

Land use and tenure J

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Santos GLNG Gas Field Development Project

Land use, planning and tenure assessment

AUGUST 2014

Prepared for
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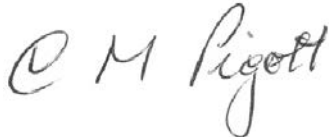


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Appendices

Appendix A	Statutory planning framework and assessment (presented in this EIS as Appendix JA)
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Abbreviations

Abbreviation	Description
ALC	Agricultural land class
ATP	Authority to prospect
CHRC	Central Highlands Regional Council
CQRGMP	Central Queensland Growth Management Framework
CQRP	<i>Central Queensland Regional Plan 2002</i>
CSG	Coal Seam Gas
DAFF	Queensland Department of Agriculture, Fisheries and Forestry
DEO	Desired Environmental Outcome
DIWA	Directory of Important Wetlands in Australia
DNRM	Queensland Department of Natural Resources and Mines
EHP	Queensland Department of Environment and Heritage Protection
EIS	Environmental impact statement
EM Plan	Environmental management plan
EP Act	<i>Environmental Protection Act 1994 (Qld)</i>
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPM	Exploratory permits for minerals
FR	Forest Reserves
GFD Project	Gas Field Development Project
GQAL	Good Quality Agricultural Land
HES	High Ecological Significance
IDAS	Integrated Development Assessment System
ILUA	Indigenous Land Use Agreement
KRA	Key resource area
MDL	Mineral development licences
MNES	Matter of national environmental significance
MR Act	<i>Mineral Resources Act 1989 (Qld)</i>
NC Act	<i>Nature Conservation Act 1992 (Qld)</i>
Petroleum Act	<i>Petroleum Act 1923 (Qld)</i>
P&G Act	<i>Petroleum and Gas (Production and Safety) Act 2004 (QLD)</i>
PL	Petroleum lease
PLA	Petroleum lease application
PPL	Petroleum pipeline licence
QLUMP	Queensland Land Use Mapping Program
RPI Act	<i>Regional Planning Interests Act 2014 (QLD)</i>
SF	State forests
SIMP	Social impact management plan
SP Act	<i>Sustainable Planning Act 2009 (QLD)</i>
SP Regulation	<i>State Planning Regulation 2009 (QLD)</i>
SPP	State planning policies
SPRP	State planning regulatory provisions
TMR	Queensland Department of Transport and Main Roads
ToR	Terms of reference
TR	Timber Reserves

Executive summary

Santos GLNG intends to further develop its Queensland gas resources to augment existing supplies for its liquefied natural gas (LNG) facility under construction on Curtis Island. This is to be achieved by expanding its approved gas fields in the Surat and Bowen basins of southern and central Queensland.

The Santos GLNG Gas Field Development Project (GFD Project) comprises the gas fields of Arcadia, Fairview, Roma and Scotia, which include the following land uses:

- Areas of rural land used for agriculture, primary production and forestry
- Protected areas of conservation, tourism and recreational values
- Proposed and existing resource extraction activities
- Towns and rural residences
- Transport and infrastructure services.

Development of the GFD Project may result in the following potential impacts:

- Disruption of agricultural and primary production activities
- Disruption to forestry operations
- Reduction in available accommodation facilities and available and appropriately zoned and serviced residential land
- Decrease in residential amenity
- Restrictions to the exploration for and/or the extraction of other resources
- Disturbance to conservation, tourism and recreational uses
- Interference with existing transportation and utility services.

These potential impacts were assessed using the following methodologies:

- Compliance assessment – where compliance was against planning schemes or guidelines
- Significance assessment – by identifying the sensitivity of the underlying land use value and assessing the magnitude of the potential impacts.

To manage and mitigate the potential impacts to the land use and tenure values, Santos GLNG has approved management strategies, plans and protocols in place that successfully manage the land use impacts of the GLNG Project. These strategies and measures are contained in a variety of strategies and management plans including:

- GFD Project Environmental protocol for constraints planning and field development
- Land access and landholder engagement strategy
- Noise Management Plan
- Road-use Management Plan
- Pest and Weed Management Plan
- Draft Environmental Management Plan.

These will be implemented for the GFD Project and supported by additional measures where necessary.

The assessment has identified a variety of avoidance, minimisation, mitigation and rehabilitation measures that will be implemented to reduce the significance of the potential impacts and to ensure those impacts are adequately managed in accordance with regulatory requirements and current industry best practice. Existing Santos GLNG management systems relevant to particular land uses have been shown to be effective at avoiding, managing and mitigating the land use impacts of the GFD Project. Implementation of these measures will ensure that the significance of the residual land use impacts is limited to either moderate or low.

Introduction

1.1 Project overview

Santos GLNG intends to further develop its Queensland gas resources to augment supply of natural gas to its existing and previously approved Gladstone Liquefied Natural Gas (GLNG) Project.

The Santos GLNG Gas Field Development Project (the GFD Project) is an extension of the existing approved gas field development and will involve the construction, operation, decommissioning and rehabilitation of production wells and the associated supporting infrastructure needed to provide additional gas over a project life exceeding 30 years.

Specifically, the GFD Project seeks approval to expand the GLNG Project's gas fields tenure from 6,887 km² to 10,676 km² to develop up to 6,100 production wells beyond the currently authorised 2,650 wells; resulting in a maximum of up to 8,750 production wells. The GFD Project will continue to progressively develop the Arcadia, Fairview, Roma and Scotia gas fields across 35 Santos GLNG petroleum tenures in the Surat and Bowen basins, and associated supporting infrastructure in these tenures and adjacent areas. The location of the GFD Project area and primary infrastructure is shown on Figure 1-1.

This GFD Project will include the following components:

- Production wells
- Fluid injection wells, monitoring bores and potentially underground gas storage wells
- Gas and water gathering lines
- Gas and water transmission pipelines
- Gas compression and treatment facilities
- Water storage and management facilities
- 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 generation and supply (overhead and/or underground)
- Laydown, stockpile and storage areas
- Borrow pits and quarries
- Communications.

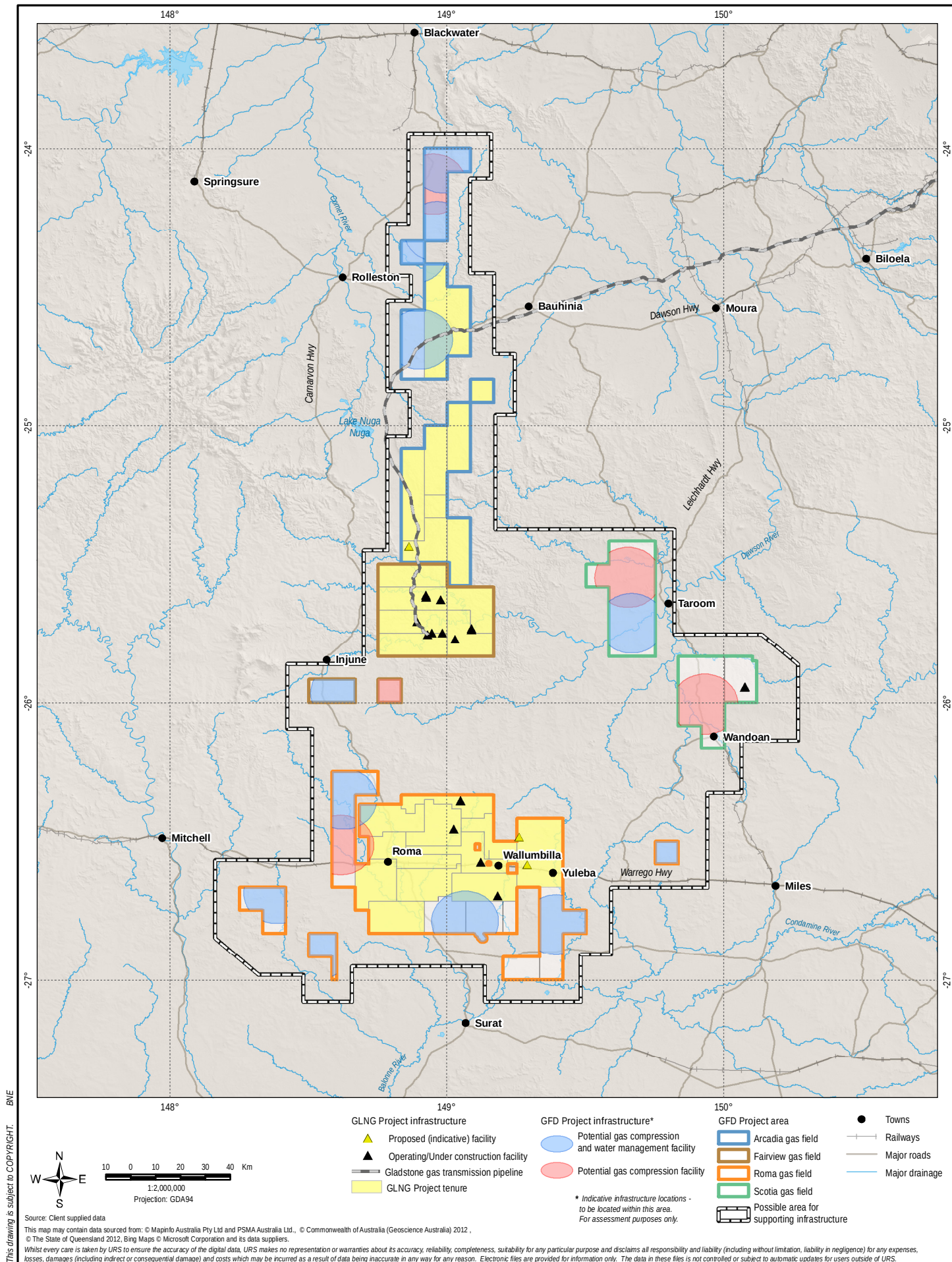
The final number, size and location of the components will be determined progressively over the GFD Project life and will be influenced by the location, size and quality of the gas resources identified through ongoing field development planning processes, which include consideration of land access agreements negotiated with landholders, and environmental and cultural heritage values.

For the purposes of transparency this EIS shows an area off-tenure that may be used for infrastructure such as pipelines and temporary camps (supporting infrastructure area). While not assessed specifically in this EIS, any infrastructure that may be located within this area would be subject to further approval processes separate to this EIS.

Where practicable, the GFD Project will utilise existing or already approved infrastructure (e.g. accommodation camps, gas compression and water management facilities) from the GLNG Project or other separately approved developments. The GFD Project may also involve sourcing gas from third-party suppliers, as well as the sharing or co-location of gas field and associated facilities with third parties.

1 Introduction

Approved exploration and appraisal activities are currently underway across the GFD Project's petroleum tenures to improve understanding of the available gas resources. As the understanding of gas resources increases, investment decisions will be made about the scale, location and timing of the next stages of field development.

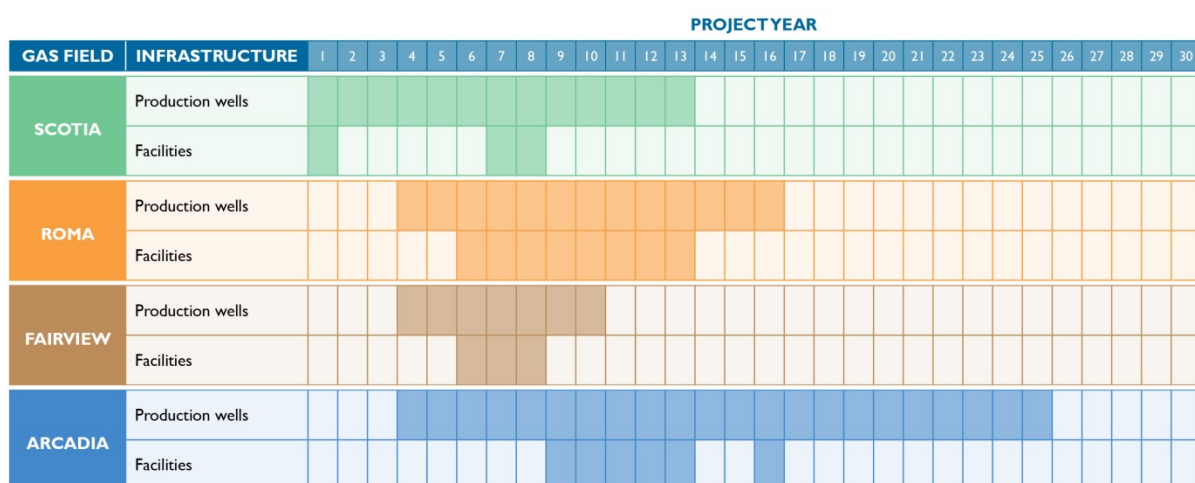


1 Introduction

For the purposes of this EIS, a scenario based on the maximum development case was developed at the approval of the Terms of Reference. This scenario assumed that production from the wells and upgrading of the gas compression facilities in the Scotia gas field would commence in 2016, followed by the GFD Project wells in the Roma, Arcadia and Fairview gas fields in mid-2019. This schedule is indicative only and was used for the purpose of the impact assessment in this EIS.

The potential GFD Project schedule is outlined in Figure 1-2. This schedule provides an overall field development scenario for the purposes of assessment in this EIS.

Figure 1-2 Proposed GFD Project development schedule



Decommissioning and rehabilitation will occur progressively throughout the life of the GFD Project as construction activities cease and exhausted gas wells are decommissioned. Final decommissioning and rehabilitation will occur at the end of gas production in accordance with relevant approvals and regulatory requirements.

1.2 Aims and objectives

This land use, planning and tenure assessment of the GFD Project has been prepared to address the relevant requirements of the *Terms of reference for an environmental impact statement* issued March 2013.

The baseline section of this report describes:

- Underlying land tenure including reserves, tenure of special interest including protected areas and forest reserves
- Areas subject to applications and determinations of Native Title
- Existing mining tenements, petroleum (including coal seam gas), geothermal and greenhouse gas tenures and licences
- Existing land uses
- Infrastructure within and adjoining the GFD Project area.

1 Introduction

The impact assessment section of this report will:

- Identify and describe the potential changes to existing and potential future land uses and tenure characteristics resulting from the construction and operation of the GFD Project
- Assess issues related to overlapping tenements and tenures and the processes to manage these issues
- Discuss potential proximity and co-location issues with current or proposed infrastructure and utilities
- Assess potential incompatible land use impacts
- Discuss avoidance, minimisation, mitigation and rehabilitation measures to manage potential impacts.

1.3 GFD Project area

Figure 1-1 shows the GFD Project gas fields and the location of the existing GLNG Project tenure. It also shows the extent of an area around the GFD Project gas fields that could possibly include supporting infrastructure.

Due to the scale, complexity and size of the GFD Project, this report has developed the following system of identifying and naming particular areas of the GFD Project being examined.

- GFD Project area — refers to the total area covered by the petroleum tenure of the GFD Project and the adjacent possible area for supporting infrastructure
- Gas fields — refers to the four gas fields (Arcadia, Fairview, Roma, Scotia) which, when combined, form the GFD Project tenure. This tenure will host major surface infrastructure, such as wells and gas compression and water management facilities
- Remainder — refers to the area surrounding the gas fields, which may be impacted by off-tenure infrastructure. This may include gas and water transmission pipelines, groundwater monitoring bores, as well as roads and power lines needed to connect gas field activities to each other and to nearby infrastructure and services.

The GFD Project area includes large areas of mostly rural land, incorporating agricultural and pastoral activities, including grazing (both beef cattle and sheep) and broadacre cropping (both irrigated and dryland). It also contains the towns of Roma, Wandoan, Wallumbilla, Yuleba and Taroom. The GFD Project area is located within parts of the Banana Shire Council and Central Highlands, Maranoa and Western Downs Regional Council areas.

Legislative and policy framework

2.1 Regulatory and compliance framework

A detailed assessment of the GFD Project against the regulatory and compliance framework relevant to land use and planning is included in Appendix A. It includes:

- Lists of relevant legislation, policies and plans affecting land use aspects, along with legislative triggers and approval agencies
- Comments on possible land use approvals, permits, licences, and authorities relevant to the planning, approval, construction and operation of the GFD Project
- Outlines of the GFD Project's consistency with relevant land use plans, policies and guidelines.

2.2 Compatibility with State, regional and local planning provisions

The *Sustainable Planning Act 2009* (SP Act) is the principal legislation in Queensland for land use planning and provides for the establishment of statutory planning instruments which guide and regulate development in Queensland. These statutory planning instruments include:

- A single State Planning Policy (SPP)
- Regional plans
- Local government planning schemes.

Appendix A includes an assessment of the GFD Project against the requirements of the relevant State, regional and local planning instruments. This assessment shows that the GFD Project is generally consistent with and allowable under these planning instruments.

2.3 Changing statutory planning and approvals framework

The State's regulatory framework which administers and regulates resource activities and developments are currently (first quarter 2014) undergoing reform to streamline and simplify the approval process. Changes to statutes have occurred and are likely to continue to occur during the assessment period for the GFD Project EIS.

Examples of legislative changes relevant to land use planning that have occurred or are imminent include:

- Proposed changes to the SP Act and the development of a new State Plan.
- Introduction of a single state-wide SPP which consolidates many of the existing State planning policies into one overarching policy.
- Changes to the *Nature Conservation Act 1992* (NC Act) delivered through the *Nature Conservation and Other Legislation Amendment Bill (No. 2) 2013*. This Bill abolished a number of protected classes used in this report, including forest reserve, conservation park and resource reserve. The State government is undertaking a process to reclassify areas that were protected under the abolished classes; however, this process was not completed at the time of preparing this report (March 2014). As a result, the to-be-abolished classes have been used for the purpose of this assessment.
- New statutory regional plans:
 - *The Darling Downs Regional Plan*
 - *The Central Queensland Regional Plan*.
- Local government planning schemes being rolled out across the State.

The effects of these changes are discussed in Appendix A.

2 Legislative and policy framework

Regional Planning Interests Act 2014 (Qld)

The RPI Act identifies and protects areas of Queensland that are of regional interest. In doing this, the RPI Act seeks to manage the impact and support coexistence of resource activities and other regulated activities in areas of regional interest. The Act aims to ensure that land use planning protects:

- Living areas (termed Priority Living Areas)
- High quality agricultural areas (termed Priority Agricultural Areas)
- Strategic cropping land (termed Strategic Cropping Areas)
- Important environmental areas (termed Strategic Environmental Areas).

Many of these areas are identified in regional planning instruments; in this way, the RPI Act gives force to regional plans.

2.4 Project implementation

The constraints approach is based upon the *GFD Project environmental protocol for constraints planning and field development* (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' environmental policies and the General Environmental Duty (GED) as outlined in the *Environmental Protection Act 1994* (Qld)
- 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 details the process that Santos GLNG will use to identify, assess and manage potential impacts to the environment during field planning and development. This process has been successfully used for the approved GLNG Project, which increases the certainty of GFD Project environmental outcomes.

The general principles of the Constraints protocol, in order of preference, are to:

- Avoid — avoid direct and indirect impacts
- Minimise — minimise potential impacts
- Mitigate — implement mitigation and management measures to minimise adverse impacts
- Remediate and rehabilitate — actively remediate and rehabilitate impacted areas
- Offset — offset residual risk in accordance with regulatory requirements.

Consistent with Santos GLNG's environmental management hierarchy, the Constraints protocol prioritises avoidance of environmental impact during field planning by identifying those areas that are not amenable to development. This includes areas of high environmental value as identified in regulatory frameworks and Santos GLNG's baseline surveys. For areas that are considered appropriate to develop, Santos GLNG will identify impacts to environmental values that could potentially occur due to the construction, operations and decommissioning activities of the GFD Project, and determine pre-mitigated impacts (i.e. those that would occur without mitigation).

2 Legislative and policy framework

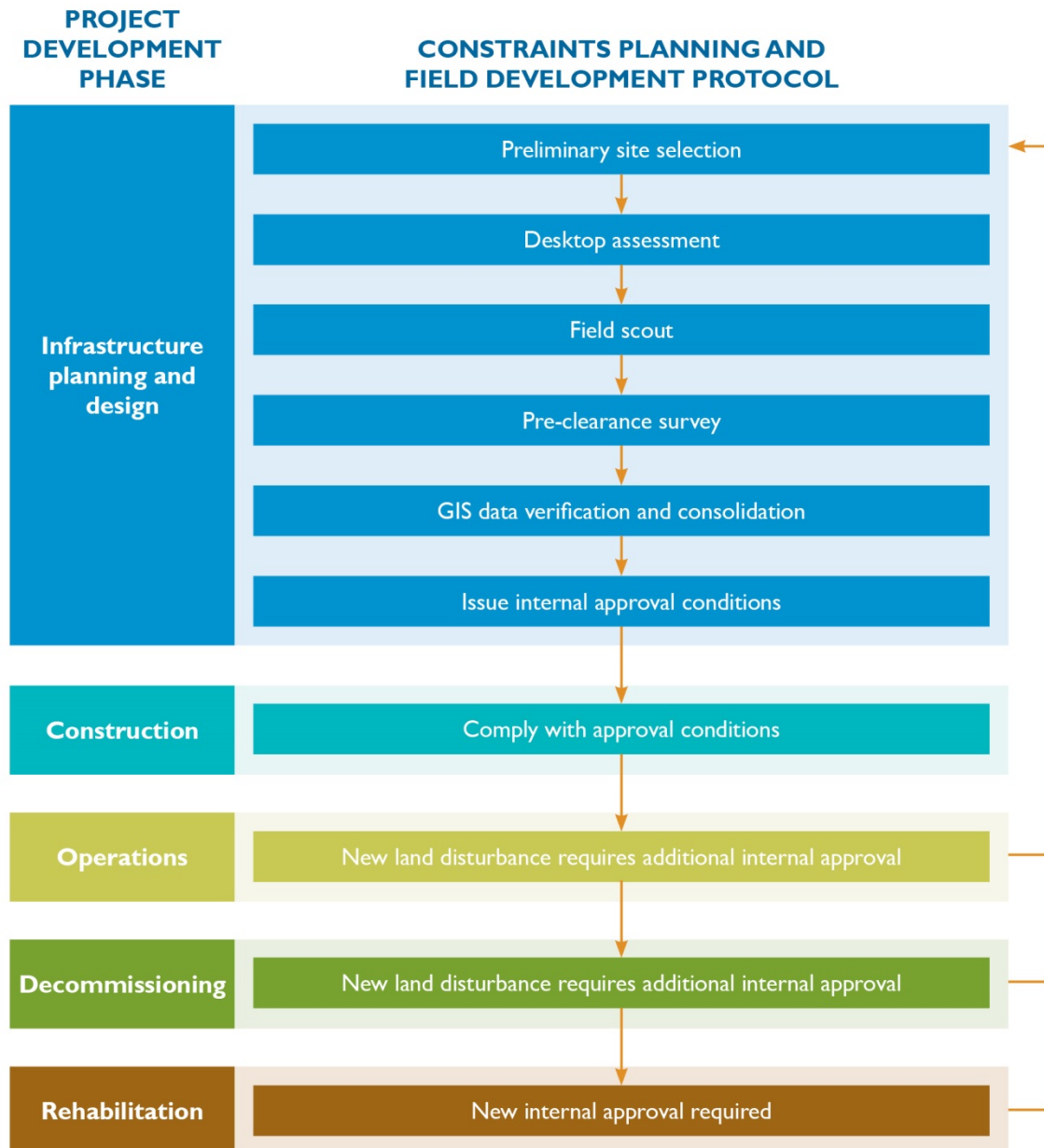
Relevant mitigation and management measures based on the approved environmental management framework already implemented for the GLNG Project are then applied to the pre-mitigated impacts to identify the mitigated (residual) impacts. This process increases certainty about potential impacts by identifying those areas that are not amenable to development, and for those areas where development could occur, how development should proceed.

The post-EIS field development process is a continuation of the field planning process and will be ongoing throughout the life of the GFD Project. The field development process will inform the GFD Project's design, together with a range of other factors including technical feasibility, cost and risk as required by standards applicable to the design, construction, operations, decommissioning and rehabilitation of gas developments. This information will be used to support the subsequent approvals process such as environmental approval application and the plan of operations.

The tasks involved in the field development process are summarised in Figure 2-1.

2 Legislative and policy framework

Figure 2-1 Field development process



The approval to construct stage includes the requirement to obtain landholder agreement. Santos GLNG is required to negotiate a conduct and compensation agreement (CCA) under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) and/or the *Petroleum Act 1923* (Petroleum Act) with landholders on whose land the petroleum activities will be carried out.

Santos GLNG engages with landholders before a proposed activity and negotiation of the CCA provides an opportunity for landholders to raise concerns specific to their property and to reach agreement on where, how and when development will occur on their property. The locations of wells, gathering lines and access tracks will be finalised in consultation with the landholder as part of these negotiations. The landholder engagement process is illustrated in Figure 2-2.

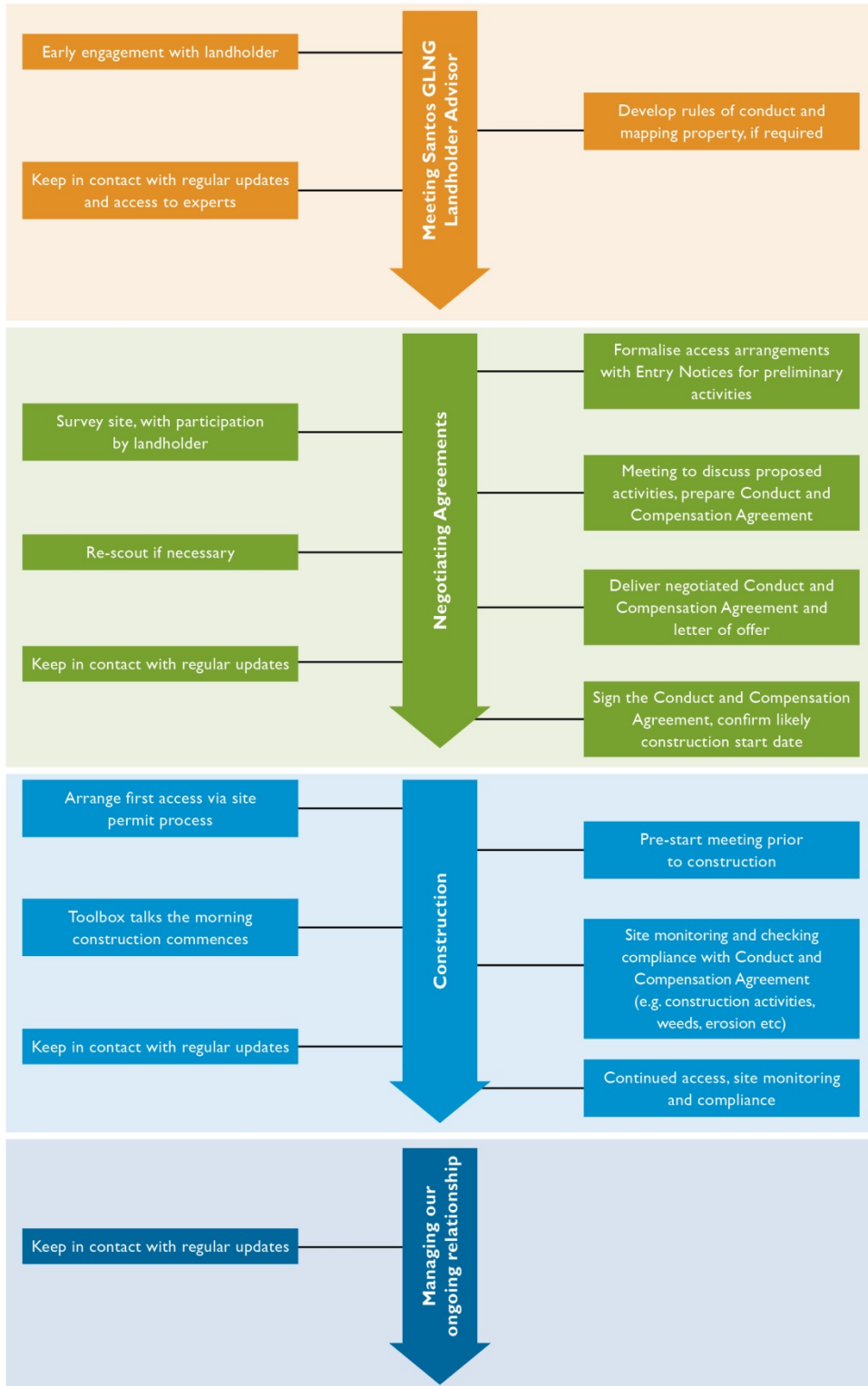
2 Legislative and policy framework

Use of the Constraints protocol and the field development process will enable Santos GLNG to optimise environmental outcomes by avoiding sensitive receptors wherever practicable and by incorporating landholder input. Where avoidance is not practicable, Santos GLNG will use a range of management and mitigation measures to minimise the impacts (discussed in Section 7). This hierarchy will be maintained throughout each phase of the GFD Project, providing multiple opportunities for refinement of scope and execution.

2 Legislative and policy framework

Figure 2-2 Landholder engagement process

Early engagement process with new landholders for future gas production activities



Land tenure and Native Title

3.1 Land tenure and ownership

The GFD Project area contains a total of 10,802 cadastral allotments under the tenures of freehold, leasehold, protected estate, reserves and unallocated State land. A summary of the land tenures of the GFD Project area are provided in Table 3-1 below. These allotments and their tenures are shown on Figure 3-1, and for each gas field in Figure 3-1a to Figure 3-1d.

Table 3-1 GFD Project area - land tenures

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

Source: Santos GLNG, 2013

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

3.1.1 Freehold

There are 7,250 allotments (approximately 92% of allotments) held in freehold title within the gas fields and 9,829 within the GFD Project area. The majority of these allotments are located within the southern half of the GFD Project area.

3.1.2 Lands lease

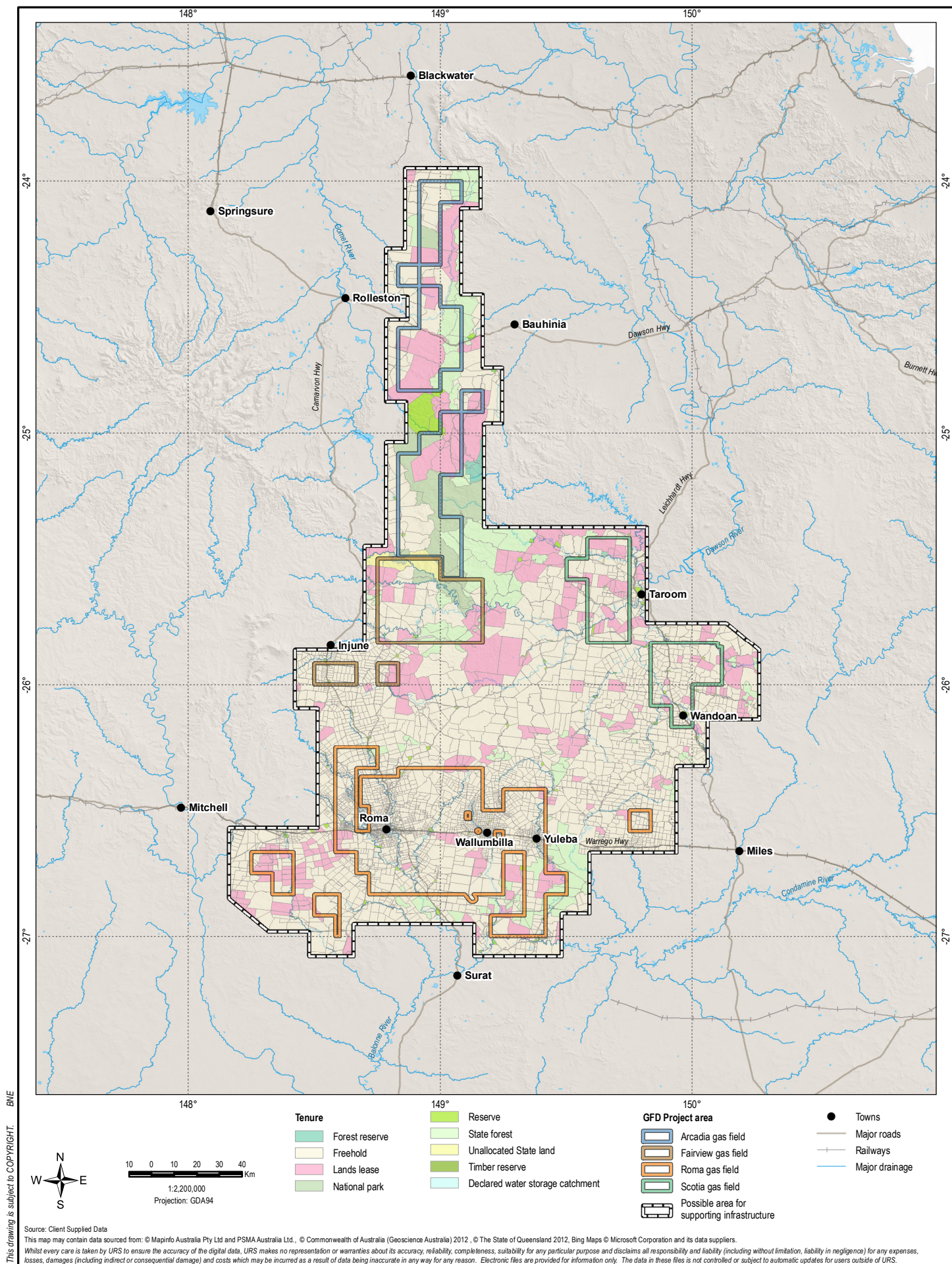
There are 237 allotments (approximately 3% of allotments) held in leasehold title within the gas fields and 422 within the GFD Project area. The majority of these allotments are located in the northern portions of the GFD Project area.

