Senex Energy Limited

Western Surat Gas Project

Initial Advice Statement

July 2015

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ABBREVIATIONS

Abbreviation	Description
1P	Proven
2P	Proved plus Probable
3P	Proved plus Probable plus Possible
APLNG	Australia Pacific Liquefied Natural Gas
ASX	Australian Securities Exchange
ATP	Authority to Prospect
BD Status	Biodiversity
CHMP	Cultural Heritage Management Plan
CSG	Coal Seam Gas
CSWM Plan	Coal Seam Water Management Plan
Cth	Commonwealth
DEHP	Department of Environment and Heritage Protection (Qld)
DOE	Department of the Environment (Cth)
EA	Environmental Authority
EIS	Environmental Impact Statement
EM Plan	Environmental Management Plan
EP Act	*Environmental Protection Act 1994* (Qld)
EPP Water	*Environmental Protection (Water) Policy 2009* (Qld)
EP Regulation	Environmental Protection Regulation 2008 (Qld)
EPBC	Environment Protection and Biodiversity Conservation, from the EPBC Act 1999 (Cth)
ESA	Environmentally Sensitive Area
EV	Environmental Values
GAB	Great Artesian Basin
GLNG	Gladstone Liquefied Natural Gas
HES	High Ecological Value
HEV	High Ecological Significance
IAS	Initial Advice Statement
km	Kilometre
km^2	Square kilometres
L/s	Litres per second
LGA	Local Government Area
LNG	Liquefied Natural Gas
mm	Millimetre
ML/day	Mega-Litre/day
NC Act	*Nature Conservation Act 1992* (Qld)
P&G Act	*Petroleum & Gas (Production and Safety) Act 2004* (Qld)
PL	Petroleum Lease granted under the P&G Act
PPL	Petroleum Pipeline Licence granted under the P&G Act
PRMS	Petroleum Resources Management System
QCLNG	Queensland Curtis Liquefied Natural Gas

Abbreviation	Description
Qld	Queensland
RE	Regional Ecosystem
ROW	Right of way
SEP	Stakeholder Engagement Plan
SP Act	*Sustainable Planning Act 2009* (Qld)
TJ/day	Tera-joules per day
ToR	Terms of Reference
VM Act	*Vegetation Management Act 1999* (Qld)
WRP	Water Resource Plans
µS/cm	Microsiemens per centimetre

EXECUTIVE SUMMARY

Senex Energy Limited ACN 008 942 827 (Senex) is an ASX 200 listed Australian oil and gas exploration and production company. Senex is currently in the planning and appraisal phase for a greenfield coal seam gas (CSG) project known as the Western Surat Gas Project (the Project) in Queensland's Surat Basin.

The Project requires approval from State and Commonwealth Governments under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cth) and Queensland *Environmental Protection Act 1994* (EP Act) (Qld) by way of an Environmental Impact Statement (EIS) assessed under the Bilateral Agreement. Section 41 of the EP Act requires that a written description of the Project and the operational land accompany the draft Terms of Reference (ToR). Senex has provided this information by way of this Initial Advice Statement (IAS).

The Project area covers 13 graticular blocks within tenures Authority to Prospect (ATP) 767, 795 and 889, an area of approximately 993 square kilometres (km^2). The Project area is located approximately 30 kilometres northeast of Roma, in southern-central Queensland.

The nature of CSG projects typically means that the field development and construction of production facilities is progressive over the life of the Project and infrastructure locations are indicative only in the early stages of Project design. Based on this, the EIS will assess potential Project impacts based on a field development plan (EIS assessment scenario) which gives a robust indication of location, types and numbers of Project infrastructure.

Studies conducted as part of the EIS will describe the existing or baseline environment, assess any potential impacts of the Project activities, identify mitigation and management measures to address those impacts and detail the management framework that Senex will adopt to help ensure environmental values are protected. The studies will be determined by the requirements of the Terms of Reference and are expected to include:

- Land use and land use suitability
- Geology, topography and soils
- Landscape and visual amenity
- Traffic and transport
- Waste management
- Surface water (hydrology and quality)
- Groundwater (including coal seam water)
- Air quality and greenhouse gas emissions
- Noise and vibration
- Terrestrial and aquatic ecology
- Cultural heritage (indigenous and non-indigenous)
- Social and economic impact
- Hazard and risk
- Cumulative impacts of energy projects on the region.

Whilst not a requirement of the EP Act, a Project Environmental Management Plan (EM Plan) will be developed as part of the EIS. The EM Plan will describe the environmental values of the Project area and will establish commitments for environmental management in order to protect these values. The EM Plan is one of the primary tools used by Senex for management of the environment on the Project tenure.

1 INTRODUCTION

1.1 Overview

Senex Energy Limited ACN 008 942 827 (Senex) is an experienced Australian energy company with an operating history spanning 30 years. With established oil and gas operations in South Australia, Senex has recently expanded its existing exploration acreage in the Surat Basin in Queensland with plans to develop a greenfield coal seam gas (CSG) project known as the Western Surat Gas Project (the Project) within the region.

The Project area covers 13 graticular blocks within tenures Authority to Prospect (ATP) 767, 795 and 889. These tenures are 100% owned and operated by Senex's wholly-owned subsidiary Stuart Petroleum Cooper Basin Gas Pty Ltd ACN 130 588 055 (Stuart Petroleum). Relevant Environmental Authorities (EAs) for the tenures are held by Stuart Petroleum.

Senex is preparing an Environmental Impact Statement (EIS) under the Queensland *Environmental Protection Act 1994* (EP Act). Approval of the Project by the State and Commonwealth Governments is required prior to carrying out commercial CSG production on the Project area. On 31 March 2015, Senex applied under sections 70 and 71 of the EP Act for approval to voluntarily prepare an EIS. Under section 72 of the EP Act, the Department of Environment and Heritage Protection (DEHP) approved the application on 6 May 2015.

The Project was referred on 24 April 2015 to the Commonwealth Department of the Environment (DoE) (EPBC 2015/7469). On 21 May 2015, the Minister for the Environment determined the project to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions are sections 16 and 17B (wetlands of international importance), sections 18 and 18A (listed threatened species and communities), 20 and 20A (listed migratory species) and sections 24D and 24E (water resource, in relation to coal seam gas development and large coal mining development). The Project will be assessed under the bilateral agreement between the Commonwealth and the State of Queensland using the EIS prepared under the EP Act.

1.2 The proponent

Senex on behalf of its wholly-owned subsidiary Stuart Petroleum, as the proponent for the Project, is an ASX 200 listed Australian oil and gas exploration and production company. Senex is currently in the planning phase for the Project, in Queensland's Surat Basin.

The proponent's head office is located in Brisbane at the following address:

Senex Energy Limited
Level 14, 144 Edward Street
Brisbane, QLD, 4000
Phone: (07) 3335 9000
Fax: (07) 3335 9999

1.3 Purpose of this Initial Advice Statement

Section 41 of the EP Act requires that a written description of the Project and the operational land accompany the draft Terms of Reference (ToR). Senex has provided this information by way of this Initial Advice Statement (IAS). The IAS identifies the potential Project impacts (positive and negative) to be investigated in detail in the Project EIS.

2 PROJECT CONTEXT AND JUSTIFICATION

2.1 Project need, justification and alternatives considered

Exploration and appraisal activities undertaken on ATPs 767, 795 and 889 to date indicate that a viable project can be supported by gas reserves on the tenure. Should the Project not proceed, the gas reserves on the tenure would not be realised, possibly resulting in relinquishment of the tenure to the Queensland Government. Associated royalties would also not be realised.

The Project represents a sizable investment with economic benefits that will have both local and regional dimensions. As a contributor to the State's CSG industry and/or domestic gas markets, the Project will provide economic and social benefits through local and regional economic stimulation. If the Project does not proceed, these potential economic and social benefits will not be realised.

The number, type, size and location of the Project components will be determined progressively over the Project life and will be influenced by the location, size and quality of the gas resources identified through ongoing field development planning processes, along with environmental, land access and cultural heritage constraints. Two alternatives for CSG processing and sale, and water treatment and disposal will be considered in the EIS. These two alternatives comprise:

1. On site treatment of gas and water with associated infrastructure, such as field compression, gas processing and water treatment facilities.
2. Direct supply of unprocessed gas and produced water to one or more third parties. This may not require any major processing facilities.

These options are discussed further in Section 4 below.

2.2 Project resource

CSG reserves within the Project area have been assessed in accordance with the definitions and guidelines set out in the 2007 Petroleum Resources Management System (PRMS) approved by the Society of Petroleum Engineers. Reserves within the Project area are categorised as Probable (2P) and Possible (3P). The gas bearing target coals within the Project area are associated with the Walloon Coal Measures, Middle Jurassic Walloon Subgroup which is located within the Jurassic-Cretaceous Surat Basin.

2.3 Economic benefits

The Project is expected to have overall positive impacts on a local and regional scale. These potential benefits may include:

- Employment opportunities for skilled and unskilled workers
- Increased business opportunities for local and regional suppliers
- Community development particularly through the provision of economic and social development opportunities.

3 APPROVALS REQUIRED FOR THE PROJECT

The Project will seek approval from the State and Commonwealth Governments, with assessment to be conducted under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Queensland EP Act by way of the bilateral agreement process. The regulatory framework for the Project is described below.

3.1 Queensland

The *Petroleum & Gas (Production and Safety) Act 2004* (P&G Act) and EP Act are the main pieces of legislation that govern Senex's activities.

3.1.1 Environmental Protection Act 1994

The EP Act is the overarching environmental regulatory framework for the protection and management of environmental values within Queensland. The EP Act requires that the Project's potential environmental impacts be assessed and measures be proposed to avoid or minimise any adverse impacts. For projects of significant scale, this is achieved through the EIS process whereby the proponent can be required to develop an EIS by DEHP or can voluntarily prepare an EIS where it is clear the project meets relevant criteria under the EP Act. Senex is preparing a voluntary EIS for the Project under the EP Act. The statutory process involves:

- Application by Senex to the chief executive to prepare an EIS for a project (s.70) (process complete for the Project)
- Chief executive determines whether an EIS is appropriate for the project (s.72) (process complete for the Project)
- Chief executive prepares a Terms of Reference notice for the project (s.42)
- Public Notification of draft Terms of Reference for comment (s.43)
- Chief executive issues the Final Terms of Reference for the Project (s.46)
- Preparation of a voluntary EIS by Senex in accordance with the Final Terms of Reference
- Submission of the voluntary EIS to the chief executive (s.47)
- Chief executive decides whether the EIS addresses the Final Terms of Reference and may proceed to public notification (s.49)
- Public notification of the EIS for comment (s.51)
- Public submissions on the EIS made to the chief executive (s.54)
- Senex is provided copies of submissions and prepares a response (s.56)
- Chief executive considers the EIS and Senex's responses to submissions and decides if it is suitable to proceed (s. 56A)
- The process is completed for an EIS when the proponent is given an EIS assessment report for the EIS (s.60).

3.1.2 Petroleum and Gas (Production and Safety) Act 2004

The P&G Act facilitates and regulates activities associated with the exploration, development and production of petroleum and gas resources in Queensland. The key licences prescribed under the P&G Act include ATPs and PLs.

An ATP under the P&G Act allows for exploration and appraisal activities but does not allow for commercial production of gas. As such, the area of the three ATPs within the Project area (767, 795 and 889) must be progressively converted into PLs in order to undertake the Project. As part of the application for a PL, Senex will prepare an initial development plan which will describe the nature and extent of activities proposed.

Under the P&G Act, approval may also be sought for a PPL, which will be required for the construction and operation of any pipelines required to transport CSG outside of the area of the PLs, depending on commercial arrangements.

3.1.3 Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (SP Act) (Qld) provides the overarching framework for Queensland's planning and development assessment system. In accordance with Schedule 4 of the SP Act, an activity authorised under the P&G Act and subject to a PL is exempt from assessment under local government planning schemes.

However, any activity outside of the area of a PL (e.g. depots, borrow pits) will trigger assessment against the SP Act and relevant local government planning scheme. Relevant applications will be submitted for such approvals as required (i.e. material change of use and operational works development applications).

3.2 Commonwealth

3.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's key piece of environmental legislation. Senex referred the Project to the Commonwealth Department of Environment on 24 April 2015 to determine if the Project requires assessment as a 'controlled action' under the EPBC Act.

On 22 May 2015 Senex received notification that the Project is determined under section 75 of the EPBC Act to be a controlled action under the controlling provisions as presented in Section 1.1.

