Chapter 17

Property and land use

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Chapter 17 Property and land use

The Secretary's environmental assessment requirements for the Narrabri Gas Project include a requirement to assess on the compatibility of the project with other land uses. A number of detailed assessments were undertaken in response to this requirement, including an agricultural impact assessment (refer to Appendix K) and a social impact assessment (refer to Appendix T1). This chapter draws on those studies to provide an overall assessment of the potential impacts of the project on land uses in the vicinity of the project.

The key findings of the impact assessment in relation to property and land use were:

- Identified land uses in the project area include agriculture, forestry and other activities in forested areas such as bee-keeping and recreation.
- Land and soil capability within the project area is generally limited while forestry activities are considered to be relatively small scale.
- The operation of the project would occupy in the order of 1.3 per cent of agricultural land in the project area, developing progressively over the life of the project.
- The project could co-exist with other land uses due to the compatibility and potential for integration of the infrastructure with current activities, as opposed to a wholesale change of land use.
- The construction of the project at Leewood would be consistent with the existing use of the property, and would therefore not represent a significant impact on existing agricultural activities.
- Field development would only occur on private property if there is a Land Access Agreement with the landholder and a Farm Management Plan is in place regarding appropriate siting of infrastructure.
- Actual loss of income would be offset through the implementation of compensation provisions contained within Land Access Agreements made with landholders.

While the project would be relatively diffuse, occupying around one per cent of the project area, relatively minor changes to existing land use are an unavoidable impact of construction and operation of the project. Changes and restrictions to existing land use as a result of the establishment of facilities on Leewood would be limited as the property is owned by Santos, and hosts existing infrastructure associated with natural gas exploration activities. Similarly, the establishment of facilities at Bibblewindi would be compatible with existing land use.

Due to the diffuse nature of the gas field, potential impacts on land use would be characterised by relatively small and discrete areas of change that could co-exist with other land uses, as opposed to wholesale land use changes. The Field Development Protocol for the project would enable flexibility in the location of well pads, gas and water gathering lines and access tracks, while avoiding environmentally sensitive areas where practicable.

The estimated area of impact during construction (532 hectares) equals about two per cent of the agricultural land in the project area. This reduces to around 1.3 per cent (351 hectares) following partial rehabilitation.

Impacts to individual landholders would be realised once the final location of gas field infrastructure is determined. Impacts to property and land use from field development would be minimised through the provisions of Land Access Agreements and Farm Management Plans.

Field development would only occur on private property if there is a Land Access Agreement with the landholder and a Farm Management Plan is in place regarding appropriate siting of infrastructure. Potential impacts to forestry and the apiary industry would be managed through consultation with relevant stakeholders including the Forestry Corporation of NSW and the conditions of an Occupation Permit.

Following operation, a decommissioning and rehabilitation plan would be implemented in order to restore pre-existing land uses, in consultation with landholders and relevant administering authorities, including the Forestry Corporation of NSW. Some intermediate rehabilitation would occur at the finalisation of construction to minimise the operational footprint of the project.

The implementation of the Field Development Protocol, Land Access Agreements, Farm Management Plans and forestry Occupation Permits, along with the implementation of additional mitigation and management measures, would avoid or minimise potential land use impacts and promote compatibility with existing land uses. The residual environmental risks presented by the project are therefore considered to be low.

17.1 Methodology

The following tasks were undertaken to assess the impacts of the project on property and land use:

- description of existing property and land use in the project area with reference to existing zoning plans, land use mapping, topographic maps and aerial photography
- identification of the potential impacts of the project on property and land use, and development of environmental mitigation and management measures to avoid or minimise those impacts
- completion of an agricultural impact assessment (refer to Appendix K). The agricultural impact assessment utilised publicly available information and targeted consultation with landholders to determine the nature of agricultural practices in the project area, and the productive value of the land. The assessment then considered the potential impacts of the project on these agricultural practices and productive values and quantified them in economic terms.

Potential impacts were classified in accordance with the significance assessment methodology outlined in Chapter 10. Potential impacts were therefore classified based on a combination of the magnitude of the potential impact and the sensitivity of the potentially impacted environmental value.

17.2 Existing environment

17.2.1 Regional overview

Narrabri local government area

The project area is located wholly within the Narrabri Shire Council local government area (LGA) in north-western NSW. Land use within the Narrabri LGA is characterised by the urban area associated with the town of Narrabri, and surrounding rural areas.

The town of Narrabri hosts a range of residential, commercial and industrial land uses. The rural areas surrounding Narrabri are predominantly used for grazing and cropping, although a range of other land uses are also present as listed in Table 17-1.

Other regional localities include Wee Waa north-west of Narrabri, Bellata and Edgeroi to the north-east, Gwabegar to the south-west, Pilliga to the west, and Baan Baa and Boggabri to the south-east.

A large forested area known as 'the Pilliga' covering over 500,000 hectares around Coonabarabran, Baradine and Narrabri is another feature of the Narrabri region. The region is also known for its honey production, occurring mainly in forested areas.

Table 17-1 Land use within the rural areas of Narrabri LGA

Land use	Proportion (%)
Extensive agriculture	54.7
Rural residential development	18.7
Native vegetation (including State forests, national parks, nature reserves and conservation areas)	14.6
Irrigation of plants (predominantly cotton)	11.1
Commercial	0.5
Extractive industries	0.1
Intensive animal husbandry	0.2
Other uses	0.1

Source: Edge Land Planning 2009

Narrabri local environmental plan

The urban area associated with the town of Narrabri contains a range of zones under the *Narrabri Local Environmental Plan 2012* including 'R1 General Residential', 'B2 Local Centre', 'RE1 Public Recreation', 'IN1' General Industrial' 'IN2 Light Industrial' and 'R5 Large Lot Residential'. Smaller regional localities including Bellata, Edgeroi, Gwabegar, Pilliga and Baan Baa are zoned as 'RU5 Village', while Wee Waa and Boggabri contain a range of zones similar to Narrabri.

The rural areas surrounding the town of Narrabri are predominantly zoned as 'RU 1 Primary Production', with large areas zoned 'E1 National Parks and Nature Reserves' and 'RU3 Forestry', particularly south-west of Narrabri in and around the project area.