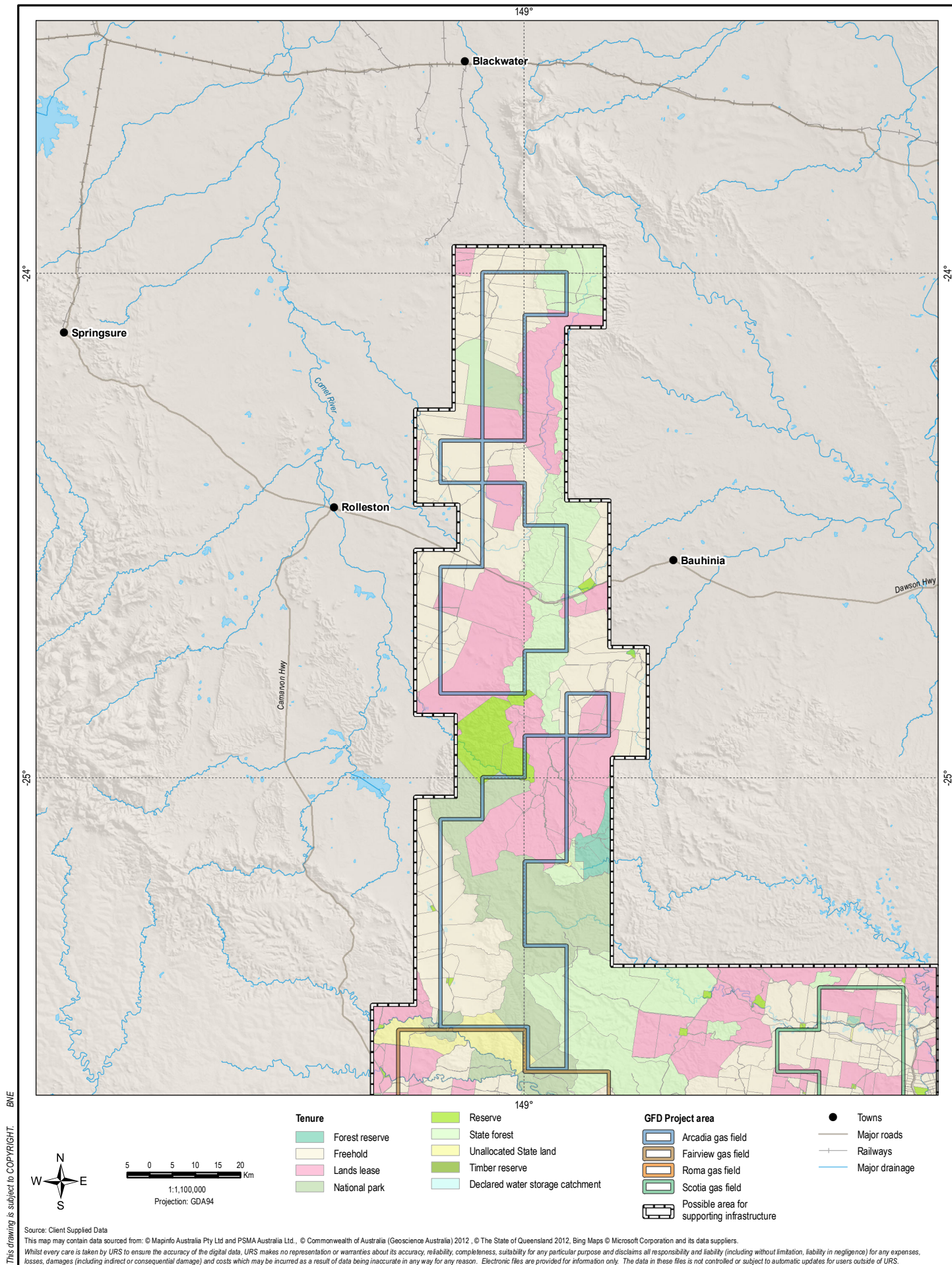
3.1.3 State held tenures

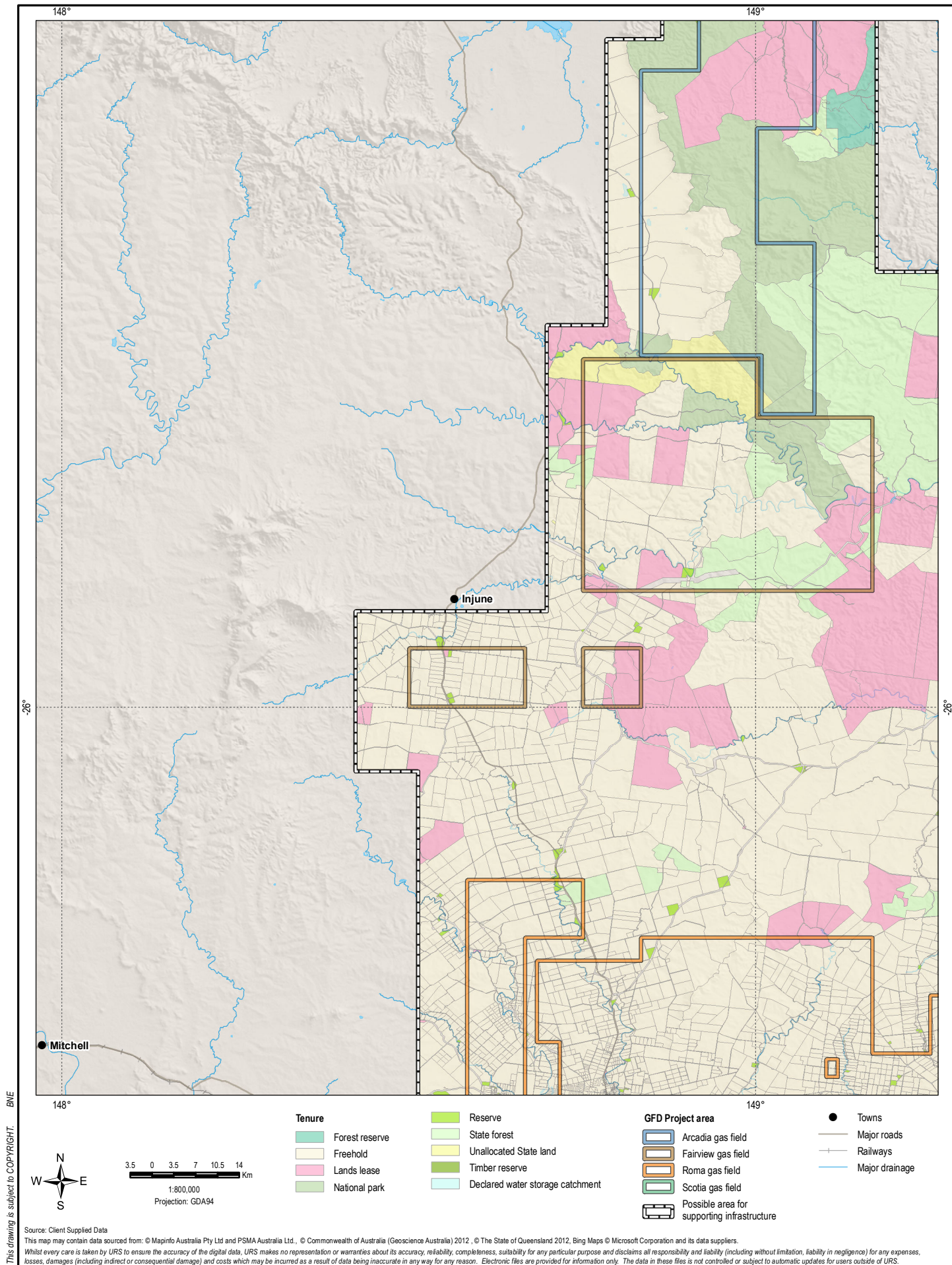
State held tenure includes unallocated State land, State forests, timber reserves, and forest reserves. Other State land within the GFD Project area includes reserves set aside for roads, rail and stock routes described in detail in sections 4 and 5 of this report.

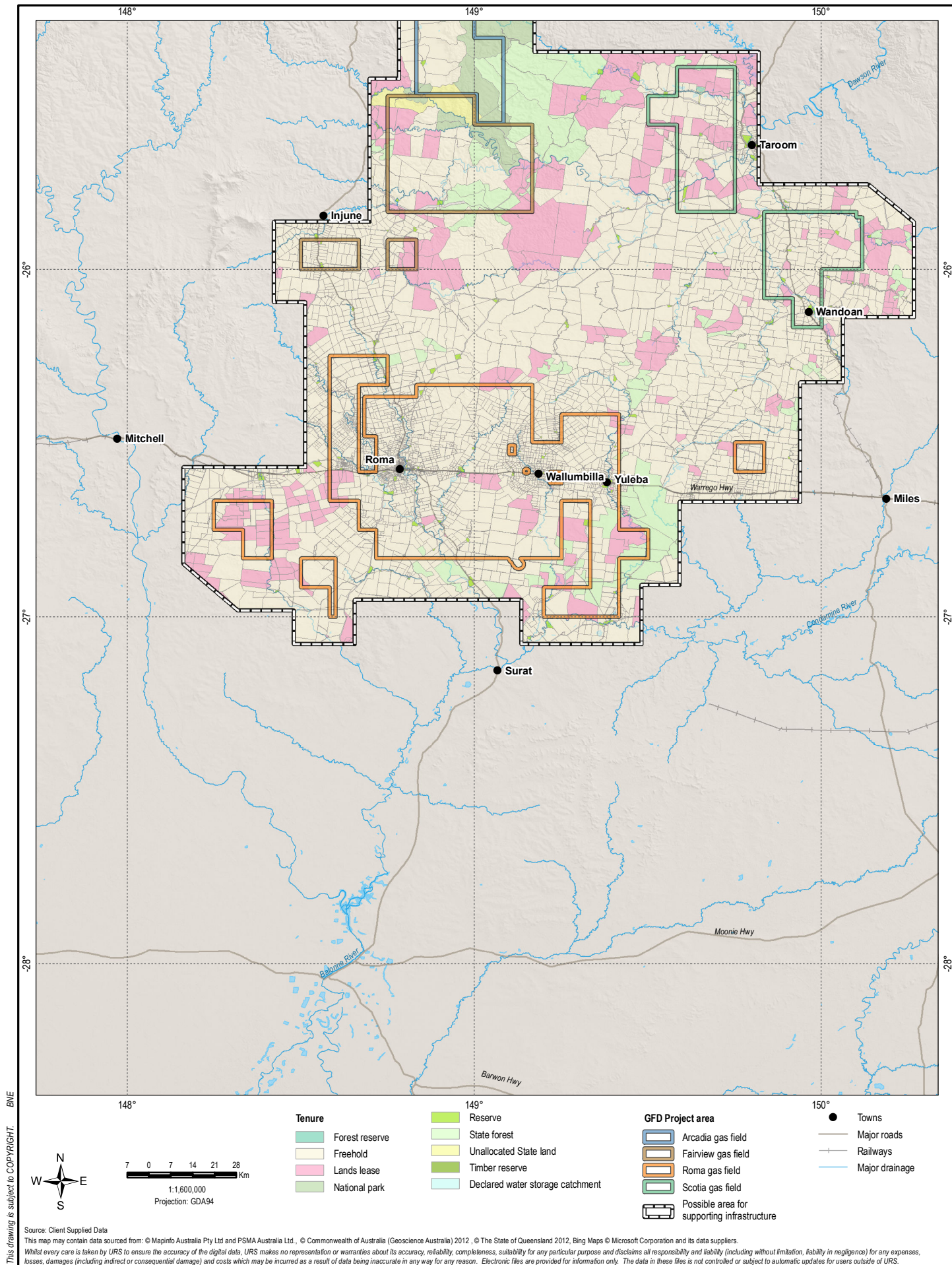
3.1.4 Declared water storage catchments

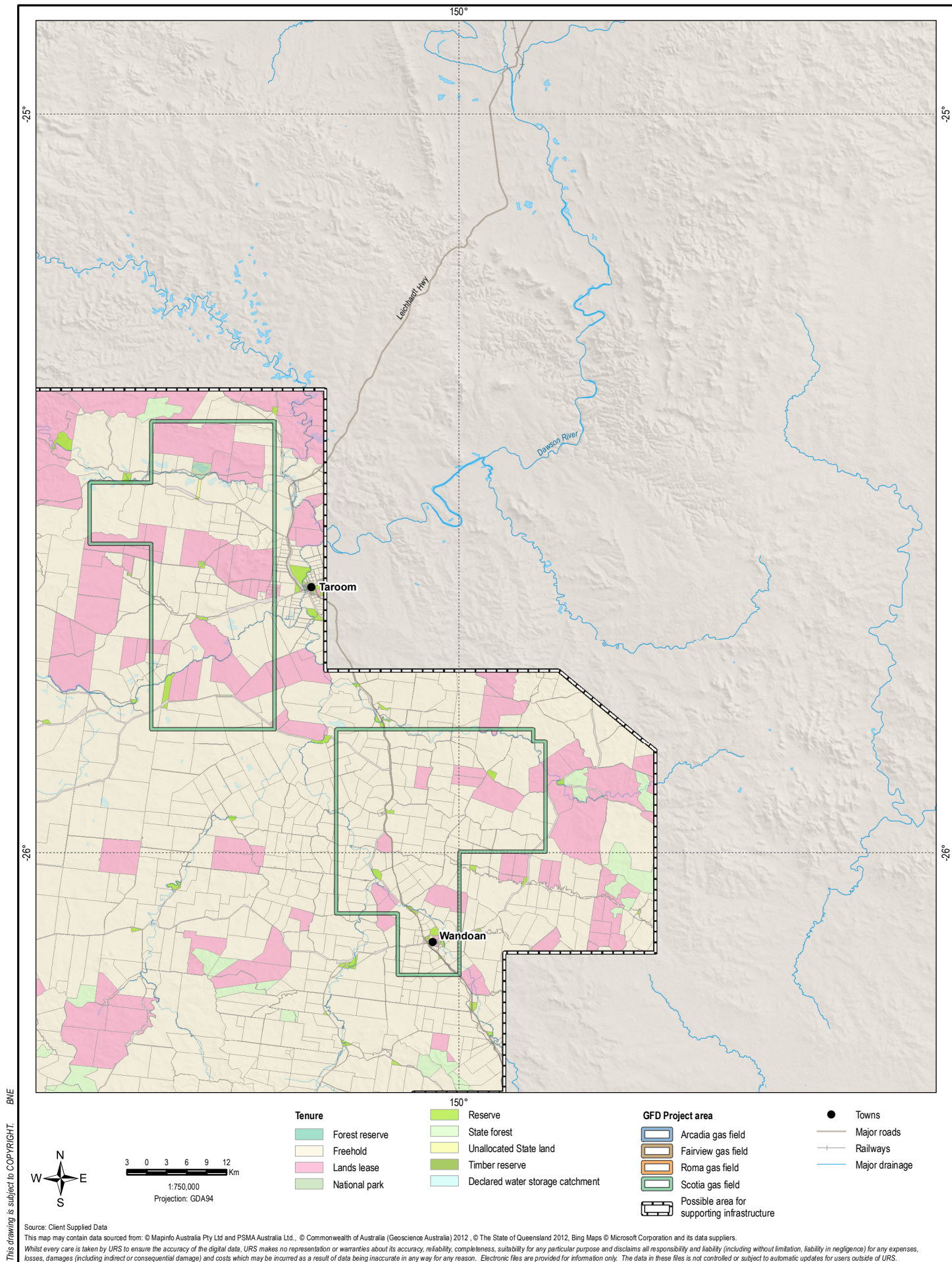
The ToR for the GFD Project requires the identification of any declared water storage catchments within the GFD Project area. Of the current 20 declared catchment areas in Queensland administered by Department of Natural Resources and Mines (DNRM), none are located within the GFD Project area.











3 Land tenure and Native Title

3.1.5 Protected areas

In Queensland, most protected areas are regulated through the NC Act. These protected areas have a number of objectives, including:

- The conservation of nature
- The involvement of Indigenous people in the management of protected areas in which they have an interest
- The use and enjoyment of protected areas by the community
- The social, cultural and commercial use of these areas in a way that is consistent with the natural, cultural and other values of the areas.

Other protected reserves (State forests and timber reserves) are regulated under the *Forestry Act 1959* (Qld) (Forestry Act).

The current use of these areas and the values they exhibit are discussed in further detail in section 4.6 Conservation, tourism and recreation.

There are numerous protected areas of varying conservation value located either in whole or in part within the GFD Project area. These include national parks, conservation parks, resource reserves and State forests. Protected areas are described in detail in Section 4.6 of this report. Table 3-2 lists the type and name of the protected areas that are located in the GFD Project area.

Table 3-2 Protected areas within GFD Project area

Gas field	National parks	Regional parks	State forest	Resource reserve
Arcadia	2	0	5	0
Fairview	1	0	5	1
Roma	0	0	8	0
Scotia	0	2	0	0
Remainder*	1	0	17	1
Total	4	2	35	1

Source: Santos GLNG, 2013

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

3.2 Native Title and Indigenous land use agreements

3.2.1 Native Title

Native Title is the recognition by the Commonwealth and State governments of the laws, rights and interests over land and water possessed by Indigenous people in Australia under their traditional laws and customs. The GFD Project is subject to a number of registered Native Title claims and determinations. Within the GFD Project area there is also land (State land) where Native Title rights have not been extinguished and therefore Native Title claims can still be made. Proposed activities that may affect or impair Native Title are classed as 'future acts' under the Native Title Act.

Table 3-3 identifies the registered Native Title claims and determinations that are located within the GFD Project area. Native Title claims are shown on Figure 3-2, and Figure 3-2a to Figure 3-2d for each gas field.

3 Land tenure and Native Title

Table 3-3 Native Title claims and determinations – GFD Project area

Gas field	Name	Claim / determination number	Federal court number	Status
Arcadia	Karingbal People	QC06/19	QUD473/06	Active
	Karingbal 2	QC06/5	QUD23/06	Active
	Bidjara People	QC08/5	QUD216/08	Active
	Wadja People	QC12/10	QUD422/12	Active
	Kanolu People #1	QC12/11	QUD418/12	Active
	Kanolu People #2	QC12/12	QUD421/12	Active
	Bidjara People #7	QC12/18	QUD644/12	Active
	Gaangalu Nation	QC12/9	QUD400/12	Active
	Iman People 2	QC97/55	QUD6162/98	Active
Fairview	Mandandanji People	QC08/10	QUD366/08	Active
	Bidjara People	QC08/5	QUD216/08	Active
	Iman People 2	QC97/55	QUD6162/98	Active
Roma	Mandandanji People	QC08/10	QUD366/08	Active
	Gunggari People #3	QC12/13	QUD548/12	Active
Scotia	Iman People 2	QC97/55	QUD6162/98	Active
Remainder*	Mandandanji People	QC08/10	QUD366/08	Active
	Brown River People	QC11/4	QUD245/11	Active
	Gunggari People # 4	QC12/14	QUD550/12	Active

Source: DNRM, 2013

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

3.2.2 Native Title agreements

An Indigenous land use agreement (ILUA) is a contract or agreement about the use and management of an area of land or water, between a Native Title party and other parties. An ILUA is one way to take into account the communal rights of the Native Title party and interests in an area of land held by other parties, and enable other parties to use the land and/or resources in the agreement area.

Table 3-4 identifies the registered ILUAs that are located within the GFD Project area. These ILUAs are shown on Figure 3-3, and on Figure 3-3a to Figure 3-3d for each gas field.

Table 3-4 Indigenous land use agreements

Gas field	Name	Tribunal number
Arcadia	Santos & Petronas & Karingbal People ILUA	QI2009/061
	Iman People #2 and QGC Limited ILUA	QI2010/003
	Santos, Petronas and Iman People #2 GLNG ILUA	QI2010/010
	Santos / Petronas - Bidjara and Karingbal People ILUA	QI2010/016
	Santos Petronas Murribinbi GLNG ILUA	QI2011/010
Fairview	Hutton Creek Crossing - Comet Ridge Project	QI2005/001
	Iman People #2 and QGC Limited ILUA	QI2010/003
	Santos, Petronas and Iman People #2 GLNG ILUA	QI2010/010
	Santos & Petronas & Bidjara ILUA	QI2010/015
	Mandandanji People and QGC Pty Limited ILUA	QI2010/034
Roma	Darling Downs to Wallumbilla Pipeline(s)	QI2007/028
	QGC Limited and Barunggam, Cobble Cobble, Jarowair, Western Wakka Wakka and Yiman Groups	QI2010/006
	Mandandanji People and QGC Pty Limited ILUA	QI2010/034

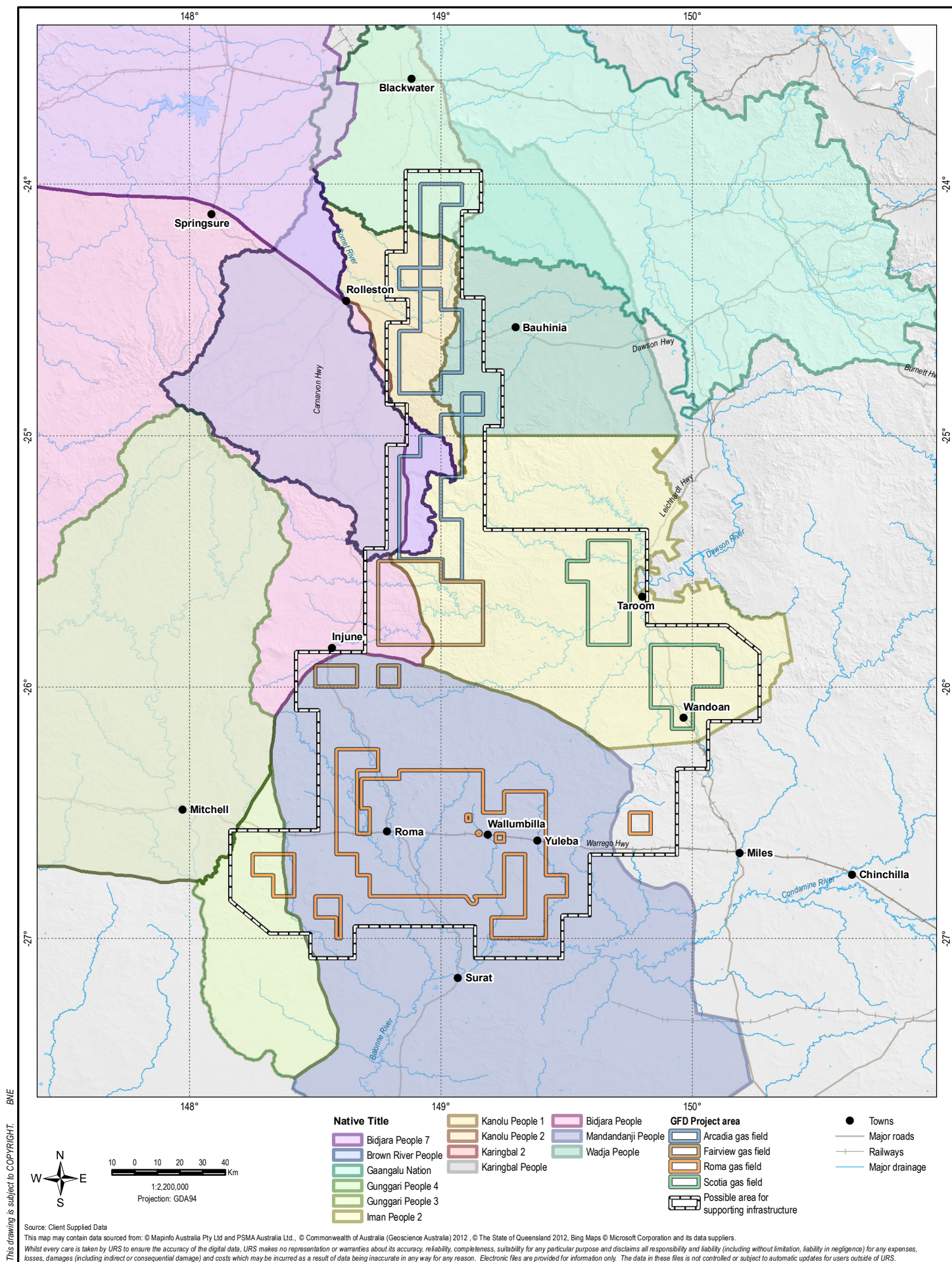
3 Land tenure and Native Title

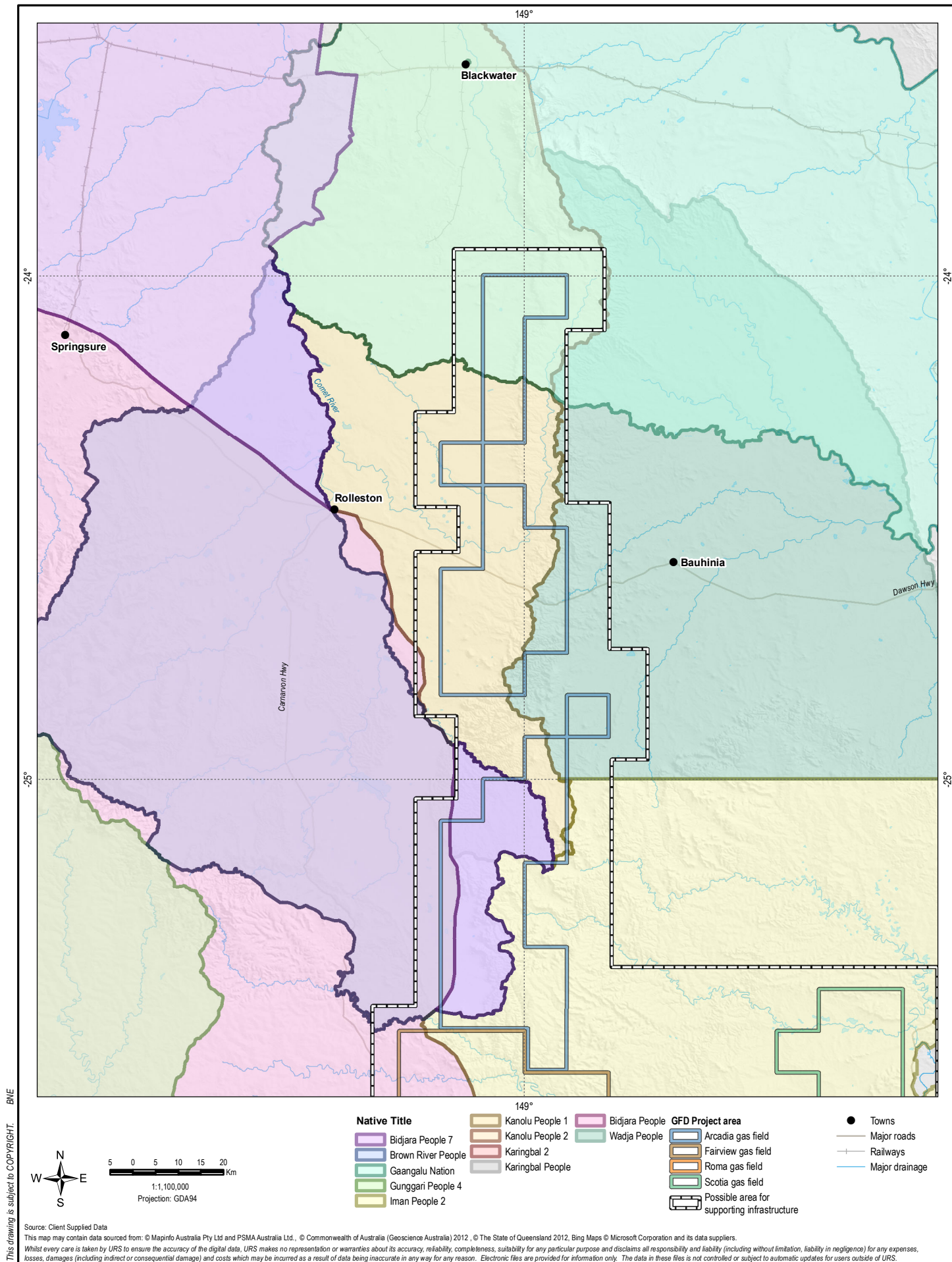
Gas field	Name	Tribunal number
Scotia	Iman People #2 and QGC Limited ILUA	QI2010/003
Remainder*	Blackwater and South Blackwater Mines	QI2001/035
	ATP701P CSG ILUA	QI2002/044
	Surat Gladstone Pipeline SGP Iman ILUA	QI2010/004
	Australia Pacific LNG and Iman People ILUA	QI2011/025
	APLNG & Mandandanji ILUA	QI2011/047

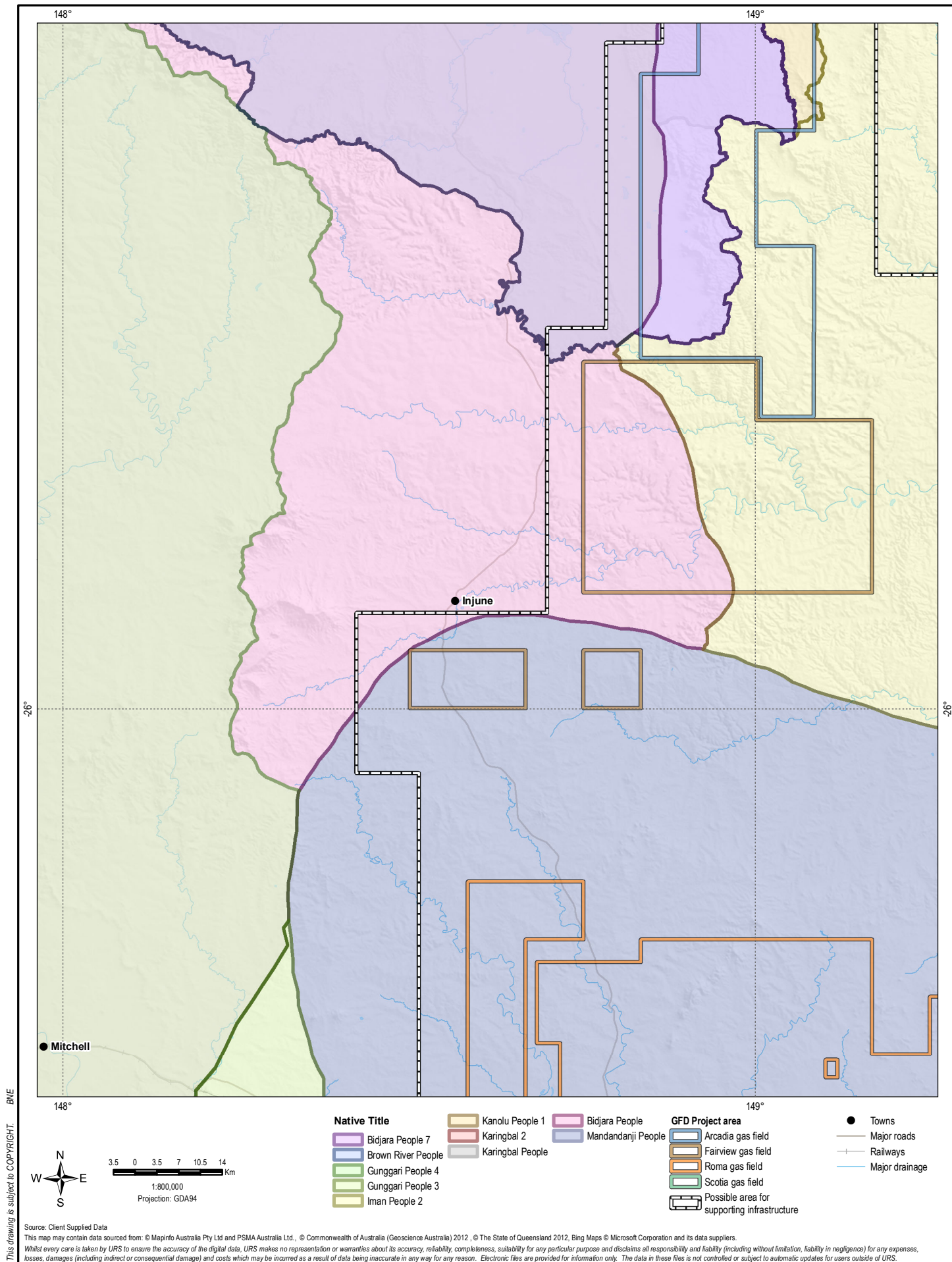
Source: DNRM, 2013

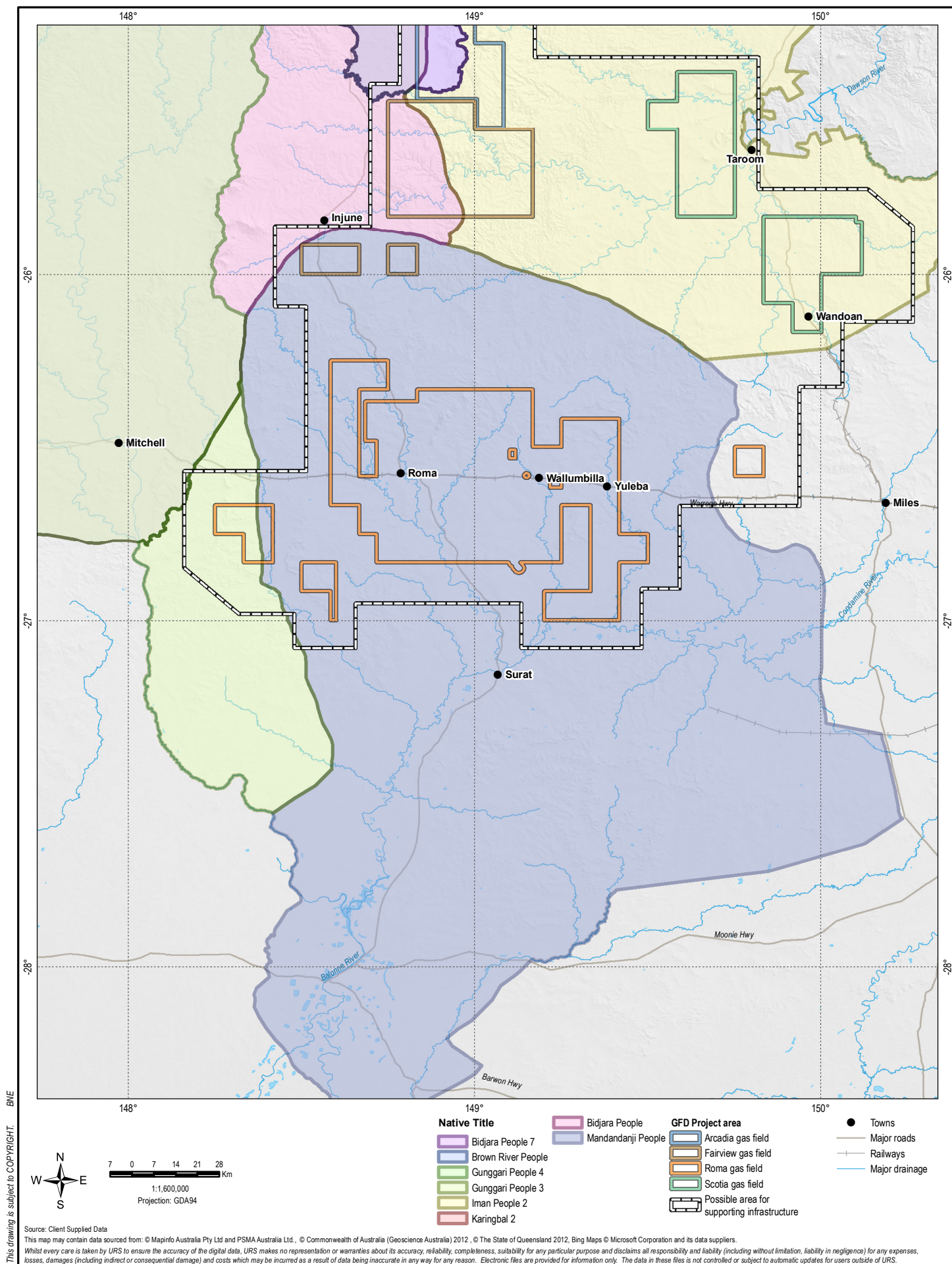
*Additional land area within the possible area for supporting infrastructure outside of the gas fields

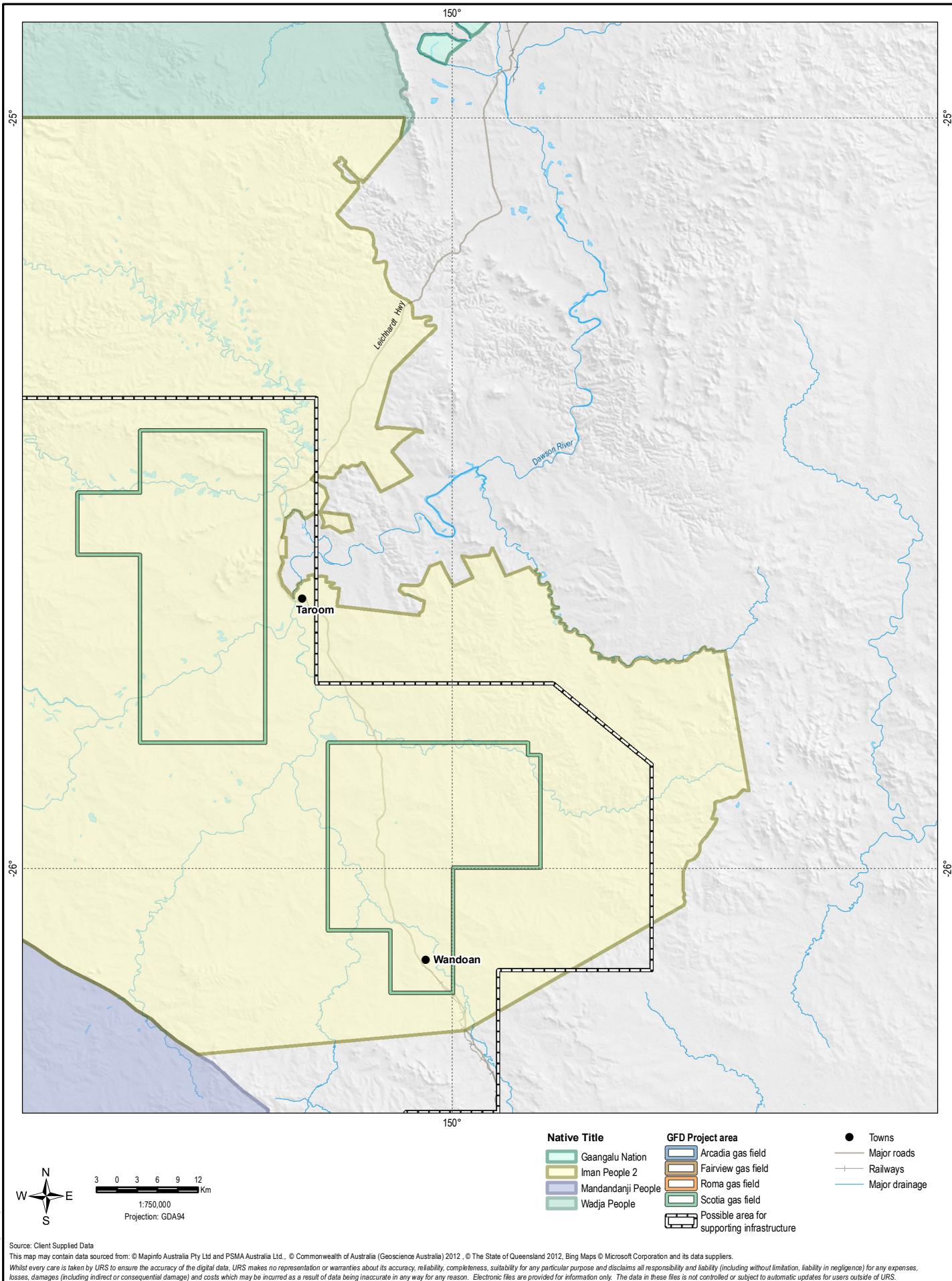
In addition, Santos GLNG has entered into agreements under future act provisions of the Native Title Act (often referred to as Section 31 agreements). Santos GLNG has entered into two Section 31 agreements with the Mandandanji people in relation to PL 314 and PL 315 and ATP 631, with the Karingbal people and Bidjarra People in relation to ATP 653 and may enter into further Section 31 agreements where appropriate.