The Project will be assessed under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth and the State of Queensland under section 45 of the EPBC Act relating to environmental assessment.

3.2.2 Native Title Act 1993

The purpose of the *Native Title Act 1993* (Cth) is to provide for the recognition and protection of native title rights for Australia's Indigenous people, as well as providing a legislative approach for dealing with issues concerning native title. The traditional landowners of the region are the Mandandanji People who have registered Native Title claims within the Project area.

3.3 Other approvals

3.3.1 Aboriginal Cultural Heritage

The *Aboriginal Cultural Heritage Act 2003* (Qld) requires a cultural heritage management plan (CHMP) to be prepared for projects that require an EIS, or for cultural heritage to be addressed in a native title agreement, prior to project approval being granted. Another key provision of the act requires activities to be undertaken in accordance with the *Aboriginal Cultural Heritage Act 2003* Duty of Care Guidelines.

An Aboriginal and Torres Strait Islander Cultural Heritage Search will be completed at a later stage of the EIS process to determine if there are any registered sites of cultural heritage significance within the Project area.

3.3.2 Other relevant Conventions, Acts and Regulations

Other legislation, regulations, conventions and treaties that may be relevant to the Project are listed below:

International Conventions and Treaties

- Japan-Australia Migratory Bird Agreement
- China-Australia Migratory Bird Agreement
- Republic of Korea-Australia Migratory Bird Agreement
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Ramsar Convention on Wetlands

Commonwealth Legislation and Regulations

- *National Greenhouse and Energy Reporting Act 2007.*

Queensland Legislation

- *Building Act 1975*
- *Electricity Act 1994*
- *Environmental Offsets Act 2014*
- *Explosives Act 1999*
- *Fisheries Act 1994*
- *Forestry Act 1959*
- *Greenhouse Gas Storage Act 2009*
- *Land Act 1994*
- *Land Protection (Pest and Stock Route Management) Act 2002*
- *Local Government Act 2009*
- *Mineral Resources Act 1989*
- *Nature Conservation Act 1992*

- *Petroleum Act 1923*
- *Regional Planning Interests Act 2014*
- *Queensland Heritage Act 1992*
- *Roads Act 2000*
- *Soil Conservation Act 1986*
- *State Development and Public Works Organisation Act 1971*
- *Transport Infrastructure Act 1994*
- *Vegetation Management Act 1999*
- *Waste Reduction and Recycling Act 2011*
- *Water Act 2000*
- *Workplace Health and Safety Act 2011.*

4 PROJECT DESCRIPTION

4.1 Location

The Project area covers approximately 993 square kilometres (km^2) over 13 graticular blocks of ATPs 767, 795 and 889, in southern-central Queensland. The majority of the blocks (12 of 13) are located approximately 30 kilometres (km) northeast of Roma, with the remaining block of the Project area, not adjoining the others, being located approximately 10 km north of Wallumbilla. The Project area is located within the Maranoa and Western Downs Local Government Areas (LGA). The location of the Project area and the associated tenure is shown in Figure 4-1.

4.2 Project activities

Senex is seeking to develop a CSG project in the western part of the Surat Basin. The Project will produce gas from the Walloon Coal Measures within ATPs 767, 795 and 889.

The Project will involve the staged drilling of up to 1,000 wells across the Project area and the construction and operation of supporting infrastructure over a period of approximately 30 years. The targeted production throughput rate is approximately 35 to 50 terajoules per day (TJ/day). The Project comprises development of a gasfield only and will not require the development of a Liquefied Natural Gas (LNG) processing facility or export pipeline connecting the gasfield to an LNG facility.

Exploration and appraisal activities have been undertaken across the tenure encompassing core holes, exploration wells, appraisal wells and production testing wells. Development will primarily commence in the southern part of the tenure, expanding out from the probable location of the Central Processing Facility (situated in the broader vicinity of the Roma-Taroom Road and Wallumbilla to Gladstone major transmission line), into the Glenora, Maisey and Daedalus (formally known as Lacerta) blocks. These blocks are where the superior part of the reservoir is located in terms of gas volumes and expected production rates. The initial number of wells required to achieve and sustain the target plateau production rate will be determined from data gained from exploration and appraisal activities undertaken on the ATPs.

Broadly speaking, development activities will generally progress east to west across the Project area commencing in the above mentioned blocks. While the number of operating wells at any time will be determined progressively over the life of the Project, dependent on matters such as the location, size and quality of reserves, along with environmental, land access and cultural heritage constraints, the predicted maximum number of wells actively producing gas on the tenure is anticipated to be between 100 and 300 wells in the first 5 years. In general, the operating life of a production well is approximately 15 to 20 years. Wells no longer in production will be progressively decommissioned and rehabilitated in stages throughout the Project life.

Project planning and design will consider the most efficient gathering system structure, with appropriate regard for the locations of environmentally and culturally significant areas and sensitive receptors in the Project area. The number, type, size and location of the Project components will be determined progressively over the Project life. Where practical and commercially viable, the Project will utilise existing infrastructure from other nearby approved developments including sharing or co-location of gas field and associated facilities with third

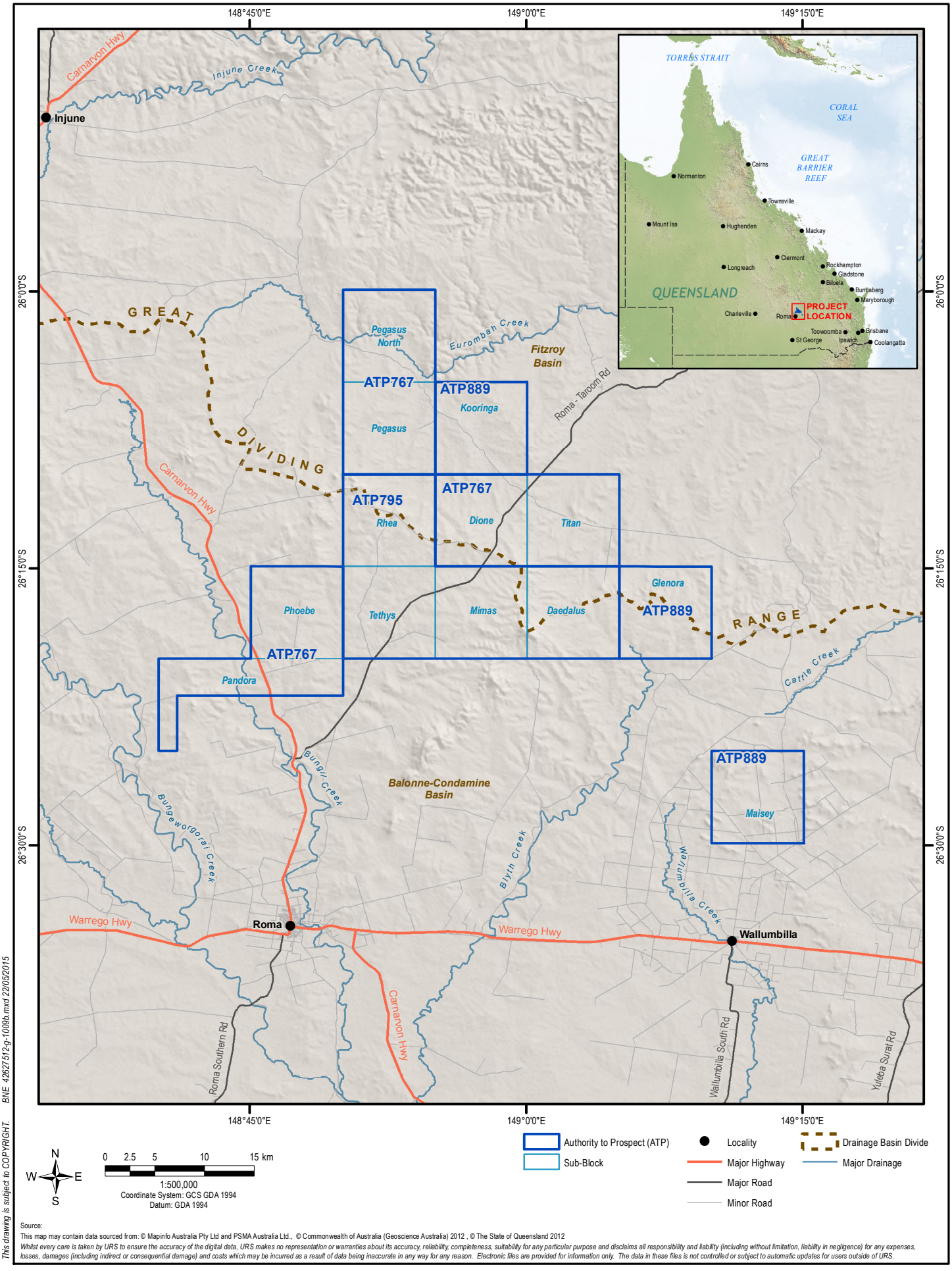
parties. The sections below describe the general gas field development, to be more fully detailed in the Project EIS.

4.2.1 Well development

Wells proposed to be drilled in the Project area comprise mainly production wells. Some exploration and appraisal wells may be drilled in areas on tenure proposed to be developed later in the Project life to assist in understanding the reservoir characteristics ahead of production drilling. In addition water monitoring bores may be drilled to provide environmental data to assist in ongoing field development planning.

Each well will likely require a well pad area of approximately 1 ha when initially drilled, with nominally one production well anticipated per well pad. Areas of the well pad not required for the ongoing operation of the well will be partially rehabilitated shortly after well construction, while maintaining sufficient space for surface facilities and workover operations which will be performed on an as required basis to ensure optimal well performance throughout the operational life of the well.

Production wells are generally drilled to a depth of 150 m to 800 m, with top sections being cased with steel and cement to prevent the movement of water between aquifers that may be intersected. It is anticipated that predominantly vertical wells will be installed, with the possibility of some minor deviated wells where there are surface access constraints to the optimal well locations. Other high angle deviated wells, and multiple well configurations within a single well site may be trialled and implemented to enhance gas recovery from the coal seams and reduce the overall Project footprint. Further detailed design, recovery methods and hydraulic stimulation will be discussed in the EIS.



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WESTERN SURAT GAS PROJECT - EIS

PROJECT LOCATION

4.2.2 Access tracks and roads

Each well will have an associated access track of generally 10 m in width to allow for construction, operation and maintenance of the well. For the most part, access tracks for well infrastructure will comprise unsealed, single carriageways that may be gravelled depending on usage and located within a gathering network Right of Way (RoW). Roads will also be required for other Project infrastructure with larger dual carriageway roads and associated turn around areas constructed if required. Existing roads on the tenure will be utilised wherever possible and will be appropriately maintained and upgraded as required.

The main public transport routes to and from the Project area comprise the Warrego Highway, the Carnarvon Highway, the Wallumbilla North Road and the Roma-Taroom Road. These roads will be used for purposes such as the transport of materials, plant and equipment required for the construction of infrastructure and for the ongoing operation and subsequent decommissioning of the Project. This may also include the removal of waste and other materials from site during construction, operations and decommissioning.

4.2.3 Gas pipelines and infrastructure

Gathering flowlines will transfer low pressure gas from the wells to small scale nodal compressors or larger scale Field Compressor Facilities (FCFs) for initial compression. Gas gathering flowlines will comprise small diameter High Density Poly-Ethylene (HDPE) pipe and will be collocated wherever possible to minimise the width of the associated RoW. Final burial depths for flowlines will typically be 0.75 m depth, and will be subject to landowner discussions. It is anticipated that the gathering RoW will be approximately 15 m in width, increasing with the number of lines and other infrastructure collocated.

Gas compressed in the FCFs or nodal compressors to medium pressure will be transferred via steel or composite trunklines to the Central Processing Facility (CPF) for further compression and dehydration processing into sales gas. A high pressure steel pipeline will be required to transfer the sales gas from the CPF to its destination. The Project is likely to require only one CPF to support producing wells.

4.2.4 Water pipelines and infrastructure

Water gathering flowlines (HDPE pipe collocated with gas gathering) will be used to transfer produced water (i.e. groundwater produced during coal seam depressurisation activities, also known as coal seam water) from the wells to produced water holding tanks or dams. The holding dams may comprise low, significant or high hazard regulated dams. This will be determined by consequence category assessment with design and construction being in general accordance with the DEHP Guideline 'Structures which are dams or levees constructed as part of environmentally relevant activities' (04 April 2014) and DEHP 'Manual for Assessing Consequence Categories and Hydraulic Performance of Structures' (10 April 2014), as amended from time to time.

