Landscape and visual amenity 10

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10 Landscape and visual amenity

10.1 Introduction

This section describes the landscape and visual amenity values that may be impacted by the GFD Project. The landscape within the GFD Project area encompasses broad flat plains and river valleys, undulating hills, rugged ridges, narrow valleys and plateaux. The general character is that of broad acre agricultural and grazing areas, interspersed with commercial forestry and natural woodland. Within this landscape are regional towns, rural residential homesteads and small-scale industrial activities such as sawmills and resource extraction including mining and oil and gas developments.

The potential impacts arising from the GFD Project activities on landscape and visual amenity are described and mitigation measures identified. Full details of the visual amenity assessment can be found in Appendix L: Landscape and visual amenity.

This section has been prepared in accordance with section 4.2.5 of the *Terms of reference for an environmental impact statement*, dated March 2013. The index to locate where each ToR requirement is met within the EIS is included at Appendix B: Terms of reference cross-reference.

10.2 Regulatory context

This EIS has been prepared in accordance with the State and Commonwealth regulatory context as provided within Appendix C: Regulatory framework. The legislation, policies and best practice guidelines related to landscape and visual amenity preservation and assessment are presented within Table 10–1.

Table 10–1 Regulatory context of the GFD Project – landscape and visual amenity

Legislation, policy or guideline	Relevance to the GFD Project
Environmental Protection Act 1994 (Qld) (EP Act) The EP Act is the principal legislation for the protection and management of environmental values within Queensland. The Act aims to protect the natural environment and associated ecological systems and processes, while allowing for sustainable development.	As part of its aim to protect Queensland's environment, the Act protects the qualities and characteristics of locations that contribute to their amenity, harmony and sense of community. This visual impact assessment outlines the characteristics of the GFD Project area that contribute to defining its landscape and visual amenity values. This is undertaken with a view to protecting these values from undesired impacts from the GFD Project, in line with the objectives of the Act.
Local planning schemes	The following planning schemes were reviewed to consider the values placed on visual amenity within the GFD Project area by the local councils: • Bauhinia Shire Planning Scheme • Taroom Shire Planning Scheme • Roma Town Planning Scheme • Bungil Shire Planning Scheme • Bendemere Shire Planning Scheme.

This EIS seeks to obtain primary approvals for the project including the Queensland Government Coordinator-Generals Report and Commonwealth Government *Environment Protection and Biodiversity Act 1999* (Cth) approval.

Application for or amendments to existing environmental authorities will occur subsequent to this EIS process. Other subsequent approvals required after the EIS process has been completed, corresponding triggers and legislative frameworks applicable to the GFD Project are identified in Section 2: Project approvals.

Approval of this EIS will trigger a number of subsequent approvals required for the GFD Project to proceed. Approvals will be required on tenure and off-tenure. Section 2: Project approvals summarises the key approvals necessary for the planning, construction, operations and decommissioning of the GFD Project. The triggers for each approval, the relevant administering authority and application details are provided. Consultation on the subsequent approvals will be ongoing with the administering authorities.

10.3 Assessment methodology

This assessment describes the landscape and visual amenity values and assesses the GFD Project's potential impact on these. Impacts were assessed using the significance assessment methodology, which considers the sensitivity of the underlying environment and the magnitude of a potential impact to assess its level of significance. This methodology is used when it is known that some impact will occur and the significance of that impact is determined by considering its magnitude and the sensitivity to change of the environmental value that will be affected. Section 5.6.3 of Section 5: Assessment framework describes the significance assessment methodology.

In the case of landscape character and visual amenity, the sensitivity of the landscape and receptor values changes considerably across the GFD Project gas fields, according to the receptor. The receptors identified most likely to be affected by the GFD Project are users of the following:

- Houses or homesteads
- Tourist/recreational areas and designated tourist roads
- Main roads/regional roads and rail lines
- Minor local roads in rural zone
- Broad acres rural lands
- Industrial areas
- State forests (noting that protected areas such as national parks, conservation parks and forest reserves are designated as a no-go area by the Constraints protocol).

The visual sensitivity of receptors based on their value and level of visual exposure is shown in Table 10–2 and is described in detail in section 3.2.3 of Appendix L: Landscape and visual amenity. Sensitivity is further modified depending on the visual absorption capacity of the landscape that the GFD Project component was placed in and the visual orientation of receptor.

Table 10–2 Visual sensitivity of receptors within the GFD Project area

Receptor		Distance to GFD Project component			
		< 1.0 km	1 km – 2.5 km	2.5 km – 7.5 km	7.5+ km
High value	Houses or homesteads	High	High	Moderate	Low
Sensitivity ↑	Tourist/recreational areas including national parks and designated tourist roads	High	Moderate	Low	Low
	Main roads/regional roads and rail lines	Moderate	Low	Low	Low
	Minor local roads in rural zone	Moderate /Low	Low	Negligible	Negligible
Low value	Broad acres rural lands; industrial sites; designated State forests	Low	Low	Negligible	Negligible

As a result of the varying sensitivity of both the existing landscape and receptor values, it is not possible to undertake a significance assessment where the sensitivity of underlying values remains static before and after mitigation measures are applied. Rather, this impact assessment has assessed sensitivity based on the nature of GFD Project components, including:

- The frequency at which they occur within the landscape
- Their potential to alter the visual amenity values of a receptor.