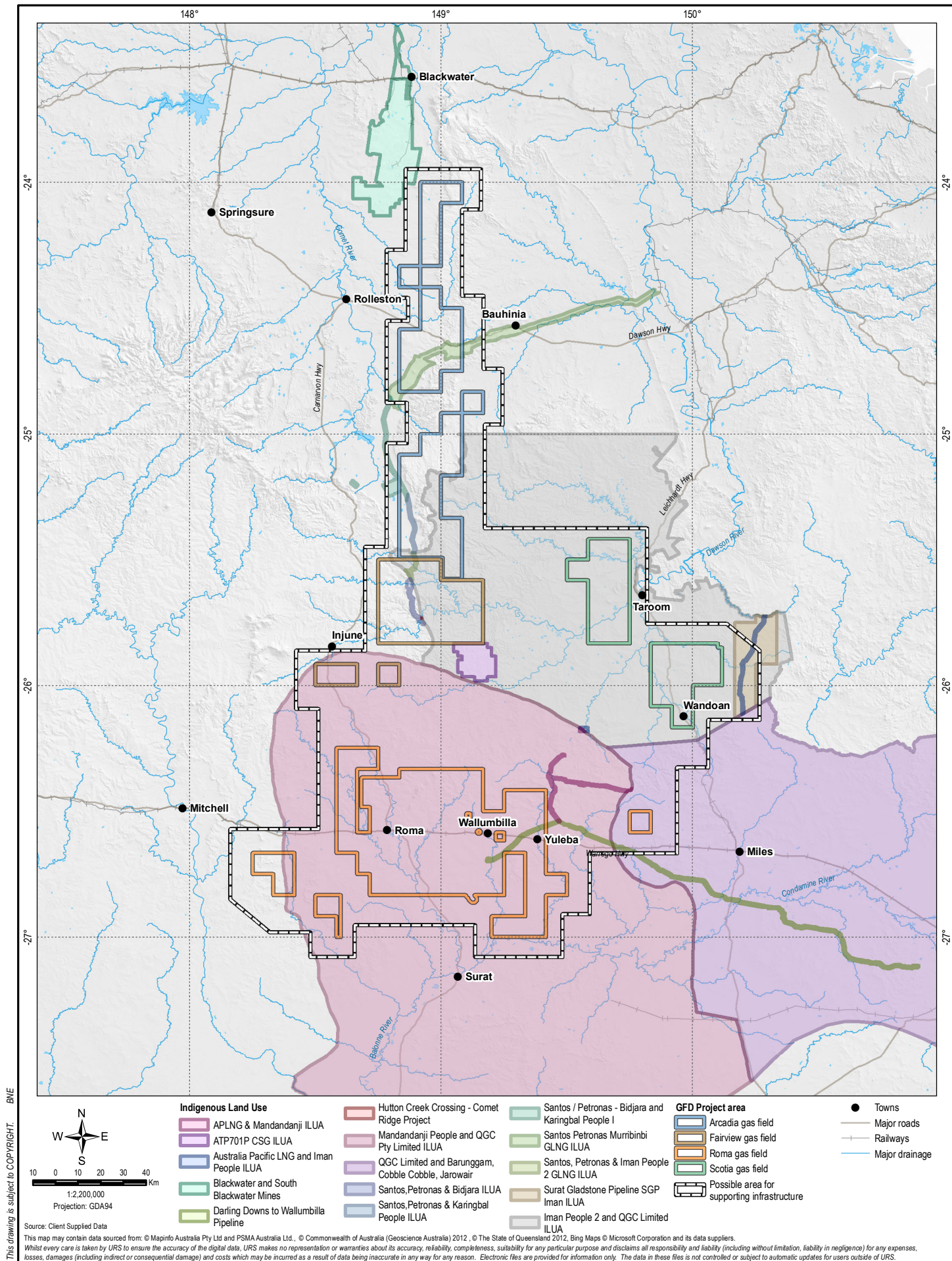












INDIGENOUS LAND USE AGREEMENTS IN THE GFD PROJECT AREA

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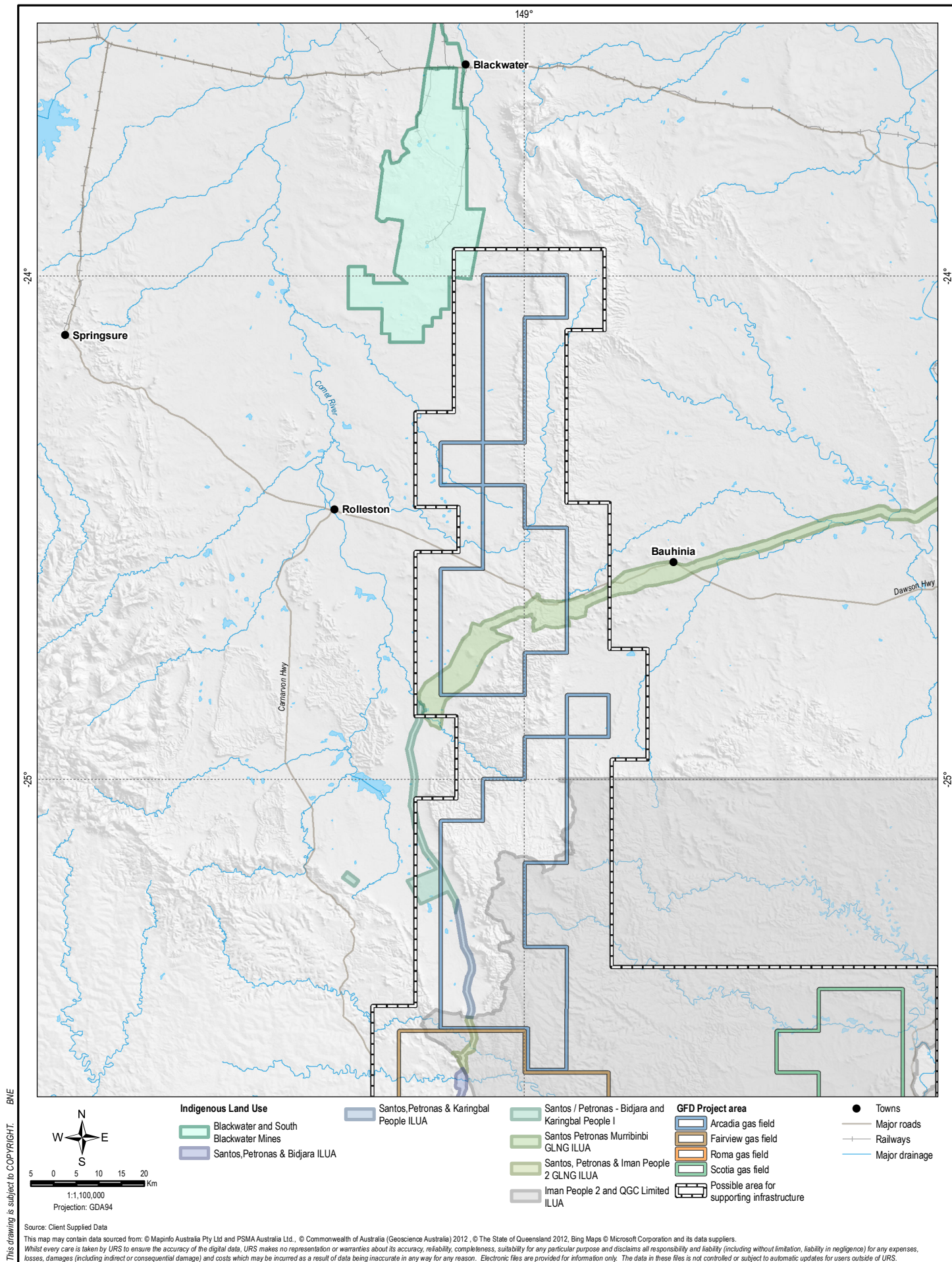
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Figure: **3-3**

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INDIGENOUS LAND USE AGREEMENTS IN THE GFD PROJECT AREA ARCADIA GAS FIELD

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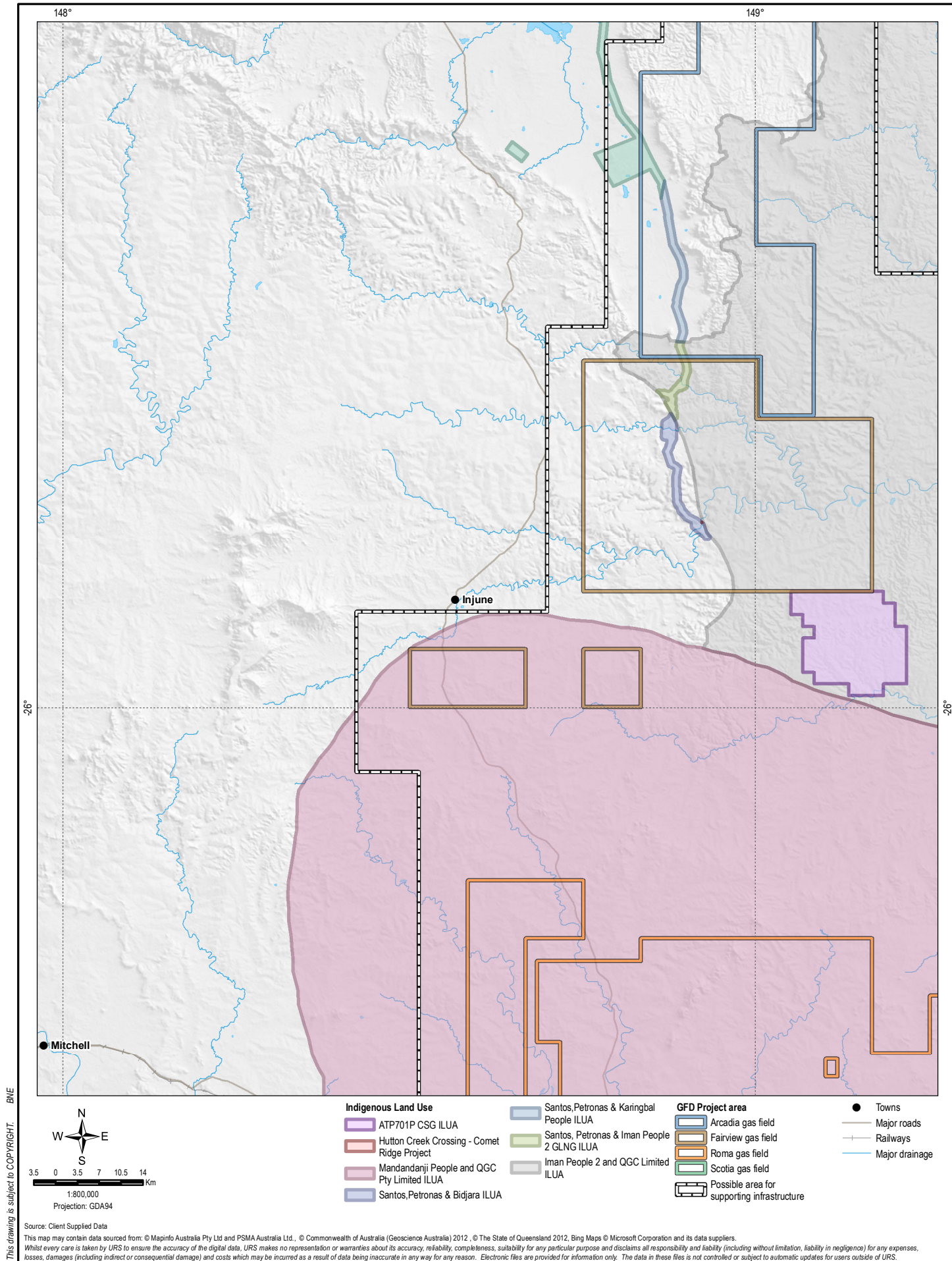
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Figure: 3-3a

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INDIGENOUS LAND USE AGREEMENTS IN THE GFD PROJECT AREA FAIRVIEW GAS FIELD

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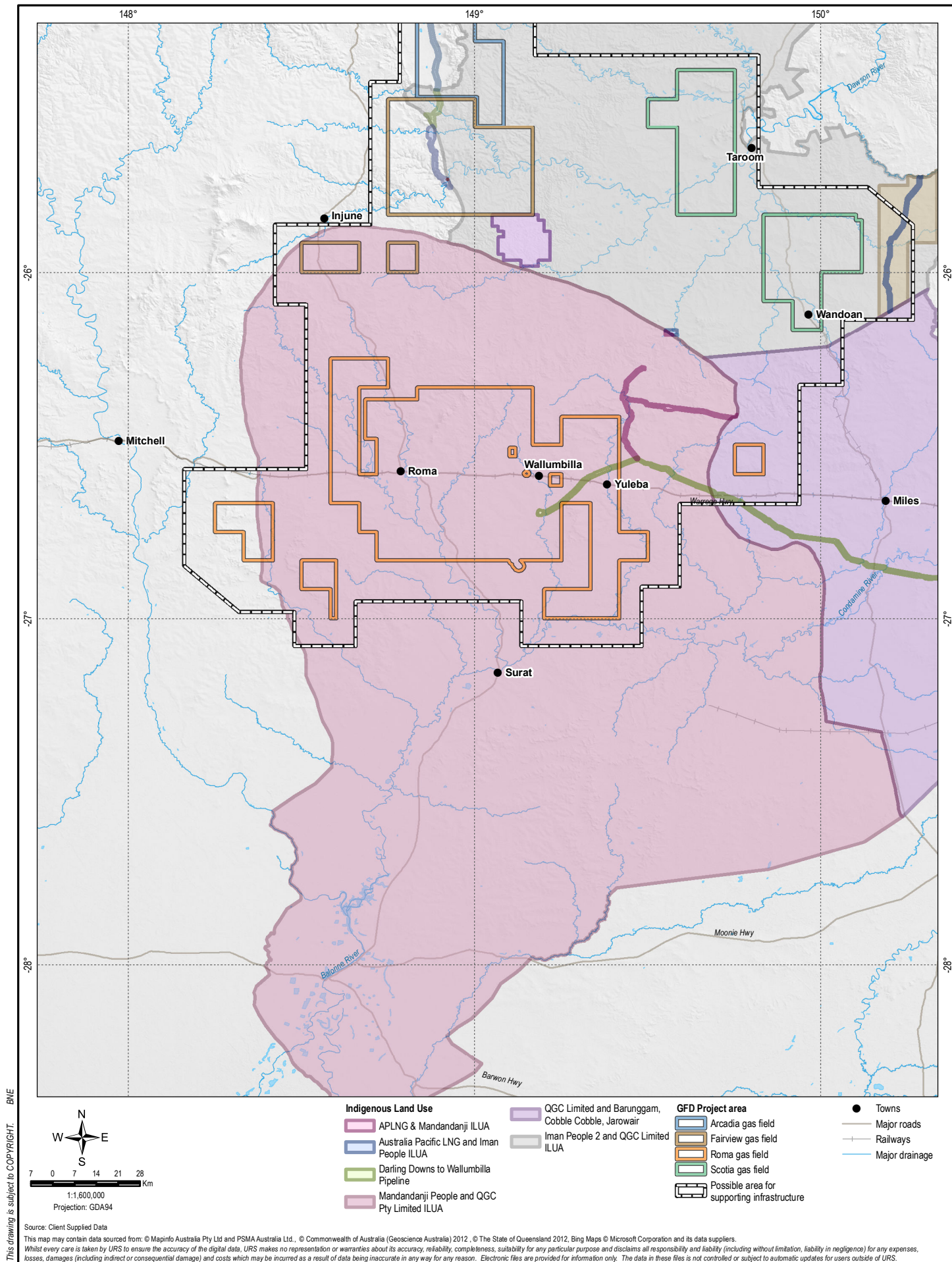
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Figure: 3-3b

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INDIGENOUS LAND USE AGREEMENTS IN THE GFD PROJECT AREA ROMA GAS FIELD

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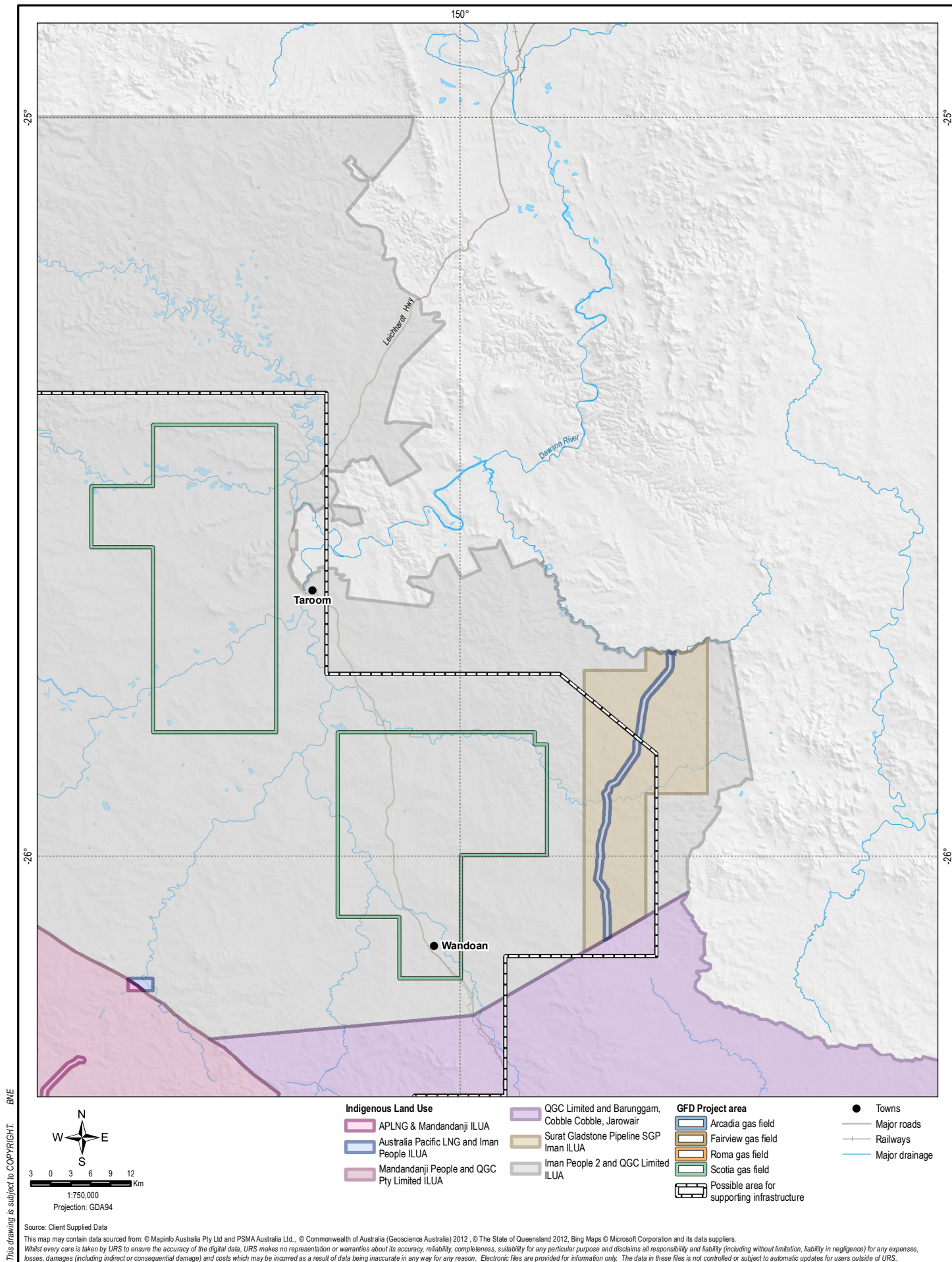
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Figure: 3-3c

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INDIGENOUS LAND USE AGREEMENTS IN THE GFD PROJECT AREA SCOTIA GAS FIELD

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Figure: 3-3d

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3 Land tenure and Native Title

3.3 Resource tenements

A number of resource tenements authorised beneath the *Mineral Resources Act 1989* (Qld) (MR Act), the Petroleum Act and the P&G Act are located within the GFD Project area. These tenements include:

- Authority to prospect (ATP)
- Petroleum pipeline licence (PPL)
- Petroleum lease application (PLA)
- Petroleum lease (PL)
- Petroleum facility licence (PFL)
- Petroleum survey licence (PSL)
- Mining lease (ML)
- Mining lease application (MLA)
- Mineral development licence (MDL)
- Exploratory permit for coal (EPC)
- Exploratory permit for minerals (EPM).

Exploration tenements (ATPs, MDLs, MLAs, EPCs and EPMs) allow the holder to undertake the activities that are required to identify the quality and quantity of a resource prior to extraction. As such, exploration tenements are granted over a much larger area than extraction tenements.

Other resource tenements within the GFD Project area include a greenhouse gas tenement and a key resource area covered in Section 3.3.3.

3.3.1 Petroleum tenure

Santos GLNG's petroleum tenure that constitutes the GFD Project are detailed in Table 3-5. There are three other coal seam gas to LNG projects present within the GFD Project area that overlap with the GFD Project in terms of timing, resources and co-location opportunities. These include the Australia Pacific LNG (APLNG) Project, the Queensland Curtis LNG (QCLNG) Project and the Arrow Energy (Bowen and Surat) Gas Project. The tenure that constitutes these projects and the GFD Project are shown on Figure 3-5.

Table 3-5 GFD Project petroleum tenure

Gas field	PL	ATP
Arcadia	PL 235	PL 233
	PL 236	PL 234
Fairview	PL 100	PL 92
	PL 90	PL 99
	PL 91	PL 232
Roma	PL 3	PL 11
	PL 6	PL 13
	PL 7	PL 93
	PL 8	PL 309
	PL 9	PL 310
	PL 10	PL 314
Scotia	PL 176	PL 315
		ATP 526P
		ATP 653P
		ATP 745P
		ATP 804P
		ATP 665P
		ATP 336P
		ATP 631P
		ATP 665P
		ATP 708P
		ATP 868P
		ATP 803P

3 Land tenure and Native Title

3.3.2 Mining tenements

Active mining tenements authorised under the MR Act are located within the GFD Project gas fields and possible area for supporting infrastructure are detailed in Table 3-6 and shown on Figure 3-4a to Figure 3-4d. The MDLs present in the GFD Project area are for coal extraction.

Table 3-6 Mining tenements within the GFD Project area

Gas field	ML/MLA		MDL
Arcadia	N/A		N/A
Fairview	N/A		N/A
Roma	ML50207		N/A
Scotia	MLA50231	MLA50229	MDL221
		MLA50230	MDL222
			MDL223
			MDL412
			MDL413
			MDL414
			MDL449
Remainder *	ML 1771 Sirius Creek	MLA 55012 Collingwood	MDL 158
	ML 5900 Woleebee No 1	#3	MDL 187
	ML 5901 Woleebee No 2	MLA 50270 Elimatta	MDL 221
	MLA 50229 Wandoan No. 1	Infrastructure	MDL 222
	MLA 50230 Wandoan No. 2	MLA 50271 Elimatta	MDL 223
	MLA 50231 Wandoan No. 3	Transport	MDL 224
	MLA 50247 Woori South Mining Lease	MLA 50277 Wandoan	MDL 411
	MLA 50248 Woori North Mining Lease	Extended #2	MDL 412
	MLA 50254 Elimatta	MLA 50279 Wandoan	MDL 413
	MLA 55010 The Range Transport	Extended #1	MDL 414
	Corridor (Offepc1112	MLA 55002 Wandoan	MDL 433
		Extended #3	MDL 449
	MLA 55011 Collingwood #2	MLA 55006 Taroom	MDL497

Source: DNRM, 2013

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

In addition to mining tenure, the GFD Project area is subject to exploration tenure, the details of which are provided in Table 3-6.

Table 3-7 Exploration permits for coal within the GFD Project area

Gas field	EPCs				
Arcadia	889	1317	1772	2380	2880
	890	1319	1861	2398	2891
	1045	1695	1865	2399	2892
	1054	1714	2051	2407	2895
	1055	1717	2062	2408	2939
	1057	1742	2201	2430	
Fairview	851	1159	1275	1318	2210
	1042	1190	1277	2201	2428
	1110	1192			
Roma	1167	1763	1816	2346	2531
	1389	1789	2021	2509	2554
	1698	1795	2024	2522	2801

3 Land tenure and Native Title

Gas field	EPCs				
Scotia	640	383	1322	1558	2204
	787	996	1436	1559	2208
	788	1143	1465	1955	2214
	790	1205	1556	2032	2237
	792	1276	1557	2203	2923
Remainder*	EPC 1695	EPC 2399	EPC 2053	EPC 1159	EPC 792
	EPC 1861	EPC 2398	EPC 1045	EPC 1274	EPC 1987
	EPC 1865	EPC 2380	EPC 1057	EPC 1436	EPC 1164
	EPC 2202	EPC 2939	EPC 1206	EPC 1556	EPC 1724
	EPC 2203	EPC 2430	EPC 1742	EPC 1042	EPC 1167
	EPC 2204	EPC 2407	EPC 1717	EPC 1276	EPC 789
	EPC 2207	EPC 2427	EPC 1054	EPC 788	EPC 1789
	EPC 2208	EPC 1502	EPC 2051	EPC 790	EPC 1322
	EPC 2209	EPC 2428	EPC 2062	EPC 859	EPC 1559
	EPC 2214	EPC 1317	EPC 1319	EPC 1558	EPC 1386
	EPC 2231	EPC 1504	EPC 1772	EPC 640	EPC 813
	EPC 2234	EPC 2408	EPC 1316	EPC 1699	EPC 1795
	EPC 2519	EPC 2201	EPC 996	EPC 1171	EPC 1143
	EPC 2520	EPC 2409	EPC 1465	EPC 1615	EPC 1251
	EPC 2776	EPC 2288	EPC 1318	EPC 791	EPC 1763
	EPC 2777	EPC 2442	EPC 1110	EPC 1603	EPC 1609
	EPC 2779	EPC 2509	EPC 1028	EPC 2210	EPC 2024
	EPC 2783	EPC 2554	EPC 1557	EPC 1192	EPC 2221
	EPC 2880	EPC 2522	EPC 1277	EPC 1563	EPC 2531
	EPC 2891	EPC 2801	EPC 851	EPC 838	EPC 2021
	EPC 2892	EPC 2587	EPC 1275	EPC 787	EPC 1698
	EPC 2895	EPC 1055	EPC 1190	EPC 650	EPC 1816
	EPC 2923	EPC 890	EPC 2237	EPC 1017	EPC 1389
	EPC 2924	EPC 889	EPC 1955	EPC 1600	
	EPC 2933				

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

3.3.3 Other resources

3.3.3.1 Greenhouse gas tenements

There is one greenhouse gas tenement in the GFD Project area as detailed in Table 3-8 and shown on Figure 3-5, and Figure 3-5a to Figure 3-5d for each gas field.