Depending on the management option employed, produced water will either be beneficially used in its raw form, depending on quality, or treated in a secondary dam using portable reverse osmosis technology or *in situ* water amelioration methods prior to beneficial use. Alternatively, the produced water will be transferred from the holding dams to the water treatment facility associated with the CPF for intensive treatment to produce permeate (clean water) and brine. Permeate will be beneficially used and brine or salt residue may be

transported off-site to a licensed disposal facility. Disposal options will be examined further in the EIS.

It is unlikely that beneficial use of produced water would comprise release to waterways on tenure or reinjected into aquifers, unless all other beneficial use options are exhausted. The Project produced water management strategy is currently being developed with reference to the DEHP 'Coal Seam Gas Water Management Strategy Policy 2012' and will be discussed along with beneficial use in detail in the EIS.

4.2.5 Gas and water processing, handling and transmission

CSG compressed at the CPF into sales gas may be delivered into one of the high pressure gas pipelines running through the tenure from Wallumbilla to Gladstone to supply LNG proponents, or delivered via the Wallumbilla hub to supply the domestic gas market.

Any requirement for pipelines located on-tenure will be described and impact assessed as part of the EIS process. The requirement for pipelines off-tenure (e.g. between Maisey block and the remainder of the tenure, or for transmission of sales gas off tenure) or between multiple tenures will be defined during Project design. At this stage, a separate approvals process under the EP Act and P&G Act will be undertaken to secure an EA and PPL to authorise the construction and use of that infrastructure if it is required. Off-tenure pipelines will not be assessed in this Project EIS.

4.2.6 Camps and other infrastructure

Construction workers will generally be housed in Roma and on-site in temporary drilling and construction camps. Drilling and completions personnel, required to operate the drilling rigs anticipated to be required for the Project, will most likely be housed in camps, and construction workers housed in a construction camp of approximately 100 personnel.

The initial permanent operational workforce will comprise approximately 20 staff living predominantly off-site in Roma and surrounds with a skeleton on-call operational presence living on-site. Over the life of the Project the operational workforce is anticipated to double in size and also be supported by local contractors living in the Roma area.

Camps will comprise demountable accommodation, administration and mess areas supported by sewage treatment systems designed to allow for the irrigation of treated effluent and greywater. The CPF will also have associated workshops and warehouses. At this stage, detail on construction camp numbers, workforce numbers, accommodation options and transport of workers, material, plant and equipment is unknown. This information will be provided in the EIS.

Laydown/hardstand and workshop areas will be required for temporary storage of equipment and materials, chemical storage and also for the maintenance and refuelling of plant, equipment and machinery. Gravel and other resources required for the construction of tracks, laydown/hardstand areas and other infrastructure may be sourced from borrow pits on the tenure.

Regulated, recyclable and general wastes may be temporarily stored on-site in appropriate receptacles prior to transport off site on an as required basis. Transport of these wastes will be conducted by appropriately licenced contractors and disposed of at licensed facilities.

It is currently anticipated that power required on-site for initial start-up of wells will be supplied using diesel generators. The generators will thereafter be powered by gas. Once there is a critical mass of gas production, wells will be initially started from gas powered generators. The CPF, FCFs and nodal compressors will be powered using gas generators as will accommodation and workshop infrastructure with critical areas supplied with diesel powered backup generators.

Communication infrastructure such as fibre optic cables will be co-located with pipelines wherever possible to minimise the disturbance footprint. Surface communication infrastructure such as radio towers may also be required.

4.2.7 Water for activities

Drilling and other Project activities such as dust suppression and construction will primarily use produced water. Depending on management options employed, current predictions indicate that the Project may require produced water treatment through a facility with capacity of up to 12 mega litres per day (ML/day). Potable mains water required for the Project (e.g. workforce drinking water at the camps) will be trucked into the Project area.

4.2.8 Gas sales and alternative strategies

With the favourable location of the Project, particularly in relation to neighbouring gas infrastructure, together with the changing market dynamics, the Project lends itself to being commercialised via a number of potential routes to market. Should gas and water be treated and processed on tenure the sale options could comprise but not be limited to:

A. Gas sales to LNG proponents via existing Wallumbilla to Gladstone pipelines.
B. Domestic gas sales via Wallumbilla hub and further on to:
    i. Utility markets;
    ii. Large industrial markets; or
    iii. Gas for power generation.

An alternative option to on-site water and gas treatment and processing, currently being investigated, involves the direct commercial supply of unprocessed gas and produced water to a third party. Unprocessed gas can easily be transported from the Project area through a series of interconnected gathering networks and pipelines to a number of end users. Under this option the Project may not require any major field compression, gas processing or water treatment facilities, in turn reducing the extent of any land disturbance associated with infrastructure construction.

If an arrangement can be reached with a neighbouring CSG to LNG operator with appropriate infrastructure, and is within existing or amended approval conditions, the unprocessed gas and produced water would be transferred via pipeline to these neighbouring operators.

Both on-site gas and water treatment prior to sale and off-site water and gas treatment and processing options will be assessed in the EIS.

4.3 Post-resource land use

Decommissioning and rehabilitation will occur progressively throughout the life of the Project over areas no longer required for operational activities. Final decommissioning and rehabilitation will occur at the end of gas production in accordance with relevant approvals and regulatory requirements. The post-resource land use will be returned to its pre-resource land use wherever possible and in consultation with the relevant landholders. Where the landholder agrees in writing, infrastructure such as access tracks or dams may be retained onsite for landholder reuse.

4.4 EIS schedule

Key milestones for the Project are provided in Table 4-1 below:

Table 4-1 Target EIS Milestones

Task	Target Milestone (Calendar Year)
EPBC Referral	Q2 2015
Initial Advice Statement	Q3 2015
Final Terms of Reference	Q4 2015
Draft EIS Submission to DEHP	Q3 2016
Public Notification and Comment	Q3 2016
EIS Supplementary Report	Q3 2016
Assessment Report from Chief Executive DEHP	Q4 2016

5 OVERVIEW OF COAL SEAM GAS APPROVALS PROCESS AND ENVIRONMENTAL FRAMEWORK

Approval for the development of CSG projects is obtained through a staged assessment process that requires more refinement in detail as the process progresses. Under the EP Act assessment process the stages comprise preparation and submission of an EIS for project approval followed by the Environmental Authority (EA process) whereby the Project is conditioned.

Comments from the public including interested and affected persons will be sought on both the draft ToR and the EIS itself. The Chief Executive of DEHP then considers all submissions in finalising the ToR. Equally all submissions are considered when preparing the EIS assessment report. The EIS assessment report will assess the adequacy of the EIS, makes recommendations about the suitability of the Project, sets out the conditions under which the Project should proceed and provides direction to government agencies and regulatory authorities for the assessment and conditioning of EAs and permits required subsequently by Senex to construct and operate the Project.

After the EIS is complete, an EA under the EP Act is then required. The EA provides detailed conditions under which a project must be carried out. The proponent may apply for a new EA or amend an existing EA. Detailed information is required to enable an EA application to be assessed by DEHP. This information will be provided in the body of the EIS itself and by way of an Environmental Management Plan (EM Plan) that captures commitments made by the proponent in the EIS. Whilst it is not a requirement of the EP Act for the proponent to prepare an EM Plan, the document will be one of the primary tools for implementing EIS commitments and EA conditions for all Senex CSG activities on its tenure. The public notification process for the EA is encompassed within the EIS public comment process due to the time period within which the EA(s) will be sought.

A proponent must have an EA before a PL can be granted over the tenure by the Department of Natural Resources and Mines (DNRM) under the *Petroleum and Gas (Production and Safety) Act 2004*. During the EIS period, Senex holds the Project area tenure as ATPs. PL applications must be published and public comment sought prior to grant of the lease. An initial development plan, which typically covers the first five years of development, must be submitted with the application. The initial development plan contains detailed information about the nature and extent of activities to be carried out under the PL. Subsequent development plans known as later development plans provide detailed information about ongoing development of the tenure. DNRM must consider any submissions in deciding whether to grant the PL and impose conditions.

Post-EIS, Senex will seek one EA for the 13-block Project area. This EA may cover more than one PL and other tenure including Potential Commercial Areas (PCA) areas and ATPs under which exploration and appraisal activities are carried out.

In addition to the EIS, EA and PL processes, the proponent must also negotiate conduct and compensation agreements (CCA) under the P&G Act with landowners on whose land the petroleum activities will be carried out. Negotiation of the CCA provides an opportunity for landowners to raise concerns specific to their property and to reach agreement with the proponent on where, how and when CSG development will occur on their property. The proponent is required to provide detailed information about the activities, the location and timing of activities, the measures to manage impacts, rehabilitation and compensation.

Negotiation of compensation includes access to dispute resolution and the Land Court, if agreement cannot be reached through the normal process.

6 SITING OF PETROLEUM ACTIVITIES

Due to the nature of CSG development, the Project EIS will not be able to address the exact locations of wells, pipelines and other associated infrastructure required throughout the life of the Project. However, as required under the EP Act, the EIS will provide enough information about the potential impacts of the Project and mitigation and management measures to adequately protect environmental values identified through detailed studies to enable the Project to be appropriately addressed. This is also the case for the purposes of the bilateral assessment for the EPBC Act process.

Siting of CSG infrastructure is a process of progressive refinement informed by resource validation during exploration and appraisal and gas field design to optimise recovery of economic CSG reserves. It commences with the development of a conceptual layout that describes how wells, gathering systems and production facilities might be arranged to extract and process gas. This is typically presented as areas in which facilities might be developed, with the arrangement of gathering systems and wells within a typical grid arrangement whereby wells are positioned at nominally 750 m intervals but may range up to 1,500 m.

A preliminary field development plan is developed during the Project's concept engineering design phase to determine priority areas for development and details on how that development may be undertaken. This preliminary field development plan is then further refined during the front end engineering design (FEED) process, undertaken during the EIS preparation.

At this stage, environmental, landholder and cultural heritage preliminary constraints analysis and environmental values identified during the EIS inform the FEED process. The process also takes into consideration technical feasibility, constructability, cost, and risk, as required by standards applicable to the design, construction and operation of petroleum and gas developments. The ongoing siting of infrastructure is an iterative process that is ongoing through the life of the Project as gas reserves mature and actual production is realised and development progresses across the tenure. Hence the development sequence would be progressively optimised through the Project life.

The preliminary field development plan refined through the FEED process is used in the EIS to assess potential Project impacts. This is known as the EIS assessment scenario. In turn information in the EIS informs the development of Project-specific EA conditions. Once Project activities are authorised to progress on the PL, further constraints analysis and confirmation is undertaken prior to final infrastructure siting. This process, comprising the preliminary constraints analysis discussed above and the final constraints analysis defined in a formal constraints protocol, forms an integral part of Senex's environmental management framework and is discussed further in the EIS.

7 KEY ENVIRONMENTAL ISSUES

This section briefly describes the existing environment in the Project area and surrounds and outlines potential impacts of the Project on the existing environment. It identifies key environmental issues requiring investigation in the EIS. A full list of EIS studies is presented in Section 9.

7.1 Climate

The regional climate is classified as subtropical with moderately dry winters and dry hot summers (Bureau of Meteorology, 2012). Changes in terrain across the Project area associated with the Great Dividing Range contribute to some variability in local climate. The region receives an annual rainfall of between 600 and 800 mm rainfall (refer Figure 7-1). The annual mean temperature for the majority of the region is 21°C. Local climate will be detailed in the EIS using data from the closest Bureau of Meteorology observation stations.

7.2 Land use and land use suitability

The Project area supports a variety of land uses including agriculture, forestry, rural residential, and a variety of minor uses such as conservation, tourism and recreational activities. The predominant land uses within the Project area are agriculture, including livestock grazing (e.g. Australian Country Choice cattle production), dryland cropping and forestry. Intensive animal production, irrigated cropping and horticultural activities also occur in minor areas of the Project tenure (refer Figure 7-2).