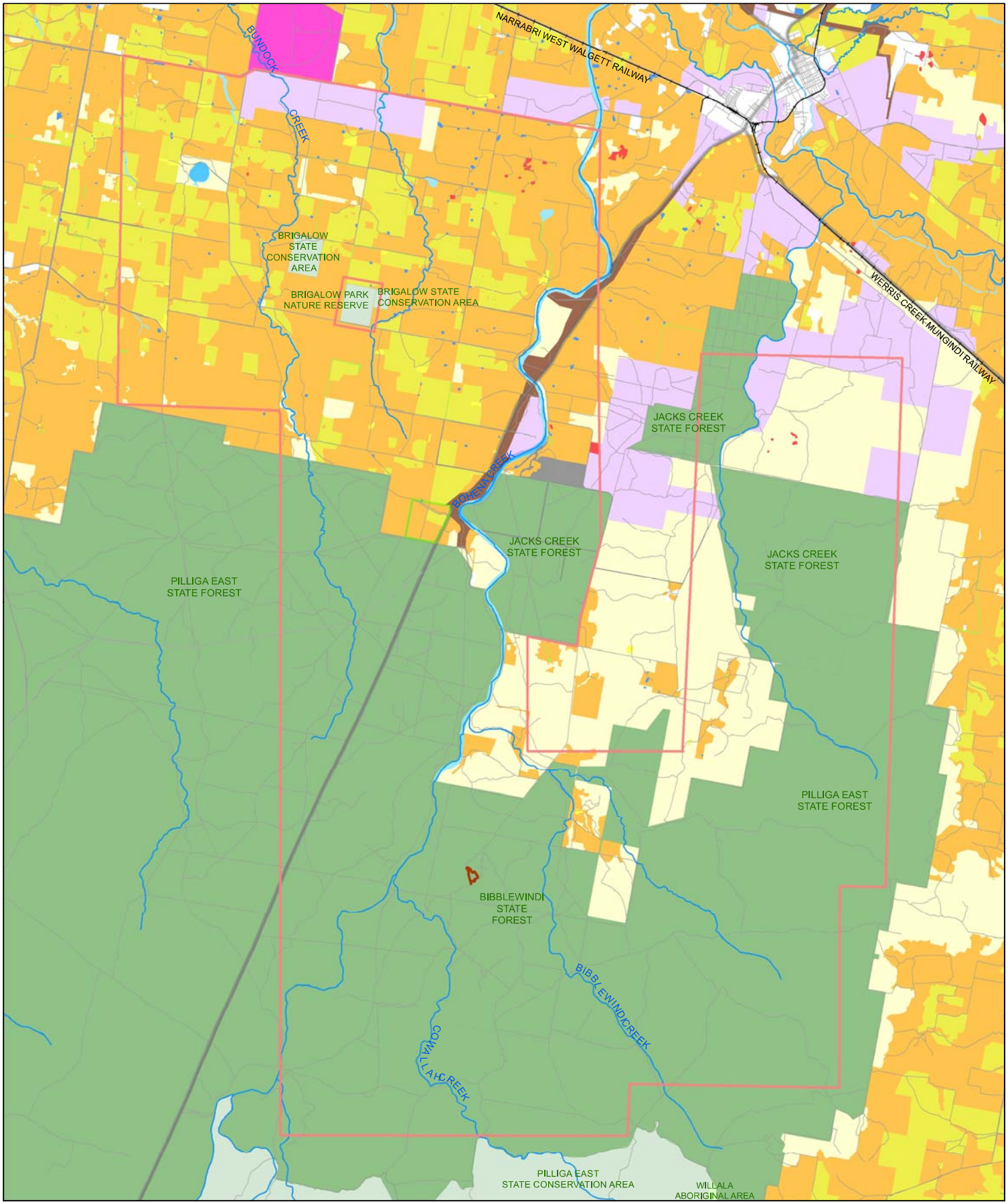
17.2.2 Land use

The project area can be broadly divided into a northern (predominantly agricultural) part and a southern (predominantly forested) part. Land use is mapped by the NSW Office of Environment and Heritage (OEH 2014), as summarised in Table 17-2 and shown in Figure 17-1. The main land uses and features in the project area, being agricultural and forested areas, are described further in Section 17.2.4 and Section 17.2.5 respectively.

Table 17-2 Land use within the project area

Land use	Area (ha.)	Proportion (%)
State forest	53,737	56.42
Native forest / Crown reserve	9,251	9.71
Lakes, rivers, swamps and drainage	820	0.86
Farm dams	80	0.08
Quarry	52	0.05
Research facility	14	0.02
Grazing properties	20,504	21.53
Cropping properties	6,629	6.96
Travelling stock routes	583	0.61
Windbreak or tree corridor	113	0.12
Farm infrastructure	154	0.16
Urban / rural residential	2,580	2.71
Infrastructure (roads)	722	0.76
Total	**95,239**	**100**

Source: NSW Office and Environment and Heritage (OEH 2014).



LEGEND

- Project area
- Leewood
- Bibblewindi
- Parks and reserves
- State forest
- Aboriginal areas
- Lakes and dams
- Watercourses
- Roads
- Train line

NSW Land Use Mapping

- State Forest
- Native Forest / Crown reserve
- Lakes, rivers, swamps and drainage
- Farm dams
- Quarry
- Research facility
- Grazing
- Cropping
- Travelling stock routes
- Windbreak or tree corridor
- Farm infrastructure
- Urban / rural residential
- Infrastructure (roads and airstrip)

0 1.75 3.5 7
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Narrabri Gas Project
Environmental Impact Satement

Job Number 21-22463
Revision A
Date FEB 2015

Land use within the project area

Figure 17-1

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Data source: DTDB and DCDB -2012-13. Santos: Operational and Base Data - 2013. Created by:afoddy

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17.2.3 Zoning

As the project area is located wholly within the Narrabri LGA, the project is zoned under the *Narrabri Local Environmental Plan 2012*. Zoning in the project area is mapped in Figure 17-2. As shown, the project area is situated in three zones:

- RU1 – Primary Production
- RU3 – Forestry
- E1 – National Parks and Nature Reserves.

The northern part of the project area is primarily zoned as 'RU1 – Primary Production'.