The sensitivity criteria for the GFD Project components adopted for the visual impact assessment are outlined in Table 10–3.

Table 10–3 Sensitivity criteria for GFD Project components

Sensitivity	Description
High	The GFD Project activity is clearly visible above ground, it is numerous, continuous and widespread and likely to intrude upon the visual amenity of a variety of receptors across a variety of landscapes.
Moderate	The GFD Project activity is visible, is numerous, replicated across large areas and may intrude upon the visual amenity of high sensitivity receptors across a variety of landscapes.
Low	The GFD Project activity is visible but limited in number and is not replicated within viewsheds of receptors.

A summary of the impact assessment is shown in section 10.7.

10.4 Environmental values

The landscape within the GFD Project area encompasses broad flat plains and river valleys, undulating hills, rugged ridges, narrow valleys and plateaux. Residents and visitors experience a low key rural landscape with a mix of broad long distance vistas, mountain ranges, natural forests and woodlands, rural roads and small townships.

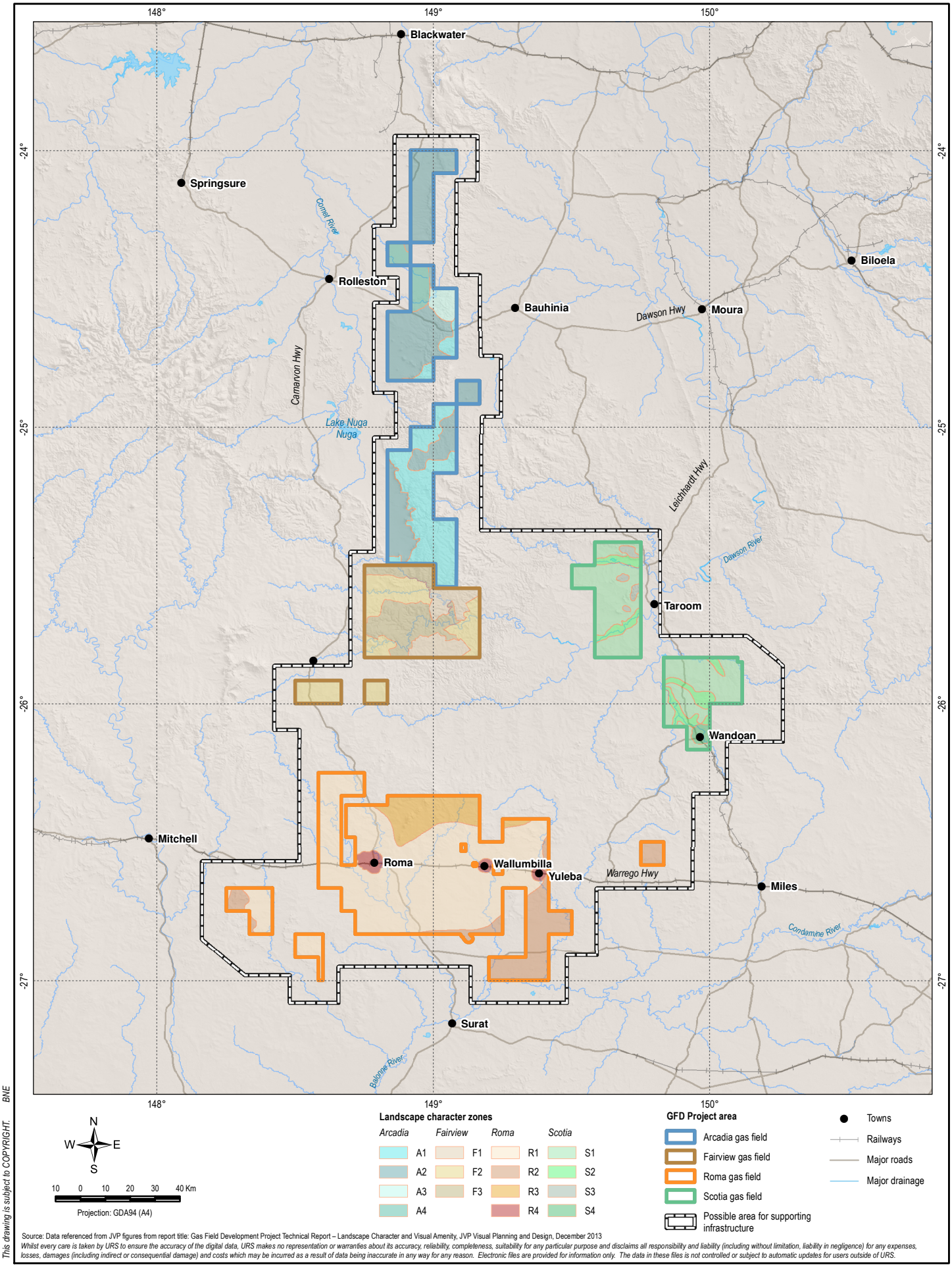
Agricultural utility vehicles, cattle trucks, tourist vehicles and campervans, buses and general vehicles use the road networks within the GFD Project area. Traffic volumes are typically light, increasing in volume closer to regional centres such as Roma.

Oil and gas production is an established land use within the GFD Project area, particularly in the region surrounding Roma. Oil and gas fields have operated in this area since the early 20th century and have become a part of the GFD Project area's historical and visual landscape.