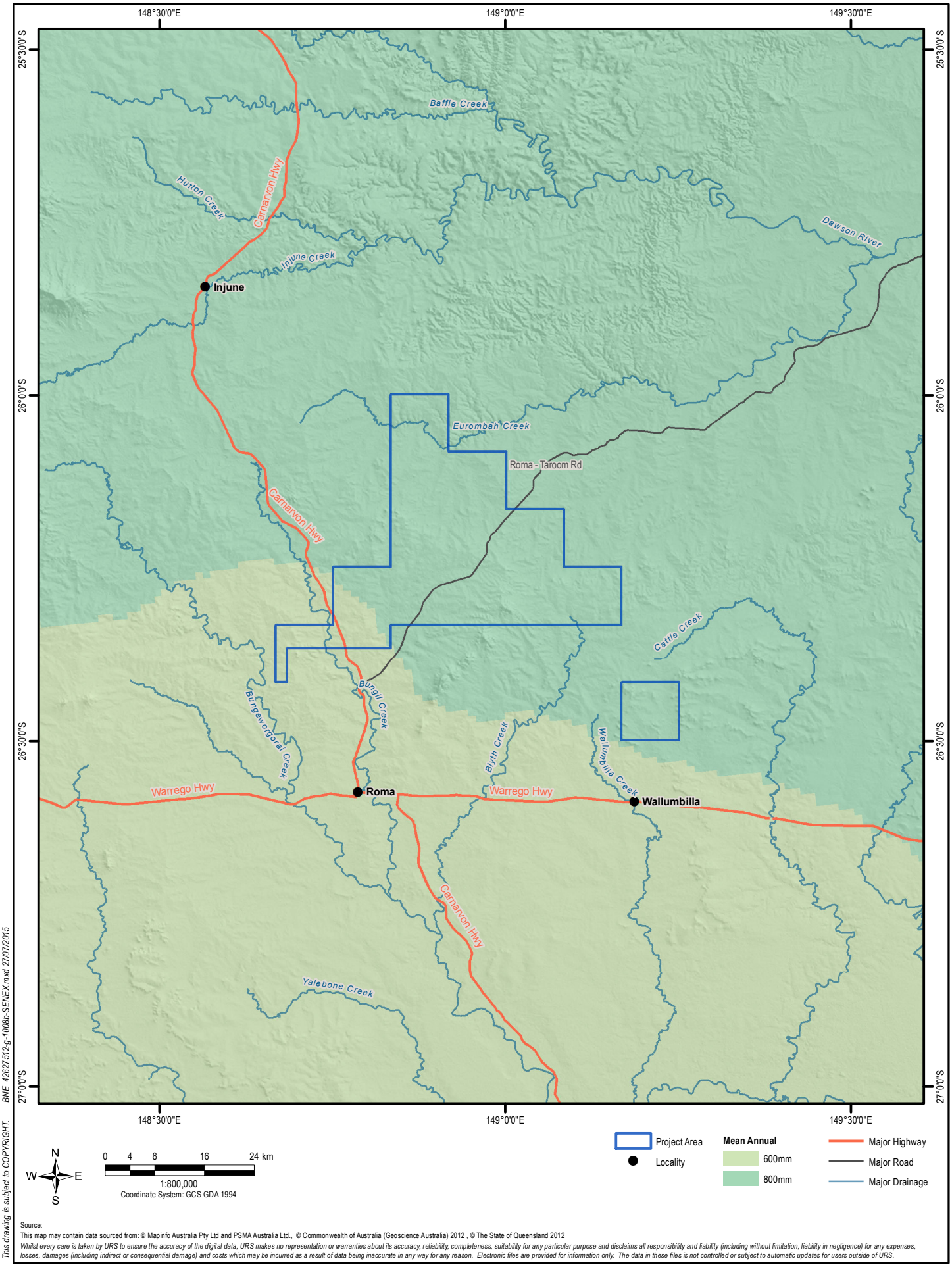
The Project is the only CSG development activity in the Project area although a number of pipeline tenures exist over the Project area. Several CSG to LNG projects are present within the greater region including the GLNG Project, APLNG Project, the Queensland Curtis LNG (QCLNG) Project and the Arrow Energy (Bowen and Surat) Gas Projects. There are also a range of coal and mineral sands mining projects present in the greater region, which are at varying stages of development. Numerous exploration tenements are present in the greater region, which allow exploration activities including remote sensing, seismic surveys, drilling and sampling. A number of coal and mineral tenements also overlap the Project area including those held by Metro Mining Limited (formerly, MetroCoal Limited) and Wanbei Coal Electricity International Mining (Australia) Pty Ltd, Glencore Coal Queensland Pty Ltd, Victory Coal Pty Ltd, Tri-Star Coal Company and Stanmore Surat Coal Pty Ltd.

Existing utilities that service the Project area may include:

- Urban, industrial and agricultural water supply infrastructure and pipelines
- Conventional and unconventional petroleum pipelines
- Gas production infrastructure servicing the GLNG, APLNG, QCLNG and Arrow Energy projects
- Powerlink and Ergon Energy electricity distribution infrastructure
- Telecommunications infrastructure such as fibre optic cables.

7.2.1 Key concerns

The Project will include the installation and operation of CSG related infrastructure across the Project area, and as such, has the potential to impact on the varied land use values of that area. The impact assessment undertaken as part of the EIS will further identify key land use values within the Project area and determine potential impacts on these values from the Project.



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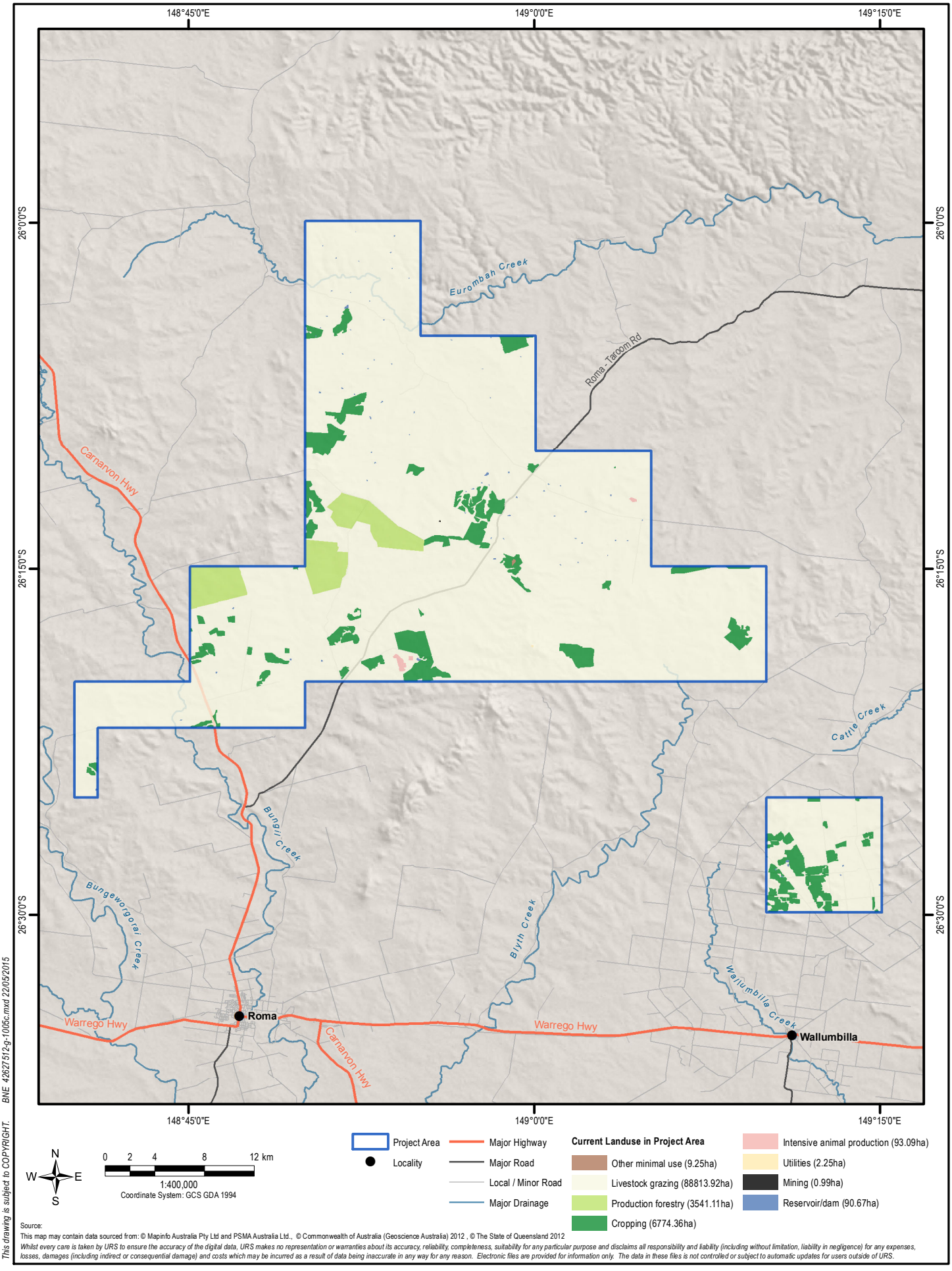
WESTERN SURAT GAS PROJECT - EIS

PROJECT AREA MEAN ANNUAL RAINFALL



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SENEX ENERGY LIMITED

WESTERN SURAT GAS PROJECT - EIS

PROJECT AREA LAND USE

7.3 Soils

The Project area is diagonally bisected by the Great Dividing Range, with extensive areas of alluvial soils developed on plains adjacent to creeks. Texture contrasting soils are situated on undulating to strongly undulating plains country and shallow undifferentiated soils occur in areas of hilly and elevated terrain. The Project area is divided into land units consistent with the Dawson Fitzroy and Balonne Maranoa land unit systems. The major land units of the Project area are presented in Figure 7-3 and summarised in Table 7-1.

The Project area is dominated by undulating to strongly undulating plains country which is dominated by texture contrast soils (Sodosols, Chromosols and Kurosols). These soils are characterised by abrupt textural changes between the typically sandy loam to loam topsoils and the medium to heavy clay subsoils. Subsoils are often sodic and dispersive and highly erodible if exposed.

Areas of cracking (Vertosols) and non-cracking (Dermosols) clay soils are present along flat alluvial plains and gently undulating plains, with some areas of cracking clays strongly gilgaied. These soils are valuable cropping soils, with agricultural development having taken place on the deeper, more fertile cracking and non-cracking clay soils within the Project area. Agricultural production on profiles formed on tertiary weathered sediments however, are usually restricted due to subsoil constraints of excessive salinity, chloride and sodicity.

Areas of undulating to steep hill country, dominated by eucalypt woodland and iron bark, occur predominantly within and on either side of the Great Dividing Range. Soil profiles in these areas are typically shallow and rocky, with areas of rock outcrop on slopes in excess of 5%. Little or no profile development evidenced as Rudosols and Tenososls has occurred within these areas and soil profiles are shallow, moderately to strongly acid, and excessively well drained.

Remaining areas consist of coarse textured, structure less to poorly structured alluvial soils (Tenosols and Kandosols), red and yellow earths, or uniform coarse-textured soils (Tenosols). These soils are acidic and very well drained with a low plant available water capacity and they are prone to erosion with the disturbance or removal of riparian vegetation.