Table 3-8 Greenhouse gas tenements within the GFD Project area

Greenhouse gas tenements	Holder / name	Type	Applicable gas field
EPQ 7	Carbon Transport And Storage Corporation (CTSCO) PTY LTD	Greenhouse gas exploration permit	Scotia (ATP 868P) Roma (ATP 631P)

Source: DNRM, 2013

3 Land tenure and Native Title

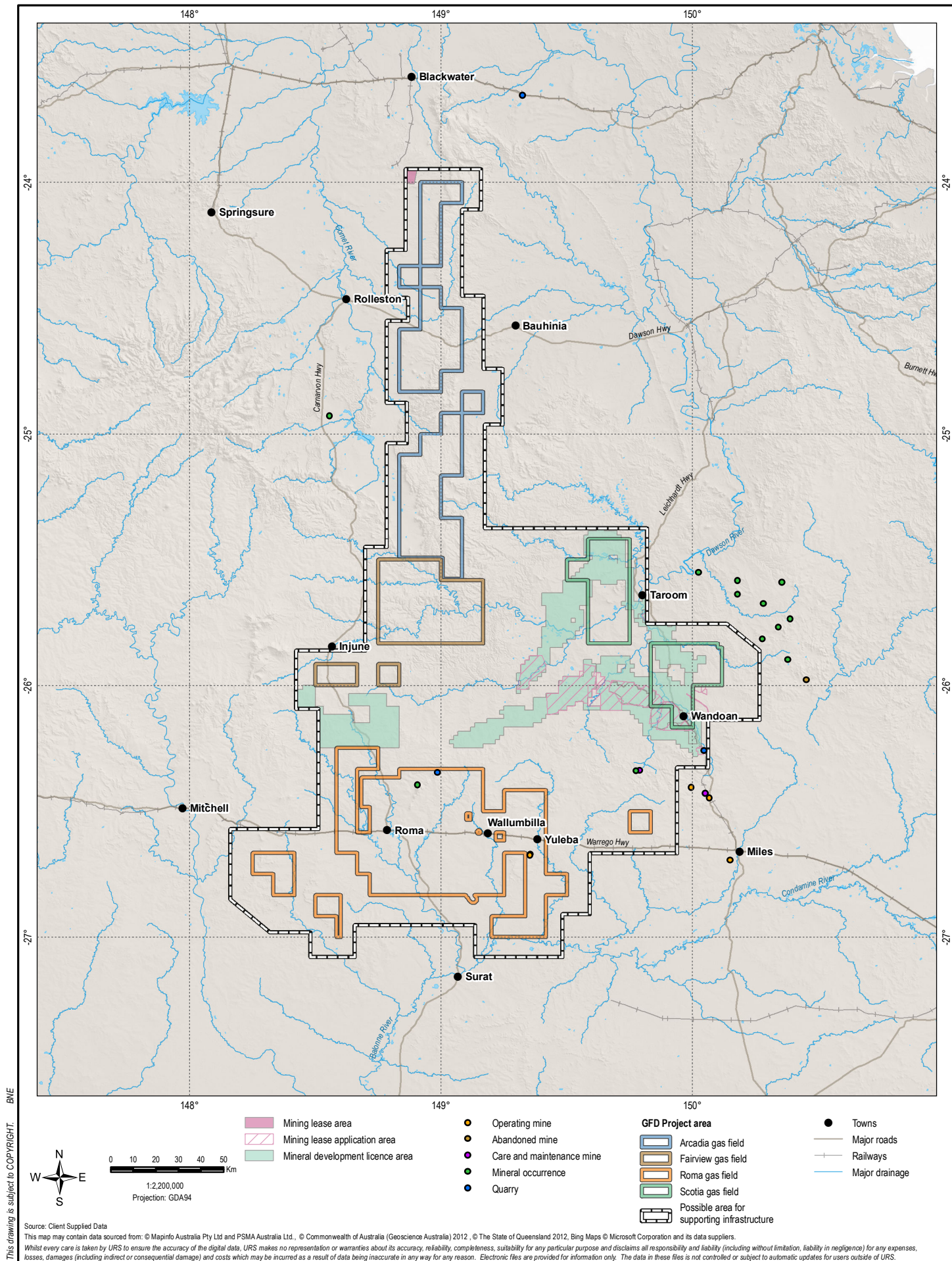
3.3.3.2 *Geothermal*

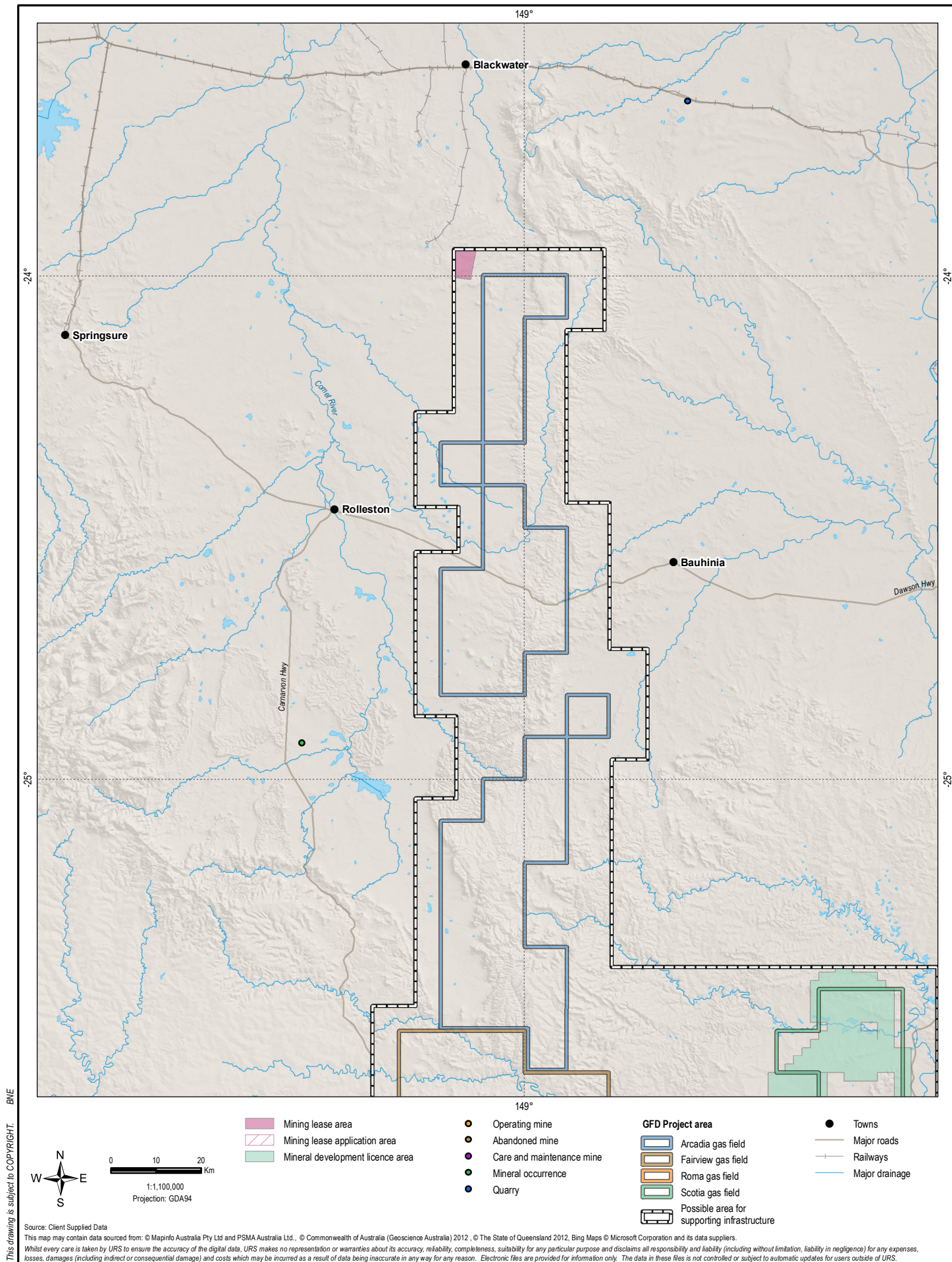
There are no licences or permits for geothermal activities within the GFD Project area.

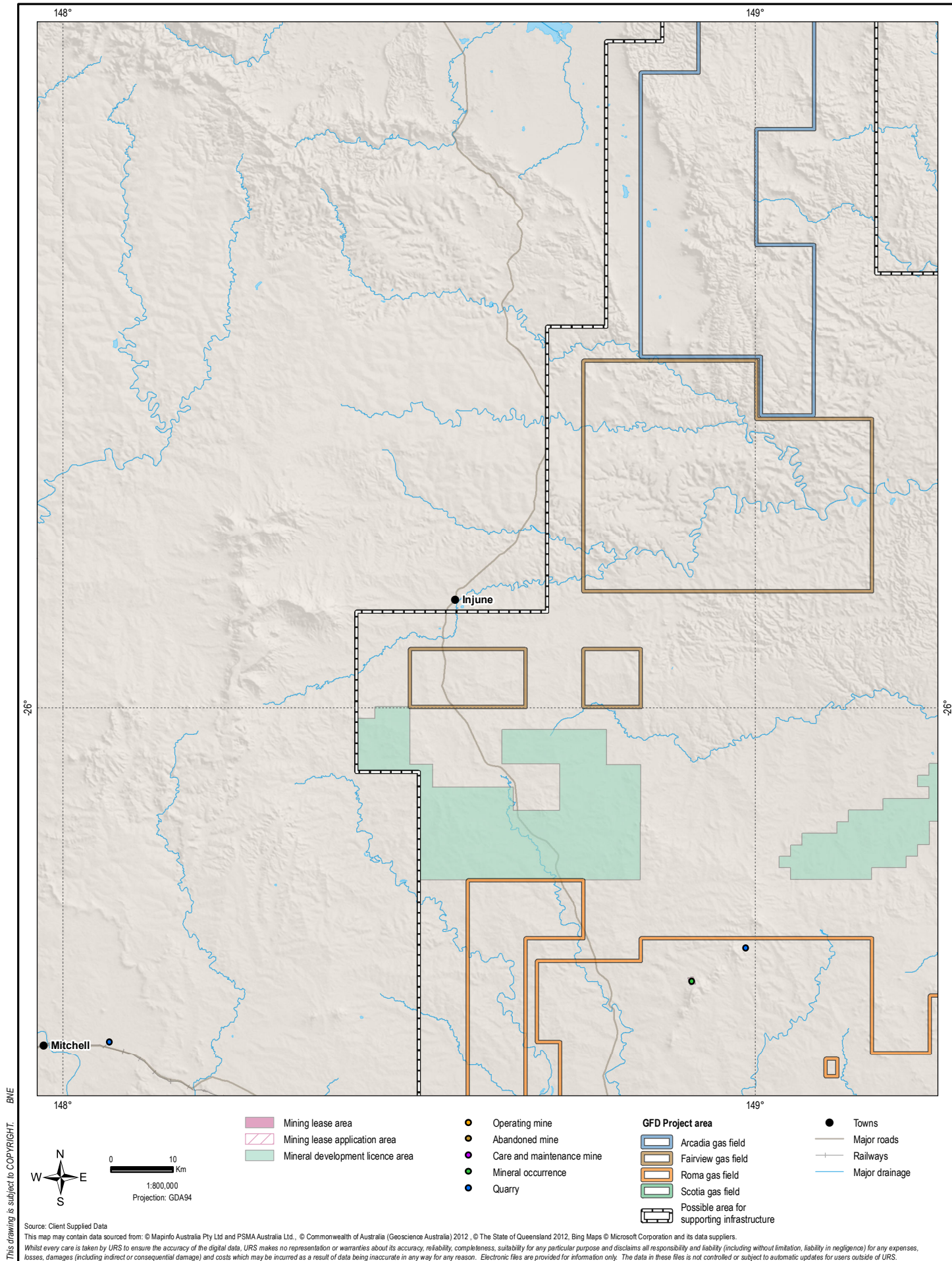
3.3.3.3 *Key resource areas*

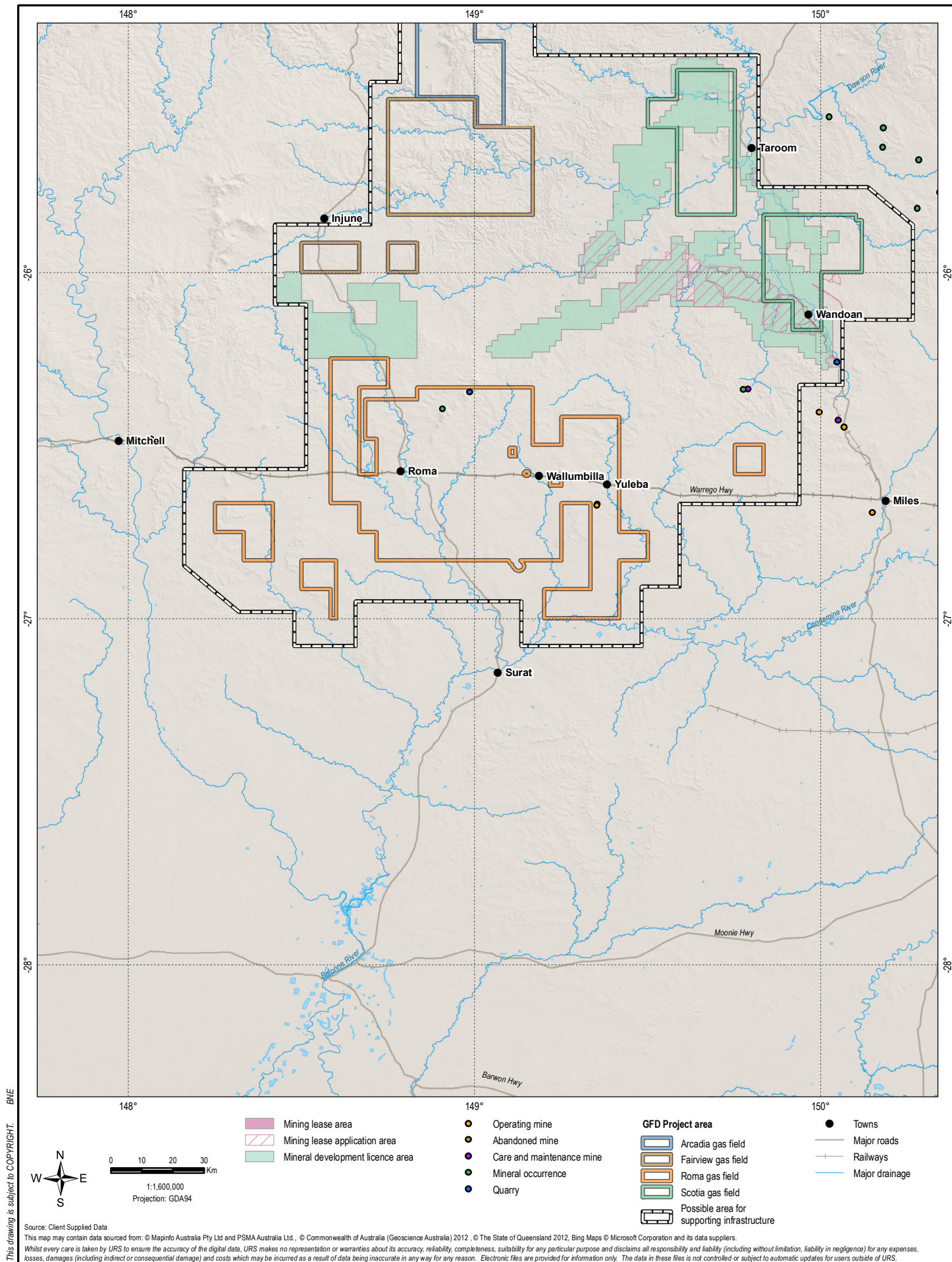
While there are numerous quarries and extractive industries within the GFD Project area, there is only one key resource area (KRA) located within the GFD Project area. The Warrian Basalt Quarry (KRA 85) located northeast of Roma off the Roma-Taroom Road, in the Roma gas field and is approximately 41 ha in size

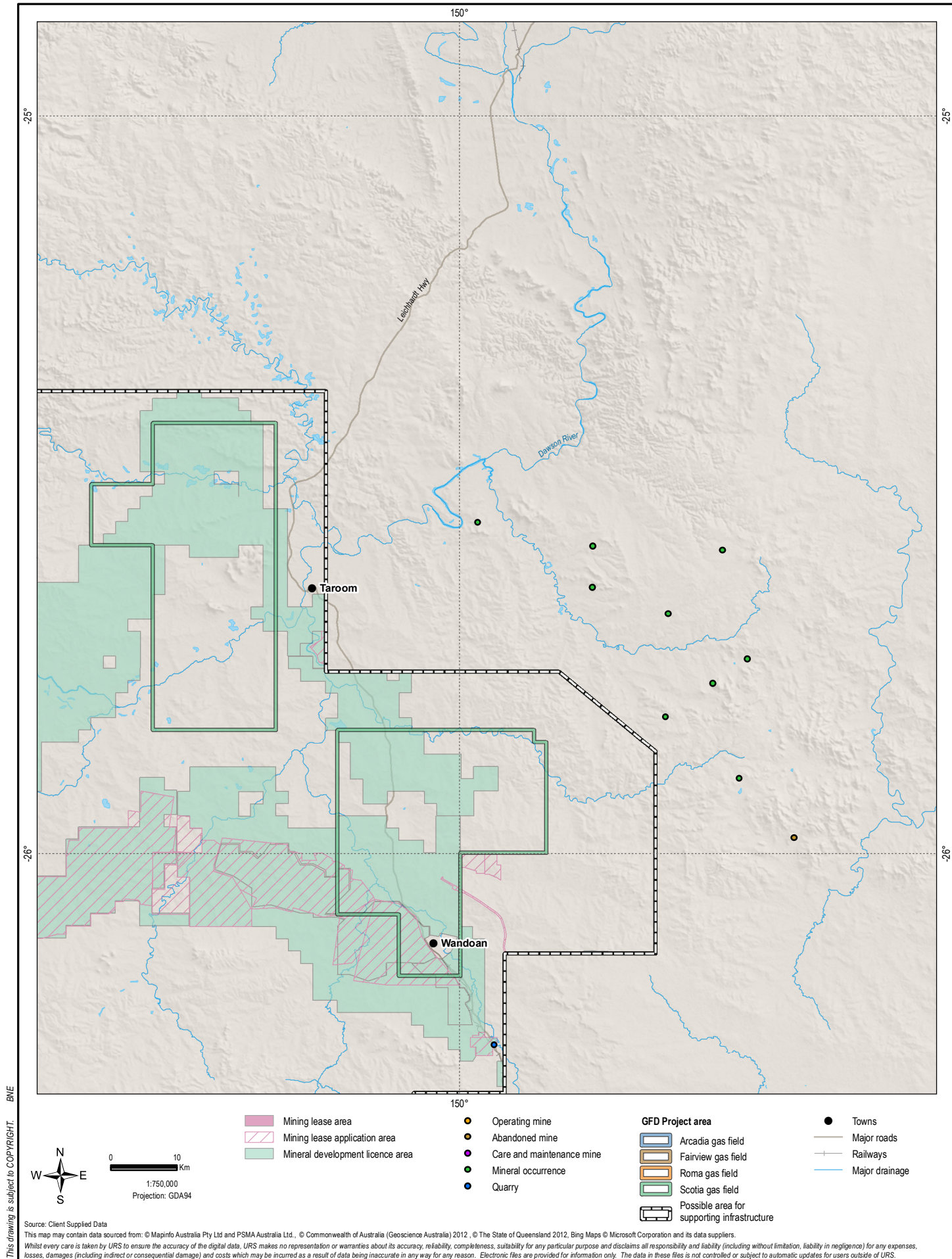
The KRA is shown on Figure 3-5c. Access to these resources and operation of the KRA will not be affected by the GFD Project. These resources may be suitable sources of construction materials for the GFD Project.

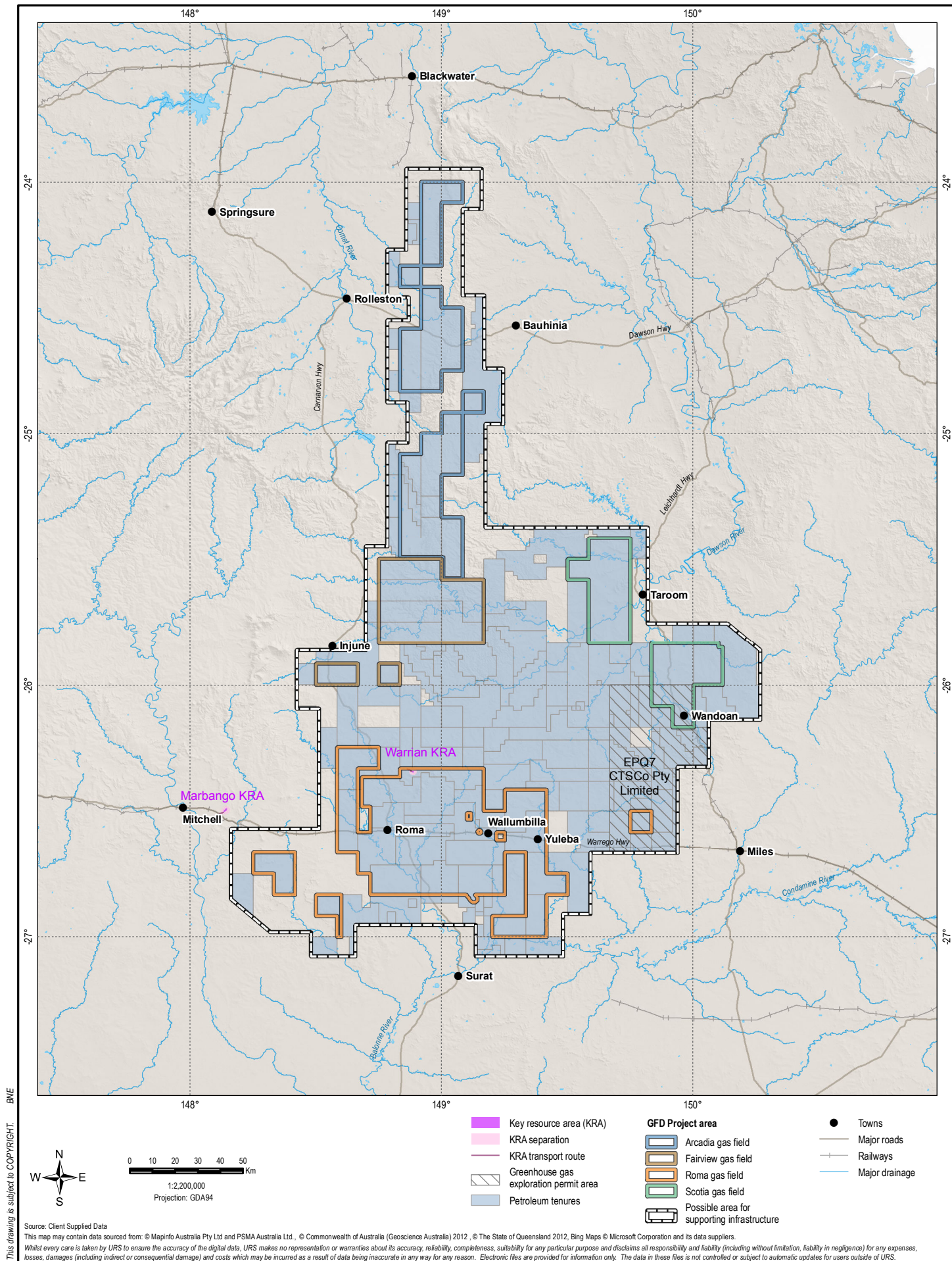


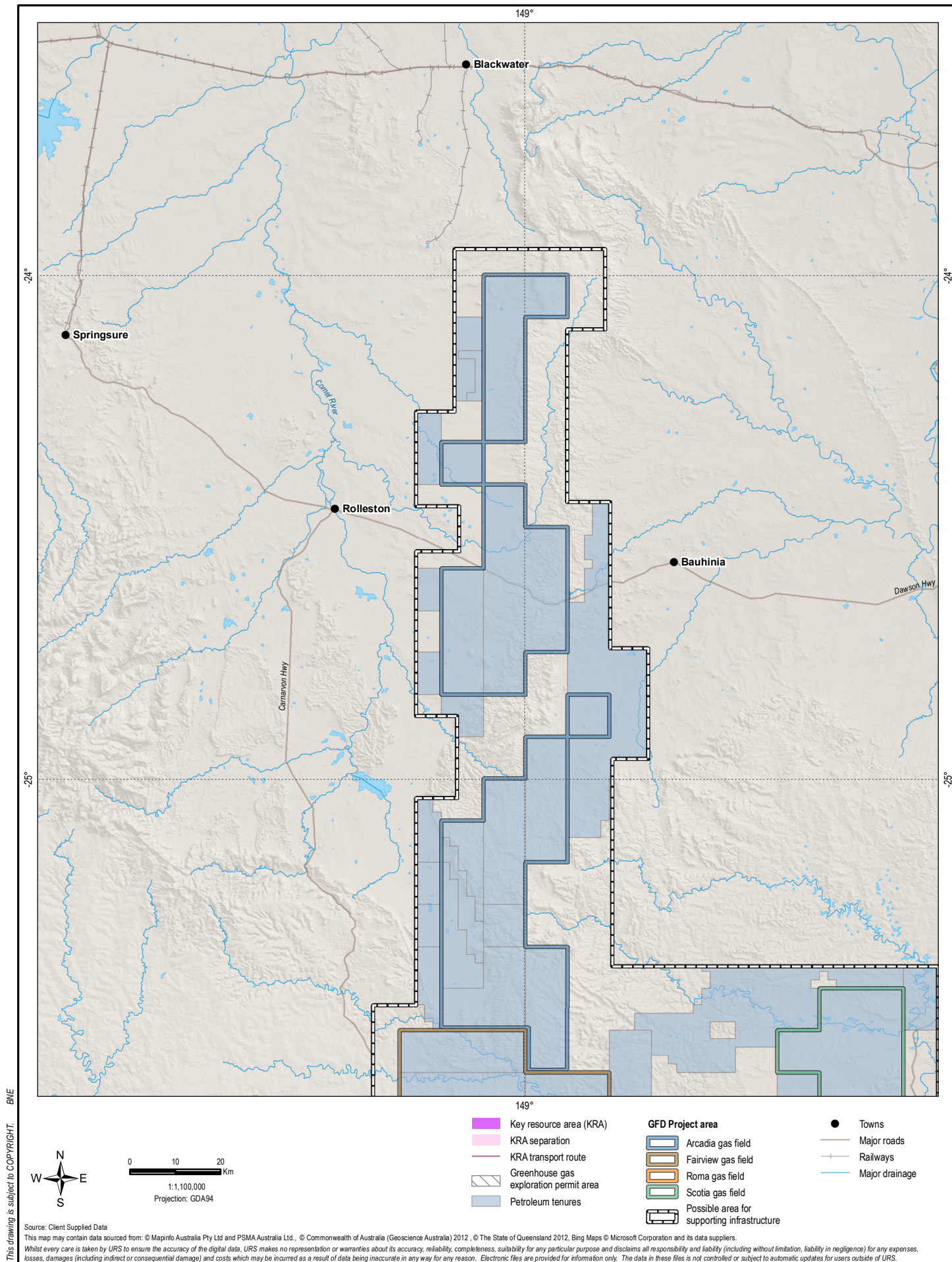


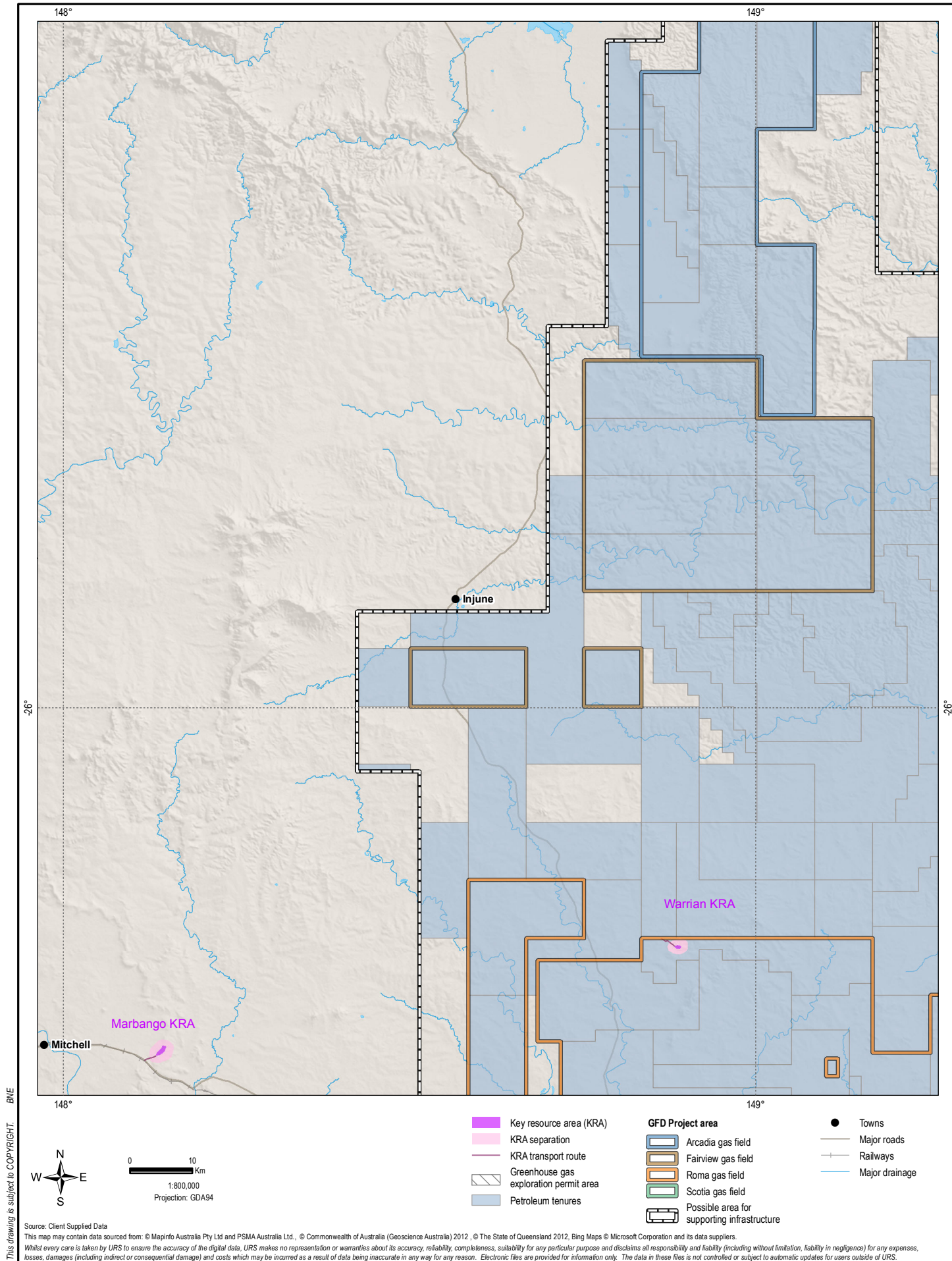


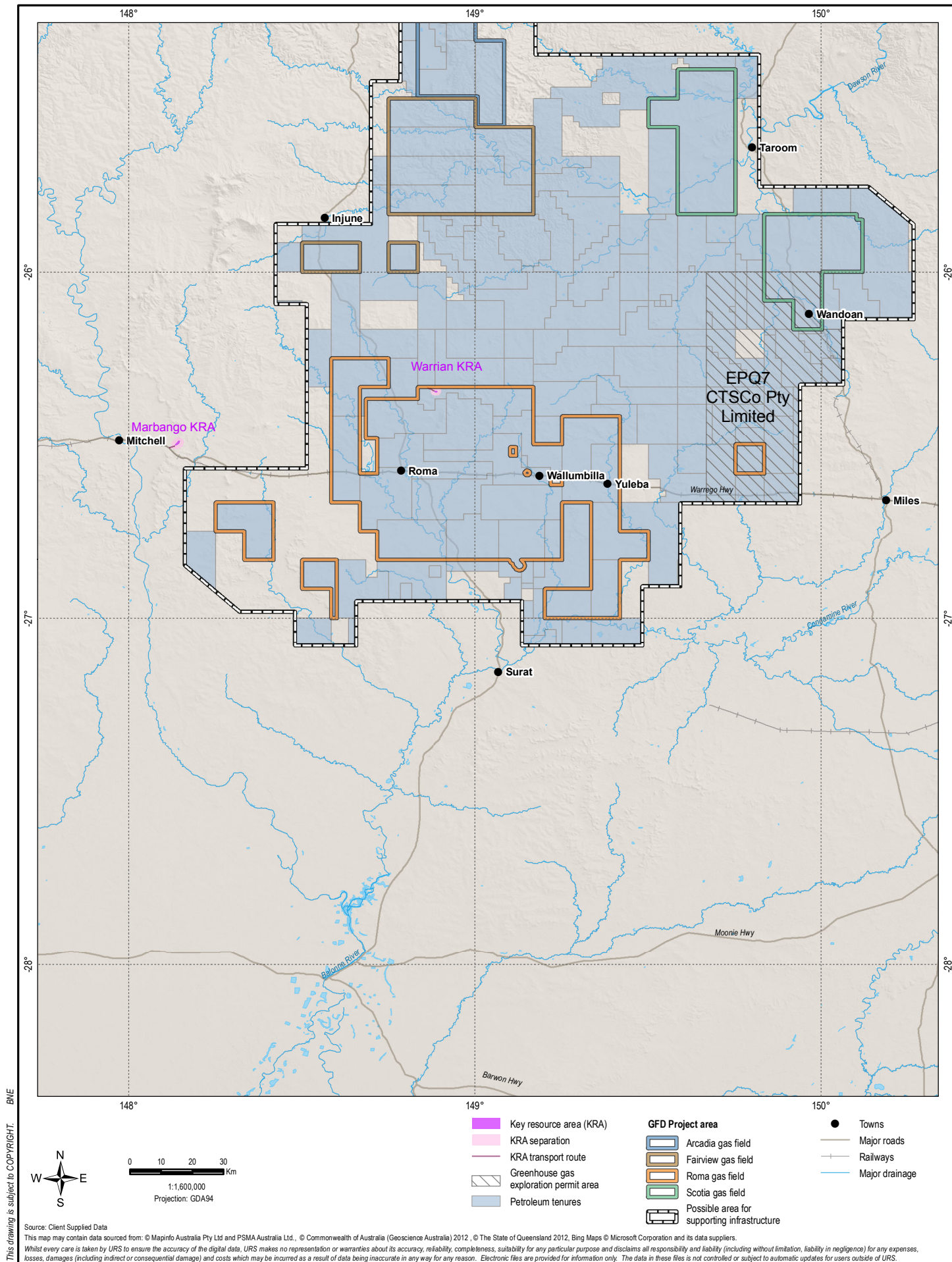


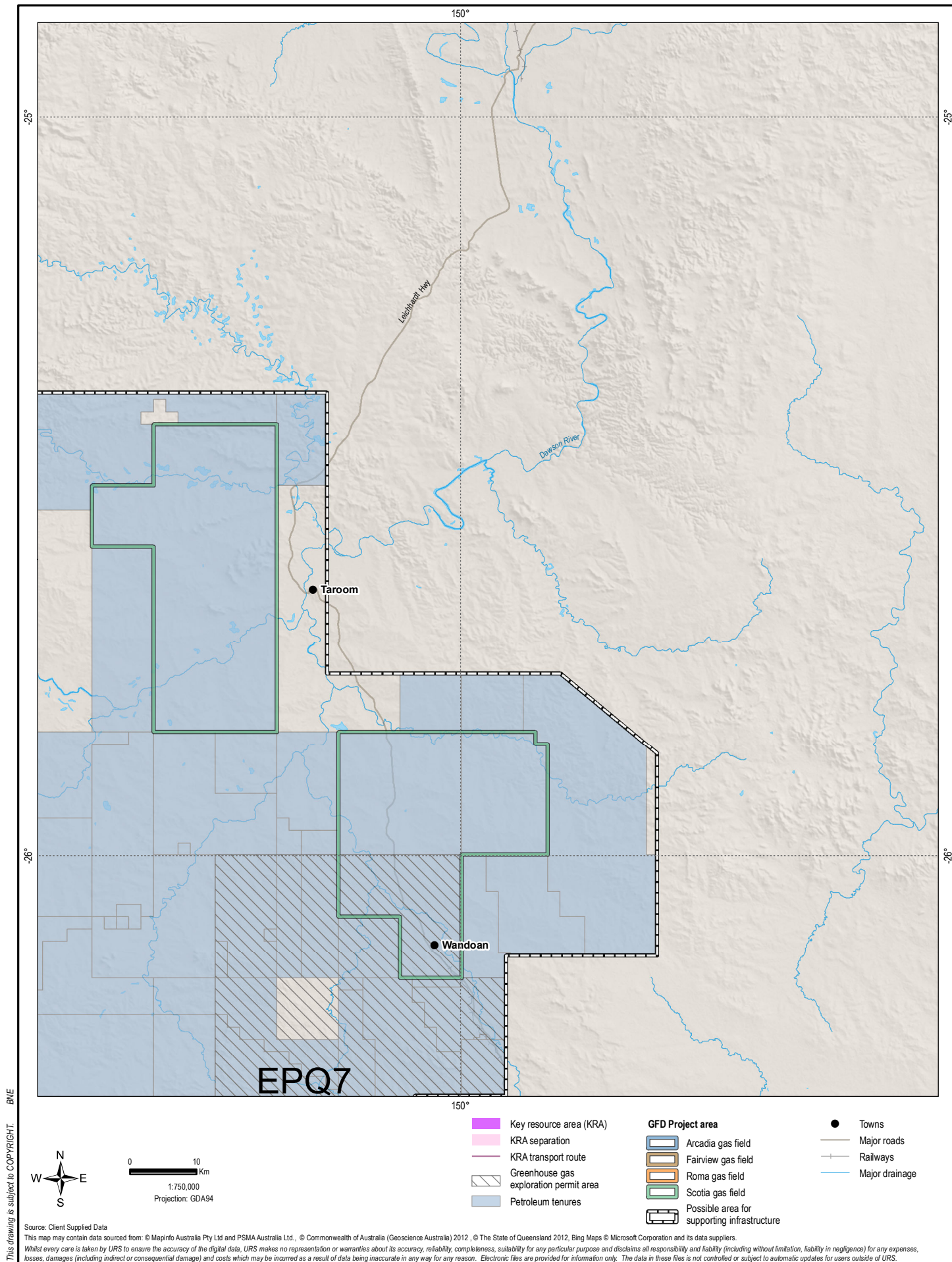












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PETROLEUM AND RESOURCE TENURES IN THE GFD PROJECT AREA SCOTIA GAS FIELD

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Figure: **3-5d**

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Land use

4.1 Land use summary

Figure 4-1 provides an overview of the land uses within the GFD Project area, and Figure 4-1a to Figure 4-1d provides context on each gas field. These figures have been developed using DNRM Queensland Land Use Mapping Program (QLUMP), which has 6 primary land use classes and 26 land use sub-classes. As the number of land use classes is more than required by the ToR, this report has adopted a thematic approach that groups these land use classes, focusing on the land uses of agriculture and primary production, forestry, urban and rural residential, resource extraction and conservation, tourism and recreation.