10.4.1 Landscape character zones

Landscapes in the GFD Project gas fields have been classified into landscape character zones (LCZs), which were established in the GLNG Project EIS (2009 EIS). Each LCZ contains similar patterns of topography, vegetation, hydrology and land use.

Further details on existing landscape features such as vegetation, land use and the capacity to absorb land use changes, as well as representative views including landmarks or viewsheds, are provided in section 4.2 of Appendix L: Landscape and visual amenity.



Source: Data referenced from JVP figures from report title: Gas Field Development Project Technical Report – Landscape Character and Visual Amenity, JVP Visual Planning and Design, December 2013

Santos GLNG Project

GFD PROJECT EIS

LANDSCAPE CHARACTER ZONE

URS

LANDSCAPE CHARACTER AND VISUAL AMENITY

Figure: **10-1**

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10.4.1.1 Arcadia gas field

The Arcadia gas field has four defined LCZ, which are shown on Figure 10–1 and discussed below.

LCZ – A1 Steep hills and mountains

Hills and mountains dominate the eastern half of the Arcadia gas field and are features in the open landscape that are visible for considerable distances. In the Arcadia gas field the mountains are generally outside the GFD Project tenures and are represented by isolated knolls, an example of which is shown in Plate 10-1.

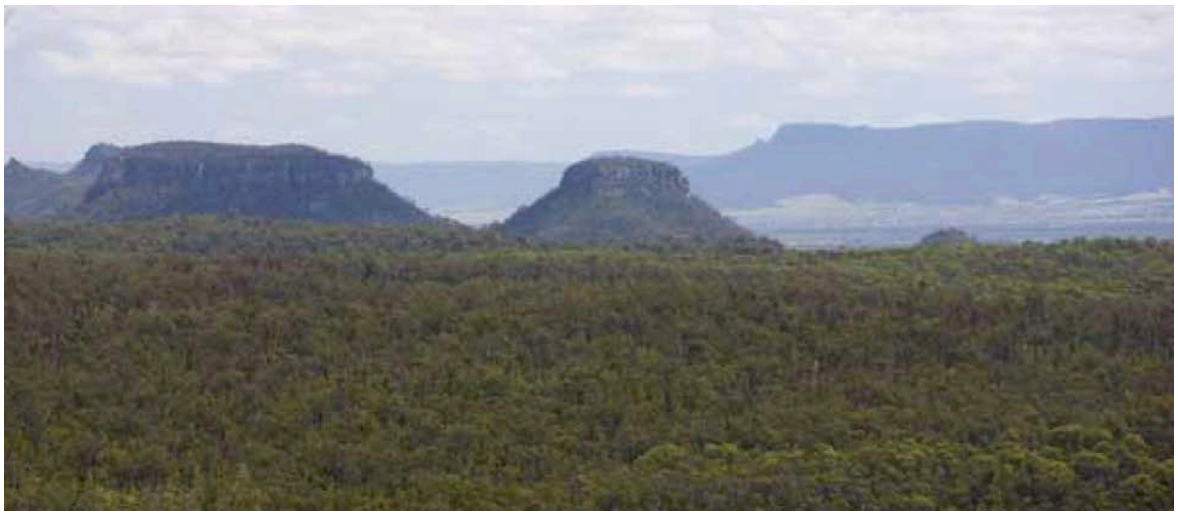

Plate 10-1 Hills and mountains in the Arcadia gas field

LCZ – A2 Valleys

This LCZ contains three valleys, the largest of which is the Arcadia Valley. The LCZ is visually defined by prominent forest covered ridges on the skyline, particularly those along the eastern and western edges of the Arcadia Valley, as shown in Plate 10-2. The valleys typically contain extensive areas of grassland, with trees scattered throughout the landscape.

Plate 10-2 Prominent ridgelines in Arcadia gas field

LCZ – A3 Undulating hills

This LCZ features undulating hills that are dominated by cleared grassland with clusters of trees typically focused along drainage lines and lower slopes, an example of which is shown in Plate 10-3.

Plate 10-3 Undulating hills to east of Arcadia gas field

LCZ – A4 Riparian areas and associated lower slopes

The riparian areas across the Arcadia gas field support varying levels of tree cover, typically along drainage lines, which restrict visibility as shown in Plate 10-4. This LCZ also includes gentle lower slopes and floodplains, both of which support pasture and cropping activities. Flood plains in some areas of the LCZ support dense red gum forests.

Plate 10-4 Riparian areas and lower slopes in the Arcadia gas field

10.4.1.2 Fairview gas field

The Fairview gas field has three defined LCZs, which are shown on Figure 10–1 and discussed below.

LCZ – F1 Forests and national parks

The northeast of the Fairview gas field features forests and national parks, with visually prominent hills and deeply incised drainage lines. This zone also includes isolated patches of grassland that have limited tree cover.

LCZ – F2 Broad valleys

This LCZ includes wide east-west valleys that generate visually prominent hills and ridges, coupled with extensive areas of grassland and remnant tree cover. Local roads located within the grazing areas of petroleum lease 655P are typically tree lined, which limits broader views as shown in Plate 10-5.