Table 7-1 Land units and dominant soil types

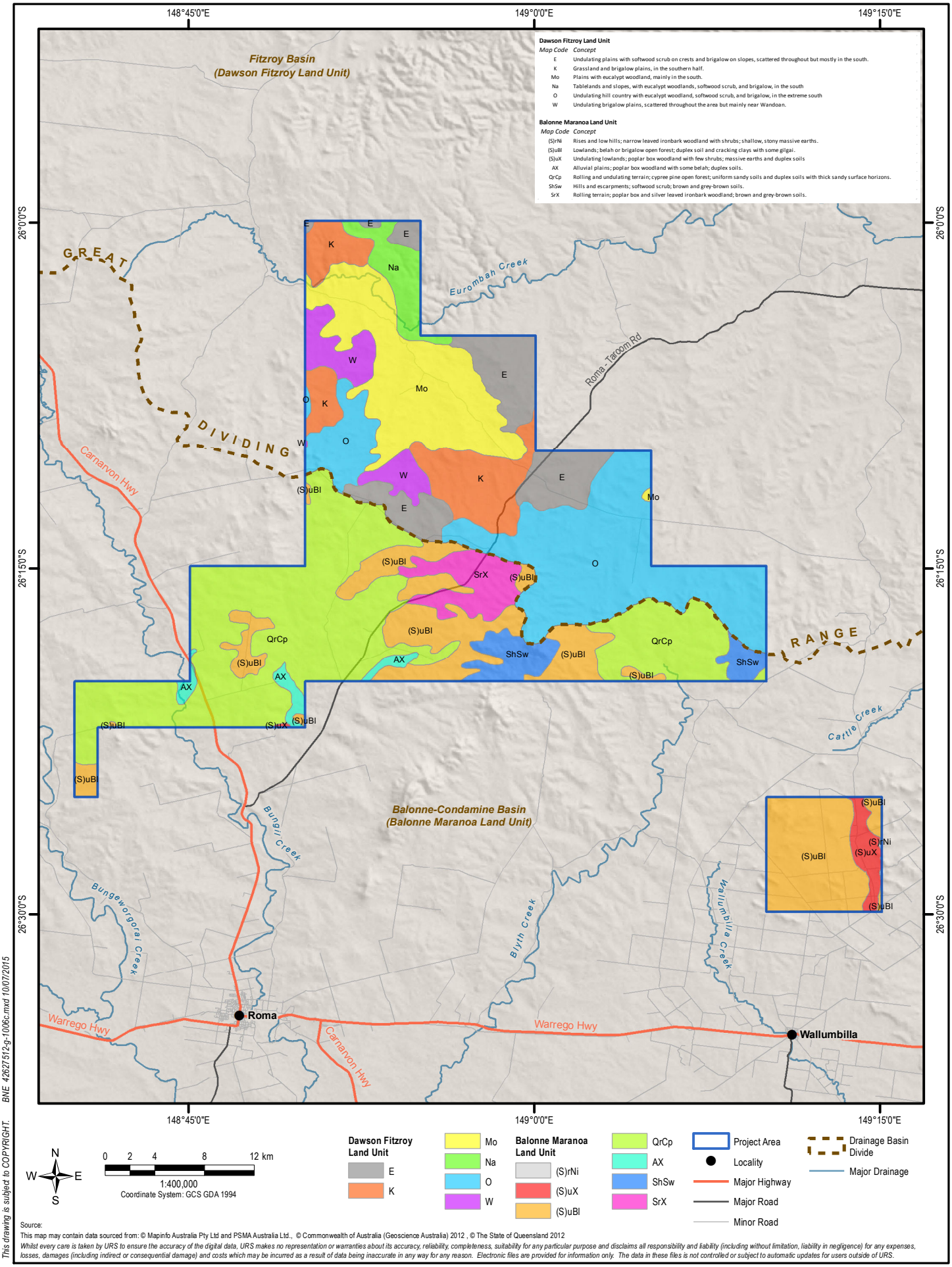
Map code	Concept	Dominant soils	Australian Soil Classification
Balonne Maranoa			
(S)rNi	Rises and low hills; narrow leaved ironbark woodland with shrubs; shallow, stony massive earths.	Dark brown and grey-brown soils: shallow to moderately deep (40-90 cm) uniform light to heavy clay soils, with strongly alkaline subsoils.	Dark brown and grey-brown Vertosols and Dermosols
(S)uBl	Lowlands; belah or brigalow open forest; duplex soil and cracking clays with some gilgai.	Texture contrast soils: 85-120 cm deep, underlain by weathered zone; thin loamy, slightly acid surface horizons over strongly acid blocky subsoils.	Kurosols and Chromosols

Map code	Concept	Dominant soils	Australian Soil Classification
(S)uX	Lowlands; belah or brigalow open forest; duplex soil and cracking clays with some gilgai.	Shallow brown and grey-brown clay soils: <60 cm deep. Some surface rock.	Shallow brown and grey-brown Vertosols and Chromosols
AX	Lowlands; belah or brigalow open forest; duplex soil and cracking clays with some gilgai.	Deep texture-contrast soils: thin sandy or loamy surface horizons over strongly alkaline to acid subsoils. Some alkaline dark grey to brown cracking clays.	Sodosols, Chromosols, and alkaline dark grey to brown Vertosols
QrCp	Rolling and undulating terrain; cypress pine open forest; uniform sandy soils and duplex soils with thick sandy surface horizons.	Skeletal sails: very shallow (<30 cm) sandy and gravelly, some minor shallow texture-contrast soils on some lower slopes.	Rudosols, Chromosols and Sodosols
ShSw	Hills and escarpments; softwood scrub; brown and grey-brown soils.	Uniform sandy soils: mainly shallow (<60 cm); some deep soils (>90 cm), medium acid throughout.	Tenosols and Kandosols
SrX	Rolling terrain; poplar box and silver leaved ironbark woodland; brown and grey-brown soils.	Uniform sandy soils: mainly >150 cm deep, yellowish brown to brown.	Deep Tenosols and Kandosols
Dawson Fitzroy			
E	Undulating plains with softwood scrub on crests and brigalow on slopes scattered throughout.	Shallow clay loams and light to medium clay and moderately deep to deep cracking clays.	Dermosols and Vertosols
K	Grassland and brigalow plains.	Moderately deep to deep cracking clays with a stony or gravelly surface. Also moderately deep to deep cracking clays, commonly with linear gilgai.	Vertosols
Mo	Plains with eucalypt woodland.	Shallow texture-contrast soils. Minor areas of deep texture-contrast soils also occur.	Sodosols and Chromosols
Na	Tablelands and slopes, with eucalypt woodlands, softwood scrub.	Shallow to moderately deep texture-contrast soil with a fine sandy surface over sandy or silly clay.	Sodosols and Chromosols

Map code	Concept	Dominant soils	Australian Soil Classification
W	Undulating brigalow plains scattered throughout the area.	Very deep cracking clays, locally deep clay loams to light clays, Shallow to moderately deep texture-contrast soils.	Vertosols, Sodosols and Chromosols.
O	Undulating hill country with eucalypt woodland, softwood scrub, and brigalow.	Shallow to deep clay loams and light to medium clays, with areas of deep to very deep cracking clays.	Dermosols and Vertosols

7.3.1 Key concerns

In general, texture contrast soils with sodic subsoils (Sodosols and Kurosols) are highly dispersive if disturbed and susceptible to sheet, rill and gully erosion, as well as tunnelling. Careful management, together with amelioration with gypsum and/or lime is often a requirement when these soil types are disturbed. The non-sodic duplex soils (Chromosols) and sands (Tenosols) are prone to rill and sheet erosion when disturbed and vegetation is removed. Appropriately designed erosion and sediment control measures, together with topsoil management will mitigate potential impacts to these soil resources.



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PROJECT AREA LAND UNITS

7.4 Traffic and transport

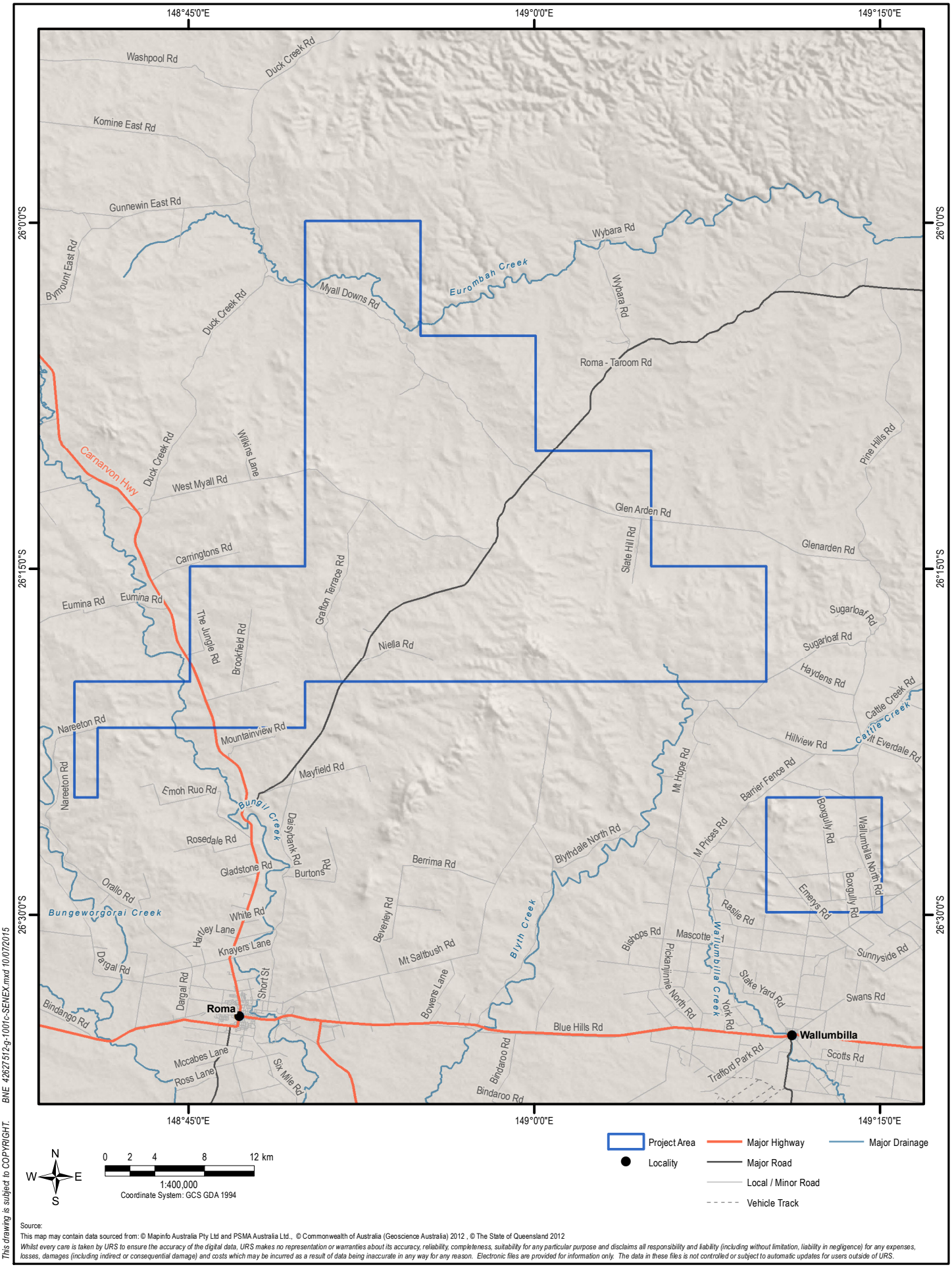
The Project area is serviced by a range of State controlled roads, council roads and unformed tracks providing access to private properties (refer Figure 7-4). The main transport routes connecting major townships in the region include:

- Carnarvon Highway
- Warrego Highway
- Roma-Taroom Road
- Myall Downs Road
- Glen Arden Road
- Grafton Terrace Road.

The primary airport servicing the area is the Roma Airport.

7.4.1 Key concerns

The Project has the potential to impact on local infrastructure such as transportation routes based on an increase in vehicle numbers during the construction phase. Development within the Project area will include construction of additional access tracks for drilling activities, rights of way for the placement of pipelines, and placement of associated infrastructure.



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WESTERN SURAT GAS PROJECT - EIS

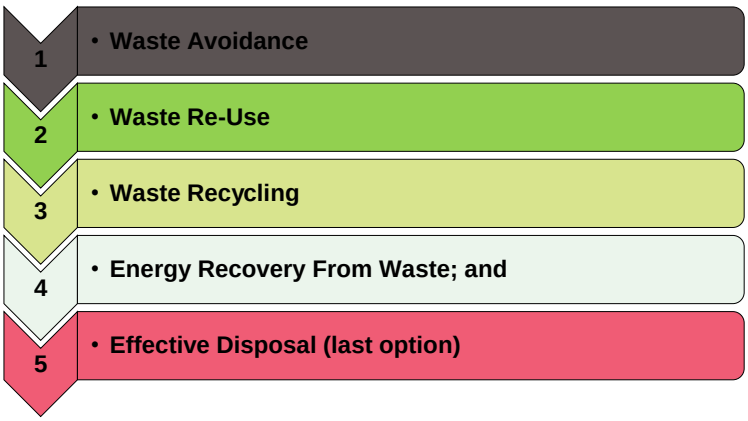
TRANSPORT ROUTES

7.5 Waste management

Within the Project area and surrounding area, solid and liquid wastes are generated from domestic and commercial premises as well as agricultural, industrial and resource extraction activities. The Maranoa Regional Council provides waste collection, recycling and disposal facilities and services for residential and commercial properties. Commercially operated waste management facilities provide additional options for collection, treatment and disposal of solid and liquid wastes.

Senex will manage its waste in accordance with relevant regulatory frameworks including the waste management hierarchy (most preferred to least preferred) (refer Figure 7-5).

Figure 7-5 Waste management hierarchy



The environmental values with the potential to be impacted by waste generated from the Project include:

- The natural environment; i.e. land, water resources, air quality, fauna and flora
- Productive capability of land; i.e. its potential for use for agricultural, forestry or other uses
- Health and safety; i.e. the life, health and wellbeing of people, including Senex employees
- Sustainability of natural resources (e.g. construction materials, fuel, electricity, water)
- Available landfill capacity for waste disposal
- Visual amenity.