The land use themes described in this report comprise the following QLUMP land use classes to graphically represent the distribution of land uses throughout the GFD Project area:

- Agriculture and primary production
 - Grazing native vegetation
 - Grazing modified pastures
 - Cropping
 - Perennial horticulture
 - Seasonal horticulture
 - Grazing irrigated modified pastures
 - Irrigated cropping
 - Irrigated perennial horticulture
 - Irrigated seasonal horticulture
 - Intensive horticulture
 - Intensive animal husbandry.
- Forestry
 - Production forestry
 - Plantation forestry
 - Irrigated plantation forestry.
- Urban and rural residential
 - Residential and farm infrastructure
 - Services
 - Manufacturing and industrial.
- Mining and resources
 - Mining.
- Conservation, tourism and recreation
 - Nature conservation
 - Managed resource protection
 - Other minimal use
 - Lake
 - River
 - Marsh/wetland.

4 Land use

4.1.1 Arcadia gas field

The Arcadia gas field (Figure 4-1a) is northernmost gas field of the GFD Project and the tenure in it have a total area of 2,726 km² (272,600 ha). It includes a number of protected areas of varying conservation value, known as the Central Queensland Sandstone Belt (discussed further in Section 4.6). It also includes developed pastoral areas in the Arcadia Valley and agricultural areas in the former Bauhinia Shire along the alluvial plains of the tributaries of the Dawson River, such as Expedition and Comely Creeks.

The Arcadia gas field is within parts of the Central Highlands, Banana and Maranoa regional council areas.

4.1.2 Fairview gas field

The Fairview gas field (Figure 4-1b) tenure has a total area of 1,962 km² (196,200 ha). It includes a number of protected areas of varying conservation value within the Central Queensland Sandstone Belt (discussed further in Section 4.6).

Natural gas from coal seam production activities have been occurring within the Fairview gas field for approximately 16 years.

The Fairview gas field includes pastoral areas, which have generally been cleared and maintained for pastoral activities. The Fairview gas field is within parts of the Banana and Maranoa Regional Council areas.

4.1.3 Roma gas field

The Roma gas field (Figure 4-1c) is roughly centred on the towns of Roma and Wallumbilla and its tenure has a total area of 4,383 km² (438,300 ha). It includes productive agricultural areas used for horticultural, pastoral and forestry activities.

Conventional gas production activities have been occurring in the area for over 50 years.

Agricultural activities are the primary economic driver and land use. However, gas is an increasing part of the regional economy and land use mix.

The Roma gas field is wholly located in the Maranoa Regional Council area.

4.1.4 Scotia gas field

The Scotia gas field (Figure 4-1d) tenure has an area of 1,605 km² (160,500 ha). It includes the town of Wandoan.

The predominant land use is agriculture, which includes cropping along the alluvial plains of the Dawson River valley and grazing. The Scotia gas field is included in within parts of the Banana Shire Council and Western Downs regional council areas.

4.2 Agriculture and primary production

The predominant land use within and around the GFD Project area is agriculture and primary production. The area generally contains agricultural land uses consisting of livestock grazing (pastoral activities), dryland and irrigated cropping, and horticultural activities.

4 Land use

The dominant pastoral activity in the GFD Project area is beef cattle production on unimproved and improved pastures. However, more recently there are large tracts of land that were used for cattle production that have now been left vacant allowing natural vegetation regrowth. Other areas are used for sheep grazing.

Pastoralists in the area participate in quality certification programs such as Cattlecare and Flockcare or may be certified organic farms.

The primary cropping species include sorghum, wheat, other cereals grains, sunflower, legumes for grain, hay and lucerne (White, 2012). Cropping activities are distributed throughout the GFD Project area where there are fertile soils and where the use of agricultural machinery is not constrained by unsuitable topography.

The western Darling Downs (which includes the Roma, Scotia and Fairview gas fields) includes extensive areas of broadacre cropping (both irrigated and dryland). A broad band in the central area of the western Darling Downs is extensively cropped, but is also interspersed with grazing and other uses. Cropping diminishes to the west of Roma due to the lower rainfall conditions (Department of Agriculture, Fisheries and Forestry (DAFF), 2013).

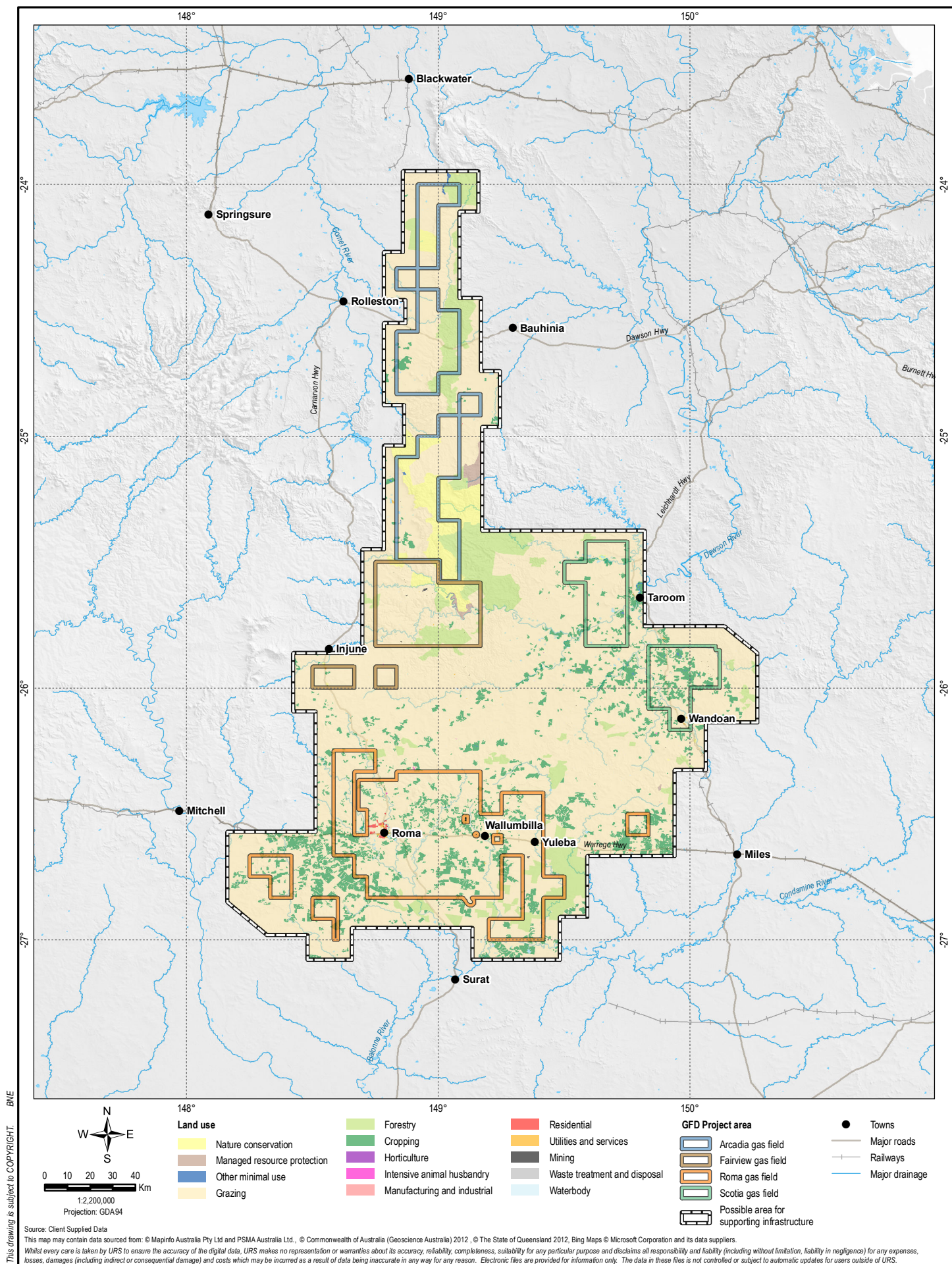
Table 4-1 below identifies the extent of differing agricultural land within the GFD Project area. These uses are shown on Figure 4-1, and Figure 4-1a to Figure 4-1d for each gas field.

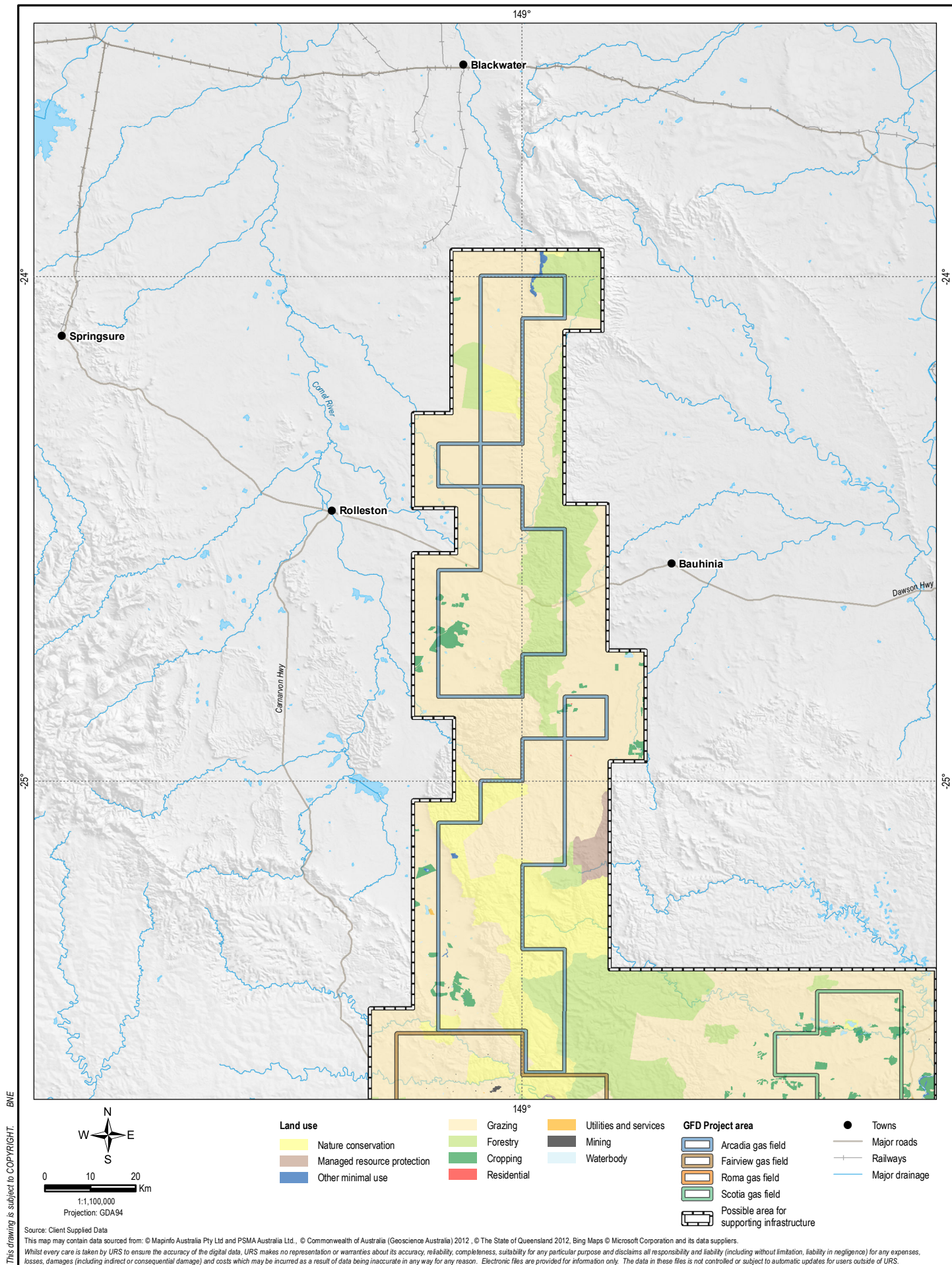
Table 4-1 Agricultural land uses in GFD Project area

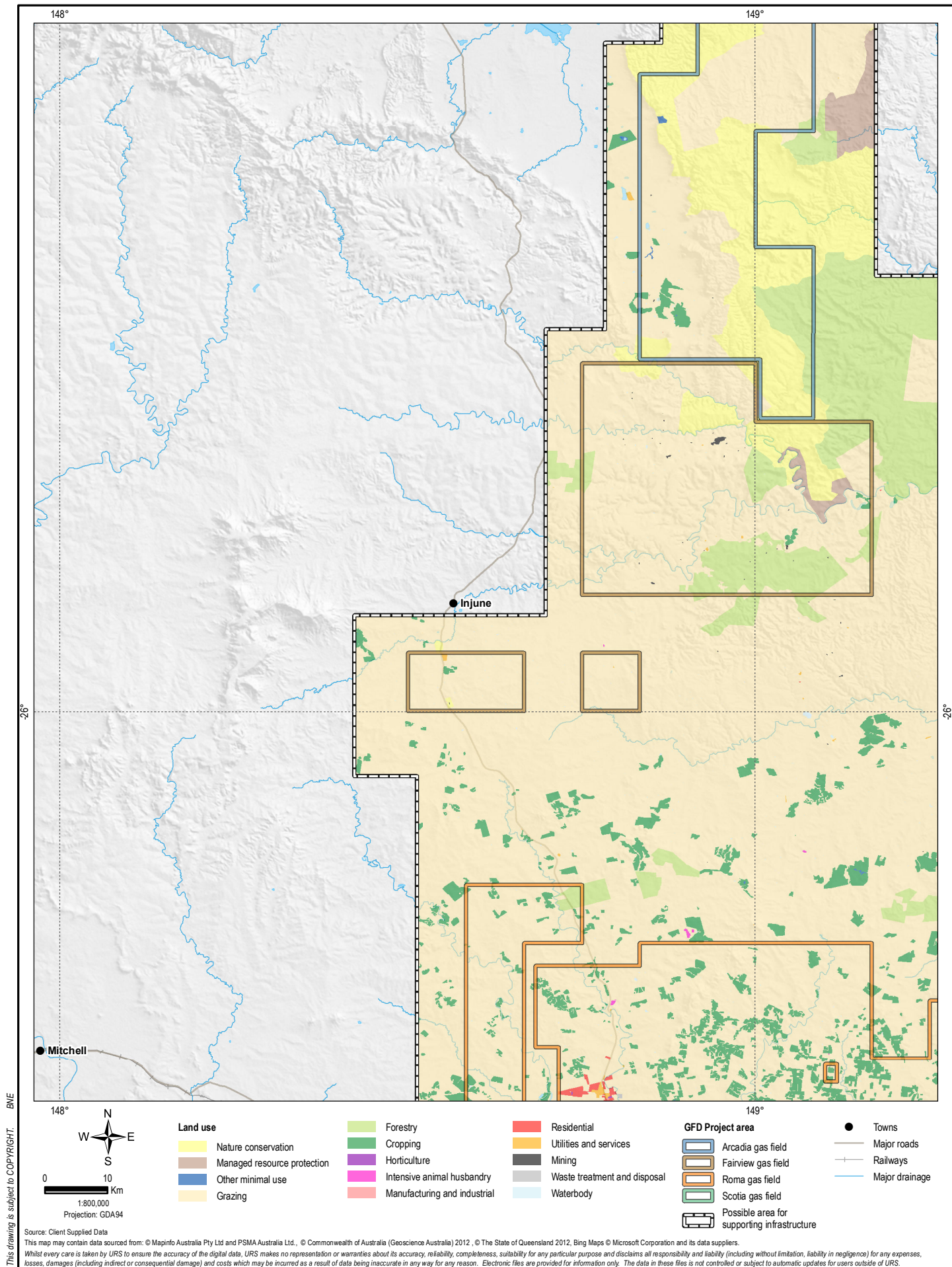
Gas field	Cropping	Perennial horticulture	Irrigated perennial horticulture	Livestock grazing	Intensive animal production	Irrigated cropping*
Arcadia	4,868	-	-	174,266	-	-
Fairview	372	-	-	119,690	-	257
Roma	73,453	9	18	376,101	75	841
Scotia	25,947	-	-	132,449	35	-
Remainder**	167,530	-	4	1,665,763	192	1,558

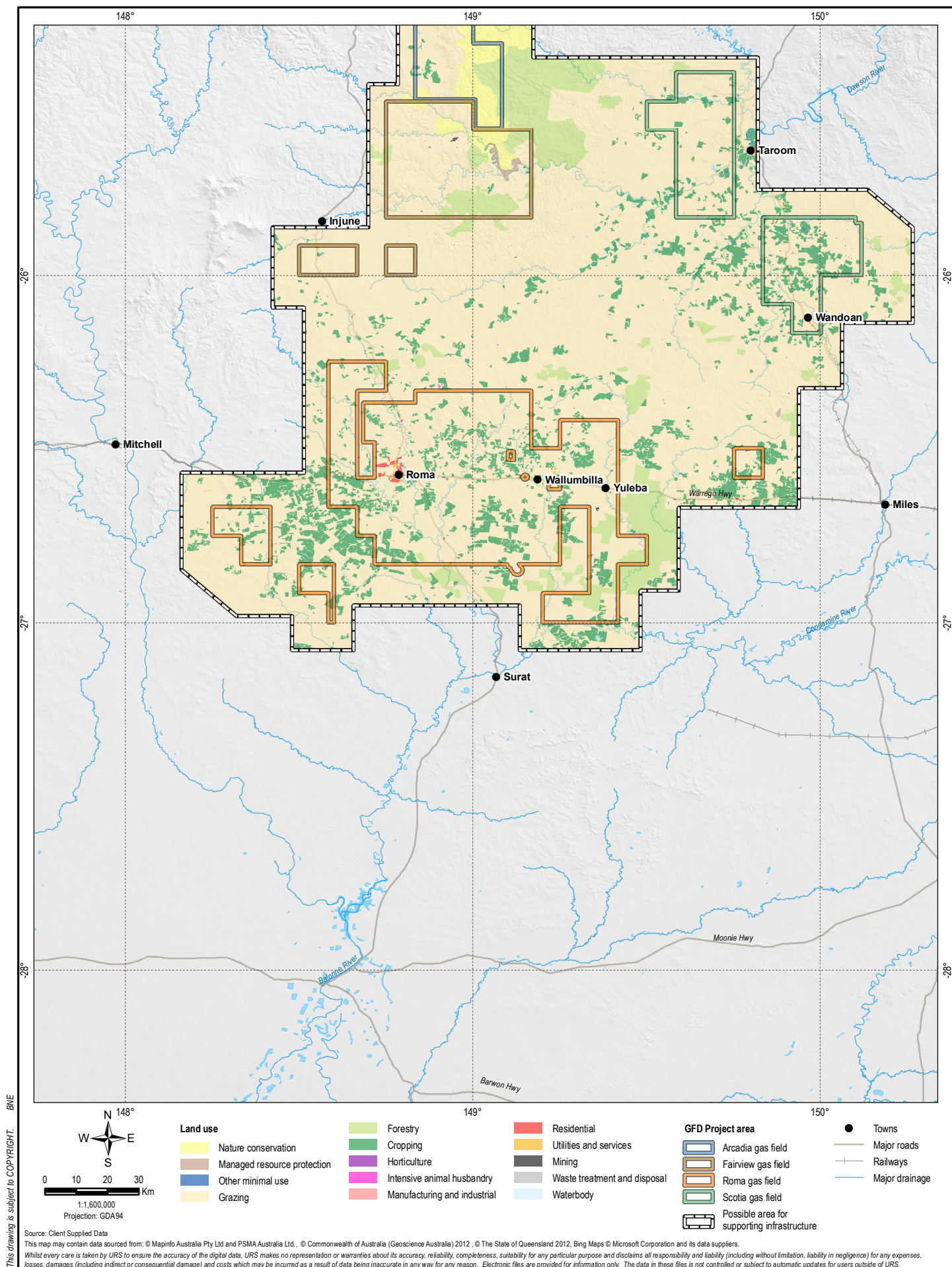
Source: Santos GLNG, 2013. *Irrigated cropping represents Santos GLNG's irrigation practices

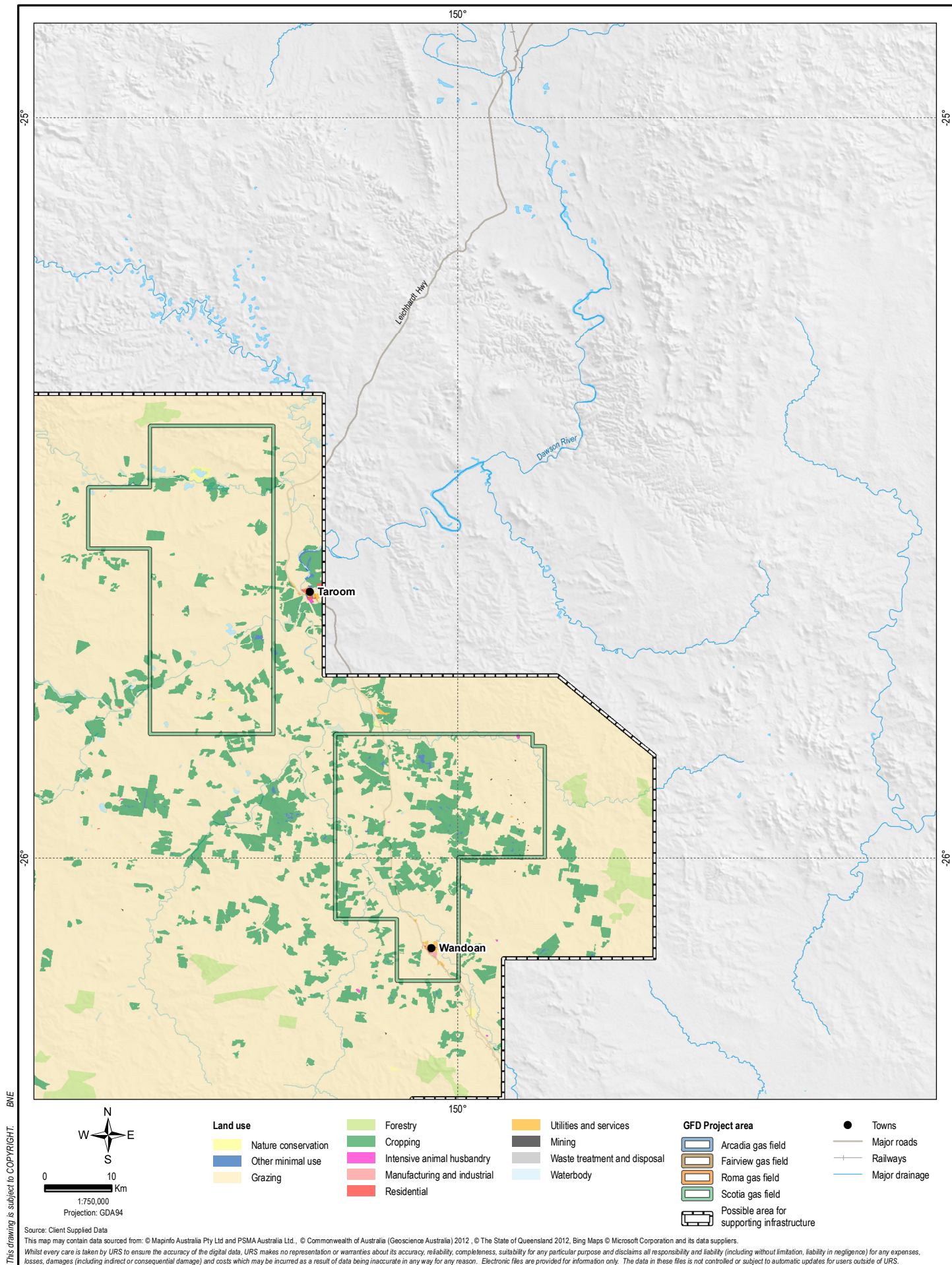
**Additional land area within the possible area for supporting infrastructure outside of the gas fields











4 Land use

4.3 Protected areas

4.3.1 Protected agricultural areas

New statutory regional plans have been prepared for Central Queensland and Darling Downs and are given force under the RPI Act. These regional plans introduce provisions to manage competing State interests, such as the agricultural and resource sectors, through the identification of four areas of regional interest. These areas are known as, Priority Agricultural Areas (PAAs), Strategic Cropping Areas (SCAs), Priority Living Areas (PLAs) and Strategic Environmental Areas (SEAs).

PAAs are strategic areas identified on a regional scale that contain significant clusters of what are considered to be the region's high value, intensive agricultural land uses. Within PAAs, certain agricultural land uses, termed Priority Agricultural Land Uses (PALUs), have been given additional protection from incompatible resource activities while maximising opportunities for the co-existence of resource and agricultural land uses. 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. These criteria define outcomes that need to be met to achieve co-existence within the PAA between the PALU and the proposed resource activity.

Within the Darling Downs and Central Queensland regional planning areas the following agricultural activities are considered PALUs:

- Cropping
- Grazing irrigated modified pastures
- Horticulture (including intensive, irrigated perennial, irrigated plantation, irrigated seasonal and perennial)
- Irrigated cropping
- Irrigated land in transition
- Irrigated plantation forestry.

Areas have been designated as PAAs if they contain PALUs (ones that have significant infrastructure or have limited capacity to modify their agricultural practices in response to resource activities). The extent of PALUs, PAAs within the GFD Project area are summarised in Table 4-2 and shown on Figure 4-2, and Figure 4-2a to Figure 4-2d for each gas field.

Table 4-2 Protected agricultural areas in the GFD Project area (hectares)

Gas field	PAA	PALU
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 possible area for supporting infrastructure outside of the gas fields

4.3.2 Strategic Cropping Areas

The RPI Act seeks to ensure the productive capacity of land considered highly suitable for cropping is protected from the impacts of development and where impacts are unavoidable, those impacts are managed. The RPI Act integrates the repealed *Strategic Cropping Land Act 2011* (Qld) policy framework for 'on-tenure' resource activities.

4 Land use

The RPI Act carries forward Strategic Cropping Land policies through:

- Declaring the SCA as an area of regional interest
- Applying the *SCA Assessment Criteria* to activities within the SCA that are not also located on a PALU within a PAA
- Providing for the chief executive to condition mitigation as part of a regional interest's development approval issued for an activity in the SCA.

A compliance certificate or protection decision issued under the *Strategic Cropping Land Act 2011* becomes a regional interests development approval under the RPI Act.

The extent of SCA within the GFD Project area is detailed in Table 4-3 shown on Figure 4-2, and Figure 4-2a to Figure 4-2d for each gas field.

Table 4-3 Distribution of strategic cropping areas in the GFD Project area

Gas field	Total SCA trigger area (ha)
Arcadia	36,244
Fairview	12,576
Roma	34,451
Scotia	101,304
Remainder*	411,225
Total	595,799

*Additional land area within the possible area for supporting infrastructure boundary outside of the gas fields

4.3.3 Urban and rural residential

4.3.3.1 Urban areas

The *Central Queensland* and *Darling Downs* regional plans have introduced the term Priority Living Area (PLA), which is described as a settlement area (urban residential, business, township and mixed use zones, areas for future urban growth), rural residential areas associated with the settlement area, and a two kilometre buffer area around the settlement area. PLAs have been introduced to provide greater certainty of investment in the development of the region's towns and urban settlements by setting aside an area for town expansion and protecting it from incompatible resource development.

The PLAs within the GFD Project area and beyond are listed in Table 4-4. URS has listed PLAs outside of the GFD Project area recognising that potential movement of people and service provision in the region may have a wider area of influence than other land-use and tenure impacts considered in this report.

Table 4-4 Priority Living Areas

PLAs in GFD Project area	Other PLAs outside of GFD Project area with the potential to be influenced by the GFD Project	
Roma (6,712.6 ha)	Miles	Bluff
Wallumbilla (2,359.7 ha)	Mitchell	Surat
Yuleba (2,300.7 ha)	Injune	Taroom
Wandoan (4,787 ha)	Blackwater	

4 Land use

Roma is the largest town within the GFD Project area and had a population of 6,906 persons at the 2011 census (ABS, 2013). Roma is a regional activity centre and provides employment and business opportunities, convenience and retail shopping, and services to the region. It also supports administrative activities, particularly by State government, delivered from Toowoomba.

The other PLAs within the GFD Project's area of influence have populations less than 1,000 persons and generally function as rural or community activity centres (DIP, 2009). Rural activity centres can accommodate concentrations of employment, businesses, convenience retail shopping opportunities, and provide essential functions for surrounding local districts. Community activity centres provide hubs for essential services and social interaction for residents in rural and remote locations. These centres provide a limited range of services, such as a single convenience store, a service station and a public bar. Most of these centres have limited educational facilities, few links to locally delivered health services and limited access to other government services and may support a single-officer police station. These centres often provide important road travel centres for transport and tourism services within the region.

4.3.3.2 Rural residential

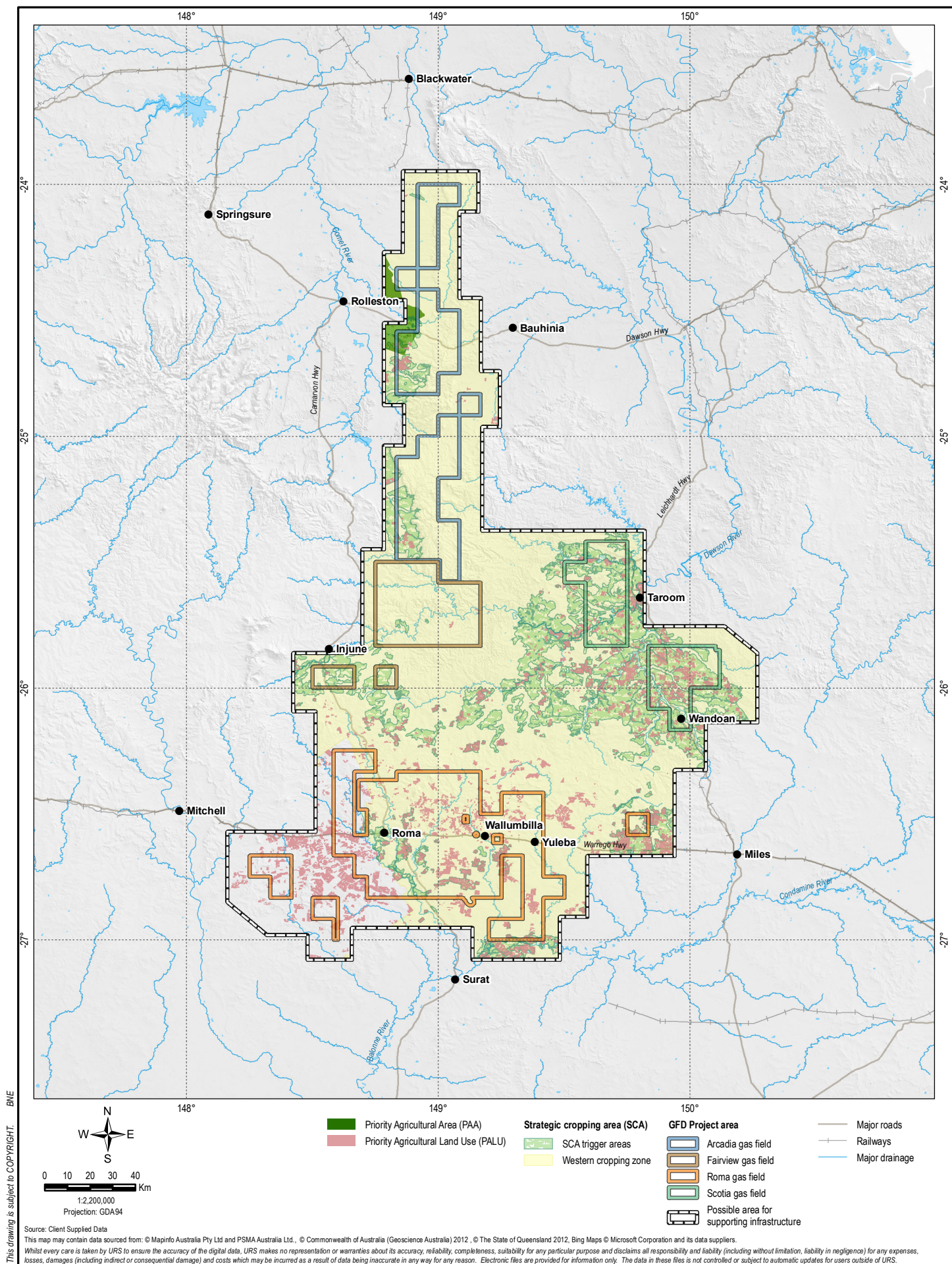
Residential uses in rural areas of the GFD Project area include localities or small settlements (generally with less than 200 people) and rural residences, which can be either homesteads on large rural properties or smaller rural lifestyle properties.

The localities and small settlements function as rural and community activity centres providing localised employment, businesses and convenience retail shopping opportunities, and basic services for surrounding districts. They also provide for social interaction for residents in the surrounding rural areas. Table 4-5 lists the localities in the GFD Project area.