The Brigalow State Conservation Area in the northern part of the project area is zoned as 'E1 – National Parks and Nature Reserves'. The adjacent Brigalow Park Nature Reserve is also zoned as 'E1 – National Parks and Nature Reserves' and is excluded from the project area.

The southern part of the project area is primarily zoned as 'RU3 – Forestry'.

17.2.4 Forest

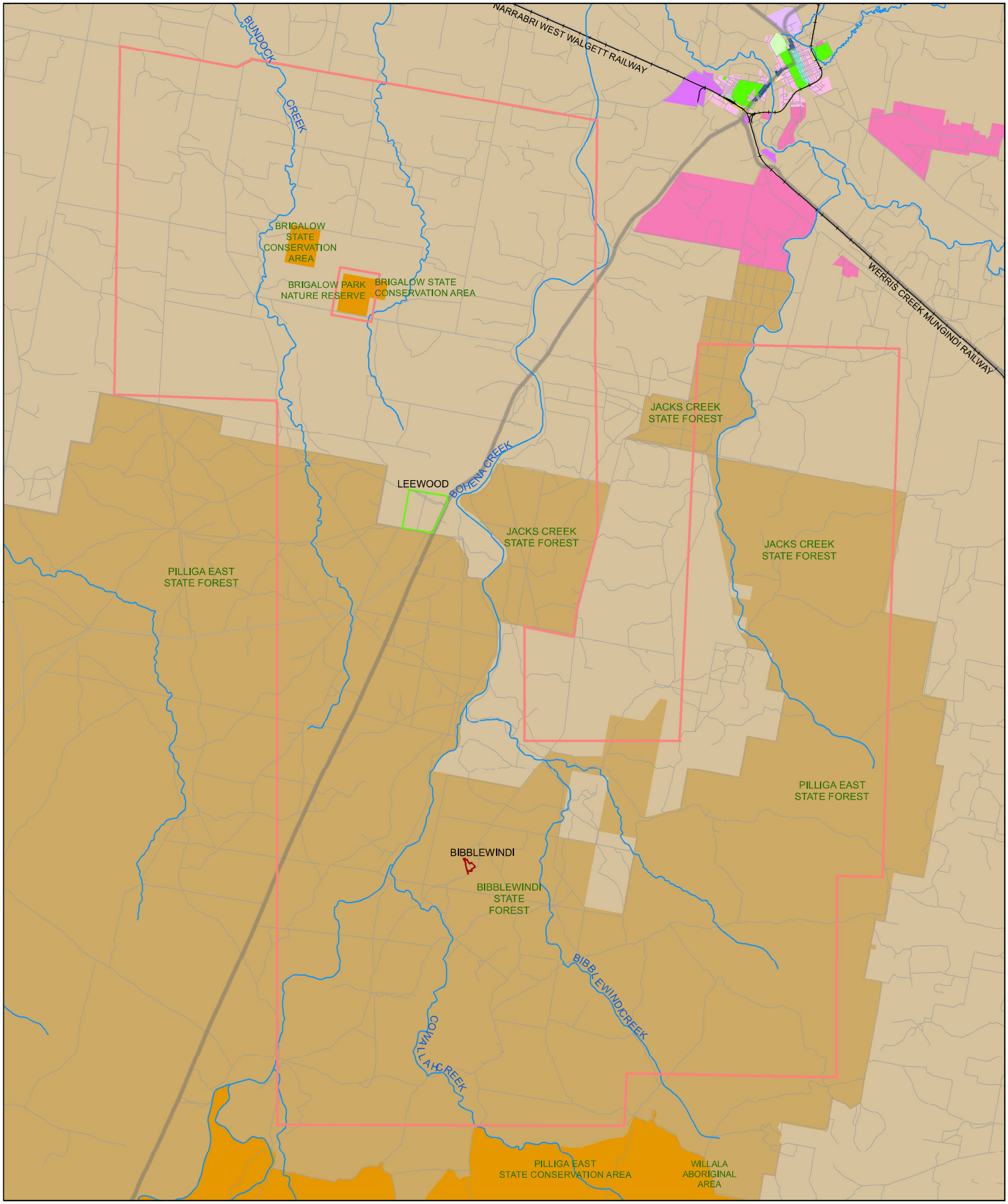
State forests cover approximately 56 per cent of the total project area, mainly toward the south. They include the Pilliga East State Forest, Bibblewindi State Forest and Jacks Creek State Forest. Other mapped forested areas, including the Brigalow State Conservation Area, account for another 10 per cent of the project area. As noted above, the Brigalow Nature Reserve is excluded from the project area.

State forests and conservation areas in the project area are administered under the *Brigalow and Nandewar Community Conservation Area Act 2005*, which designates a Community Conservation Area. The purpose of the area is to reserve land for conservation, sustainable forestry and mining and other appropriate uses, while protecting areas of natural and cultural heritage significance to Aboriginal people.

Within the Community Conservation Area, there are four dedicated management zones that have defined purposes and uses. State forests in the project area (Pilliga East State Forest, Bibblewindi State Forest and Jacks Creek State Forest) are designated as Zone 4 – Forestry, recreation and mineral extraction. The *Brigalow and Nandewar Community Conservation Area Agreement* (NSW Government 2009) states the following strategic aims for Zone 4:

- provide and encourage the use of timber products and materials in accordance with the *Forestry Act 2012* and the Integrated Forestry Operations Approval for the Brigalow and Nandewar regions and, where relevant, the *Plantations and Reafforestation Act 1999*
- conserve, promote the growth of, and utilise timber in the zone to the best advantage of the State
- provide for exploration, mining, petroleum production and extractive industry in accordance with the *Mining Act 1992* and the *Petroleum (Onshore) Act 1991* and associated Regulations and guidelines.

The project is consistent with these strategic management aims as it would involve petroleum exploration and production in accordance with the relevant legislation, and would be generally compatible with the continuation of forestry in the project area. Furthermore, the disturbance footprint from project infrastructure of around 1,000 hectares is estimated to approximate one per cent of the total project area of approximately 95,000 hectares.