The context and status of these environmental values will be further assessed as part of the EIS.

7.5.1 Key concerns

Potential impacts to the identified environmental values and receptors may result from excessive waste generation from the inefficient use of resources or from the improper management or storage of wastes generated during the different phases of the Project. Senex will use a sustainable approach to waste generations, management and disposal that follows the waste management hierarchy, and satisfies Queensland *Environmental Protection Regulation 2008* and *Waste Reduction and Recycling Act 2011* obligations.

7.6 Surface water

The Project area is located within the Upper Dawson River sub-basin (within the Fitzroy Basin), and the Upper Balonne River sub-basin (within the Condamine-Balonne Basin) (refer Figure 7-6). Watercourses in these sub-basins are mostly ephemeral, with the exception of major watercourses such as the eastern portion of the Dawson River and parts of the Condamine River. Both catchments are heavily influenced by anthropogenic pressures including land use, riparian management, water infrastructure and point sources of pollution. The catchments are also highly modified as a result of agricultural and grazing practices.

The Project area is traversed by the Great Dividing Range, which generally runs northwest to southeast through the centre of the tenure. North of the Great Dividing Range, Eurombah Creek generally flows east-west through the Project area (ATP 767) and flows northeast off tenure. South of the Great Dividing Range, Bungil and Blyth Creeks flow south from the Project area to join the Balonne River near the town of Surat. Tributaries of Wallumbilla Creek and Yuleba Creek drain the southern-most block of the Project area and flow southeast off tenure to the Condamine River. Several other smaller drainage lines are present within the Project area. Creeks on the tenure are government-mapped as Stream Order 1 to Stream Order 5 with the majority comprising Stream Order 1 and 2. Several springs are also identified by government mapping on ATP 795 (Figure 7-6).

The *Environmental Protection (Water) Policy 2009* (EPP Water) defines Environmental Values (EVs) for the surface water environment in Queensland via a series of Water Resource Plans (WRP). The EVs and water quality objectives are defined on a sub-basin scale. Surface water resources within the Project area are primarily managed by the Fitzroy Basin Water Resource Plan 2011 and the Condamine-Balonne Water Resource Plan 2004.

Currently within the Project area, only the Fitzroy Basin has defined EVs and water quality objectives under the EPP Water (within the Fitzroy Basin Water Resource Plan 2004). There are no defined EVs or water quality objectives for the Condamine-Balonne Basin under the Condamine and Balonne WRP 2004. However, draft EVs for the Condamine and Balonne rivers and tributaries are included within a draft Healthy Waters Management Plan released by the Queensland Murray-Darling Committee in 2012 (for Condamine-Balonne watercourses only). The EVs identified for the surface water environment within the Project area are summarised in Table 7-2.

Table 7-2 Environmental values for surface waters within the Project area (Fitzroy and Condamine-Balonne Basin)

Environmental values	Condamine-Baloone Basin			Fitzroy Basin (Upper Dawson River)
	Bungil and Murilla Creeks	Balonne River	Yuleba Creek	Southern Tributaries
Aquatic ecosystems	High	High	High	✓
Irrigating crops	High	High	High	✓
Agriculture (farm use)	High	High	High	✓
Stock watering	High	High	High	✓
Aquaculture	Low	Low	Low	×
Human consumption	High	High	High	✓
Primary recreation	High	High	High	✓
Secondary recreation	High	High	High	✓
Visual appreciation	High	High	High	✓
Raw drinking water	High	High	High	✓
Industrial use	Low	Low	Low	✓
Cultural and spiritual values	High	High	High	✓

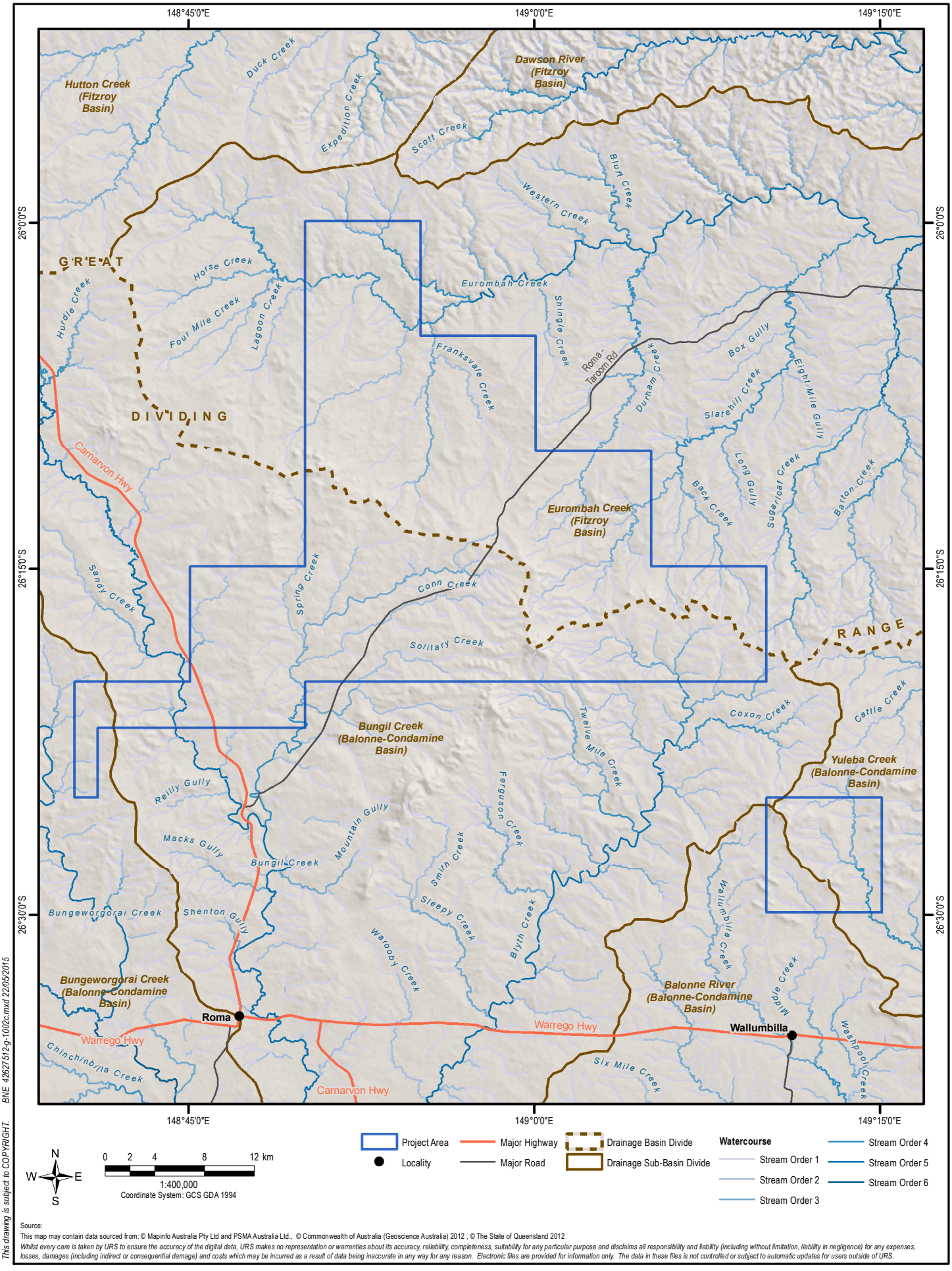
✓ = Environmental Value applicable to surface water resources within the Project area.
× = Environmental Value not applicable to surface water resources within the Project area.

7.6.1 Key concerns

Key concerns in relation to surface water quality potentially arising from Project activities comprise:

- Increased sedimentation in surface water bodies resulting from earthwork activities leading to changes in surface water quality
- Erosion of stream banks resulting from disturbance of riparian habitat, watercourse crossings and runoff from impervious surfaces leading to changes in surface water quality
- Inadvertent release of potentially polluting compounds to surface water bodies from activities such as vehicle refuelling/washdown and uncontrolled or controlled release of produced water, hydrotest water, brine or treated/untreated sewage leading to changes in surface water quality.

An assessment of impacts and risks to surface water quality associated with the various phases of the Project will be undertaken as part of the EIS.



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SENEX ENERGY LIMITED

WESTERN SURAT GAS PROJECT - EIS

SURFACE WATER HYDROLOGY

7.7 Groundwater

The geology of the Project area is predominantly sedimentary, composed of sandstone, conglomerate, siltstone, mudstone and coal. The soils are mostly highly weathered bedrock, sand and alluvium sediments derived from underlying sandstones (CSIRO, 2015).

The gas bearing target coals within the Project area are associated with the Middle Jurassic Walloon Subgroup, which is sub-divided into three units: the Juandah Coal Measures; the Tangalooma Sandstone; and the Taroom Coal Measures. The Walloon Subgroup is located within the Jurassic-Cretaceous Surat Basin (QWC, 2012).

The Surat Basin, a sub-basin of the hydrogeological Great Artesian Basin (GAB), is a multi-layered mainly confined system of alternating layers of water-bearing sandstone and non-water bearing siltstone and mudstone. The sandstone units store and transmit groundwater and are defined as aquifers. These aquifers are sufficient to yield economically significant quantities of groundwater to production bores as well as springs (Habermehl, 1980).

The aquitards (siltstone and mudstone) hinder but do not totally prevent groundwater flow of leakage between aquifers. Within the Project area, the formations are of relatively uniform thickness, laterally continuous, and hydraulically connected.

The major aquifer units through the Surat Basin include the following formations: Nullawurt Sandstone (Bungil Formation); Mooga Sandstone; Gubberamunda Sandstone; Springbok Sandstone; Hutton Sandstone; and Precipice Sandstone. Major aquitards include: Wallumbilla Formation; Orallo Formation; Westbourne Formation; and Evergreen Formation (Habermehl, 1980).

The major GAB aquifers within the Surat Basin are recharged by rainfall infiltration and leakage from streams into outcropping sandstone formations, mainly along the eastern margins of the GAB, along the Great Dividing Range. Regional groundwater flow is from the topographically higher recharge areas around the basin towards the lowest parts of the basin in the southwest. Natural discharge, as mound springs and watercourse springs, occurs primarily in the south-western area of the basin. Natural discharge from aquifers occurs within and immediately adjacent to the Senex ATPs (refer Figure 7-6) through spring vents, baseflow to rivers, vertical leakage between aquifers, and subsurface (throughflow) into adjoining areas.

Groundwater resources associated with the multi-layered aquifer and aquitard system, based on registered groundwater bore database data (Department of Natural Resources and Mines, 2015), indicates the following:

- The Wallumbilla Formation provides sub-artesian water supplies, used predominately for stock and domestic purpose. Yields are low (<5 litres per second (L/s)), and water quality is variable due the marine deposition of this formation
- The Bungil Formation, comprising interbedded sandstone, siltstone and mudstone, provides sub-artesian supplies for stock and domestic purposes
- The Mooga Sandstone outcrops in the north where it is recharged. This aquifer is used extensively for stock, domestic and feedlot purposes. It also provides significant urban water supply for surrounding towns including Muckadilla, Roma, Wallumbilla and Yuleba. Water quality is good and yields are high (up to 35 L/s)
- The Gubberamunda Sandstone, a major GAB aquifer, provides significant feedlot, industrial and urban supplies including the town of Roma

- The Injune Creek Group provides predominantly sub-artesian stock supplies, due to variable water quality, where water salinity ranges from 1,500 to over 10,000 microsiemens per centimetre (µS/cm)
- The Hutton Sandstone aquifer is not extensively developed, even though its water quality is good, owing to its depth within the Roma area
- The Precipice Sandstone is known to contain significant supplies of good quality water, however, is relatively undeveloped due to depth. A number of bores are screened within this aquifer having been converted from conventional petroleum exploration wells.

7.7.1 Key concerns

Depressurisation of the coal seams due to production of CSG, through groundwater extraction can result in the following:

- The drawdown of groundwater levels in the target coal seams
- The drawdown of groundwater levels, through induced flow, in overlying and underlying aquifers
- The reduction of groundwater levels within aquifers, which could result in the reduction of landholder bore yields
- The reduction of baseflow to surface water systems, groundwater dependent ecosystems, and springs.