Table 4-5 Localities in the GFD Project area

Gas field	Locality					
Arcadia	Bedourie		Humboldt		Pyramid Hill	
Fairview	Beilba		Komine		Okoro	
	Blairgowrie		Mount Hutton		Waterview	
	Gunnewin		Myrtle Vale			
Roma	Bendemere	Dargal Road	Miawood	Orange Hill	Tingun	Warooby
	Blythdale		Mooga	Pickanjinie	Wallabella	Wununa
	Bungeworgorai	Eumina	Nareeten	Roma Downs	Wallumbilla North	Yingerbay
	Bungil	Euthulla	North	Summerhope	Wallumbilla South	Yuleba
	Combarngo	Hodgson	Hodgson	Tineen	Warkon	Yuleba South
		Kingull	Nullawurt			
Scotia	Broadmere		Nunbank			

Source: Streetspro, 2013



PROTECTED AREAS IN THE GFD PROJECT AREA

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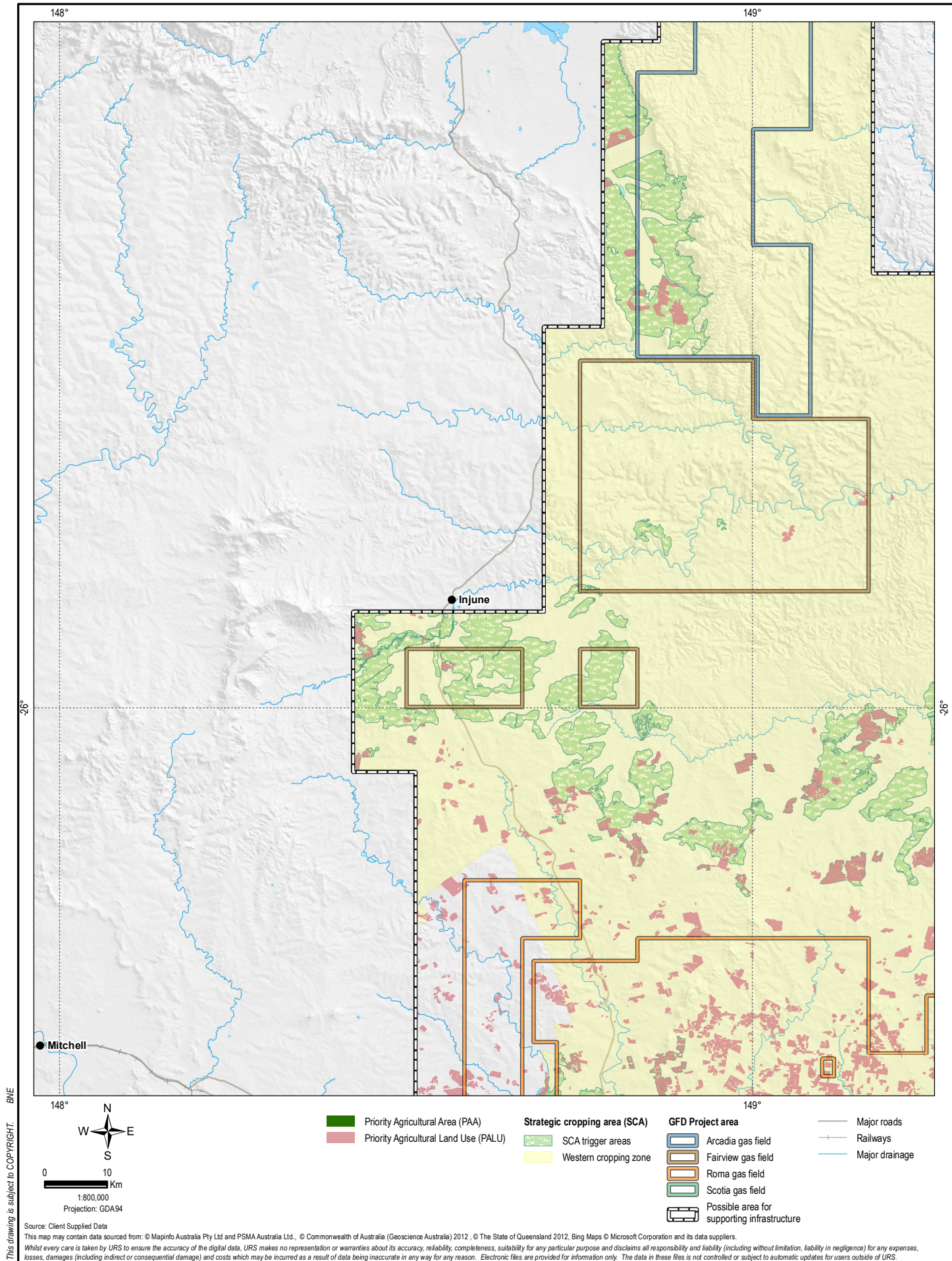
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PROTECTED AREAS IN THE GFD PROJECT AREA FAIRVIEW GAS FIELD

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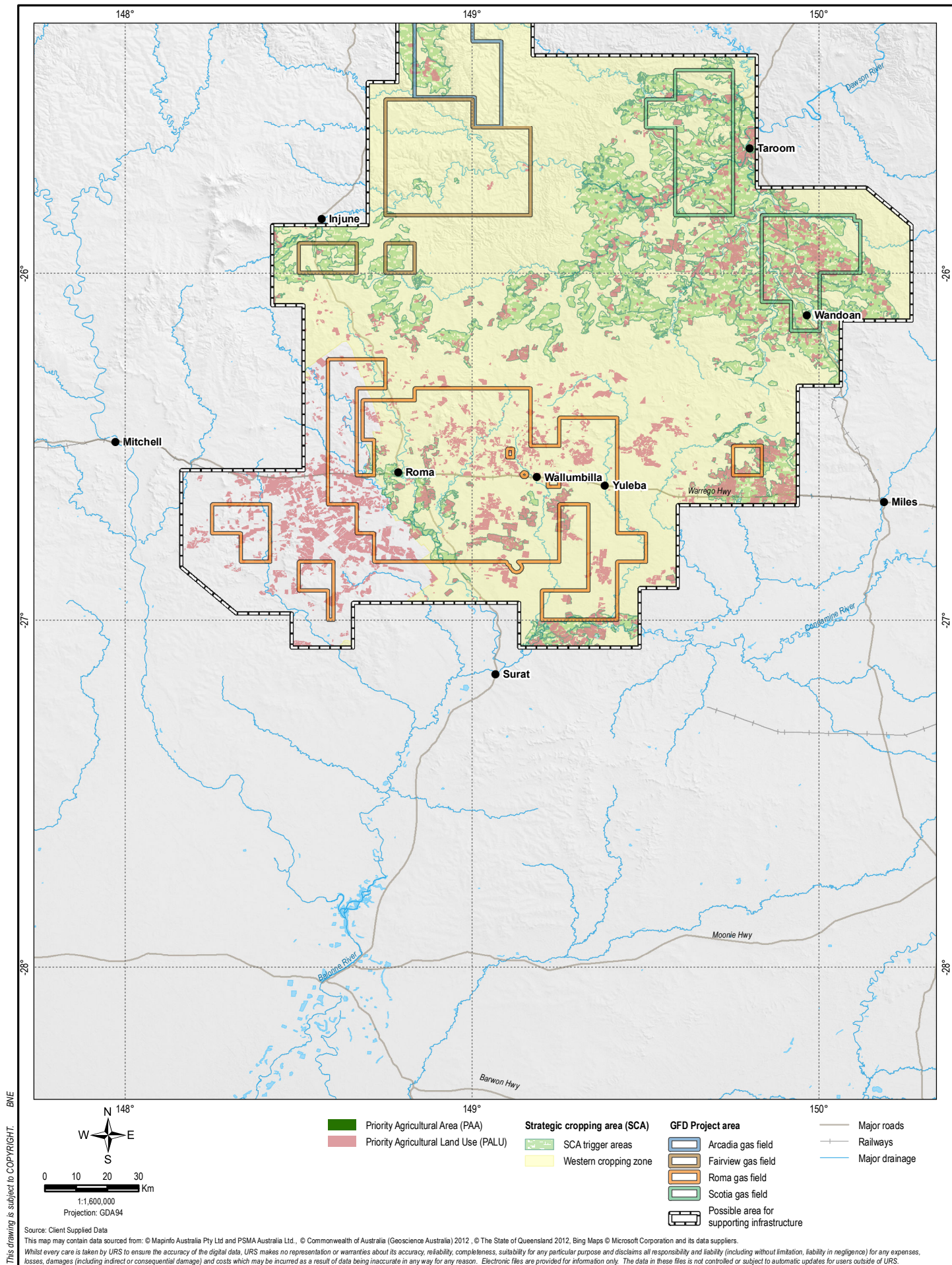
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PROTECTED AREAS IN THE GFD PROJECT AREA ROMA GAS FIELD

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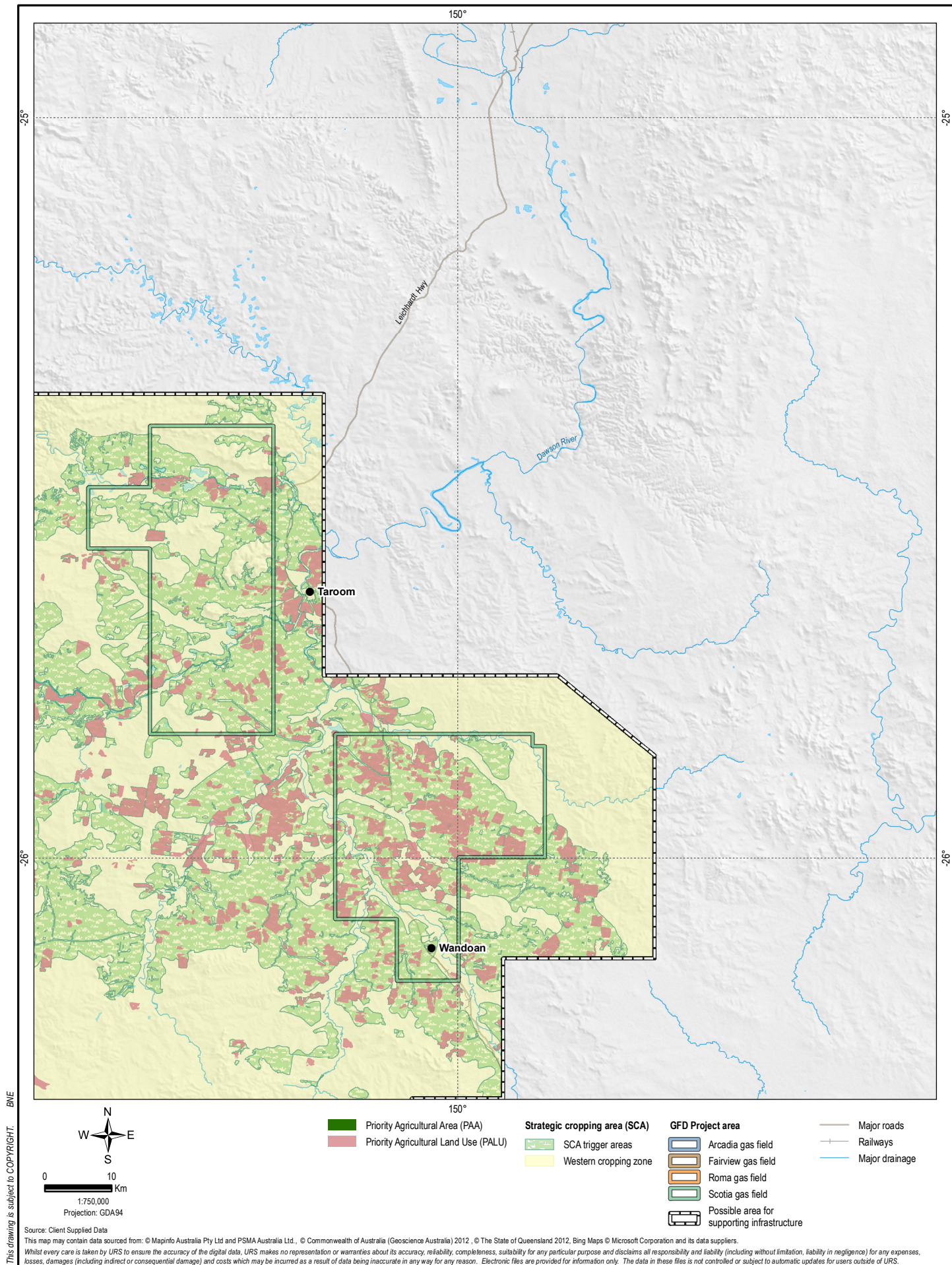
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4 Land use

4.4 Forestry

Forestry for millable timber and ancillary land uses to forestry such as quarrying and apiary enterprises within state forests, timber reserves and other areas of appropriate tenure, are common in suitable locations within the GFD Project area (as mentioned in section 4.1). Most forestry lands are also grazed and generally combine forestry and grazing in a mutually beneficial way.

Most of the forestry production occurs within State forests primarily situated within the Arcadia and Fairview gas fields. State forests located within the GFD Project gas fields are identified in Table 4-6 and those State forests within the GFD Project area are illustrated on Figure 4-1, and Figure 4-1a to Figure 4-1d for each gas field.

Forestry production predominately comes from timber resource areas (native and plantation) on State-owned lands under the Forestry Act, native forest practice notification areas on private (freehold) land under the *Vegetation Management Act 1999* (Qld), and plantation forestry areas on private land (DAFF, 2013).

Native forestry, predominately cypress and hardwood species, produce a range of forest products including sawlogs, poles, bridging girders, fencing timbers and craftwood for a broad range of processing purposes. Native forestry activities currently occur across the GFD Project area and generally occur on land that is also used for grazing. The key commercial native forestry tree species include white cypress pine, spotted gum, ironbark, Queensland blue gum and box, plus a broad range of other suitable species (DAFF, 2013).

There are a number of timber processing facilities well as portable sawmills and fencing timber processors within the GFD Project area. Cypress sawmills are located at Injune and Roma. Queensland's largest hardwood sawmill is located at Wandoan (DAFF, 2013).

4.5 Mining and resources

There are numerous types of resource tenements over large portions of the GFD Project area. These are discussed in section 3.3 and shown on Figure 3-4 and Figure 3-5.

The dominant resource development activity in the GFD Project area is the approved development of production wells and associated infrastructure of the GLNG Project. In addition there is a relatively small mineral resource activity of the Yuleba Silica Sand Mine.

There are numerous exploration tenements within the GFD Project area. These allow the holder to undertake the activities that are required to identify the quality and quantity of a resource prior to extraction. Exploration includes a variety of activities including remote sensing, seismic surveys, drilling and sampling.

4.6 Conservation, tourism and recreation

National parks and conservation parks are regulated under the NC Act and identified as Category A environmentally sensitive areas. Resource reserves are regulated under the NC Act 1992 and are classified as Category C environmentally sensitive areas. State forests and timber reserves are regulated under the Forestry Act and identified as Category C environmentally sensitive areas.

4 Land use

Protected areas located within the GFD Project area are listed in Table 4-6. Figure 4-1, and Figure 4-1a to Figure 4-1d, show the protected areas within the GFD Project area. These protected areas hold conservation, tourism and recreational values by virtue of their undeveloped and in most instances, natural status.

Expedition and Humboldt Tableland National Parks are located with the GFD Project area and form parts of the Central Queensland Sandstone Belt. The Central Queensland Sandstone Belt is an area of over 25 separate mountain ranges and plateaus that cover approximately 82,000 km² and is so named due to the predominant geology. The area is afforded significant natural and Aboriginal cultural heritage values, containing towering multi-hued cliffs, caves and overhangs, clear running streams and a mosaic of vegetation communities all combining to form vital elements of this scenic landscape (Department of National Parks, Recreation, Sport and Racing, 2012). Lake Murphy conservation park, Carraba conservation park are also present within the GFD Project area.

The GFD Project area includes areas of undeveloped rural landscapes that are primarily used for low intensity grazing activities. Some of these rural areas hold intrinsic landscape and open space values which exhibit scenic amenity attributes as a result of the low impact nature of the dominant land use. In addition, some areas such as rivers, river banks and flood plains are used for informal and unregulated recreational activities.

Table 4-6 Conservation, tourism and recreational land uses of the GFD Project area

Gas field		Real property description
Arcadia	Shotover State Forest	28FTY1207
	Humboldt National Park	194NPW722
	Expedition (Limited Depth) National Park	27NPW826
	Presho State Forest	50FTY1872
	Expedition State Forest	7SP142673
	Expedition State Forest	29FTY1847
	Mount Nicholson State Forest	47FTY1838
	Belington Hut State Forest	46FTY1813
Fairview	Hallett State Forest	55FTY1153
	Expedition (Limited Depth) National Park	27NPW826
	Expedition Resource Reserve	5TR839674
	Beilba State Forest	20FTY1805
	Stephenton State Forest	62FTY1809
	Doonkuna State Forest	74FTY1686
	Belington Hut State Forest	46FTY1813
Roma	Brucedale State Forest	369FTY1237
	Tinowon State Forest	381FTY1149
	Wallabella State Forest 2	473FTY1151
	Yuleba State Forest	328FTY1860
	Wallabella State Forest 1	468FTY1150
	Trinidad State Forest 2	461FTY399
	Inglebogie State Forest	462FTY400
	Gubberamunda State Forest 1	389FTY1024
Scotia	Lake Murphy Conservation Park	12LE295
	Carraba Conservation Park	35FT923

Infrastructure and utilities

5.1 Transport infrastructure

Transport infrastructure within and surrounding the GFD Project area is shown on Figure 5-1, and Figure 5-1a to Figure 5-1d for each gas field, and summarised in Table 5-1.

Table 5-1 Transport infrastructure

Gas field	State-controlled roads	Stock routes		Rail	Aerodromes
Arcadia		S043BAUH02 U354BAUH02 U726DUAR01	S354BAUH02 S043DUAR01 U726TARO01		
Fairview	Carnarvon Highway	M709BUNG02 M709BUNG01 M695BUNG01 M698BUNG01 M697BUNG01 P070BUNG02 P070BUNG03	M699BUNG01 M709TARO01 P070BUNG01 M699BUNG04 M699BUNG03		
Roma	Warrego Highway Carnarvon Highway	M705BEND02 S071BEND02 M705BEND01 S071BEND03 U797BEND01 P005BUNG02 M704BEND03 M705WARR01 M705BEND04 U794BEND03 M705BEND03 U599BEND01 U794BEND02 U433MURI01 U599WARR01 U301WARR01 M694BUNG02 S707BUNG01 U693BUNG01 P070BUNG04 P002BUNG02 P002BUNG03 P070BUNG04	M694BUNG01 S707BUNG02 P070BUNG05 M708BUNG01 M708BUNG02 M689BUNG01 P071BUNG01 M692BUNG01 M704BEND01 P002BEND01 S071BEND01 M704BEND02 U794BEND01 P002BUNG03 P010BUNG01 P010BUNG02 P002BUNG04 P010BUNG03 P005BUNG01 U791BUNG01 M694BUNG02	Western line Injune branch	Roma
Scotia	Leichhardt Highway	M423TARO06 U708TARO02 M423TARO07 M707TARO07 U733TARO01 U731TARO02 S707TARO06	M423TARO05 U723TARO01 U722TARO01 M707TARO07 S707TARO05	Wandoan branch	

5 Infrastructure and utilities

Gas field	State-controlled roads	Stock routes	Rail	Aerodromes
Remainder*	Carnarvon Highway Condamine Highway Fitzroy Developmental Road Leichhardt Highway Dawson Highway	Too many to list (1257)	#	Western Taroom

The stock routes present in the possible area for supporting infrastructure are too numerous to list here and are included in Figure 5-1a to Figure 5-1d.

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

5.1.1 Roads

As shown in Figure 5-1, the GFD Project area is serviced by a network of highways that provide connections to Rockhampton, Gladstone and Brisbane, along with other east coast centres via connections to the Bruce Highway. Connectivity to Townsville in the north, New South Wales in the south, Charleville to the west and Longreach and Mt Isa to the northwest is facilitated through connections to the Warrego and Landsborough Highways.

The GFD Project area is intersected by a large number of locally and State-controlled roads, including the Warrego, Carnarvon, Dawson and Leichhardt Highways as detailed in Table 5-1.

5.1.2 Stock routes

Stock routes are a key component of Queensland's rural infrastructure. Stock routes are used for the movement of stock without reliance on the road or rail transport network and provide for alternative agistment areas, particularly during times of drought. Stock routes located within the GFD Project area are identified in Table 5-1 and exhibited in for each gas field in Figure 5-1a to Figure 5-1d.

The nomenclature used in Table 5-1 indicates the classification of the stock routes as primary (P), secondary (S), minor (M) or unused (U). This classification is based on their significance to the transportation of stock and their connectivity.

The stock route network is administered by both the relevant local government and DNRM. The respective local government is responsible for the particular stock route's day-to-day management and DNRM is the custodian of the land, providing support, guidance and strategic directions for management.

5.1.3 Rail

The Western Line running from Brisbane to Cunnamulla services Roma and passes through the Roma gas field. The Blackwater coal system, which provides dedicated coal haulage, runs through the north of the GFD Project area. The locations of these rail lines are shown on Figure 5-1a to Figure 5-1d.

5 Infrastructure and utilities

5.1.4 Surat Basin Infrastructure Corridor

The Surat Basin Infrastructure Corridor is a 214 km rail corridor between the towns of Wandoan and Banana. Declared as a State Development Area in November 2011 beneath the *State Development and Public Works Organisation Act 1971* (Qld), the Surat Basin Infrastructure Corridor has been declared to accommodate the proposed Surat Basin Rail Project as well as other forms of linear infrastructure between the Surat Basin in the south and Gladstone in the north.

As a result of recent global economic uncertainty and subsequent global coal market instability, the Surat Basin Rail Project schedule has been delayed. However, at the time of writing (November 2013), the Queensland Government confirmed that the Surat Basin Infrastructure Corridor will remain declared for future use.

5.1.5 Aeronautical facilities

There are two Civil Aviation Safety Authority certified aerodromes within the GFD Project area located at Roma and Taroom. The GFD Project area also includes a large number of private, unnamed landing grounds and small aerodromes that service homesteads and agricultural activities in the region. These aerodromes are listed in Table 5-1 and, together with the other aeronautical facilities, are shown Figure 5-1a to Figure 5-1d.

5.2 Utilities and services

As discussed below, there is a variety of major utilities across the GFD Project area, including:

- Urban, industrial and agricultural water supply infrastructure and pipelines
- Conventional and unconventional petroleum pipelines
- Gas production infrastructure servicing the Asia Pacific LNG, QGC and Santos GLNG Projects
- Powerlink and Ergon electricity distribution infrastructure
- Telecommunications infrastructure such as fibre optic cables.

5.2.1 Water pipelines and distribution infrastructure

There are a number of water pipelines and distribution networks within the GFD Project area including the domestic and industrial reticulated water supply in Roma, Wallumbilla, Injune and Wandoan, various on-farm water distribution networks servicing pastoral and cropping activities, and water gathering pipelines servicing the GLNG Project.

5.2.2 Gas field development infrastructure

The approved GLNG Project operates within the GFD Project area and includes various items of project-specific infrastructure including wells, gas and water gathering networks, transmission pipelines, gas compression facilities and water management facilities. The primary infrastructure associated with Santos GLNG is shown in Figure 1-1. In addition, the GFD Project area includes other major gas to LNG projects, as discussed in section 4.5. As such, similar infrastructure to that of the GFD Project is being developed in these tenures, including gas transmission pipelines. Table 5-2 lists the major gas pipelines which intersect or are in proximity to the GFD Project tenure. The locations of these pipelines are shown on Figure 5-2a to Figure 5-2d.

5 Infrastructure and utilities

Table 5-2 Major gas pipelines in relation to GFD Project tenure

Gas field	Major gas pipelines	Owner
Arcadia	Rapid Growth Project to Rolleston Junction and ASF to Rapid Growth Project Gas Trunklines	Santos GLNG (operated by Origin Energy)
	Fairview to Gladstone Gas Transmission Pipeline	Santos GLNG
	Queensland Gas Pipeline.	Jemena
Fairview	Queensland Gas Pipeline.	Jemena
	Fairview pipeline compression station to Wallumbilla Gas Trunkline.	Santos GLNG
Roma	Queensland Gas Pipeline.	Jemena
	Fairview pipeline compression station to Wallumbilla Gas Trunkline.	Santos GLNG
	Spring Gully to Wallumbilla Gas Trunkline.	Origin Energy
	Spring Gully to Wallumbilla Loop to Talinga.	Origin Energy
	Roma to Brisbane Gas Pipeline.	APT Petroleum Pipelines
	Ballera to Wallumbilla Gas Pipeline.	EPIC
	Silver Springs to Wallumbilla Gas Trunkline.	AGL
	Kincora to Wallumbilla Gas Trunkline.	Origin Energy
Scotia	Peat Lateral Pipeline.	APT Petroleum Pipelines
Remainder*	QCLNG Pipeline	QCLNG
	Arrow Surat Pipeline	Arrow Energy
	Myall Creek – Beranga pipeline	Oil Investments

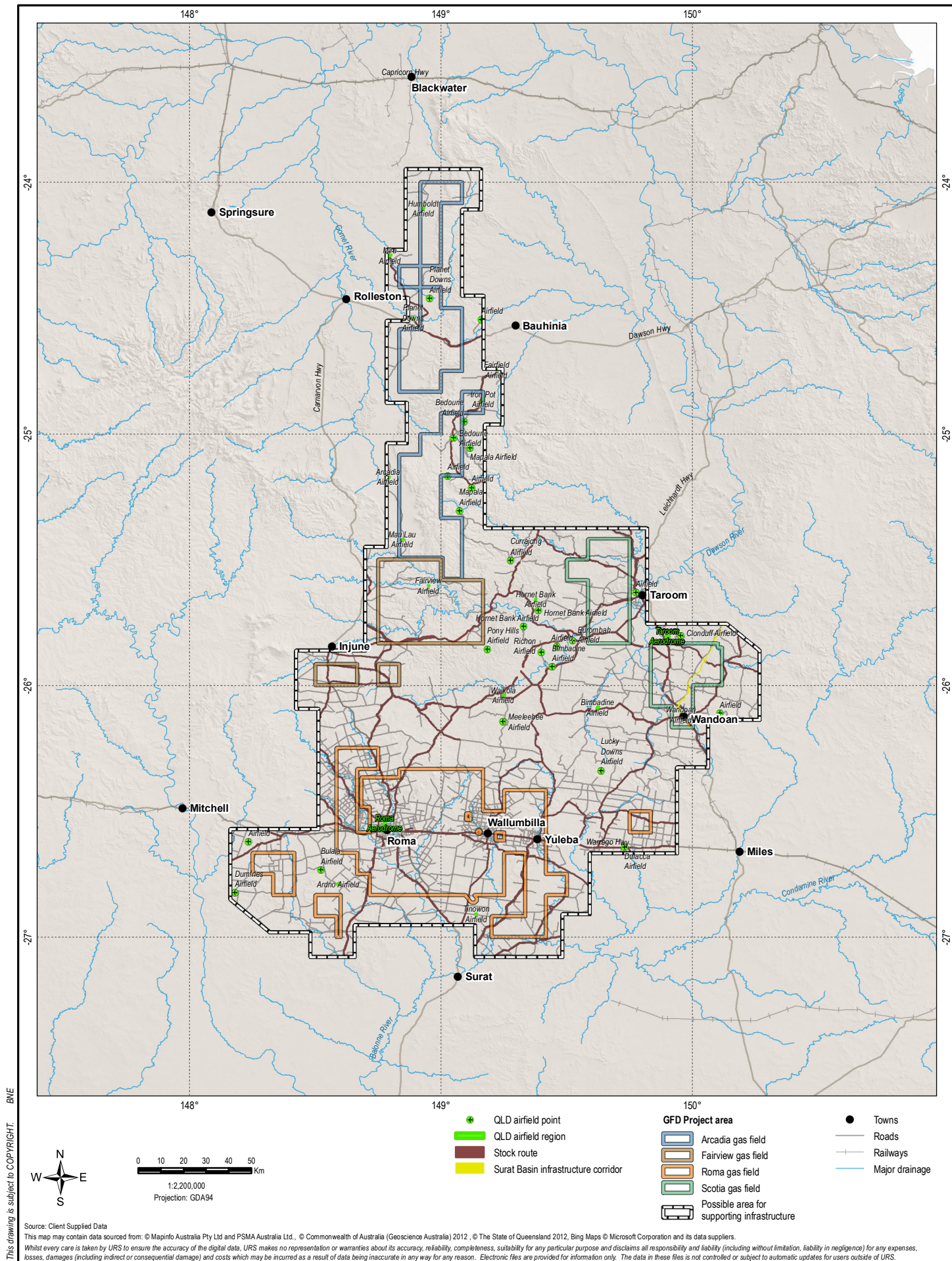
Source: DNRM, 2013

*Additional land area within the possible area for supporting infrastructure outside of the gas fields

5.2.3 Electricity generation and distribution network

The Powerlink and Ergon electricity distribution networks service industrial, urban and rural electricity users within the GFD Project area. Aboveground and underground transmission lines ranging from 132 kilovolts (kV) to 12.7 kV are within the GFD Project area and are shown on Figure 5-2a to Figure 5-2d for each gas field. In addition to the transmission lines serving the region, there are numerous substations and switching stations operated by Powerlink, Ergon and Santos GLNG within the GFD Project area.

Powerlink is proposing to develop additional transmission lines and substations to service the growing gas developments in the GFD Project area.



TRANSPORT INFRASTRUCTURE IN THE GFD PROJECT AREA

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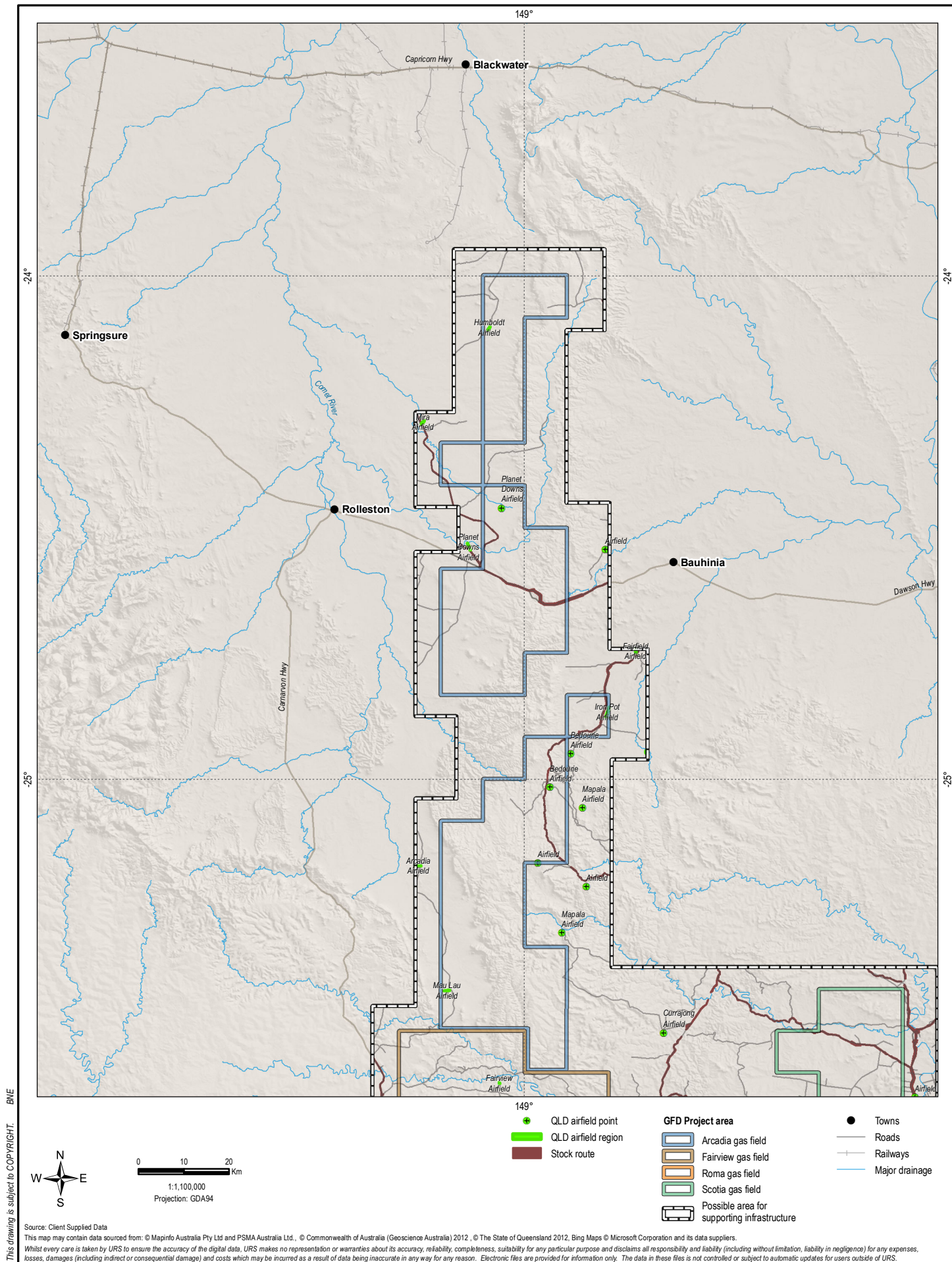
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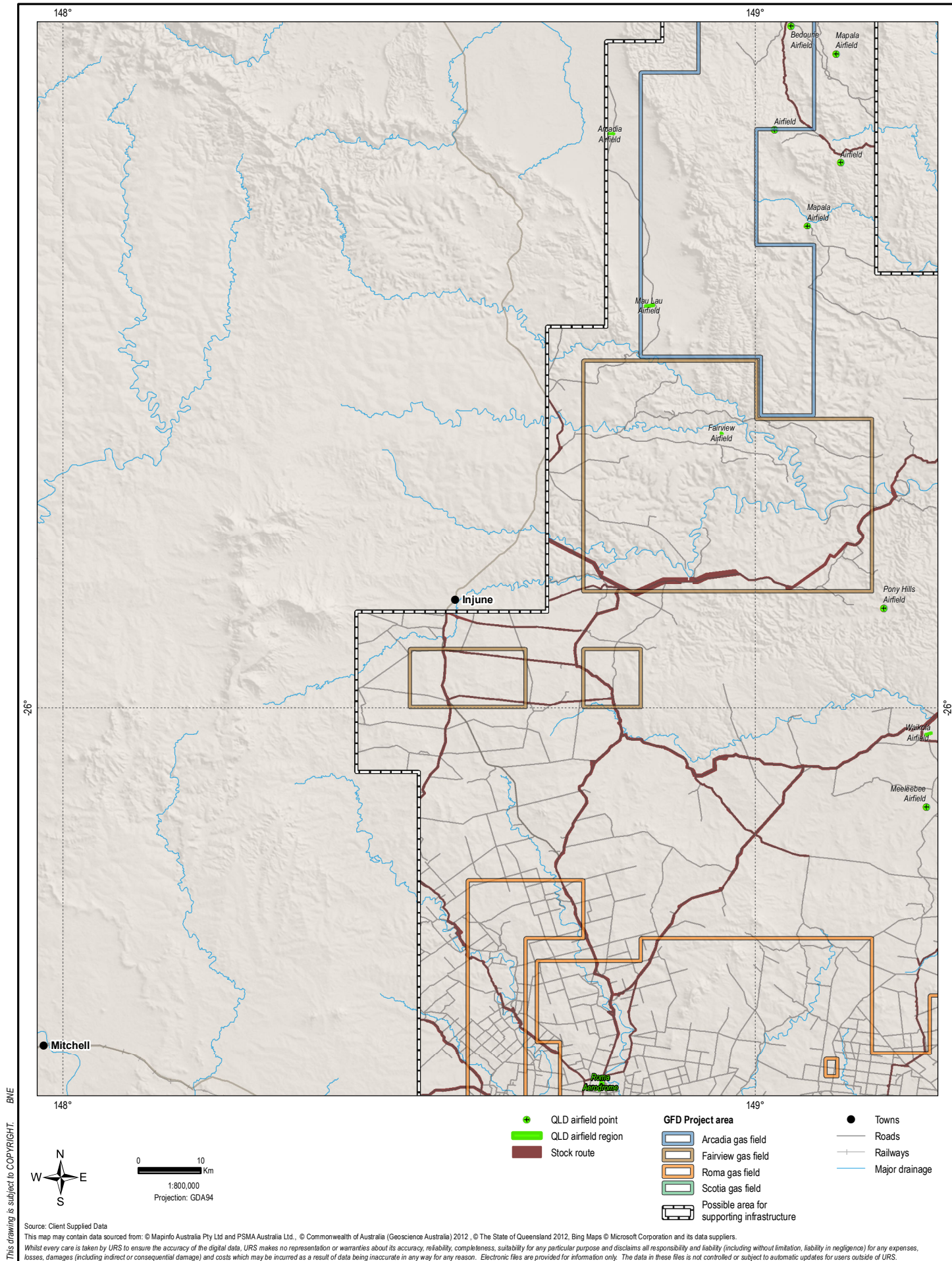
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TRANSPORT INFRASTRUCTURE IN THE GFD PROJECT AREA FAIRVIEW GAS FIELD