Plate 10-5 Tree lined local roads in Fairview gas field

LCZ – F3 Hills and valleys

This LCZ features steep sided valleys interspersed with plateaux. The plateaux are generally covered by grassland; however, scattered tree cover and small areas of remnant woodland feature across the landscape. The strength of the landforms in this zone results in long distances views from ridge tops, which themselves are prominent within the valleys, as shown in Plate 10-6.

Plate 10-6 Extensive broad valley grassland and cattle grazing in the Fairview gas field

10.4.1.3 Roma gas field

The Roma gas field has four defined LCZs which are shown on Figure 10–1 and discussed below.

LCZ – R1 Roma / Wallumbilla agricultural areas

This zone covers a variety of agricultural land used for irrigated cropping, dryland cropping and grazing. The grazing land include grassland with scattered trees, open woodland areas, and dense woodland and forest areas particularly in drainage corridors. The topography is typically flat to gently rolling, which allows for extensive views; however, viewsheds may be restricted by vegetation and local hills. There is considerable variation in landscape values from year to year, based on rainfall and crop rotations.

Plate 10-7 Irrigated croplands and grazing lands in the Roma gas field

R2 Hill slopes with grazing land uses

This LCZ contains moderately undulating hills, which drain by a system of creeks into the Bungil and Wallumbilla Creeks. Patches of grassland used for grazing alternate with extensive areas of State forest and small areas of remnant woodland. Views from public roads include open long-distance views as well as short-distance views where roadside vegetation is present as shown in Plate 10-8.

Plate 10-8 Hills slopes, grazing land and remnant woodland in the Roma gas field

LCZ – R3 Hills / valleys with grazing and forestry land uses

This LCZ consists of rolling hills and small valleys that are used for grazing. They generally support some scattered trees, tree clumps or open woodland areas with well-established continuous tree cover along the creeks and some road easements (Plate 10-9). Long distance views from ridge tops showcase grazing and forestry land uses with scattered rocky outcrops that dominate this LCZ as shown in Plate 10-10.

Plate 10-9 Tree cover along road easements in the Roma gas field

Plate 10-10 Rolling grazing lands to distinctive rocky outcrops and ridgelines within the Roma gas field

LCZ – R4 Roma and Wallumbilla

These towns are an obvious contrast to their surrounding landscapes. Both are situated on the Warrego Highway and spread north and south from it. They contain residential land uses as well as small businesses including hotels, retail, and automotive service centres. Roma also is the regional centre for airlines and government services.

Generally, these towns are flat with broad tree-lined streets and one to three storey buildings (Plate 10-11). The tallest built elements within each town are telecommunication towers, water towers or grain silos. Both have flood prone creeks within the town boundaries.

Plate 10-11 Wallumbilla along the Warrego Highway in the Roma gas field

10.4.1.4 Scotia gas field

The Scotia gas field has four defined LCZs, which are shown on Figure 10–1 and discussed below.

LCZ – S1 Undulating hills | rural areas – Juandah Creek

This LCZ is characterised by a mixture of gentle undulating hills, which are used for contour cropping, and flat grasslands with limited remnant tree cover, which are used for grazing, as shown in Plate 10-12. Tree cover across the zone generally limits distant views, particularly from certain local roads.

Plate 10-12 Broad flat grasslands with scattered trees within the Scotia gas field

LCZ – S2 Water courses and riparian areas

Roche Creek and Juandah Creek incise the Scotia gas field, primarily in open rural areas and wooded or undulating sloped areas. Watercourses are typically lined with vegetation; shrubs, grasses and trees that may overhang the creek lines, creating a shady green corridor, as shown in Plate 10-13. Riparian vegetation offers a high level of visual absorption capacity. However, if the GFD Project components were in open land with the vegetation as a backdrop, visual absorption capacity is reduced.

Plate 10-13 Views along Juandah Creek in the Scotia gas field

LCZ – S3 Steep hills and mountains

This LCZ consists of two areas that contain isolated groups of steep hills and ridges, which are located in the north and the south of the Scotia gas field. Both formations are surrounded by open grassland, which in the north is used for cropping.

Plate 10-14 Isolated forested hills in the Scotia gas field

LCZ – S4 Wandoan

Wandoan is a town of under 500 people and contains regional facilities including council and sporting infrastructure. Wandoan is flanked by the Leichhardt Highway to the western side of the town (refer Plate 10-15). This side of town supports the main commercial activities including the main street, with residential areas to the east. The town buildings are generally inward looking with little in terms of major views outward from the town. The showground is a short distance out of town to the east but it also is inward looking and surrounded by vegetation.

Plate 10-15 Wandoan township approach view from west in the Scotia gas field

10.4.2 Character of surrounding areas

GFD Project activities may extend beyond the petroleum tenure boundaries as required to develop supporting infrastructure. Understanding the landscape characters of these surrounding areas is relevant to providing a comprehensive visual assessment of GFD Project activities in a broader regional sense.

Key landscape character elements of surrounding areas consist of:

- North: Blackdown Tablelands National Park, mining areas and townships along the Capricorn Highway
- East: Expedition National Park, grazing, and croplands
- South: agriculture, cropland, and forestry
- West: Carnarvon National Park, forestry, highlands in the north; grazing and cropping to the south.