LEGEND

- Leewood
- Bibblewindi
- Parks and reserves
- State forest
- Aboriginal areas
- Lakes and dams
- Watercourses
- Train line
- Roads

LEP Zoning 2012

- SP2, Infrastructure
- RU3, Forestry
- RU1, Primary Production
- RE2, Private Recreation
- RE1, Public Recreation
- R5, Large Lot Residential
- R1, General Residential
- IN2, Light Industrial
- IN1, General Industrial
- E3, Environmental Management
- E1, National Parks and Nature Reserves
- B4, Mixed Use
- B2, Local Centre
- B1, Neighbourhood Centre

0 1.75 3.5 7
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Date 27 Jul 2016

Land zoning within the project area

Figure 17-2

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Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Created by: jrichardson

State forests in the project area are managed by the Forestry Corporation of NSW, mainly for timber harvesting. Only Pilliga East State Forest is currently being harvested for timber. The harvesting activities are considered to be relatively small scale, due to the relatively low value of the sawlog and a reduction in marketable timber due to recent fire. The quality of sawlog is not likely to significantly improve over the life of the project due to slow regeneration rates.

State forest within the project area has been fragmented and otherwise impacted by commercial timber harvesting and related other human activities over the last century, including the establishment of more than 5,000 kilometres of roads, tracks and trails (refer to Section 17.2.6).

The following activities also have potential to occur in forested parts of the project area:

- bee-keeping (the Narrabri area is known for its honey production)
- harvesting of commercial and community firewood
- harvesting of broombush for fencing
- harvesting of timber for fencing.

State forests also support a range of recreational activities, including:

- bird watching and wildfselower appreciation
- bushwalking
- hunting
- bike riding
- camping
- picnicking.

17.2.5 Agriculture

The main agricultural activity in the project area is livestock grazing (mainly beef cattle and sheep), which occurs on approximately 22 per cent of the project area. Dryland cropping is less extensive and occurs on approximately seven per cent of the project area. There is also a small amount of timber and honey production on agricultural land.

Land and soil capability of agricultural land within the project area is summarised in Table 17-3 and mapped in Figure 17-3, as per the NSW Office of Environment and Heritage classification system (OEH 2012). The majority of the project area is classified as Class 4, Class 5 or Class 7, meaning it is generally incapable of sustaining cropping without specialist management practices and resources. A relatively small proportion of the project area is classified Class 3 and is therefore capable of sustaining higher productivity land uses, such as cropping.

The relatively low utilisation of land for cropping in the project area is reflected in an analysis by the NSW Office of Environment and Heritage (OEH 2009), which found that 93 per cent of the cleared properties were not cropped between 2000 and 2009.

The project area does not contain biophysical strategic agricultural land under the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* as confirmed through a detailed assessment and soil survey (refer to Chapter 14 – Soils and land contamination). This has been confirmed by the issue of a BSAL Certificate for the project area by the NSW Government.

Table 17-3 Land and soil capability in the project area

Classification	Land and soil capability	Area in project area (ha.)	Proportion of project area (%)
Class 1	No limitations. This land is of extremely high capability and has no limitations. There are no special land management practices required and land is capable of all rural land uses and land management practices	0	0
Class 2	Slight limitations. Land is of very high capability and has slight limitations which can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.	0	0
Class 3	Moderate limitations. Land capable of sustaining high impact land uses using more intensive, readily available and accepted management practices.	17,000	18
Class 4	Moderate to severe limitations. Land generally not capable of sustaining high impact land uses unless using specialised management practices with high level of knowledge, expertise, inputs, investment and technology.	32,500	34
Class 5	Severe limitations. Land not capable of sustaining high impact land uses except where resources allow for highly specialised land management practices to overcome limitations (such as high value crops). Lower impact land uses (such as grazing) can be managed by readily available practices.	45,500	48
Class 7	Extremely severe limitations. Land incapable of sustaining most land uses. Limitations cannot be overcome.	< 50	< 0.1
Class 8	Extremely severe limitations. Land is unusable for agricultural production	0	0