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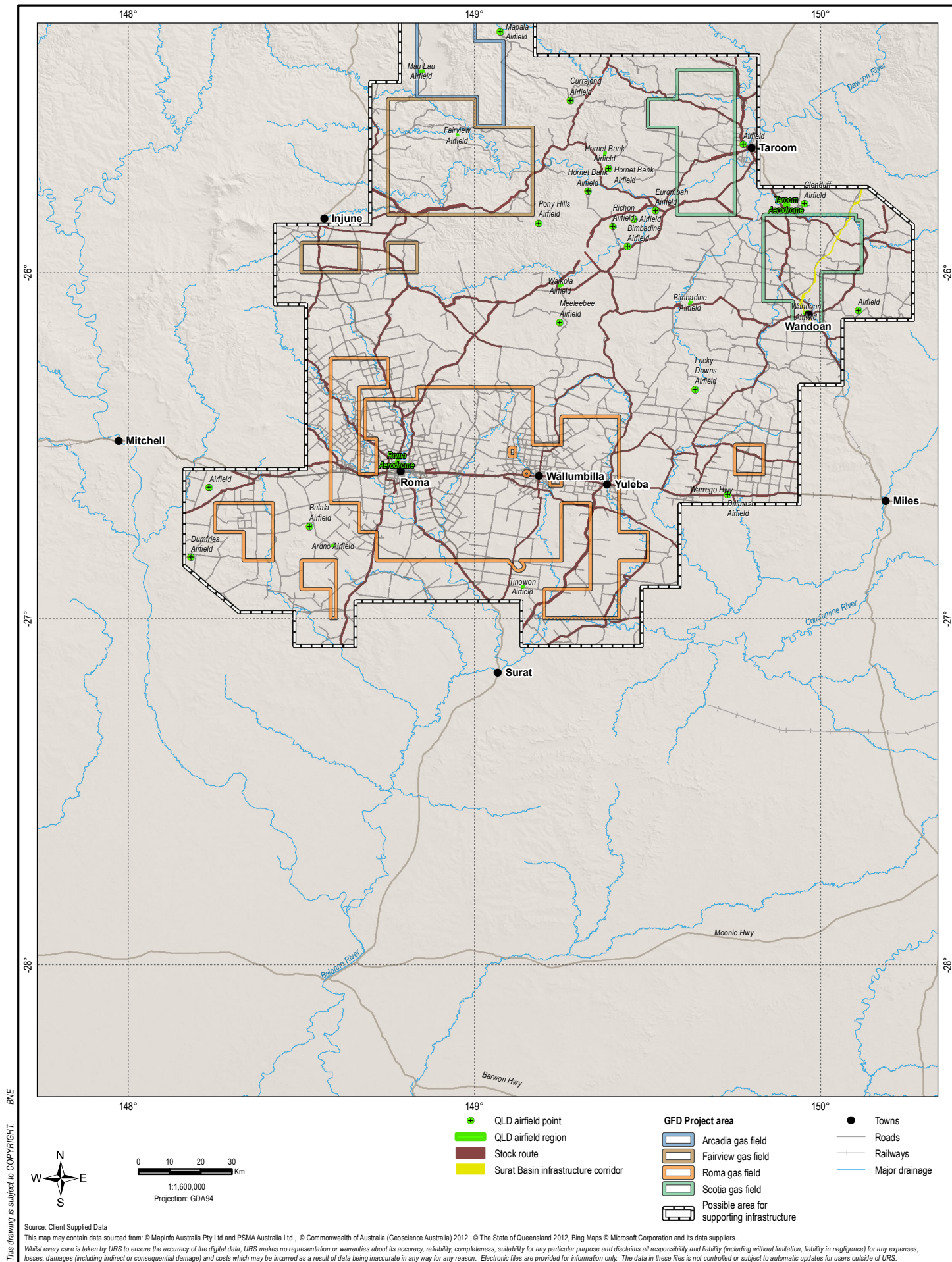
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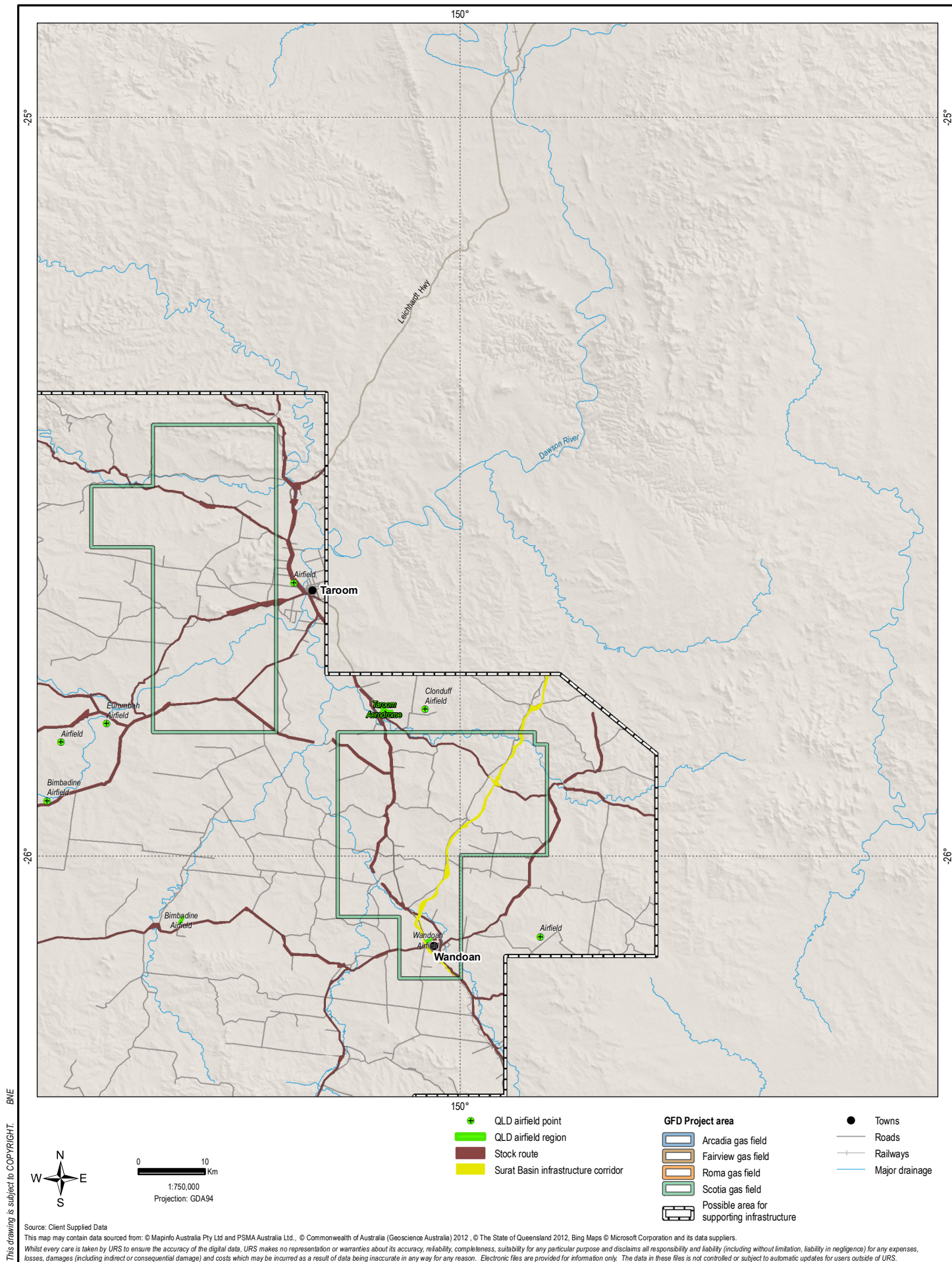
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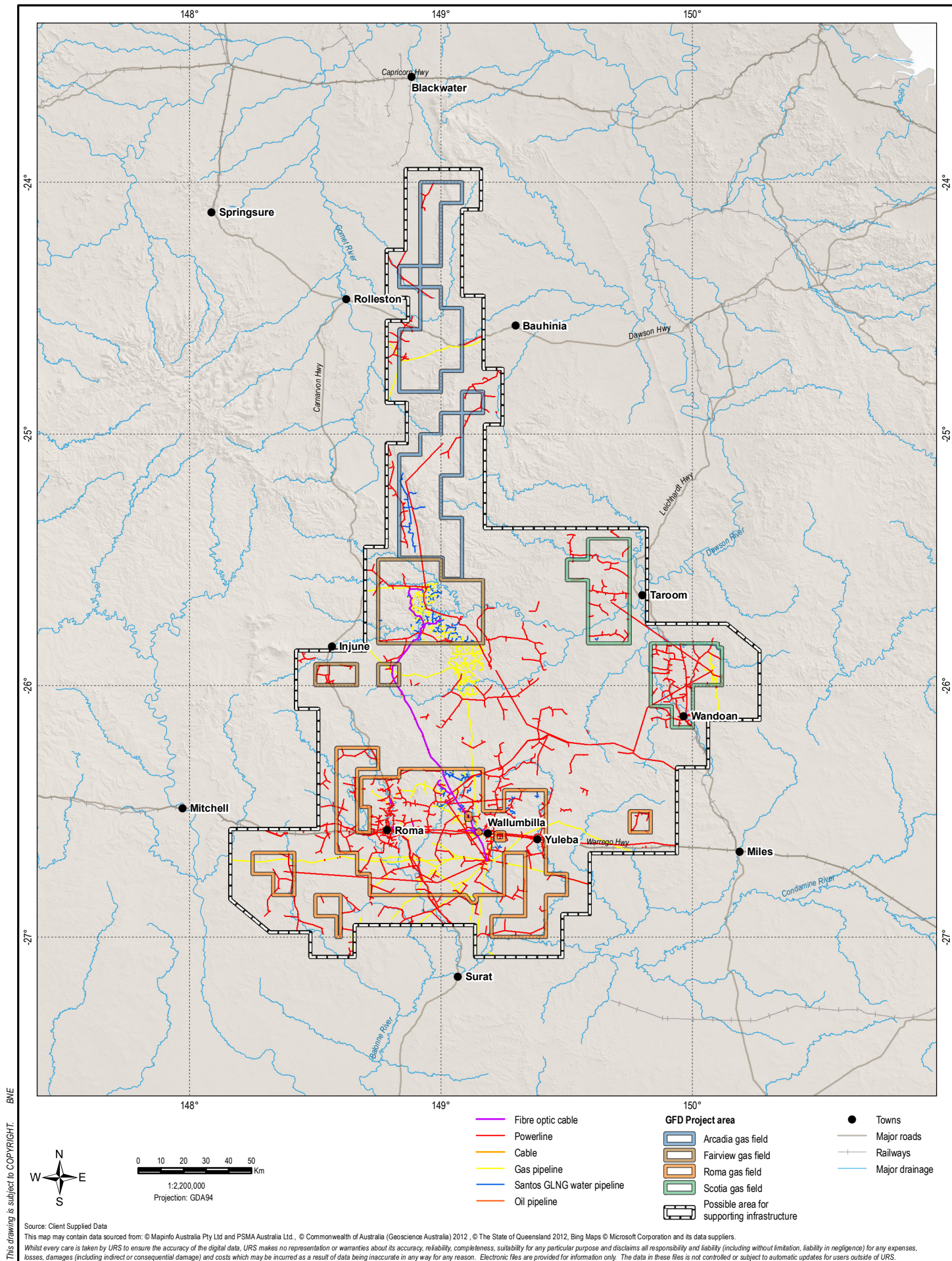
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UTILITIES AND SERVICES IN THE GFD PROJECT AREA

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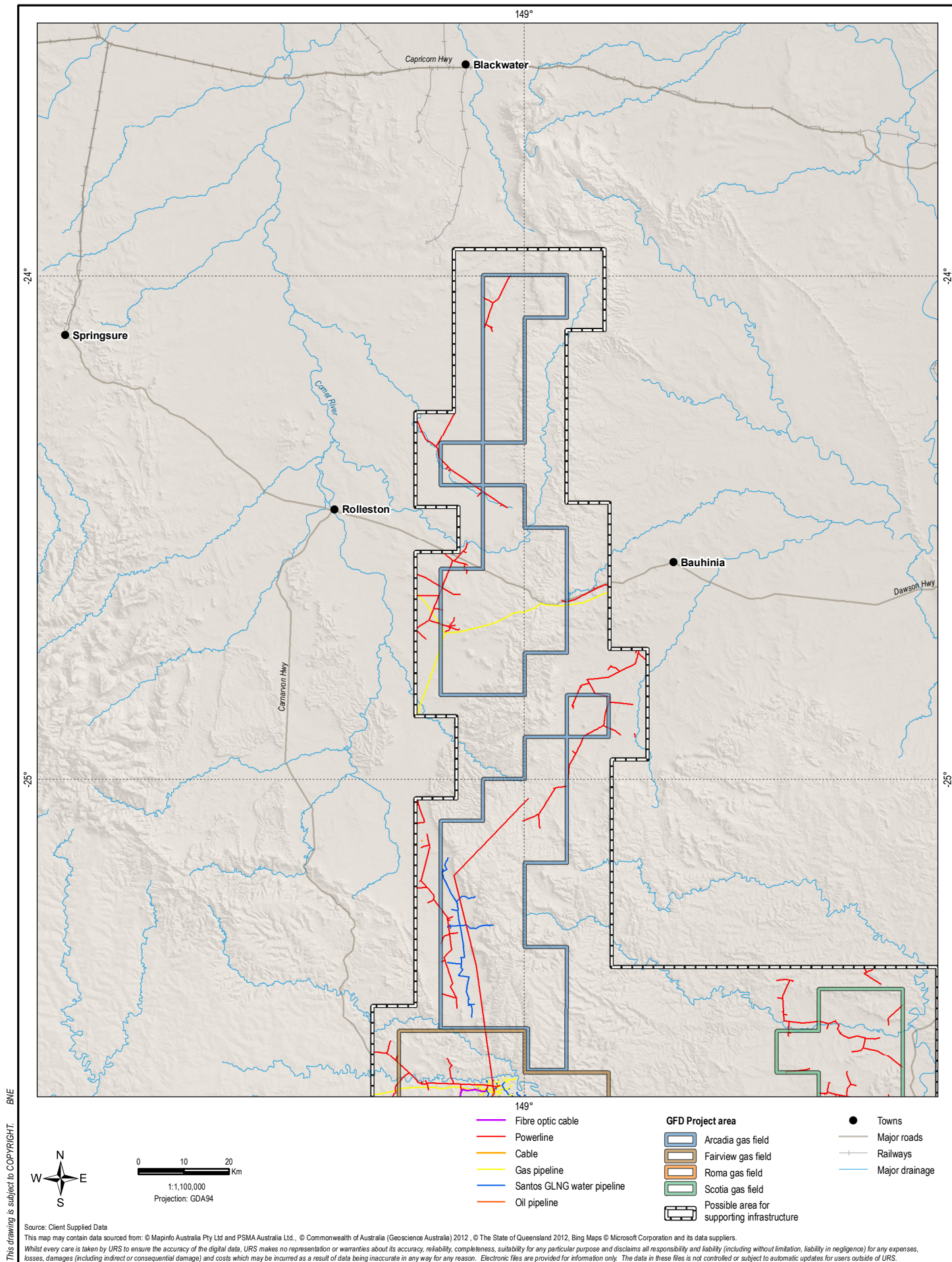
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Figure: **5-2**

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UTILITIES AND SERVICES IN THE GFD PROJECT AREA ARCADIA GAS FIELD

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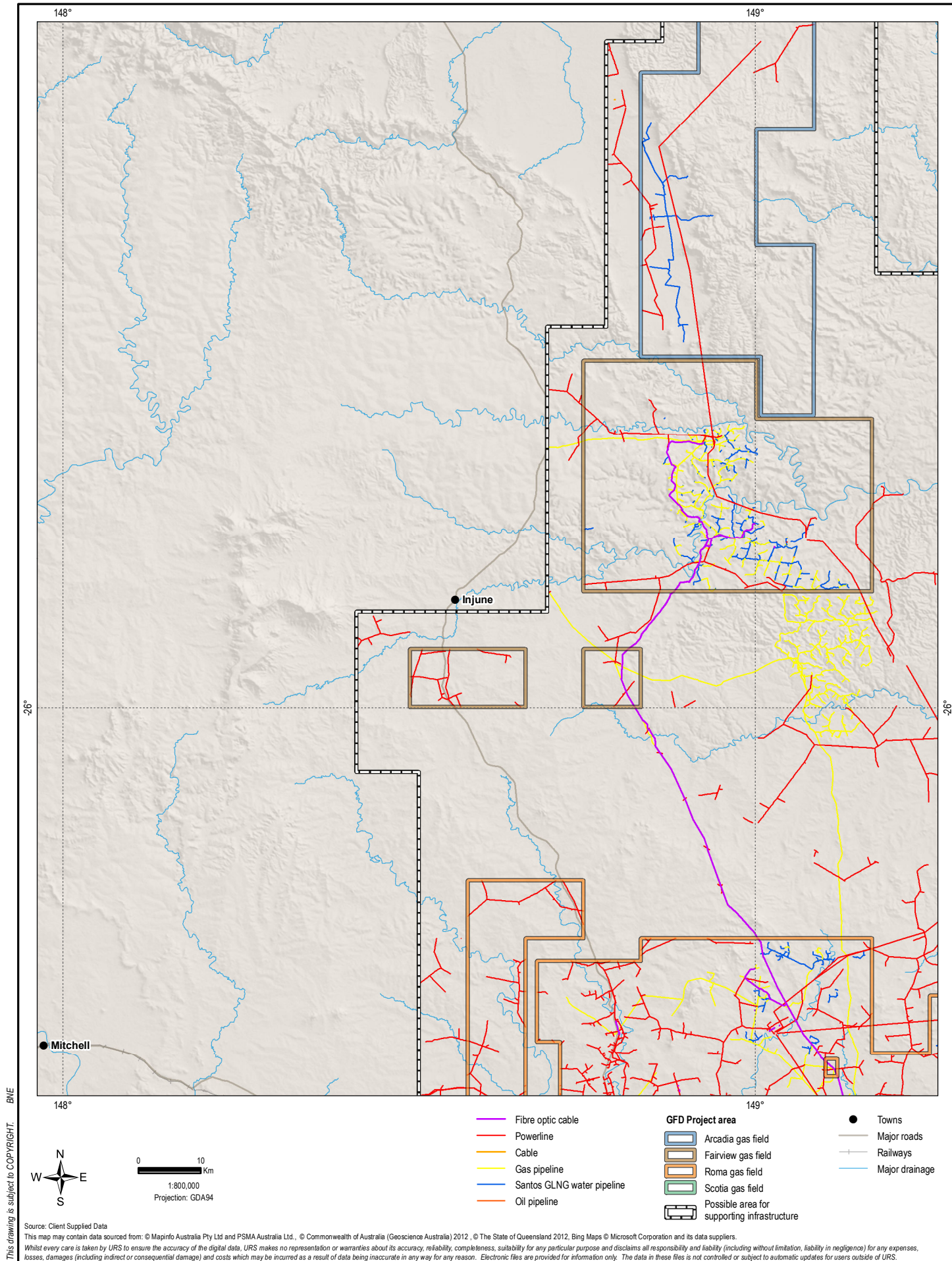
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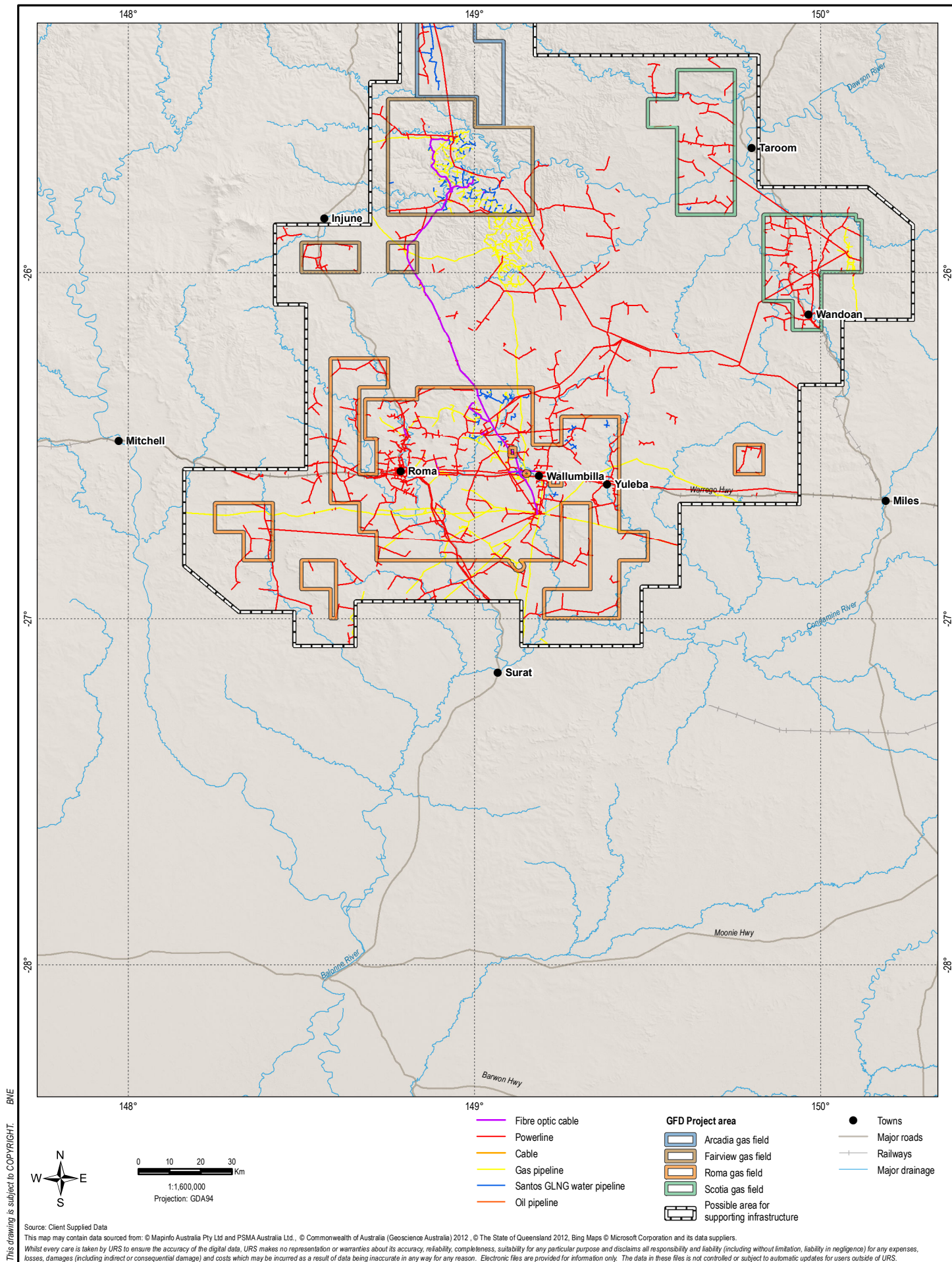
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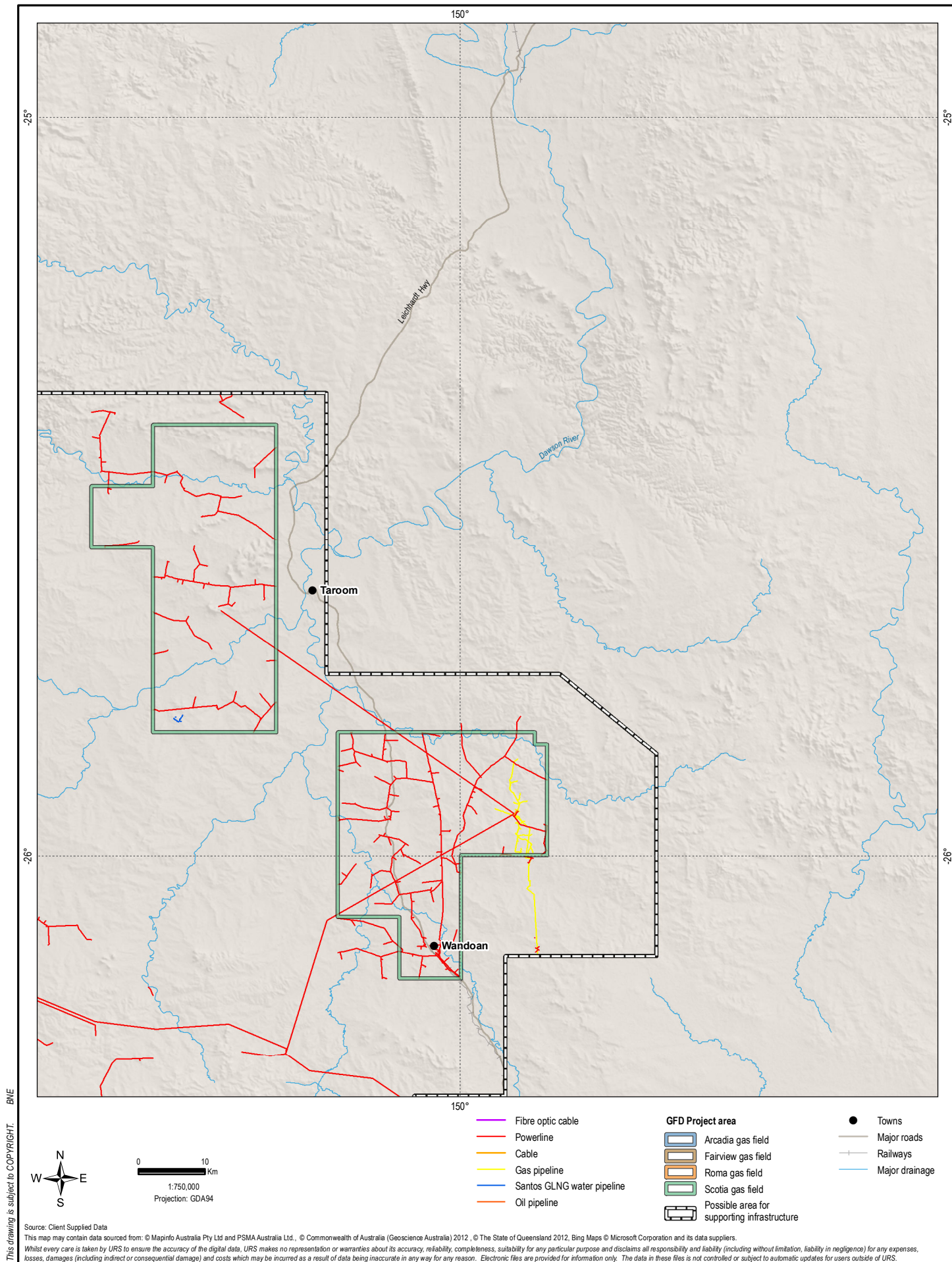
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UTILITIES AND SERVICES IN THE GFD PROJECT AREA SCOTIA GAS FIELD

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Potential impacts

This section describes potential land use impacts from the GFD Project. Potential impacts are those that could result following the application of the constraints planning process but before the application of mitigation or rehabilitation measures.

6.1 Constraints planning process

As discussed in Section **Error! Reference source not found.**, Santos GLNG has adopted a constraints planning process to assist in the planning of its field development activities. The process is documented in the Constraints protocol which has been successfully used for the GLNG Project and will also be adopted for the GFD Project.

The highest priority planning principle in the Constraints protocol for the choosing the location of GFD Project infrastructure is avoidance i.e. not placing certain types of infrastructure in areas that have been identified as being constrained by existing environmental or land use values. The levels of constraint relevant to the land use aspects of the GFD Project are summarised in Table 6-1.

Table 6-1 Land use constraints

Level of constraint	Constraint layer
No-go area	Category A environmentally sensitive areas including national parks, conservation parks, and forest reserves (NC Act).
	EPBC Act-listed spring vents and complexes including primary 200 m buffer.
	Wetlands of national importance including 200 m buffer.
	Wetlands of high ecological significance or high conservation value (<i>Map of Referrable Wetlands</i>).
Surface development exclusion area	Primary 200 m buffer for Category A environmentally sensitive areas.
	The following Category C environmentally sensitive areas: - Nature refuges (NC Act) - Koala habitat areas (<i>Nature Conservation (Koala) Conservation Plan 2006</i>) - Declared catchment areas (<i>Water Act 2000 (Qld)</i>).
	The following Category B environmentally sensitive areas: - Coordinated conservation areas (NC Act). - State forest park/special forestry areas (<i>Forestry Act 1959 (Qld)</i> (Forestry Act)) - Ramsar sites listed as wetlands of international importance.
High constraint area	Watercourses (stream orders) including 100 m buffer.
	Wetland defined as 'general ecologically significant wetland' or 'wetland of other environmental value' (<i>Map of Referrable Wetlands</i>).
	Spring vents and complexes (not protected under the EPBC Act) including primary 200 m buffer.
Moderate constraint area	Secondary 100 m buffer for Category A environmentally sensitive areas.
	Secondary 100 m buffer for spring vents and complexes (EPBC Act).
	Matters of national environmental significance including habitats (threatened species habitat and migratory species habitat), threatened ecological communities (derived from state regional ecosystem mapping or verified from field surveys), flora species.
	State forests and timber reserves.
	Endangered regional ecosystems including primary 200 m buffer.

6 Potential impacts

Level of constraint	Constraint layer
	The following Category C environmentally sensitive areas: • Essential habitat including primary 200 m buffer (NC Act). • Essential regrowth habitat including primary 200 m buffer (NC Act). • Of concern regional ecosystems including primary 200 m buffer. • Resource reserve (NC Act). • State forests / timber reserves (Forestry Act).
	Endangered, vulnerable and near-threatened species (NC Act).
Low constraint areas	High value regrowth (endangered and of concern regional ecosystems).
	No concern at present regional ecosystems.
	Type A species (NC Act).
	Existing Santos GLNG infrastructure.
	Existing road, rail, pipeline and other infrastructure.
	Remaining areas once other constraints have been applied.

¹ **Low impact petroleum activities** means petroleum activities that 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, and installation of environmental monitoring equipment (including surface water).

² **Limited petroleum activities** mean any low impact petroleum activity and single well leases (includes observation, pilot, injection and production wells) and associated infrastructure (water pumps and generators, sumps, flare pits or dams) located on the well lease; multi-well leases and associated infrastructure (water pumps and generators, sumps, flare pits, dams or tanks) located on the well leases; construction of new access tracks that are required as part of the construction or servicing a petroleum activity; upgrading or maintenance of existing roads or tracks, power and communication lines, gas gathering lines from a well lease to the gas compression facility; water gathering lines from a well lease to water storage; and camps within well lease that may involve sewage treatment works that are a no release works.

³ **Petroleum activities** include low impact petroleum activities, limited petroleum activities, and all other GFD Project 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.

⁴ **Linear infrastructure** means linear infrastructure including (but not limited to) gas and water gathering lines, low and high pressure gas and water transmission pipelines, power lines, communication, roads and access tracks. By planning petroleum activities in accordance with the constraint areas listed in Table 6-1, Santos GLNG can avoid significant land use impacts. This approach has already been successfully used for the GLNG Project thus increasing certainty in the GFD Project's environmental outcomes.

The impacts that result after the application of the constraints planning discussed above are the potential impacts that have been assessed in this section.

6.2 Disturbance areas

The phased development of the GFD Project will introduce different areas of disturbance for the construction, operations, and decommissioning and rehabilitation phases. Typical disturbance areas required for each of these phases are outlined below.

6 Potential impacts

6.2.1 Construction phase

Disturbance during the construction phase is short-term and limited in any particular area to the construction period. Generally, the extent of disturbance will reduce from the construction to the operational phases. For example, during the construction and drilling of wells, the expected area required for a single well lease is approximately 1.5 ha and approximately 2.5 ha for a multi-well lease, while during the operational phase the required lease areas are reduced to 0.3 ha and 0.5 ha respectively. This is also evident in the construction and operation of other pieces of GFD Project infrastructure as depicted in Table 6-2 and Table 6-3.

Table 6-2 Typical construction phase land requirements

Infrastructure components	Construction footprint	Construction timeframes
Well lease	Single well lease: 1.5 ha Multi-well lease: 2.5 ha	Civil works: 30-60 days Drilling: 24 hours per day, 10-30 days per well Completions: 150 days Commissioning: 60 days
Access tracks and roads	1.5-3.0. ha per km	Civil works: 30-60 days
Gas and water gathering lines	1- 2.5 ha per km	Up to 4 days per 500 m to clear, trench and bury line; plus up to 14 days for installation of vents, drains, manifolds, etc.
Gas and water transmission pipelines	2.5-5 ha per km	Up to 5 days per 500 m for surveying, clearing and supplies; 2 days per 2 km for trenching, laying and burying; plus 1-7 days for hydrotesting.
Hub gas compression (and treatment) facilities	20-40 ha each	2-3 years
Nodal gas compression facilities	2-8 ha each	1-2 years
Water management facilities	5-10 ha each	180 days +
Water storage	Tanks: Up to 1 ha each Large dams: 5-16 ha each	Tanks: 30 days Large dams: 180+ days
Brine storage	Large dams: 5-16 ha each	Large dams: 180+ days
Camps	1-20 ha each	Large temporary camp (i.e. 400 persons): 6-9 months Permanent camp (i.e. 80 persons): 6-9 months
Laydown and storage yards	5-40 ha each	Up to 7 days
Borrow pits and quarries	5-50 ha each	Up to 7 days

6.2.2 Operation phase

Following completion of construction activities, the extent of disturbance will be reduced to the operational footprint of the facility and/or activity as identified in Table 6-2. The remaining areas disturbed by construction will be rehabilitated.