10.5 Potential impacts

Visual impacts will be generated by GFD Project activities and the establishment of long-term or permanent infrastructure that creates a contrast in the landscape. The extent to which these activities and infrastructure alter the visual amenity of landscapes depends on the sensitivity of receptors, the landscape and the visual adsorption capacity of that landscape. These variable aspects of sensitivity are described in section 3.2.3 of Appendix L: Landscape and visual amenity.

The GFD Project components that may generate an impact on visual amenity are described in Section 4: Project description and section 5.1 of Appendix L: Landscape and visual amenity. Each of these GFD Project components has associated activities that have the potential to impact visual amenity, including:

- Clearing, comprising removal of vegetation and topsoil
- Construction / decommissioning activities (including earthworks)
- Traffic
- Night lighting (including lighting from vehicles)
- Operating activities (presence of component).

The impacts associated with each of these activities will be at their highest during construction; thereafter, the visual effects are expected to reduce. For example, the footprint required for each component during construction reduces (often considerably) during operation, as is discussed in Section 4: Project description. Similarly, night lighting is most often required during the construction phase, with the exception of certain infrastructure, such as accommodation facilities, which requires illumination during operations. The impacts of night lighting on fauna have been assessed in sections 18.5 and 18.6 of Section 18: Terrestrial ecology.

The operations phase visual effects of GFD Project infrastructure components will extend from their commissioning (signalling the end of the construction phase for these components) to decommissioning. The exception to this is power lines and communications infrastructure, which is likely to increase over time and gas extraction occurs in more remote areas.

Further details on the potential impacts associated with these activities are provided in Appendix L: Landscape and visual amenity.

10.6 Mitigation measures

Santos GLNG has developed an effective management framework, discussed in Section 6: Management framework, to be implemented for the GFD Project. Santos GLNG's corporate environmental, health, safety and community policies are supported by its Environment, Health and Safety Management System and the GFD Project Environmental Protocol for Constraints Planning and Field Development (Constraints protocol). Environment, Health, and Safety Management Standards (EHSMS) and Environmental Hazard Standards (EHS) applicable to landscape character and visual amenity include:

- *EHS01 Biodiversity and land disturbance*
- *EHSMS07 Consultation and communication*

The primary mechanism to protect visual amenity is the adoption of the Constraints protocol during field planning and location selection incorporating the visual sensitivity of receptors. The Constraints protocol for the GFD Project reduces the potential for high visual impact by preventing development in a number of landscapes that are sensitive such as national parks. Further, implementation of the Constraints protocol will act to preserve vegetation that has high levels of visual absorption capacity, which will reduce the overall impact of the GFD Project. Further, to retain visual absorption capacity across areas that are amenable to development, areas will be cleared in accordance with EHS01, with the intent of minimising disturbance. Methods include:

- Considering post-construction land use during planning and design
- Keeping to marked roads and access tracks
- Minimising area of impact (e.g. lease size, road or pipeline width)
- Using common or adjacent easements for pipelines, roads or seismic lines
- Using previously disturbed areas.

Where GFD Project components are located on a landholder's property, Santos GLNG will engage with the landholder to determine the infrastructure location and the extent of visual mitigation if necessary. This will be undertaken in accordance with EHSMS07 and the Land access and Landholder Engagement Strategy outlined in Figure 5-6 of Section 5: Assessment framework and provided in Appendix AA: Land access.

The management plans that apply to the protection of visual amenity are outlined in Table 10–4.

Table 10–4 Management commitments – landscape and visual amenity

Management plan	Mitigation measures
GFD Project environmental protocol for constraints planning and field development (the Constraints protocol)	The Constraints protocol applies to all gas field related activities. The scope of the Constraints protocol is to: • Enable Santos GLNG to comply with all relevant State and Federal statutory approvals and legislation • Support Santos GLNG's environmental policies and the General Environmental Duty (GED) as outlined in the EP Act • Promote the avoidance, minimisation, mitigation and management of direct and indirect adverse environmental impacts associated with land disturbances • Minimise cumulative impacts on environmental values. The Constraints protocol will be implemented to guide placement of infrastructure which adopts the following management principles: • Avoidance — avoiding direct and indirect impacts • Minimisation - minimise potential impacts • Mitigation — Implement mitigation and management • Remediation and rehabilitation — actively remediate and rehabilitate impacted • Offset — offset residual adverse impacts in accordance with regulatory requirements. The Constraints protocol enables the systematic identification and assessment of environmental values and the application of development constraints to effectively avoid and / or manage environmental impacts.
Draft environmental management plan (Draft EM Plan)	The Draft EM plan identifies 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 comprises: • Environmental values potentially affected by the GFD Project • Environmental management objectives and associated management measures • Environmental monitoring and reporting • Coal seam water management • Proposed conditions. Impacts associated with night lighting will be managed and mitigated in through the Draft EM plan. Lighting disturbances will be minimised where practicable by: • Directing lighting away from sensitive receptors, including houses, homesteads, tourists roads and recreational areas • Engineering solutions to limit light spillage where practicable.
Land access and landholder engagement strategy	Santos GLNG has adopted an early engagement strategy where landholders that may be affected by GFD Project activities are able to discuss the potential location, timing and impacts of infrastructure on their property or business, and how Santos GLNG can help to minimise those impacts. This early engagement strategy has been developed in accordance with the *Land Access Code* (Department of Employment, Economic Development and Innovation, 2010). Santos GLNG will negotiate a CCA under the P&G Act with landholders on whose land the petroleum activities will be carried out. The locations of wells, gathering lines, and access tracks will be finalised in consultation with the landholder as part of the negotiations.
Decommissioning and abandonment management plan (DAMP)	The DAMP describes the management framework associated with the cessation of petroleum activities. The objectives of the plan are to: • Undertake decommissioning of assets in a manner that complies with regulatory requirements and minimises the risk of environmental harm • Undertake decommissioning activities in a manner that meets stakeholder expectations • Leave a landform that is stable, compatible with the intended post-closure land use Provide for the retention and beneficial reuse of infrastructure constructed by Santos GLNG to third parties (e.g. landholders or local authorities) where an appropriate agreement has been signed by both parties and regulatory authorities are satisfied.