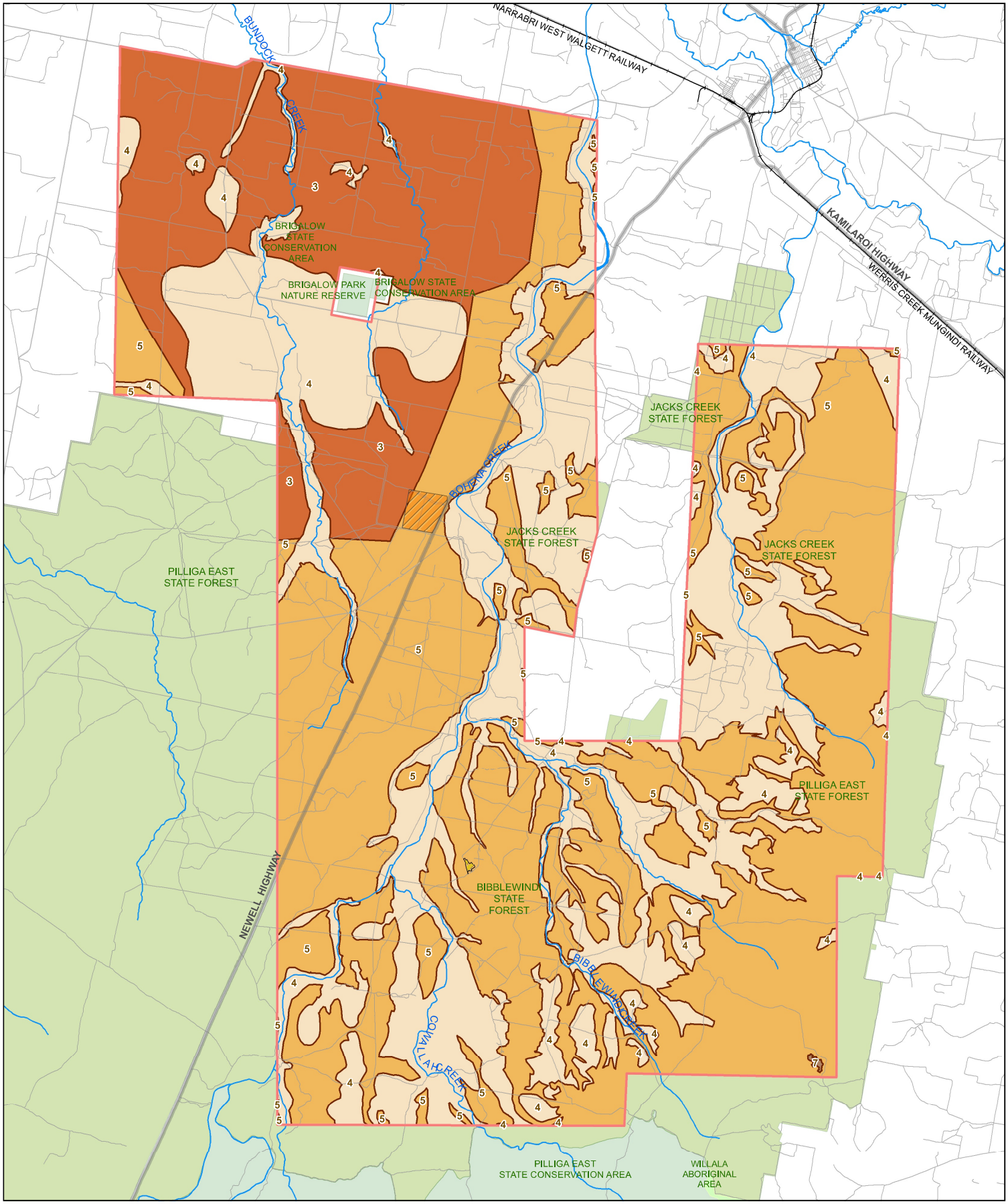
17.2.6 Other land uses

A total of 217 sensitive receivers were identified in and around the project area as shown in Figure 17 4. The identified sensitive receivers are typically rural residences at low density in and around the project area. They also include the CSIRO's Australia Telescope Compact Array in the north of the project area.

Other land uses and features of the project area include:

- Yarrie Lake in the north-west of the project area, which is a key visitor attraction and is highly valued by the local community
- the Newell Highway, which is a major transport corridor, linking Queensland, NSW and Victoria
- numerous roads, track and trails, including forestry roads
- a range of existing and approved infrastructure for natural gas exploration and appraisal including the Leewood produced water and brine management ponds; Bibblewindi Ponds 1, 2 and 3; Bibblewindi, Dewhurst, Tintsfield, Coonarah and Bohena pilots and associated flow lines; and Westport workers' accommodation.

Existing and approved infrastructure for natural gas exploration and appraisal in the project area is discussed in detail in Chapter 2.



LEGEND

- Project area
- Leewood
- Bibblewindi
- Parks and reserves
- State forest
- Aboriginal areas
- Lakes and dams
- Watercourses
- Roads
- Train line

Land and soil capability (LSC) classes

- 3
- 4
- 5
- 7

0 1.75 3.5 7

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Narrabri Gas Project
Environmental Impact Statement

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Revision A
Date 20 Jul 2016

Land and soil capability

Figure 17-3

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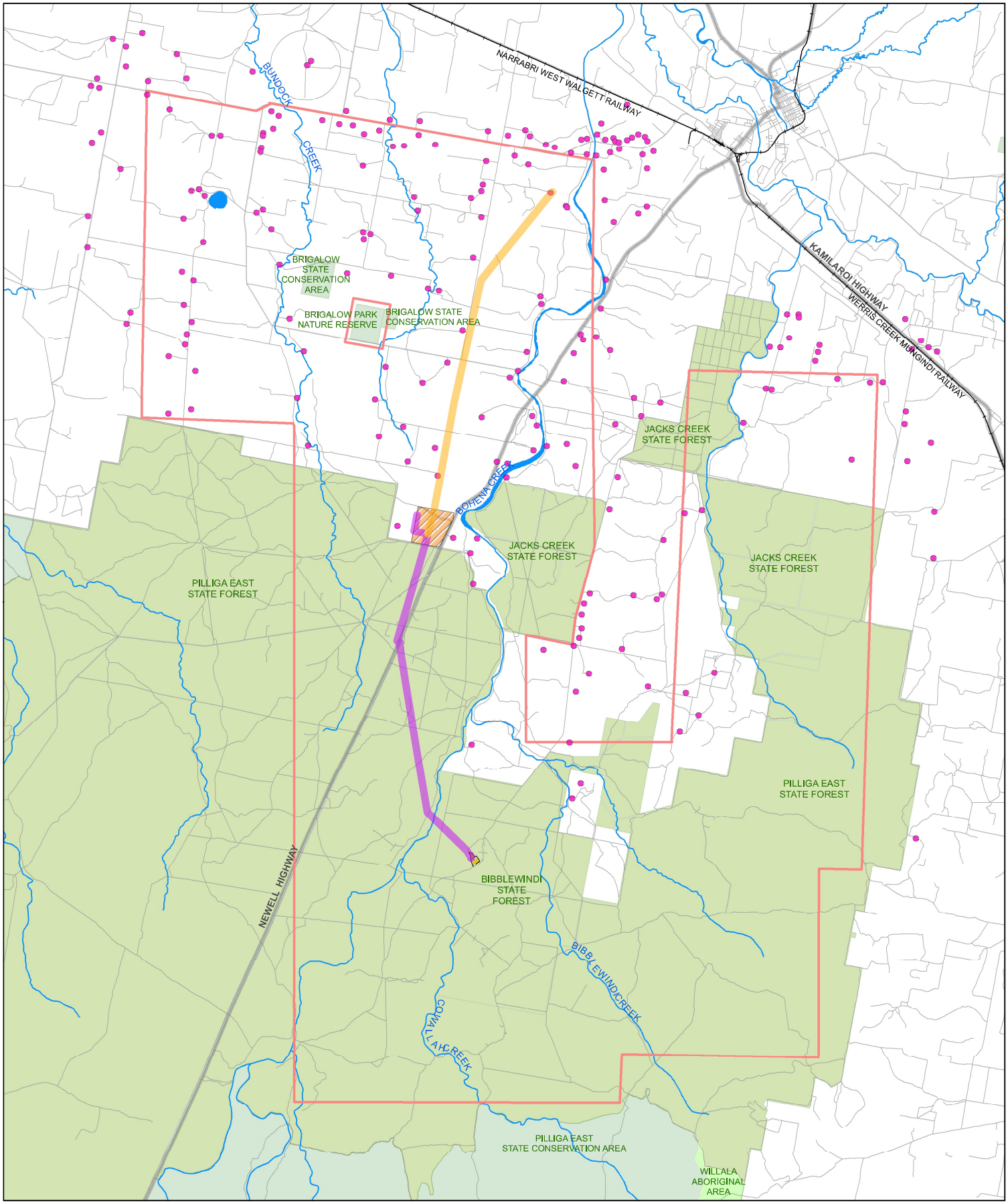
Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013, Created by: jrichardson