6 Potential impacts

Table 6-3 Typical operation phase land requirement

GFD Project component	Operation footprint
Well lease	Single well lease: 0.3 ha Multi-well lease: 0.5 ha
Access tracks and roads	0.8-1.5 ha per km
Gas and water gathering lines	None (right of way maintained)
Gas and water transmission pipelines	None (right of way maintained)
Hub gas compression facilities	10-15 ha each
Nodal gas compression facilities	1-4 ha each
Water management facilities	2-5 ha each
Water storage	Up to 0.5 ha for large tanks 3-8 ha each for large dams
Camps	0.5-10 ha each
Laydown and storage yards	None
Borrow pits	None

6.2.3 Decommissioning and rehabilitation phase

To minimise the disturbance footprint of the GFD Project, decommissioning and rehabilitation will occur progressively as operations areas are no longer required. Initial rehabilitation of areas not required for ongoing operations will generally commence following construction activities. Final rehabilitation will be completed as operational activities cease and exhausted gas field developments are decommissioned in accordance with relevant approvals and regulatory requirements.

Decommissioning will involve the safe dismantling and removal of surface infrastructure and assets, or the appropriate rehabilitation of subsurface infrastructure in order to leave it in situ. Should any surface infrastructure or assets have value to a third party, they will be handed over in accordance with relevant contractual and regulatory requirements. Rehabilitation will involve the restoration of landform and vegetation to an agreed non-contaminating and self-sustaining land use in accordance with regulatory approvals.

6.3 Impacts on agriculture and primary production

The majority of the land on which the GFD Project is located is used for grazing. Cropping and horticulture are also important industries in parts of the GFD Project area. The main impacts are expected to occur during the construction of the GFD Project when some pastoral and agricultural activities are likely to be temporarily restricted in the localised areas where the project facilities are being built.

As discussed in section 4.3.1, the *Central Queensland Regional Plan* and *Darling Downs Regional Plan* have introduced the concept of Priority Agricultural Areas (PAAs) and Priority Agricultural Land Uses (PALUs) to manage the competing State interests affecting the agricultural and resources sectors. There is no PAA within that part of the GFD Project area that is covered by the *Darling Downs Regional Plan*. However there are 279 ha of PALU within a PAA in the Arcadia gas field which is included in the *Central Queensland Regional Plan*. Should GFD Project development activities be proposed in this area, they will be designed to comply with the co-existence criteria which are to be developed to enable compatible resource activities to co-exist with PALUs within PAAs

6 Potential impacts

As discussed in 4.3.2, while there are no SCAs within the Fairview, Roma and Scotia gas fields there are 6,992 ha in the Arcadia gas field. As required by the RPI Act, Santos GLNG will avoid and minimise to the maximum extent practicable any impacts on SCAs. Where this is not practicable potential impacts will generally be during the construction phase and hence will be short-term, localised and, apart from the operations footprints, will be rehabilitated after construction in accordance with regulatory approvals.

As required by the P&G Act, Santos GLNG must negotiate a conduct and compensation agreement (CCA) with landholders on whose land the petroleum activities will be carried out. Santos GLNG will engage with landholders before any proposed activity and negotiation of the CCA to provide an opportunity for landholders to raise concerns specific to their property and to reach agreement on where, how, and when development will occur on their property. The locations of wells, gathering lines, and access tracks will be finalised in consultation with the landholder as part of the negotiations. The final locations will also need to comply with relevant approval conditions. Santos GLNG is required to provide detailed information in the CCA about the proposed activities, the locations and timing of activities, impact management, rehabilitation and compensation to the landholder.

In this way potential impacts on the agricultural or primary production of the property will be minimised. Nevertheless, some localised impacts on pastoral and agricultural activities may occur including:

- Loss of productive land
- Diminished productivity
- Disturbance of the soil structure
- Changes to surface water and irrigation flow patterns
- Weed and pest introduction
- Disruption to landholder operations.

As discussed in Section 6.2, the disturbance footprint from GFD Project activities will reduce significantly from the construction phase to the operations phase with a subsequent reduction in the level of impact as initial rehabilitation occurs. Potential impacts to pastoral activities during the operational phase will generally be limited to the displacement of the land use within the footprint of the operations infrastructure. After the completion of construction activities and subsequent initial or final rehabilitation, pastoral land uses will generally be able to recommence in the areas formally required for the construction activities. It is expected that the pastoral activity will be able to continue subject to the minor restrictions resulting from the operation of infrastructure. In general, the effect of the GFD Project will be to introduce an additional land use that will co-exist with existing uses.

Surface infrastructure components that may impact landholders include wells, pipelines, gas compression and water management facilities, accommodation camps and supporting infrastructure. The infrastructure components that will be most widespread and hence most likely to impact on pastoral activities are the wells and pipelines (gas and water gathering systems). However, these impacts will be short-term as pastoral activities will be able to recommence upon rehabilitation of the construction areas around the wells and along the pipeline alignments and will be able to continue for the life of the GFD Project. The other GFD Project components (gas compression and water management facilities and accommodation camps) will be operational for the GFD Project life and will exclude the pre-existing uses from their footprints for that duration.

The impact on landholder operations will vary depending on the GFD Project phase, the activity being undertaken, particular property circumstances and land use pattern, and the ability to locate infrastructure in locations beneficial to both the GFD Project and the landowners. The potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

6 Potential impacts

6.4 Loss of forestry resources

As discussed in Section 4.4, there are extensive forestry resources within the GFD Project area. Most forestry lands are also grazed and generally combine forestry and grazing in a mutually beneficial way. As discussed in Section 6.1, forests reserves have been classified as no-go areas in Santos GLNG's Constraints protocol and hence these areas of high forestry value will not be impacted by the GFD Project.

State forests and timber reserves have been classified as moderate constraint areas and hence major facilities such as permanent accommodation camps, gas compression and water management facilities will not be built within these areas. The GFD Project infrastructure permitted in state forests and timber reserves will be wells, gathering lines, transmission pipelines, access tracks, communication, power and related infrastructure. There is some flexibility as to where this type of infrastructure can be located and Santos GLNG will enter into an agreement or seek approval from forestry owners on whose land the petroleum activities will be carried out. This will enable agreement to be reached on the development and minimise the potential impacts on the forestry resources and activities.

Nevertheless, some localised impacts on forestry resources may occur during the GFD Project life including:

- 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.

These potential impacts will be mitigated and managed as discussed in Section 7.2. In addition to these measures, regulatory approvals beneath the Forestry Act will be sought where required.

6.5 Impacts on residential areas

6.5.1 Urban areas

As discussed in Section 6.1, the Constraints protocol classifies the PLAs identified in the relevant regional plans as moderate constraint areas. As discussed in 4.3.3, there are five PLAs within the GFD Project area (Roma, Taroom, Wallumbilla, Wandoan and Yuleba). These towns and a two kilometre buffer area surrounding them (as defined by the relevant regional plan) are currently classed as moderate constraint areas. In these areas, petroleum activities such as gas and/or water treatment facilities, gas hubs, nodal compressor are prohibited.

Population growth caused either directly or indirectly by the GFD Project is expected to increase the demand for residential, retail, commercial and industrial land uses in some of the PLAs. While the GFD Project's construction workforce and the vast majority of its operational workforce will be accommodated in accommodation camps, up to 5% of the operational workforce may seek accommodation in towns within the wider area of possible influence, as indicated in section 4.3.3.

The potential land use impacts from this increased demand could include:

- Increased competition for accommodation facilities
- Increased competition for available and appropriately zoned and serviced residential land
- Increased demand for retail, commercial and industrial uses.

These potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2

6 Potential impacts

6.5.2 Rural residential

Potential impacts on rural residential areas will generally not be related to direct effects on residential land use, but rather to amenity issues as a result of construction activities and the operational aspects of wells and associated infrastructure.

For rural residential land (localities, homesteads and rural residences), Santos GLNG will enter into CCAs with landholders where petroleum activities will be carried out (Section **Error! Reference source not found.**). These agreements will provide an opportunity for landholders to raise specific concerns and to reach agreement on where, how, and when development will occur. Decisions regarding the location of GFD Project infrastructure will include consideration of amenity issues such as noise, dust, traffic and lighting.

Despite the avoidance measures incorporated into the Constraints planning process, some amenity impacts could occur to rural residences. Generally these impacts would be associated with construction activities and would be short term and localised. During operations, fewer rural residences would be exposed. Potential amenity impacts could be caused by:

- Noise
- Vibration
- Dust
- Increased traffic on local roads
- Lighting.

These potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

6.6 Impacts on existing and proposed resource extraction industries

As discussed in Section 3.3, the GFD Project tenure overlaps exploration and production tenements held by resource extraction proponents other than Santos GLNG. Most of these tenements relate to coal mining projects. The GFD Project area also includes extractive industries of varying size and scale. The potential impacts from overlapping tenures could include restrictions on the exploration for or extraction of these other resources.

Activities and infrastructure associated within the construction and operations of the GFD Project can be compatible with those of other resource or extractive industry operations. Extraction of gas does not preclude the subsequent extraction of the coal. In fact, gas extraction is often required prior to coal extraction (particularly for underground mining) to reduce potential dangerous gas concentrations to levels acceptable for mining. It is also of significant benefit for open-cut mining as it reduces fugitive emission of methane. Coordinated coal and gas extraction can be mutually beneficial and commercially feasible.

Where GFD Project infrastructure is located in areas of overlapping tenure with coal mining projects, the design and location of wells and gathering lines, as well as the rates of production, will have flexibility to allow for consideration of future coal mining operations.

The potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

6 Potential impacts

6.7 Impacts on areas of conservation, tourism and recreation value

The GFD Project's Constraints protocol places Category A environmentally sensitive areas (national parks, conservation parks, forest reserves) as well as natural springs (including EPBC protected springs), wetlands of national importance and their associated buffers as no-go areas. In this way none of these high value areas will be directly impacted by GFD Project activities.

The Constraints protocol places Category B environmentally sensitive areas (coordinated conservation areas, Ramsar sites, State forest parks, special forestry areas), Category C areas (nature refuges, koala habitat areas, declared catchment areas), and 200 m buffers around Category A areas as surface development exclusion areas. In these areas, only exploration, survey or monitoring activities that do not require clearing of native vegetation, earthworks or excavation will be undertaken. Consequently, the GFD Project will have no direct impacts on these areas of high conservation, tourism and/or recreational value.

Areas of moderate conservation, tourism or recreational value such as threatened ecological communities, essential habitats, endangered or of-concern regional ecosystems and state forests are classified as moderate constraint areas in the GFD Project's Constraints protocol. In these areas, major facilities such as permanent accommodation camps, gas compression and water management facilities will not be permitted. The GFD Project infrastructure permitted in moderate constraint areas will be wells, gathering lines, access tracks and related infrastructure.

Despite the application of the Constraints protocol, there is the potential for impacts to areas of moderate or low conservation, tourism and/or recreation value as a result of GFD Project activities. These impacts are likely to mainly relate to disturbance to vegetation and/or habitat as well as amenity issues such as increases in noise, vibration, lighting, dust, traffic, and/or changes to the visual landscape. The amenity impacts will occur mainly during the construction phase and hence will be short term. Impacts to state forests are discussed further in section 6.4.

These potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

6.8 Impacts on transport infrastructure

Activities associated with the GFD Project have the potential to impact on transport infrastructure, such as roads, rail activities, aerodromes and landing grounds, stock routes, and easements.

Some short-term disruptions may occur to vehicular access and the road network during construction activities such as the trenching or drilling that may be required to provide access across State-controlled and local roads for the underground gas and water gathering network and transmission pipelines. The significance of the impacts will generally be minor and localised but will vary according to the local context and the location of the GFD Project infrastructure.

While petroleum activities will generally not occur in rail reserves, including a 100 m buffer, there is the potential for impact where elements of the GFD Project intersect or parallel railway lines and associated reserves. Impacts on rail infrastructure and services resulting from the ongoing operation of the GFD Project are not expected.

6 Potential impacts

No above-ground GFD Project facilities will be established in designated stock routes. However, there is potential for minor short-term impacts to stock routes during construction activities. This may occur due to the temporary closure of some stock routes for safety purposes to allow for material delivery, construction of buried linear infrastructure, or the safe conduct of construction activities in close proximity to the stock route. Stock route infrastructure such as watering points, bores, windmills and holding yards within the GFD Project area is not expected to be impacted by the GFD Project as it will be avoided during field development planning.

Aerodromes and landing grounds within the GFD Project area will be avoided but there may be some short-term impacts to their operation from construction activities. This could include interference with the obstacle limitation zone through light intrusion or the location of temporary tall structures such as drill rigs in proximity to landing grounds or their approach paths.

These potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

6.9 Potential impacts on utilities and services

Within the GFD Project area there are a number of high voltage transmissions lines, major gas pipelines and water infrastructure servicing existing gas developments, mining operations and urban areas.

The GFD Project will require the construction of gas and water pipeline gathering networks, transmission pipelines as well as connections to an the installation of power and telecommunications networks.

Construction of the GFD Project's gathering network is likely to cross a number of existing buried gas or water pipelines or telecommunications cables. Where such crossings are required, Santos GLNG will negotiate with the relevant pipeline or cable owners to reach agreement on how such crossings will occur. It is likely that most crossing will be either bored or directionally drilled so that there will be no interference with the existing services. Impacts from the GFD Project's operational phase are not expected so potential impacts will be short-term only during the construction phase.

Where GFD Project infrastructure is proposed in proximity to high voltage power infrastructure, appropriate design and construction techniques will be employed to ensure issues surrounding induced currents are addressed. Construction of the GFD Project infrastructure will not interrupt existing high voltage electricity supplies.

These potential impacts will be mitigated and managed in accordance with the measures discussed in Section 7.2.

Impact assessment, management and monitoring

7.1 Assessment methodology

7.1.1 Methodology types

This report has used different impact assessment methodologies for different land uses, compliance and tenure values (land use value). The methodology used depended on the nature of the regulatory regime that applies to the particular value, its sensitivity or vulnerability, the nature of the impacts, and how mitigation measures apply.

This land use impact assessment was based upon two impact assessment methodologies, as follows:

- **Compliance assessment** — where compliance with a known guideline or policy is required. This is used where the land use impact has a known assessment criteria, for example, statutory planning tools like state planning policies. A compliance assessment of the GFD Project against the applicable statutory planning instruments is contained in Appendix A.
- **Significance assessment** — where the sensitivity and vulnerability of the land use values may be impacted and the assessment is based on an identification of the magnitude of the impacts resulting from the GFD Project.

This land use impact assessment draws on both assessment methodologies to provide a compliance assessment, which determines the GFD Project's compatibility with guidelines and policies set out under the relevant statutory framework, and a significance assessment which measures the significance of the changes that may occur to land uses as a result of the GFD Project.

7.1.2 Compliance assessment

A compliance assessment methodology was used to assess the GFD Project against the relevant regulatory land use planning frameworks. Statutory instruments contained within these frameworks identify a series of outcomes and prescriptive controls to which the GFD Project should adhere to or comply with.

An assessment of the GFD Project against the applicable land use regulatory frameworks is contained within Appendix A. This assessment identifies the extent to which the GFD Project complies with the requirements prescribed by legislation, plans and policies and identifies the extent of mitigation and management measures needed to provide compliance. The GFD Project achieves a high level of compliance with the relevant State, regional and local planning frameworks.

7.1.3 Significance assessment

A significance assessment was used for those land use values for which statutory guidelines were not available. The assessment has been undertaken across the GFD Project area as a whole rather than at the level of individual properties.

The assessment methodology applied was similar to a risk assessment process but the criteria applied relate to sensitivity and magnitude. These criteria are summarised in Table 7-1 and Table 7-2.

7 Impact assessment, management and monitoring

Table 7-1 Sensitivity criteria

Sensitivity	Description
High	The land use value is listed on a recognised or statutory state, national or international register as being of conservation significance. The land use value is intact and retains its intrinsic value. The land use value is unique to the environment in which it occurs. It is isolated to the affected system/area which is poorly represented in the region, territory, country or the world. The land use has not been exposed to threatening processes, or they have not had a noticeable impact on the integrity of the values. GFD Project activities would have an adverse effect on the values.
Moderate	The land use value is recorded as being important at a regional level, and may have been nominated for listing on recognised or statutory registers. The land use value is in a moderate to good condition despite it being exposed to threatening processes. It retains many of its intrinsic characteristics and structural elements. It is relatively well represented in the systems/areas in which it occurs but its abundance and distribution are limited by threatening processes. Threatening processes have reduced its resilience to change. Consequently, changes resulting from GFD Project activities may lead to degradation of the prescribed value. Replacement of unavoidable losses is possible due to its abundance and distribution.
Low	The land use value is not listed on any recognised or statutory register. It might be recognised locally by relevant suitably qualified experts or organisations e.g., historical societies. It is in a poor to moderate condition as a result of threatening processes which have degraded its intrinsic value. It is not unique or rare and numerous representative examples exist throughout the system / area. It is abundant and widely distributed throughout the host systems / areas. There is no detectable response to change or change does not result in further degradation of the environmental value. The abundance and wide distribution of the land use value achieves replacement of unavoidable losses.

Table 7-2 Magnitude criteria

Magnitude	Description
High	An impact that is widespread, long lasting and results in substantial and possibly irreversible change to the land use value. Avoidance through appropriate design responses or the implementation of site-specific management controls are required to address the impact.
Moderate	An impact that extends beyond the area of disturbance to the surrounding area but is contained within the region where the GFD Project is being developed. The impacts are short term and result in changes that can be ameliorated with specific management controls.
Low	A localised impact that is temporary or short term and either unlikely to be detectable or could be effectively mitigated through standard management controls.

The significance of each impact is then determined by combining the sensitivity and magnitude criteria in the assessment process as shown in Table 7-3.

Table 7-3 Impact significance matrix

Magnitude	Sensitivity		
	High	Moderate	Low
High	Major	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Negligible

7 Impact assessment, management and monitoring

The impact significance classifications used in Table 7-3 (major, high, moderate, low and negligible) are defined as follows:

- **Major impact** arises when an impact will potentially cause irreversible or widespread harm to a land use value that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
- **High impact** occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the land use value. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
- **Moderate impact** results in degradation of the land use value due to the scale of the impact or its susceptibility to further change even though it may be reasonably resilient to change. The abundance of the land use value ensures it is adequately represented in the region, and that replacement, if required, is achievable.
- **Low impact** occurs where a land use value is of local importance and temporary or transient changes will not adversely affect its viability provided standard management controls are implemented.
- **Negligible impact** does not result in any noticeable change and hence the proposed activities will have negligible effect on land use values. This typically occurs where the activities are located in already disturbed areas.

7.2 Management and mitigation measures

Santos GLNG has developed and implemented a management framework that manages the impacts of the existing GLNG Project. This management framework will incorporate the management requirements of the GFD Project.

Table 7-4 summarises the key management framework that relates to land use aspects of the GLNG Project, which will also be implemented for the GFD Project.

Table 7-4 Land use management framework

Management plan	Description and key management strategies
Decommissioning and abandonment management plan (DAMP)	The DAMP will be implemented to mitigate and manage impacts resulting from the cessation of petroleum activities. The plan includes measures such as: • Undertake decommissioning of assets in a manner that complies with legislative requirements and minimises environmental harm • Undertake decommissioning activities in a manner that meets stakeholder expectations • Leave a landform which is stable, compatible with the intended post-closure land use and enable effective transfer to third parties, such as landholders • 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.
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

7 Impact assessment, management and monitoring

Management plan	Description and key management strategies
	Proposed conditions.
Erosion and sediment control management plan (ESCMP)	The ESCMP identifies erosion and sedimentation risk and provides an erosion and sediment control strategy that incorporates understanding of the risk inherent to local land resource characteristics. The ESCMP is supported by the Erosion and sediment control manual, which provides erosion, sediment and drainage controls in line with best practice guidelines. Appropriate dust management strategies will be implemented to protect residential amenity and agricultural productivity such as: - Construction activities will aim to reduce exposure of disturbed areas to the minimum time period required, with progressive revegetation or rehabilitation as soon as practicable after the completion of construction. - Dust suppression (water, mulching or alternative measures) will be applied to exposed surfaces that are generating dust.
Fauna management plan (FMP)	The FMP provides Santos GLNG's strategy to manage fauna during the construction and operations phases of the GFD Project. The plan: - Identifies fauna species present within the gas fields - Prioritises management of both livestock and wildlife - Provides mitigation measures to minimise impacts to fauna from Santos GLNG activities.
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 Environmental Protection 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 provides a framework to guide placement of infrastructure and adopts the following management principles: - Avoidance — avoiding direct and indirect impacts - Minimisation — minimise potential impacts - Mitigation — implement mitigation and management measures to minimise cumulative adverse impacts - Remediation and rehabilitation — actively remediate and rehabilitate impacted areas - Offset — offset residual adverse impacts in accordance with regulatory requirements. The land use constraints identified in the constraints planning process (Section 6.1) will be applied to ensure that GFD Project infrastructure with potentially high or moderate impacts will be generally avoided in areas of high or moderate land use value.
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 <i>Land Access Code</i> (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.

7 Impact assessment, management and monitoring

Management plan	Description and key management strategies
Noise management plan (NMP)	The NMP identifies potential noise impacts from Santos GLNG activities and provides a strategy, methods and controls to: • Avoid — plan the activity and engage with potentially affected stakeholders • Minimise — implement noise mitigation measures to minimise noise impacts • Manage — conduct monitoring, review mitigation methods and ensure compliance with Santos GLNG procedures. Relevant noise management strategies will be implemented to protect residential amenity such as: • Risk / constraint analysis methods to be undertaken prior to new operation or installation of new equipment that has the potential to create noise nuisance • Procedures and methods to undertake noise assessments to determine compliance with the stipulated noise limits • Procedures for handling noise complaints, and procedures for community liaison and consultation • Details of petroleum activities and measured and/ or predicted noise levels of noise sources associated with those activities • Reasonable and practicable control or abatement measures to ensure compliance with the established noise limits • Mediation processes to be used in the event that noise complaints are not able to be resolved.
Pest and weed management plan (PWMP)	The management of pest and weed species will be undertaken in accordance with the PWMP. The plan includes measures such as: • Identification of pest and weed species and areas of infestation • Avoidance of traversing and placing infrastructure in areas of known infestation • Prevention of the spread of pest and weed species by implementing appropriate work practices and promotion of risk awareness • Control of identified pest and weeds through containment, reduction or eradication as required by legislation. Santos GLNG will review local government's pest and weed management plans and apply measures from these to the PWMP where it is appropriate.
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.
Significant species management plan (SSMP)	The plan provides an overview of the strategy, methods and controls implemented by Santos GLNG to manage adverse impacts EPBC Act-listed significant species and their habitats, and threatened ecological communities. Specifically, the SSMP: • Identifies and profiles significant species and threatened ecological communities that are present, or may occur, within the gas fields • Identifies key threats to significant species and threatened ecological communities caused by activities within the gas fields • Outlines general mitigation measures to be implemented by Santos GLNG to minimise the potential adverse impact of key threats to significant species and threatened ecological communities caused by Santos GLNG activities.

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Management plan	Description and key management strategies
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

7.3 Residual impacts

The potential land use impacts identified in Section 6 will be managed through the mitigation and management measures discussed in Section 7.2. While these measures together with the proposed decommissioning and rehabilitation measures will reduce the significance of the impacts, not all impacts will be eliminated and residual land use impacts will remain.

Table 7-5 summarises the significance of the potential impacts prior to mitigation along with the proposed management and mitigation measures. In most cases implementation of these measures will reduce the significance of the impacts and Table 7-5 lists the residual impacts that will remain after mitigation.

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Table 7-5 Residual land use impacts

Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
Impacts on agriculture and primary production							
Loss of productive land	Construction	Moderate	Moderate	Moderate	The Land access and landholder engagement strategy will be employed to reduce the potential for GFD Project activities to impact upon landholder operations.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Diminished productivity	Construction	Moderate	Moderate	Moderate	The DAMP will be implemented to mitigate and manage impacts resulting from the cessation of petroleum activities. The plan includes measures as identified in Table 7-4.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Disturbance of soil structure	Construction	Moderate	Moderate	Moderate	The Rehabilitation management plan will be implemented to enable the return of disturbed areas to a pre-clearance state or another stable landform consistent with the surrounding undisturbed area or to final acceptance criteria. The plan includes measures as identified in Table 7-4.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Changes to surface water and irrigation flow patterns	Construction	Moderate	Moderate	Moderate		Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Disruption to landholder operations	Construction	Moderate	Moderate	Moderate		Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Weed and pest introduction	Construction	Moderate	Low	Low	Implement the management principles contained in the PWMP as identified in Table 7-4.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Loss of forestry resources							
Restrictions of access to forestry resources	Construction	Moderate	Low	Low	A permit is required under the <i>Forestry Act 1959</i> (Qld) prior to interfering with forest products on a State forest, timber reserve or forest entitlement area. Such permits are subject to provisions and conditions, including securing payment to the chief executive for any loss and damage to	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Loss or premature	Construction	Moderate	Moderate	Moderate		Moderate	Moderate

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Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
harvesting of millable timber	Operations		Low	Low	the State forest, timber reserve or forest entitlement area.	Low	Low
	Decommissioning		Low	Low	The DAMP will be implemented to mitigate and manage impacts resulting from the cessation of petroleum activities. The plan includes measures as identified in Table 7-4.	Low	Low
Reduction of the amount of land available for growing timber	Construction	Moderate	Low	Low	The GFD Project will 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.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Interference with logging operations	Construction	Moderate	Moderate	Moderate	The Rehabilitation management plan will be implemented to enable the return of disturbed areas to a pre-clearance state or another stable landform consistent with the surrounding undisturbed area or to final acceptance criteria. The plan includes measures as identified in Table 7-4.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Additional traffic on logging tracks	Construction	Moderate	Low	Low		Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Impacts residential areas – urban areas (PLAs)							
Increased competition for accommodation facilities	Construction	Moderate	Moderate	Moderate	The established SIMP 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.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Increased competition for available and appropriately zoned and serviced residential land	Construction	Moderate	Moderate	Moderate	The SIMP will be supplemented by the following action plans as agreed with the Coordinated Project Delivery Division of the Coordinator-General's office:	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Increased demand for retail, commercial and industrial uses	Construction	Moderate	Moderate	Moderate	- Workforce management action plan - Housing and accommodation action plan - Stakeholder engagement action plan - Community health and wellbeing action plan.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low

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Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
					The SIMP will be used to assess and develop a range of strategies that could be applied, associated with impacts on residential land uses such as: - Actively monitor the housing market and engage with key stakeholders to ensure appropriate housing strategies are in place prior to field development - Use purpose built temporary and permanent workforce accommodation facilities, located outside major communities - Assist members of the community vulnerable to housing affordability pressures. This may include rental assistance subsidies, capacity building programs, and strategies to release identify supply constraints.		
Impacts residential areas – rural							
Noise and vibration	Construction	Moderate	Low	Low	Noise and vibration will be managed in accordance with the NMP identified in Table 7-4	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Dust	Construction	Moderate	Low	Low	The limitation of disturbed areas and progressive rehabilitation (to assist in dust minimisation) will be implemented as detailed in the ESCMP. Appropriate dust management strategies will be implemented to protect residential amenity and agricultural productivity such as: - Construction activities will aim to reduce exposure of disturbed areas to the minimum time period required, with progressive revegetation or rehabilitation as soon as practicable after the completion of construction. - Dust suppression (water, mulching or alternative measures) will be applied to exposed surfaces that are generating dust.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Increased traffic on local roads	Construction	Moderate	Low	Low		Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low
Lighting	Construction	Moderate	Low	Low	The Road-use management plan was developed to manage the impact associated with the implementation of the Santos GLNG Project, and will be either adapted or a new plan developed to manage the potential impacts resulting from the GFD Project. The objectives of the plan include:	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low

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Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
					- 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 - Minimise traffic related complaints and incidents. Impacts associated with night lighting will be managed and mitigated through the Draft EM plan and the SIMP. In accordance with the Draft EM plan, lighting disturbance's 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.		
Impacts to mining, petroleum and extractive industries							
Restrictions to the extraction of other resources	Construction	Moderate	Moderate	Moderate	Santos GLNG will establish agreements with overlapping tenure holders to minimise impacts of the GFD Project on the exploration for and/or mining of mineral resources within the GFD Project area. These agreements will include issues such as safety and environmental management as well as commercial and operational aspects.	Moderate	Moderate
	Operations		Moderate	Moderate		Low	Low
	Decommissioning		Low	Low		Low	Low
Restrictions to the exploration for other resources	Construction	Moderate	Moderate	Moderate	For other extractive operations such as those associated with the Warriar KRA (KRA 85), Santos GLNG will seek agreement with the operators to ensure compatibility with any proposed GFD Project activities.	Low	Low
	Operations		Moderate	Moderate		Low	Low
	Decommissioning		Low	Low		Low	Low

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Potential impact	Phase	Sensitivity	Premitigated significance		Mitigation and management measures	Residual significance	
			Magnitude	Significance		Magnitude	Significance
Impacts to conservation, tourism and recreational values							
Disturbance to vegetation and/or habitats	Construction	Moderate	Moderate	Moderate	The SSMP provides an overview of the strategy, methods and controls implemented by Santos GLNG to manage adverse impacts EPBC Act- listed significant species and their habitats, and threatened ecological communities. Specifically, the SSMP: - Identifies and profiles significant species and threatened ecological communities that are present, or may occur, within the gas fields - Identifies key threats to significant species and threatened ecological communities caused by activities within the gas fields - Outlines general mitigation measures to be implemented by Santos GLNG to minimise the potential adverse impact of key threats to significant species and threatened ecological communities caused by Santos GLNG activities. The FMP will be implemented to mitigate and manage potential impacts to fauna during vegetation clearing activities. The plan details: - A description of the current distribution of fauna within the project area highlighting species of conservation significance - Management strategies and procedures to be implemented to minimise impacts to fauna species - Monitoring and reporting requirements. The management of pest and weed species will be undertaken in accordance with the PWMP identified in Table 7-4. The Rehabilitation management plan will be implemented to enable the return of disturbed areas to a pre-clearance state or stable landform consistent with the surrounding undisturbed area or to final acceptance criteria. The plan includes measures as identified in Table 7-4.	Moderate	Moderate
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low

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Potential impact	Phase	Sensitivity	Premitigated significance		Mitigation and management measures	Residual significance	
			Magnitude	Significance		Magnitude	Significance
Reduced amenity affecting existing tourism and recreational values	Construction	Low	Moderate	Low	Noise and vibration will be managed in accordance with the NMP. Relevant noise management strategies will be implemented to protect tourism and recreational amenity such as: • Risk/constraint analysis methods to be undertaken prior to new operation or installation of new equipment that has the potential to create noise or vibration nuisance • Procedures and methods to undertake noise assessments to determine compliance with the stipulated noise limits • Procedures for handling noise complaints, and procedures for community liaison and consultation • Details of petroleum activities and measured and/or predicted noise levels of noise sources associated with those activities • Reasonable and practicable control or abatement measures to ensure compliance with the established noise and vibration limits • Mediation processes to be used in the event that noise complaints are not able to be resolved. The limitation of disturbed areas and progressive rehabilitation (to assist in dust minimisation) will be implemented as detailed in the ESCMP. Appropriate dust management strategies will be implemented to protect residential amenity and agricultural productivity such as: • Construction activities will aim to reduce exposure of disturbed areas to the minimum time period required, with progressive revegetation or rehabilitation as soon as practicable after the completion of construction. • Dust suppression (water, mulching or alternative measures) will be applied to exposed surfaces that are generating dust.	Low	Negligible
	Operations		Low	Low		Low	Negligible
	Decommissioning		Low	Low		Low	Negligible

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Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
					The Road-use management plan was developed to manage the impact associated with the implementation of the Santos GLNG Project, and will be either adapted or a new plan developed to manage the potential impacts resulting from 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 vehicles • Minimise impacts on road infrastructure • Minimise traffic related complaints and incidents. This plan will be revised for the GFD Project, as appropriate and is not included in this EIS.		
Impacts to transport infrastructure							
Disturbance to or interference with the operations of transport infrastructure, such as roads, rail activities, aerodromes and landing grounds and stock routes	Construction	Moderate	Moderate	Moderate	Santos GLNG will negotiate a conduct and compensation agreement 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. Impacts to road infrastructure will be mitigated through implementing measures contained in the Road-use management plan identified in Table 7-4. Where a gas or water gathering line is required to cross under a railway line it will be either bored or directionally drilled thereby avoiding direct impacts. No above-ground GFD Project facilities will be established in designated stock routes.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low

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Potential impact	Phase	Premitigated significance			Mitigation and management measures	Residual significance	
		Sensitivity	Magnitude	Significance		Magnitude	Significance
Impacts to utilities and services							
Disturbance to or interference with existing high voltage transmissions lines, gas pipelines, water pipelines or telecommunications facilities	Construction	Moderate	Low	Low	Santos GLNG will negotiate a conduct and compensation agreement 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.	Low	Low
	Operations		Low	Low		Low	Low
	Decommissioning		Low	Low		Low	Low

7 Impact assessment, management and monitoring

7.4 Monitoring and review

Santos GLNG will implement the Draft EM Plan. This strategy includes provision for monitoring environmental parameters relevant to land use issues including:

- Soils
- Noise
- Dust
- Ecology.

The monitoring program uses both operations and specialist teams to undertake a combination of qualitative and quantitative monitoring. A series of defined response actions will be triggered due to either the potential for exceedance or quantitative data indicating an exceedance of permit conditions or potential for harm.

Conclusions

8.1 Overview

This land use, planning and tenure assessment:

- Provides a detailed baseline description of the existing land uses, tenure and planning values relevant to the GFD Project area
- Identifies potential impacts from the proposed GFD Project development
- Assess the significance of the potential impacts using:
 - A compliance assessment methodology for relevant impacts against guidelines and policies set out under applicable components of the applicable statutory planning instruments
 - A significance assessment methodology for relevant impacts by identifying the sensitivity of the underlying land use value and assessing the magnitude of the potential impacts.
- Identifies the mitigation and management measures to be applied to minimise the GFD Project's potential impacts.

8.2 Impact assessment

8.2.1 Compliance assessment

Generally the GFD Project is consistent with the relevant elements of the statutory planning framework as detailed in Appendix A.

8.2.2 Significance assessment

The land use values potentially impacted by the GFD Project area include:

- Areas of rural land used for agriculture and primary production
- Areas used for forestry production
- Protected areas of conservation, tourism and recreational values
- Existing and proposed resource extraction activities
- Urban areas and rural residences
- Transport and infrastructure facilities that service the region.

The significance assessment identified a number of potential impacts that generally related to:

- Displacement of existing land uses
- Restrictions to existing land uses
- Amenity effects through:
 - Noise or vibration
 - Dust
 - Lighting
 - Additional traffic.

8.3 Mitigation and management measures

The assessment has identified a variety of avoidance, minimisation, mitigation and rehabilitation measures that will be implemented to reduce the significance of the potential impacts and to ensure those impacts are adequately managed in accordance with regulatory requirements. Existing Santos GLNG management systems relevant to particular land uses have been shown to be effective at avoiding, managing and mitigating the land use impacts of the GFD Project. Implementation of these measures will ensure that the significance of the residual land use impacts is limited to either moderate or low.

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