The groundwater impact assessment undertaken as part of the EIS will identify key groundwater values within the Project area and determine potential impacts on these values from the Project. The groundwater impact assessment will identify mitigation measures to avoid or minimise any potential impacts.

7.8 Air quality

The air quality within the Project area and adjacent surrounds is considered to be consistent with a rural setting and of high quality. Localised air quality impacts are from dust generated from stock movements, dust of natural origin, bushfires and controlled burns, vehicular movements on unsealed roads, and from other gas/mining operations in the region. Several townships are located in the vicinity of the Project area. These townships are expected to generate localised air emissions from motor vehicles as well as domestic, industry and business activities.

7.8.1 Key concerns

The Project has the potential to have an adverse impact on air quality, as well as contributing to increased greenhouse gas concentrations. Air quality may be impacted by the Project as a result of:

- Dust and combustion emissions from clearing and construction activities
- Combustion emissions from operational plant such as compressors
- Fugitive emissions from wells and gas transmission

- Greenhouse gas emissions from construction and operation, including scope 1, scope 2 and scope 3 emissions.

The assessment of the air quality and suitable mitigation measures will be outlined in the Project EIS.

7.9 Noise

Generally, the ambient noise level for the Project area is expected to be typical of rural areas with the prominent noise sources likely to be from agricultural activities. As the noise levels are typical of a rural area, the night time background and ambient noise levels are expected to be lower than those experienced during the day.

7.9.1 Key concerns

The potential for noise impacts from the Project is dependent on the separation distances to sensitive receptors (generally rural residences), the level and duration of the noise and the time of day that the noise occurs.

Noise will be generated from a variety of sources during Project construction, including vegetation clearing and earthworks associated with site preparation and drilling activities. Given the rural location and hence typically large distances to most residences, and the relatively short-term nature of these activities, the impact is expected to be low and of relatively short duration. Operation of the Project will generate noise from infrastructure including compressor and water treatment facilities.

Identification of residences and other sensitive receptors will be undertaken as part of the EIS as well as a noise impact assessment based on the Project description information.

7.10 Terrestrial fauna and flora

The Project area is situated within the Queensland Brigalow Belt bioregion. This bioregion is characterised by woodland and forest communities of *Acacia harpophylla* (brigalow), with scattered ecosystems dominated by eucalypt species, cypress pine, acacia species and grasslands. The Brigalow Belt bioregion has experienced an extensive loss of vegetation, generally associated with agricultural and grazing practices. Vegetation clearing has occurred on most of the lowland landscapes, with rugged landscapes such as those associated with sandstone and metamorphic ranges remaining relatively undisturbed (Sattler and Williams, 1999). Tracts of vegetation still exist as intact patches and isolated stands within lowland areas.

Within the Project area, vegetation is typically dominated by *Eucalyptus populnea* (Poplar Box), *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) woodland. Stands of *Acacia harpophylla* (Brigalow) and *Casuarina cristata* (Belah) are interspersed throughout the Project area. Other *Eucalyptus* and *Corymbia* species woodland are also present.

A search of State and Commonwealth government ecological databases for the Project area was conducted to identify any conservation significant values including threatened ecological communities, regional ecosystems and threatened flora and fauna. A summary of the results of this desktop assessment is outlined below.

7.10.1 Matters of National Environmental Significance

The EPBC Protected Matters search (under the Commonwealth EPBC Act) identified 20 listed threatened species and 4 threatened ecological communities as potentially being present within 10 km of the Project area. The EPBC Act listed species identified as potentially occurring in the Protected Matters search report as considered Matters of National Environmental Significance (MNES) under the EPBC Act. MNES species included four bird species, one fish species, four mammal species, six reptile species and five plant species. This list is based on the likelihood of occurrence in the Project area according to the distribution of species and their habitats (Department of the Environment, 2015).

The search also identified nine migratory species as potentially being present within 10 km of the Project area. Listed migratory species included one migratory marine species, four migratory terrestrial species and four migratory wetland species.

7.10.2 Matters of State Environmental Significance

The *State Planning Policy 2014* (SPP) defines matters of state environmental significance (MSES) that are potentially relevant to the Project as:

- Threatened wildlife under the *Nature Conservation Act 1992* (NC Act) and special least concern animal under the *Nature Conservation (Wildlife) Regulation 2006*
- Protected areas (including all classes of protected area except coordinated conservation areas) under the NC Act
- Regulated vegetation under the *Vegetation Management Act 1999* that is:
  - Category B areas on the regulated vegetation management map, that are ‘endangered’ or ‘of concern’ regional ecosystems
  - Category C areas on the regulated vegetation management map that are ‘endangered’ or ‘of concern’ regional ecosystems
  - Category R areas on the regulated vegetation management map
  - Areas of essential habitat on the essential habitat map for wildlife prescribed as ‘endangered wildlife’ or ‘vulnerable wildlife’ under the NC Act
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse map
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map
- Wetlands in a wetland protection area or wetlands of high ecological significance shown on the Map of Referable Wetlands under the *Environmental Protection Regulation 2008*
- Wetlands and watercourses in high ecological value waters as defined in the *Environmental Protection (Water) Policy 2009*, schedule 2
- Legally secured offset areas.

The Queensland DEHP Wildlife Online database search for the Project area yielded a total of 666 species records including 17 amphibian species, 156 bird species, 35 mammal species, 11 fish species, 36 reptile species and 411 plant species. Of these species, six are listed under the NC Act and/or the EPBC Act, comprising one bird species, two mammal species

and three reptile species. The search also identified five migratory bird species listed under the EPBC Act (Department of Science, Information Technology and Innovation, 2015).

HERBRECS records from the Queensland Herbarium indicated a total of 1,194 records representing 619 plant species. Of these, 3 flora species are considered conservation significant (Department of Science, Information Technology, Innovation and the Arts, 2014).

Nineteen regional ecosystems (REs), listed under the *Vegetation Management Act 1999* (Qld) (VM Act), displaying different vegetation were identified as existing in the Project area based on a desktop review of state government RE mapping (refer Figure 7-7). Of the 19 REs, 2 were identified as Endangered REs and 5 were Of Concern REs. The remaining 12 were classified as Least Concern. The Biodiversity Status (BD Status) of the REs identified above comprised 5 endangered REs, 4 of concern REs and 10 no concern at present REs. The biodiversity status of REs is relevant when considering environmentally sensitive areas (ESAs) in relation to petroleum projects (Department of Environment and Heritage Protection, 2013). These REs and their respective status are outlined below in Table 7-3.

Table 7-3 Regional ecosystems within the Project area

RE	Short description	VM Act	BD Status
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Least concern	Of concern
11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains	Of concern	Endangered
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Least concern	Of concern
11.3.39	*Eucalyptus melanophloia* +/- *E. chloroclada* open woodland on undulating plains and valleys with sandy soils	Least concern	No concern at present
11.5.1	*Eucalyptus crebra* and/or *E. populnea*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces	Least concern	No concern at present
11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Least concern	No concern at present
11.7.6	*Corymbia citriodora* or *Eucalyptus crebra* woodland on Cainozoic lateritic duricrust	Least concern	No concern at present
11.8.3	Semi-evergreen vine thicket on Cainozoic igneous rocks	Of concern	Of concern
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on fine-grained sedimentary rocks	Least concern	No concern at present
11.9.4a	Semi-evergreen vine thicket, generally dominated by a low tree layer (5-10m high) which is floristically diverse and variable. Common codominant species include *Croton insularis*, *Denhamia oleaster*.	Of concern	Endangered
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	Endangered	Endangered
11.9.7	*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	Of concern	Of concern
11.9.10	*Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes *Casuarina cristata* on fine-grained sedimentary rocks	Of concern	Endangered

RE	Short description	VM Act	BD Status
11.10.1	*Corymbia citriodora* woodland on coarse-grained sedimentary rocks	Least concern	No concern at present
11.10.6	*Xanthorrhoea johnsonii* shrubland with *Angophora leiocarpa*, *Callitris glaucophylla* open storey on coarse-grained sedimentary rocks. Occurs on deep red sandy loam.	Least concern	No concern at present
11.10.7	*Eucalyptus crebra* +/- *Callitris glaucophylla* +/- *Angophora leiocarpa* +/- *Eucalyptus* spp. woodland.	Least concern	No concern at present
11.10.9	*Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	Least concern	No concern at present
11.10.11	*Eucalyptus populnea*, *E. melanophloia* +/- *Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	Least concern	No concern at present

Environmentally Sensitive Areas (ESAs) are defined under the Queensland *Environmental Protection Regulation 2008* as locations that have environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical, or cultural heritage value, or are important in providing amenity, harmony or sense of community. Within the Project area, the following ESAs have been identified (refer Figure 7-8):

- Endangered REs (biodiversity status)
- Of concern REs (biodiversity status)
- Gubberamunda State Forest
- Essential habitat.

Generally speaking, there are limited areas of wetlands of significance present within the Project area. There is one RAMSAR wetland (Narran Lake Nature Reserve) located approximately 400 km south-southwest of the Project area which will be assessed as part of the EIS. Wetlands of High Ecological Value (HEV) and High Ecological Significance (HES) are not currently identified as occurring within the Project area; however HEV areas have not yet been scheduled for the Condamine-Balonne River basin by DEHP. The closest HEV to the Project area is the Woodduck State Forest (HEVa2150) located immediately east of ATP 889, and the closest identified HES wetland is a small section of the Dawson River (Southern Tributaries), which is located approximately 10 km northeast of ATP 767 (outside of the Project area). However, three Referable wetlands, which are spring fed (based on DEHP mapping) do occur within the Project area on ATP 795 (refer Figure 7-6).

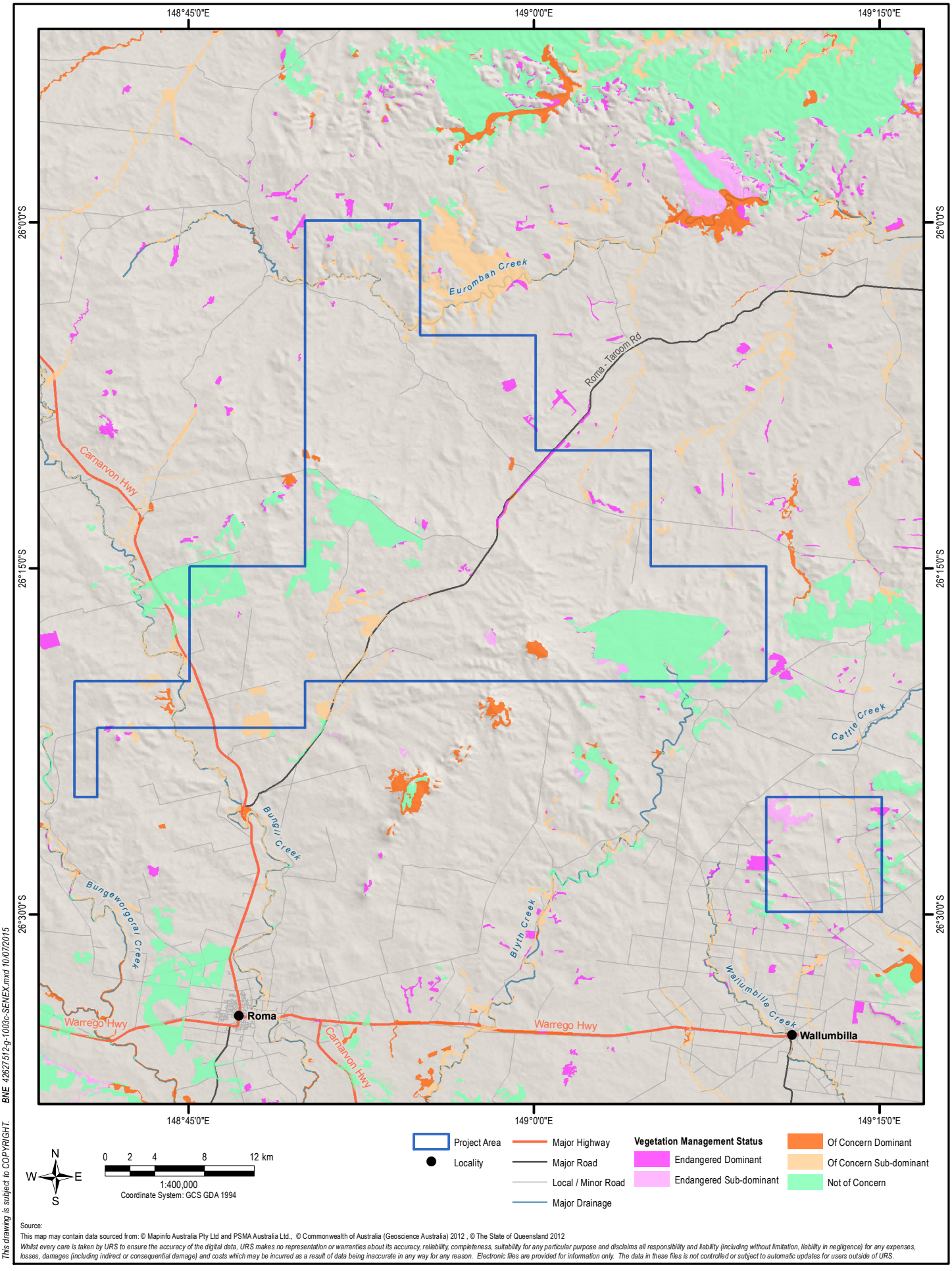
7.10.3 Key concerns

The potential environmental impacts of the Project on terrestrial ecology include vegetation clearing and fauna habitat loss. As a result of clearing, there may also be potential impacts upon threatened flora and fauna as well as threatened ecological communities. Other potential impacts related to clearing and works in vegetated areas include habitat fragmentation and the potential for increased risk of weed invasion.