LEGEND

- Project area
- Leewood
- Bibblewindi
- Parks and reserves
- State forest
- Aboriginal areas
- Lakes and dams
- Watercourses
- Roads
- Train line
- Sensitive receivers
- Leewood to Wilga Park infrastructure corridor
- Bibblewindi to Leewood infrastructure corridor

0 1.75 3.5 7
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Narrabri Gas Project
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Sensitive receivers within three kilometres of the project area

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Figure 17-4

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Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Created by: jrichardson

17.3 Potential impacts – construction

17.3.1 Forest

Construction of the project has the potential to impact forestry and recreational activities at discrete locations within State forests by changing land use and restricting access to facilities for safety and security reasons. Potential impacts on State forest would primarily occur through the construction of:

- facilities at Bibblewindi
- the Bibblewindi to Leewood infrastructure corridor
- the gas field (well pads, gas and water gathering lines and access tracks).

Impacts on State forests from the construction of the Leewood infrastructure, the Leewood to Wilga Park underground power line, Westport workers' accommodation and other ancillary infrastructure would be negligible as:

- construction of the Leewood infrastructure would occur on a previously cleared property outside of the forested area, which is currently utilised for water management activities associated with natural gas exploration
- construction of the Leewood to Wilga Park underground power line would occur within an existing, cleared pipeline corridor outside of the forested area
- expansion of Westport workers' accommodation would occur in a vegetated area adjacent to the existing accommodation facilities which is not designated State forest
- upgrades to intersections on the Newell Highway would occur within the existing road corridor and would involve limited additional clearing
- the treated water pipeline from Leewood to Bohena Creek would be constructed in a vegetated area adjacent to Leewood, which is not designated State forest
- the site of the treated water irrigation area would be situated outside of State forests due to soil and clearing constraints.

Potential impacts on forestry operations within State forests include direct loss of sawlog through clearing, and obstruction of access to forestry operations. The potential for impacts to occur is limited as forestry operations in the project area occur at a relatively small scale (refer to Section 17.2.4), while the Forestry Corporation of NSW would retain the right to timber removed for the project and would be consulted to this effect (refer to Section 17.6). The quality of sawlog is not likely to significantly improve over the life of the project due to slow regeneration rates.

Apiarists generally rely on the use of public land for their hives with the majority of NSW production being derived from eucalypt species. Eucalyptus species tend to flower on a two to five-year cycle. Therefore, it is important for apiarists to have a variety of forests available in different locations throughout the year.

The proponent has completed a number of consultation activities with the NSW Apiarist's Association including a field trip to the proposed project area in 2012 (Australia's Honeybee News 2012). In addition, the proponent addressed the NSW Apiarists' Association 2014 annual conference, which was held in Narrabri. The proponent presented an overview of the project, including a discussion on the potential impact on the bee industry with reference to access. The proponent will continue to undertake ongoing stakeholder communication with the apiary industry.

The diffuse nature of the gas field infrastructure to be constructed in the State forests, and ongoing consultation with the apiary industry, result in a negligible impact on the apiary industry.

Due to the diffuse nature of the gas field, potential impacts on recreational values would be characterised by a limited and temporary restriction of access during construction, as opposed to a wholesale change of land use. The potential for impacts to occur is limited as the identified values (such as bird watching, bushwalking or hunting) would occur over a wide area. Potential impacts on access would be transient, as construction activities progress through the gas field.

Potential impacts of the project in forested areas would be limited and are therefore considered to be generally compatible with existing uses. It is noted that the project is consistent with strategic aims under the *Brigalow and Nandewar Community Conservation Area Act 2005*. Impacts on State forests during construction would be avoided as far as practicable through consultation with the Forestry Corporation of NSW. Measures to control impacts within the State forests are further described in Section 17.6.

17.3.2 Agriculture

The construction of infrastructure on Leewood and of some parts of the gas field itself, have the potential to impact upon agriculture in the project area as they would occur on cleared land with potential for agricultural use. The nature of the impact would be the exclusion of agricultural land uses at the construction sites for these project components, with limited potential to restrict surrounding agricultural land uses.

Impacts on agriculture from the construction of Bibblewindi, the Bibblewindi to Leewood infrastructure corridor, the Leewood to Wilga Park underground power line, Westport workers' accommodation and other ancillary infrastructure would be negligible as:

- construction of Bibblewindi, the Bibblewindi to Leewood infrastructure corridor and Westport workers' accommodation would primarily occur in vegetated areas not used for agriculture
- construction of the Leewood to Wilga Park underground power line would occur within an existing, cleared pipeline corridor
- upgrades to intersections on the Newell Highway would involve limited additional clearing
- the treated water pipeline from Leewood to Bohena Creek would be constructed in a vegetated area
- the site of the treated water irrigation area would already host an agricultural activity.

Santos owns the former agricultural property named Leewood which now hosts existing and approved infrastructure associated with natural gas exploration activities (refer to Section 17.2.6). The construction of the project at Leewood would be consistent with the existing use of Leewood, and would therefore not represent a significant impact on existing agricultural activities.

The proponent will not undertake field development on private land without a Land Access Agreement in place. In NSW, land access is undertaken in accordance with the *Agreed Principles of Land Access* (NSW Government 2014b), to which Santos is a signatory, along with AGL, NSW Farmers Association, Cotton Australia, Dairy Connect, the Country Women's Association of NSW and the NSW Irrigators Council. The *Agreed Principles of Land Access* include:

- Any landholder must be allowed to freely express their views on the type of drilling operations that should or should not take place on their land without criticism, pressure, harassment or intimidation. A landholder is at liberty to say "yes" or "no" to the conduct of operation on their land.
- Gas companies will respect a landholder's wishes and not enter onto a landholder's property to conduct drilling operations where that landholder has clearly expressed the view that operations on their property would be unwelcome.

