HVR	high value regrowth
IAS	initial advice statement
ICH	Indigenous cultural heritage
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
ILUA	indigenous land use agreement
JAMBA	Japan–Australia Migratory Bird Agreement
L _{A10}	those noise levels that are exceeded for one per cent of each eighteen-hour sample period
L _{Aeq}	the average A-weighted sound pressure level of a continuous steady sound that has the same mean square sound pressure as a sound level that varies with time
LGA	local government area
LNG	liquefied natural gas
LP Act	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>
MCU	material change of use
mg/L	milligrams per litre of liquid/gaseous liquid
ML	megalitres
MNES	matters of national environmental significance
MRA	<i>Mineral Resources Act 1989</i>
MSES	matters of state environmental significance
NC Act	<i>Nature Conservation Act 1992</i>
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
NICH	non-Indigenous cultural heritage
NO ₂	nitrogen dioxide
OGIA	Office of Groundwater Impact Assessment
PAA	priority agricultural area
PALU	priority agricultural land use
P&G Act	<i>Petroleum and Gas (production and Safety) Act 2004</i>
PL	petroleum lease
PLA	priority living area

Acronym	Definition
PFL	petroleum facility licence
PM ₁₀	particulate matter with equivalent aerodynamic diameter less than 10mm
PM _{2.5}	particulate matter with equivalent aerodynamic diameter less than 2.5mm
PPL	petroleum pipeline licence
PPV	peak particle velocity, which is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mms-1
PWMP	pest and weed management plan
QPS	Queensland Police Service
QRC	Queensland Resources Council
RE	regional ecosystem
RMP	rehabilitation management plan
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
RPI Act	<i>Regional Planning Interests Act 2014</i>
RUMP	road-use management plan
SARA	state assessment and referral agency
SCA	strategic cropping area
SCR	state-controlled roads
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SEA	strategic environmental area
SEVT	semi-evergreen vine thickets
SIA	social impact assessment
SIMP	social impact management plan
SIMR	social impact management report
SPA	<i>Sustainable Planning Act 2009</i>
SR	sensitive receptor
TEC	threatened ecological community
TJ	terajoules
TOR	terms of reference
UWIR	Underground Water Impact Report
VKT	vehicle kilometres travelled
VM Act	<i>Vegetation Management Act 1999</i>
WMP	waste management plan
WQO	water quality objective

Glossary

Term	Definition
bilateral agreement	The agreement between the Australian and Queensland governments that accredits the State of Queensland's EIS process. It allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
controlling provision	The matters of national environmental significance, under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth), that the proposed action may have a significant impact on.
coordinated project	A project declared as a 'coordinated project' under section 26 of the SDPWO Act. Formerly referred to as a 'significant project'.
Coordinator-General	The corporation sole constituted under section 8A of the <i>State Development and Public Works Organisation Act 1938</i> and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
environment	As defined in Schedule 2 of the SDPWO Act, includes: <ol style="list-style-type: none"> a) ecosystems and their constituent parts, including people and communities b) all natural and physical resources c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).
environmentally relevant activity (ERA)	An activity that has the potential to release contaminants into the environment. Environmentally relevant activities are defined in Part 3, section 18 of the <i>Environmental Protection Act 1994</i> (Qld).
imposed condition	A condition imposed by the Queensland Coordinator-General under section 54B of the SDPWO Act. The Coordinator-General may nominate an entity that is to have jurisdiction for the condition.

initial advice statement (IAS)	<p>A scoping document, prepared by a proponent, that the Coordinator-General considers in declaring a coordinated project under Part 4 of the SDPWO Act. An IAS provides information about:</p> <ul style="list-style-type: none"> Y the proposed development Y the current environment in the vicinity of the proposed project location Y the anticipated effects of the proposed development on the existing environment Y possible measures to mitigate adverse effects.
matters of national environmental significance	<p>The matters of national environmental significance protected under the <i>Environment Protection and Biodiversity Conservation Act 1999</i>. The eight matters are:</p> <ul style="list-style-type: none"> a) world heritage properties b) national heritage places c) wetlands of international importance (listed under the Ramsar Convention) d) listed threatened species and ecological communities e) migratory species protected under international agreements f) Commonwealth marine areas g) the Great Barrier Reef Marine Park h) nuclear actions (including uranium mines).
matters of state environmental significance	<p>Matters of state environmental significance include the following natural values and areas protected under Queensland's environmental legislation:</p> <ul style="list-style-type: none"> Y regulated vegetation Y connectivity areas Y wetlands and watercourses Y designated precincts in strategic environmental areas Y protected wildlife habitat Y protected areas Y declared fish habitat areas and highly protected zones of State marine parks Y waterway providing for fish passage Y marine plants Y legally secured offset areas.
mining activity	As defined in section 110 of the EP Act
nominated entity (for an imposed condition for undertaking a project)	An entity nominated for the condition, under section 54B(3) of the SDPWO Act.

properly made submission (for an EIS or a proposed change to a project)	<p>Defined under Schedule 2 of the SDPWO Act as a submission that:</p> <ul style="list-style-type: none"> a) is made to the Coordinator-General in writing b) is received on or before the last day of the submission period c) is signed by each person who made the submission d) states the name and address of each person who made the submission e) states the grounds of the submission and the facts and circumstances relied on in support of the grounds.
proponent	<p>The entity or person who proposes a coordinated project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.</p>
stated condition	<p>Conditions stated (but not enforced by) the Coordinator-General under sections 39, 45, 47C, 49, 49B and 49E of the SDPWO Act. The Coordinator-General may state conditions that must be attached to a:</p> <ul style="list-style-type: none"> • development approval under the <i>Sustainable Planning Act 2009</i> • proposed mining lease under the <i>Mineral Resources Act 1989</i> • draft environmental authority (mining lease) under Chapter 5 of the <i>Environmental Protection Act 1994</i> (EPA) • proposed petroleum lease, pipeline licence or petroleum facility licence under the <i>Petroleum and Gas (Production and Safety) Act 2004</i> • non-code compliant environmental authority (petroleum activities) under Chapter 4A of the EPA.
works	<p>Defined under the SDPWO Act as the whole and every part of any work, project, service, utility, undertaking or function that:</p> <ul style="list-style-type: none"> a) the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body is or may be authorised under any Act to undertake, or b) is or has been (before or after the date of commencement of this Act) undertaken by the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body under any Act, or c) is included or is proposed to be included by the Coordinator-General as works in a program of works, or that is classified by the holder of the office of Coordinator-General as works.

The Coordinator-General

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