Management plan	Mitigation measures
Rehabilitation management plan	The Rehabilitation management plan outlines the rehabilitation objectives for Project-related disturbances within the GFD Project Area. This includes the phasing of rehabilitation to first achieve stabilisation and subsequently final rehabilitation for disturbances to land (i.e. ground surface). The Rehabilitation management plan: • Describes Santos GLNG's approach to rehabilitation • Identifies key rehabilitation objectives and criteria to deem rehabilitation success • Outlines general rehabilitation actions to be undertaken by Santos GLNG when rehabilitation a disturbance Provides an overview of monitoring and maintenance actions to be conducted on rehabilitated areas.
Road-use management plan	The Road-use management plan was developed for to manage the impact associated with the implementation of the Santos GLNG Project. It will be adapted to manage the potential impacts of the GFD Project. The objectives of the plan include: • Manage the efficiency of the road network impacted including State-controlled roads and local government roads • Ensure user safety and safe operation of GFD Project vehicles • Minimise impacts on road infrastructure condition • Minimise traffic related complaints and incidents to maintain community amenity.
Social impact management plan (SIMP)	The SIMP established for the GLNG Project will be implemented across the GFD Project. The plan outlines the roles, responsibilities and rights of Santos GLNG, the government, impacted communities and other stakeholders in relation to the GFD Project. In particular, it outlines the framework for community engagement, management strategies to avoid, mitigate or minimise potential impacts and to maximise opportunities and benefits arising throughout the life of the GFD Project, as well as a monitoring and reporting process. The GLNG Project SIMP will be supplemented by issue action plans relating to the GFD Project that focus on the following key areas as agreed with the Coordinated Project Delivery Division of the Coordinator-General's office: • Water and environment • Community safety • Social infrastructure • Community wellbeing and liveability • Local industry participation and training • Aboriginal engagement and participation. The SIMP is an operational document that is updated to reflect the ongoing needs of Santos GLNG and the communities it operates in. It is available on the web at: http://www.santosglng.com/resource-library/community/social-impact-management-plan-community-handbook.aspx

Santos GLNG is committed to implementing the mitigation measures in Table 10–4 to manage potential impacts to visual amenity. These measures will be incorporated into Santos GLNG's management framework, as described in Appendix Y: Draft environmental management plan.

10.7 Significance assessment

As discussed in section 10.3, impacts were assessed using the significance assessment methodology. As the GFD Project area covers a large geographical area, the general nature of potential impacts to environmental values associated with GFD Project activities are identified and assessed within this section.

Table 10-5 summarises the assessment undertaken for the potential impacts of the GFD Project on landscape and visual values. For each identified potential impact, the assessment considered:

- The potential pre-mitigated significance, which that only the Constraints protocol has been applied and the potential impacts are at their greatest.
- The mitigation measures that will be used to manage the potential impacts on landscape and visual values. These measures will reduce the (magnitude) of the potential impacts.
- The residual significance of the potential impact after the implementation of mitigation measures. The residual significance takes into account the potential for impact that remains after the mitigation measures are applied.

Table 10–5 Significance assessment – landscape and visual amenity

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
Vegetation clearing	Wells	Construction	Moderate	Moderate	Moderate	In addition to the Constraints protocol the potential for visual impacts from vegetation clearing and earthworks will be managed and mitigated through the EHS01, the Land access and landholder engagement strategy, Rehabilitation management plan and DAMP. Areas will be cleared in accordance with EHS01, with the intent of minimising disturbance. Methods include: • Considering post-construction land use during planning and design • Keeping to marked roads and access tracks • Minimising area of impact (e.g. lease seize, road or pipeline width) • Using common or adjacent easements for pipelines, roads or seismic lines • Using previously disturbed areas. Through the adoption of the Land access and landholder engagement strategy, Santos GLNG will engage from an early stage with the landholders that may be affected by GFD Project activities to discuss the potential location, timing and impacts of infrastructure on their property or business, and how Santos GLNG can help to minimise those impacts. Decommissioning of cleared land will adhere to the DAMP and objectives of the Rehabilitation management plan. Decommissioning and rehabilitation will be undertaken as soon as practicable in accordance with the relevant statutory requirements and approvals, unless an agreement is in place with the relevant administering authority and relevant landholder. This agreement may allow the disturbance to be re-used e.g. farm dams, roads, etc.	Low	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Gathering lines / transmission pipelines	Construction	High	Low	Moderate		Low	Moderate
		Operations		Low	Moderate		Low	Moderate
		Decommissioning		Low	Moderate		Low	Moderate
	Gas compression facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Negligible		Low	Negligible
	Water management facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		Low	Negligible		Low	Negligible
	Accommodation facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Access roads and tracks	Construction	Moderate	Moderate	Moderate		Low	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Fuel storage, workshops and laydown /storage/ maintenance areas	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Borrow pits and quarries	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Moderate	Low		Moderate	Low