- The parties will uphold a landholder's decision to allow access for drilling operations and do not support attempts by third-party groups to interfere with any agreed operations. The parties condemn bullying, harassment and intimidation in relation to agreed drilling operations.

A Farm Management Plan would also be developed in consultation with the landholder that would include locations for gas field infrastructure.

Due to the diffuse nature of the gas field, potential impacts would be characterised by relatively small and discrete areas of change that could coexist with surrounding agricultural uses, as opposed to a wholesale change of land use. Gas field infrastructure would impact a relatively limited area, with well pad sizing during construction approximating one hectare. Existing roads and access tracks would be utilised wherever possible, or would generally be co-located with gas and water gathering lines, occupying a right of way averaging 10 metres in width.

The estimated area of impact (532 hectares) equals about two per cent of the agricultural land in the project area. It is noted that if the proponent-owned Leewood property is excluded the estimated area of impact drops to around 1.2 per cent of agricultural land in the project area. As field development would occur progressively over the life of the project, the area of impact at one time would likely be less.

The overall impact of the construction of the project on agriculture has been quantified in economic terms. Although not likely to be significant, the potential impacts of the project on the efficiency of agricultural operations through interrupted management of impeded access were included in the calculation. Potential increases in labour costs due to competition with the project were also considered.

The productive value of agricultural land in the project area was estimated at $533 per hectare. This value was informed by publicly available information and targeted consultation with landholders. Considering this estimated productive value of land, the total economic impact would be in the order of $325,588 to $368,056 (including indirect impacts) over the duration of field development.

The estimate of economic impact is considered conservative (that is, greater than would likely occur) as landholders would influence the location of infrastructure and would tend to prefer less productive areas, such as those adjacent to fence lines. The location of infrastructure would be agreed and formalised in Land Access Agreements and Farm Management Plans. Actual loss of income would be offset through compensation provisions in Land Access Agreements made with landholders.

Construction of the project also has the potential to impact agricultural operations through:

- damage or alteration of farm infrastructure such as internal roads, fences, water pipelines or dams, which would be short-term and rectified with the implementation of the mitigation and management measures presented in Section 17.6
- dust generated during construction, which would be temporary and transient, and generally well below the level that would inhibit plant growth or palatability to livestock
- noise generated construction, which is not expected to impact on productivity as livestock generally become habituated to noise and where grazing patterns may be altered, productivity is not affected
- soil erosion and contamination, which is discussed in Chapter 14 (Soil and land contamination)
- introduction or spread of weed species, which is discussed in Chapter 15 (Terrestrial ecology).

Impacts on agriculture during construction would be avoided as far as practicable through consultation with landholders, Land Access Agreements and Farm Management Plans as discussed above. Measures to control impacts on agricultural land are further described in Section 17.6. As such, the project is considered to be generally compatible with existing land uses in agricultural areas.

17.3.3 Other land uses

Implementation of the Field Development Protocol would minimise the potential for environmental impacts to sensitive receivers (refer to Chapter 10 – Approach to the impact assessment). However, there remains the potential for indirect air quality, ambient noise and visual amenity impacts at some sensitive receivers. These indirect impacts would be relatively temporary given that construction activities at a given location would be transient and short-term.

Air quality impacts at sensitive receivers during construction would mainly relate to the generation of dust and are assessed in Chapter 18 (Air quality). Noise impacts at sensitive receivers during construction would mainly relate to noise-generating construction activities at Leewood, Bibblewindi and various locations through the gas field, and are assessed in Chapter 19 (Noise and vibration). Visual amenity impacts are assessed in Chapter 23 (Landscape and visual).

The construction of the gas field also has the potential to impact the Newell Highway where crossings are necessary to connect well pads to Bibblewindi or Leewood, via gas and watering gathering lines. Potential impacts would be avoided in the first instance through detailed design of the project. Where crossings of the Newell Highway are required, they would be directionally drilled under the highway to minimise disruption, and co-located where practicable. Impacts of increased traffic on the Newell Highway and other roads are assessed in Chapter 22 (Traffic and transport).

Yarrie Lake's recreational values will be retained through a surface infrastructure exclusion zone of 200 metres around the lake and detailed project risk management and design measures.

17.4 Potential impacts – operation

17.4.1 Forest

Potential impacts on State forests and other forested areas during operation would be lower than potential impacts during construction for the following reasons:

- clearing, if required, would be restricted to regrowth within operational areas or fire breaks
- well pads, gas and water gathering and access tracks would be partially rehabilitated at the end of construction, meaning the cleared area required for ongoing operations would be substantially reduced
- obstruction of access would be negligible, particularly as gas and water gathering lines would be buried and pre-existing access would be restored at the end of construction.

Operation of the gas field infrastructure in the State forests, along with ongoing consultation with the apiary industry, results in a negligible impact on the apiary industry.

17.4.2 Agriculture

Impacts on agriculture during operation would be generally consistent with those described for construction, noting that the area of impact would be substantially reduced as well pads and gas and water gathering would be partially rehabilitated.

The majority of well pads would be reduced from approximately one hectare to around one-quarter of a hectare, while the right of way for access tracks and gas and water gathering would be reduced from an average of 10 metres to approximately five metres.

As for construction, gas field infrastructure would operate under Land Access Agreements and Farm Management Plans developed in consultation with landholders.

The area of agricultural land occupied during operation would reduce to an estimated 351 hectares through partial rehabilitation of well pads from an estimated 532 hectares during construction (refer to Section 17.3.2). The reduced estimated area of around 351 hectares represents about 1.3 per cent of agricultural land in the project area. It is noted that if the Santos-owned Leewood property is excluded, the estimated area of impact drops to around 0.5 per cent of agricultural land in the project area. As field development would occur progressively over the life of the project, the area of impact at one time may be less.

The overall impact of the operation of the project on agriculture has been quantified in economic terms, including the direct impact on the estimated 351 hectares. Although not likely to be significant, the potential impacts of the project on the efficiency of agricultural operations through interrupted management of impeded access were included in the calculation.

The productive value of agricultural land in the project area was estimated at $533 per hectare. This value was informed by publicly available information and targeted consultation with landholders. Considering this estimated productive value of land, the total economic impact would be in the order of $215,452 to $243,554 (including indirect impacts) per year of operation.

As noted in Section 17.3.2, the estimate of economic impact is considered conservative (that is, greater than would likely occur) as landholders would be able to influence where infrastructure is located on their properties. Actual loss of income would be offset through compensation provisions in Land Access Agreements made with landholders.

As dust and noise would be generated in significantly lower volumes during operations as compared to construction, indirect impacts on agricultural activities associated with noise and dust are anticipated to be insignificant. Refer to Chapter 18 (Air quality) and Chapter 19 (Noise and vibration) for additional detail. Given that noise levels are lower during construction relative to operations, no impacts on agricultural productivity are anticipated (refer to Appendix K). Soil erosion and other potential impacts would also be relatively limited during operation, as described in Chapter 14 (Soil and land contamination), while the introduction of, and potential for, the spread of weed species is discussed in Chapter 15 (Terrestrial ecology).

Impacts on agriculture during operation would be avoided as far as practicable through consultation with landholders, Land Access Agreements and Farm Management Plans as discussed above. Measures to control impacts on agricultural land are further described in Section 17.6. As such, the project is considered to be generally compatible with existing land uses in agricultural areas.

17.4.3 Other land uses

The potential for indirect air quality, ambient noise and visual amenity impacts at sensitive receivers was assessed for project operation. Air quality impacts at sensitive receivers during operation include emissions from Leewood, Bibblewindi and generators at wells pads, though were assessed as generally negligible. These impacts are assessed in Chapter 18 (Air quality). Potential noise impacts at sensitive receivers during operation would relate to the operation of infrastructure at Leewood, Bibblewindi and well pads. These impacts are assessed in Chapter 19 (Noise and vibration). Potential visual amenity impacts during operation are assessed in Chapter 23 (Landscape and visual).

Impacts on Yarrie Lake would continue to be negligible as assessed herein (refer to Section 17.3.3), while traffic on the Newell Highway and other roads would be significantly less during operations than during construction (refer to Chapter 22 – Traffic and transport).

17.5 Potential impacts – decommissioning

Decommissioning would involve the removal of aboveground infrastructure. Where required, procedures and responsibilities for the removal of underground infrastructure would be developed in consultation with landholders. Decommissioning would facilitate the re-establishment of post-development land uses as appropriate and in consultation with the landholder at the time of decommissioning. Dust and noise impacts during decommissioning would be temporary and transient, and would be similar to the impacts described for the construction phase (refer to section 17.3.3).

Decommissioning may also indirectly impact agricultural operations through soil erosion and contamination and introduction or spread of weed species. Potential impacts and mitigation measures regarding soils and other impacts are discussed in Chapter 14 (Soil and land contamination). Potential impacts and mitigation measures regarding weed species are discussed in Chapter 15 (Terrestrial ecology).

17.6 Significance assessment

A range of mitigation and management measures are proposed to control potential impacts of the project with regard to property and land use. Table 17-4 demonstrates the effectiveness of these mitigation measures in reducing the level of environmental risk posed by the project.

Table 17-4 Environmental significance assessment

Potential impact	Phase	Pre-mitigated significance			Mitigation and management measures	Residual significance		
		Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance
Impacts on rural residential or agricultural land	Construction	Moderate	Moderate	Moderate	Land Access Agreements and Farm Management Plans will be developed in consultation with affected landholders. Unless a written agreement is in place with the relevant landholder, no project infrastructure will be located within 200 m of an occupied residence on that property.	Low[a]	Low	Negligible
	Operation	Moderate	Low	Low		Low[a]	Low	Negligible
	Decommissioning	Moderate	Moderate	Moderate		Low[a]	Low	Negligible
Impacts on forestry operations	Construction	Moderate	Moderate	Moderate	The Forestry Corporation of NSW will be consulted in accordance with the agreed Occupation Permit.	Low	Low	Negligible
	Operation	Moderate	Low	Low		Low	Low	Negligible
	Decommissioning	Moderate	Moderate	Moderate		Low	Low	Negligible
Impacts on other forest activities including recreation and/or bee-keeping	Construction	Moderate	Moderate	Low		Low	Low	Negligible
	Operation	Moderate	Low	Low		Low	Low	Negligible
	Decommissioning	Moderate	Moderate	Moderate		Low	Low	Negligible
Impacts on Yarrie Lake	Construction	Moderate	Moderate	Moderate	A 200 metre surface development exclusion zone would be established around Yarrie Lake to prevent impacts on its recreational value and amenity.	Moderate	Low	Low
	Operation	Moderate	Low	Low		Moderate	Low	Low
	Decommissioning	Moderate	Moderate	Moderate		Moderate	Low	Low

[a] Landholders would influence the location of infrastructure and would tend to prefer less productive areas, such as those adjacent to fence lines.

17.7 Conclusion

The implementation of mitigation and management measures and relevant design elements of the project would be satisfactory to control and minimise the potential impacts of the project. The residual environmental risks presented by the project are generally low.

Although the project would occupy some agricultural land, impacts on agricultural operations would be mitigated and managed through Land Access Agreements and Farm Management Plans. Actual loss of income would be offset through the implementation of compensation provisions contained in Land Access Agreements made with landholders.

Furthermore, the agricultural land would be rehabilitated in consultation with relevant landholders at project decommissioning. The residual significance associated with each of the key impacts assessed in this chapter is presented in Table 17-5.

Impacts on forestry operations and other forest activities including recreation and / or bee-keeping have been assessed as negligible through construction, operations and decommissioning. Impacts on other land uses have been assessed as low through construction, operations and decommissioning.

Table 17-5 Property and land use significance of residual impacts

Potential impact	Construction	Operation	Decommissioning
Impacts on agricultural land and operations	Negligible	Negligible	Negligible
Impacts on forestry operations	Negligible	Negligible	Negligible
Impacts on other forest activities including recreation and/or bee-keeping	Negligible	Negligible	Negligible
Impacts on Yarrie Lake	Low	Low	Low