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
		Decommissioning		Low	Low		Low	Low
	Power lines and communications	Construction	High	Low	Moderate		Low	Moderate
		Operations		Low	Moderate		Low	Moderate
		Decommissioning		Low	Moderate		Low	Moderate
Construction / decommissioning activities (including earthworks)	Wells	Construction	Moderate	Moderate	Moderate	Santos GLNG will ensure that post-closure activities have minimum impact on the environment. Complaints concerning earthworks and vegetation clearing will be managed according to the dispute resolution process outlined within the SIMP.	Low	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Low	Low		Low	Low
	Gathering lines / transmission pipelines	Construction	High	Low	Moderate		Low	Moderate
		Operations		NA	NA		NA	NA
		Decommissioning		NA	NA		NA	NA
	Gas compression facilities	Construction	Low	High	Moderate		Moderate	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Moderate	Low		Low	Low
	Water management facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Moderate	Low		Low	Low
	Accommodation facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Moderate	Moderate		Low	Low
	Access roads and tracks	Construction	Moderate	Low	Low		Low	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Fuel storage, workshops and laydown/ storage maintenance	Construction	Low	Moderate	Low		Low	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Moderate	Low		NA	Low

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
	areas							
	Borrow pits and quarries	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Moderate	Low		Moderate	Low
		Decommissioning		Low	Negligible		Low	Negligible
	Power lines and communications	Construction	Moderate	Moderate	Moderate		Low	Low
		Operations		NA	NA		NA	NA
		Decommissioning		Low	Low		Low	Low
Traffic	Wells	Construction	Moderate	Moderate	Moderate	Santos GLNG will minimise the visual impacts associated with traffic and transportation in accordance with the Road-use management plan, and SIMP. The Road-use management plan developed for the GLNG Project will be expanded or a new plan developed to include the following: • Haul roads will be well maintained • Traffic speeds on unsealed surfaces, adjacent or close to sensitive receptors will be limited to minimise dust generation • The transport of oversize loads will be restricted to non-peak periods • Car-pooling and bus services will be implemented where practicable to minimise worker journeys. Complaints concerning traffic and transportation will be managed according to the dispute resolution process outlined within the SIMP.	Low	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Gathering lines / transmission pipelines	Construction	Low	Moderate	Moderate		Low	Negligible
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		Low	Negligible		Low	Negligible
	Gas compression facilities	Construction	Low	High	Moderate		Moderate	Low
		Operations		Low	Negligible		Moderate	Low
		Decommissioning		Moderate	Low		Low	Negligible
	Water management facilities	Construction	Low	Moderate	Low		Moderate	Low
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		Moderate	Low		Low	Negligible
	Accommodation facilities	Construction	Moderate	Moderate	Moderate		Moderate	Moderate
		Operations		Moderate	Moderate		Moderate	Moderate
		Decommissioning		Low	Low		Low	Low
	Access roads and tracks	Construction	Moderate	Low	Low		Low	Low
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
	Fuel storage, workshops and laydown/ storage/ maintenance areas	Construction	Moderate	Moderate	Moderate		Moderate	Moderate
		Operations		Low	Low		Low	Low
		Decommissioning		Low	Low		Low	Low
	Borrow pits and quarries	Construction	Low	Moderate	Low		Low	Low
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		Low	Negligible		Low	Negligible
	Power lines and communications	Construction	Low	Low	Negligible		Low	Negligible
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		Low	Negligible		Low	Negligible
Night lighting	Wells	Construction	Moderate	Moderate	Moderate	Impacts associated with night lighting will be managed and mitigated through the Draft environmental management plan and the SIMP. In accordance with the Draft environmental management plan, lighting disturbances will be minimised where practicable by: • Directing lighting away from sensitive receptors, including houses, homesteads, tourists roads and recreational areas • Engineering solutions to limit light spillage where practicable. Complaints concerning night lighting will be managed according to the dispute resolution process outlined within the SIMP.	Low	Low
		Operations		NA	NA		NA	NA
		Decommissioning		NA	NA		NA	NA
	Gas compression facilities	Construction	Low	NA	NA		NA	NA
		Operations		Moderate	Low		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Water management facilities	Construction	Low	NA	NA		NA	NA
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Accommodation facilities	Construction	Low	NA	NA		NA	NA
		Operations		Moderate	Low		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Access roads and tracks	Construction	Low	Low	Negligible		Low	Negligible
		Operations		NA	NA		NA	NA
		Decommissioning		NA	NA		NA	NA

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
	Fuel storage, workshops and laydown/ storage/ maintenance areas	Construction	Low	Moderate	Low		Low	Negligible
		Operations		Low	Low		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Borrow pits and quarries	Construction	Low	Moderate	Low		Low	Negligible
		Operations		NA	NA		NA	NA
		Decommissioning		NA	NA		NA	NA
	Wells	Construction	Moderate	NA	NA		NA	NA
		Operations		Low	Low		Low	Low
		Decommissioning		NA	NA		NA	NA
	Gathering lines / transmission pipelines	Construction	Moderate	NA	NA		NA	NA
		Operations		Low	Low		Low	Low
		Decommissioning		NA	NA		NA	NA
Operating infrastructure (presence of component)	Gas compression facilities	Construction	Low	NA	NA	The primary means of managing the visual impacts associated with infrastructure is through avoiding impacts to sensitive receptors during field planning and location selection. Santos GLNG will engage with the landholder to determine the siting of infrastructure and visual mitigation as agreed, this may include the use of vegetation screening. Complaints concerning the placement of infrastructure will be managed according to the dispute resolution process outlined within the SIMP.	NA	NA
		Operations		Moderate	Low		Moderate	Low
		Decommissioning		NA	NA		NA	NA
	Water management facilities (water treatment)	Construction	Low	NA	NA		NA	NA
		Operations		Moderate	Low		Moderate	Low
		Decommissioning		NA	NA		NA	NA
	Water management facilities (water storage)	Construction	Low	NA	NA		NA	NA
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Accommodation facilities	Construction	Low	NA	NA		NA	NA
		Operations		Moderate	Low		Moderate	Low

Impact	Infrastructure	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance	
			Sensitivity	Magnitude	Significance		Magnitude	Significance
		Decommissioning		NA	NA		NA	NA
	Access roads and tracks	Construction	Moderate	NA	NA		NA	NA
		Operations		Low	Low		Low	Low
		Decommissioning		NA	NA		NA	NA
	Fuel storage, workshops and laydown/ storage/ maintenance areas	Construction	Low	NA	NA		NA	NA
		Operations		Moderate	Low		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Borrow pits and quarries	Construction	Low	Low	Negligible		Low	Negligible
		Operations		Low	Negligible		Low	Negligible
		Decommissioning		NA	NA		NA	NA
	Power lines and communications	Construction	High	NA	NA		NA	NA
		Operations		Moderate	High		Moderate	High
		Decommissioning		NA	NA		NA	NA

10.8 Conclusions

Implementing the mitigation and management measures discussed in section 10.6 will reduce the significance of the majority of potential visual impacts to low or negligible, with some activities being moderate. One exception is the sensitivity of the operations phase impact of overhead power lines, which is assessed as high. Where power is to be reticulated throughout the GFD Project area, it will be co-located with other infrastructure such as water and gas gathering lines, transmission pipelines or access roads where practicable. These management strategies will be used to reduce the visual impact of the GFD Project as much as practicable.

The significance of the residual impacts for each infrastructure component for the construction, operations and decommissioning phases are summarised in Table 10–6.

Table 10–6 Summary of residual impacts – landscape and visual amenity

Activity	GFD Project component	Residual **significance**		
		Construction	Operations	Decommissioning
Vegetation clearing	Wells	Low	Low	Low
	Gathering lines / transmission pipelines	Moderate	Moderate	Moderate
	Gas compression facilities	Low	Low	Negligible
	Water management facilities	Low	Negligible	Negligible
	Accommodation facility	Moderate	Low	Low
	Access tracks	Low	Low	Low
	Laydown and storage areas	Low	Low	Low
	Borrow pits and quarries	Low	Low	Low
	Power lines and communications	Moderate	Moderate	Moderate
Construction / decommissioning activities (including earthworks	Wells	Low	NA	Low
	Gathering lines / transmission pipelines	Moderate	NA	NA
	Gas compression facilities	Low	NA	Low
	Water management facilities	Low	NA	Low
	Accommodation facility	Low	NA	Low
	Access tracks	Low	Low	Low
	Laydown and storage areas	Low	NA	Low
	Borrow pits and quarries	Low	Low	Negligible
	Power lines and communications	Low	NA	Low
Traffic	Wells	Low	Low	Low
	Gathering lines / transmission pipelines	Negligible	Negligible	Negligible
	Gas compression facilities	Low	Low	Negligible
	Water management facilities	Low	Negligible	Negligible
	Accommodation facility	Moderate	Moderate	Low
	Access tracks	Low	Low	Low
	Laydown and storage areas	Moderate	Low	Low
	Borrow pits and quarries	Low	Negligible	Negligible
	Power lines and communications	Negligible	Negligible	Negligible

Activity	GFD Project component	Residual significance		
		Construction	Operations	Decommissioning
Night lighting	Wells	Low	NA	NA
	Gas compression facilities	NA	Negligible	NA
	Water management facilities	NA	Negligible	NA
	Accommodation facility	NA	Negligible	NA
	Access roads and tracks	Negligible	NA	NA
	Laydown and storage areas	NA	Low	NA
	Borrow pits and quarries	Negligible	NA	NA
	Wells	NA	Low	NA
Operating infrastructure (presence of component)	Gathering lines / transmission pipelines	NA	Low	NA
	Gas compression facilities	NA	Low	NA
	Water management facilities	NA	Negligible	NA
	Accommodation facility	NA	Low	NA
	Access tracks	NA	Low	NA
	Laydown and storage areas	NA	Negligible	NA
	Borrow pits and quarries	Negligible	Negligible	NA
	Overhead power lines	NA	High	NA