The results of the ecological assessment to be undertaken as part of the EIS will inform the Project by providing detailed information regarding the conservation significant values present.

Detailed mitigation measures which aim to avoid and reduce potential impacts will then be developed as part of the EIS.

Any potential impacts of particular relevance to MSES will be addressed in the EIS chapters that identify potential impacts and mitigation measures for ESA's and terrestrial and aquatic ecological values. Any potential impacts of particular relevance to MNES will be separately addressed in the standalone EPBC report appended to the EIS that identifies potential impacts and mitigation measures for all relevant MNES.



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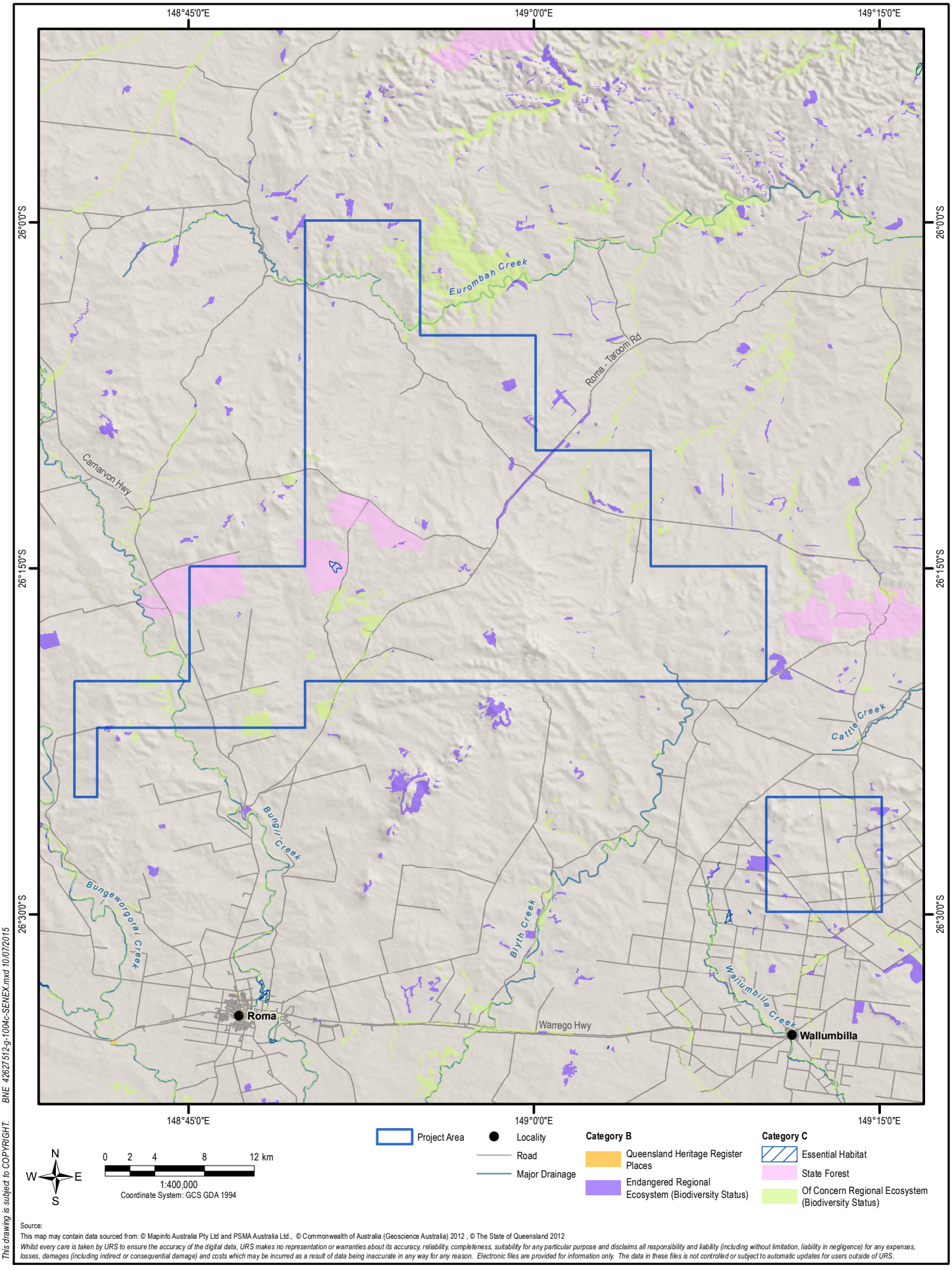
WESTERN SURAT GAS PROJECT - EIS

REGIONAL ECOSYSTEMS



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WESTERN SURAT GAS PROJECT - EIS

ENVIRONMENTALLY SENSITIVE AREAS

7.11 Aquatic ecology

The Project area is located within Fitzroy River and Balonne-Condamine catchments, dissected by the Great Dividing Range. Within the Fitzroy River catchment, the Project area is located within the Dawson River sub-catchment. Within the Balonne-Condamine catchment, the Project area is located within the Balonne River sub-catchment.

The Project area is located within the upper reaches of the Fitzroy River and Balonne-Condamine catchments and as a result, the waterways within the Project area are typically lower stream orders (primarily Stream Order 1 and 2) and are generally ephemeral in nature. Both catchments are heavily influenced by anthropogenic pressures including land use, riparian management, water infrastructure and point sources of pollution. The catchments are highly modified as a result of agricultural and grazing practices.

A field assessment of aquatic habitat was undertaken within the Project area in March and April 2015. Waterways generally supported a sandy substrate with occasional in-stream habitat such as branch piles, logs and rocks identified. Bed rock habitat also occurs in a number of waterways, with the presence of semi-permanent water pools noted. Disturbance within the waterways from grazing practices was recorded within all waterways and included the presence of exotic pasture grass species along the creek banks and direct disturbance from cattle dispersing along/across the waterway. A number of waterways were identified as providing key ecological connectivity values including Blyth Creek, Bungil Creek and Eurombah Creek.

The desktop assessment of aquatic values identified one fish, Murray cod (*Maccullochella peelii peelii*) and one turtle, Fitzroy River turtle (*Rheodytes leukops*), as being potentially present within the Project area. As discussed above, referable wetlands have been identified based on government mapping as occurring on ATP 795.

7.11.1 Key concerns

The Project may result in potential impacts on aquatic values if activities are not appropriately managed. Potential exists for the degradation of aquatic habitats through decreased water quality associated with construction activities or point source and non-point source discharges. The degradation of aquatic (riparian and in-stream) habitats may potentially result in a reduction of species diversity and abundance.

Downstream effects from the Project could potentially influence a broader range of fish species. Alteration to stream flow, flood event duration and occurrence, and fish passage during construction or operation, although unlikely, can impact downstream aquatic ecology including fish communities.

The aquatic impact assessment undertaken as part of the EIS will identify key aquatic values of conservation significance within the Project area and determine potential impacts on aquatic values from the Project. The aquatic ecology impact assessment will identify mitigation measures to avoid or minimise any potential impacts.

7.12 Cultural heritage

7.12.1 Indigenous cultural heritage

The traditional landowners of the region are the Mandandanji People whom have registered Native Title claims within the Project area. Senex has developed a cultural heritage management agreement with the Mandandanji and will seek to have this cultural heritage management agreement approved as a Cultural Heritage Management Plan (CHMP) under the *Aboriginal Cultural Heritage Act 2003* (Qld).

The CHMP will provide for cultural heritage management for the life of the Project. Under this CHMP the Mandandanji People will undertake cultural heritage site surveys for Senex prior to the carrying out of any ground disturbance activities.

An Aboriginal and Torres Strait Islander Cultural Heritage Search will be completed during the EIS process to determine if there are any registered known sites of cultural heritage significance within the Project area.

7.12.2 Non-indigenous cultural heritage

There are no National Heritage Places identified within the Project area. The majority of listed non-indigenous heritage sites, including public buildings, memorials, houses, churches and cemeteries, are found in major towns surrounding the Project area such as Roma. An assessment of the non-indigenous heritage values of the Project area will be undertaken as part of the EIS.

7.13 Rehabilitation

As described above, decommissioning and rehabilitation will occur progressively throughout the life of the Project, with final decommissioning and rehabilitation undertaken at the end of gas production in accordance with relevant approvals and regulatory requirements.

The post-resource land use will be returned to its pre-resource land use wherever possible and in consultation with the relevant landholders. Where there is a written agreement (such as a Conduct and Compensation Agreement) between the landholder and Senex, infrastructure such as access tracks and dams may be retained onsite for ongoing landholder use. Where this is the case rehabilitation standards for revegetation by the EA holder will not be required. Decommissioning and rehabilitation will be addressed as part of the EIS.

7.14 Social impacts

The Project will be located in a rural area predominantly within the Maranoa Regional Council LGAs. The eastern part of the Project area falls within the Western Downs Regional Council LGA. The Project area and surrounds supports small to medium sized country towns, and dispersed rural populations. As described above the predominant land uses include grazing and cropping. With the growth of the resource sector over the past five years, CSG activities comprise a significant land use in the region of the Project and have had considerable economic and social impacts.

7.14.1 Key concerns

Potential social issues arising from the Project may include the following:

- The potential for a negative impact on housing affordability in the region
- Competition with established businesses for skilled labour and technical personnel in the vicinity of the Project area
- An increase in pressure on local services and facilities based on the influx of workers for the construction of the Project.

It is however anticipated that the majority of the social impacts from the Project will be positive in nature due to the recent decline in CSG development activities in the region and the resultant increase in availability of resources.

8 ENVIRONMENTAL MANAGEMENT

An EM Plan for the Project will be developed as part of the EIS. The EM Plan will be developed based on the information contained in the EIS and will establish commitments for environmental management in order to avoid where possible or mitigate potential impacts on the identified environmental values.

The EM Plan will incorporate environmental and social mitigation measures from the EIS as a framework for continuing management, monitoring, reporting and improvement. Its primary purpose will be to identify the environmental values potentially affected by the Project and detail measures to manage the risk of potential adverse impacts to these environmental values. For each study component, the EM Plan will outline the following:

- Environmental values
- Potential impacts
- Environmental protection objectives
- Management controls
- Monitoring programs
- Proposed EA conditions.

A separate Coal Seam Water Management Plan (CSWM Plan) will be developed to outline how Senex proposes to manage coal seam water within the regulatory framework established by the Queensland and Commonwealth Governments. The CSWM Plan will be consistent with DEHP's *Coal Seam Gas Water Management Policy 2012*. It will be based on the results of the CSG water management strategy to be developed as part of the EIS as well as other relevant sections of the EIS such as ecology, surface water and groundwater.

The CSWM Plan will outline how the volume and quality of coal seam water will vary over time and across the Project area. It will discuss how technology and the requirements of potential beneficial users are also likely to change over the Project life. It will also consider issues of flexibility and adaptation in the management strategy's implementation.

9 EIS STUDIES PROGRAM

The technical studies expected to be presented in the EIS in line with the Project Final ToR include:

- Land use and land use suitability
- Geology, topography and soils
- Landscape and visual amenity
- Traffic and transport
- Waste management
- Surface water (hydrology and quality)
- Groundwater (including coal seam water)
- Air quality and greenhouse gas emissions
- Noise and vibration
- Terrestrial and aquatic ecology
- Cultural heritage (indigenous and non-indigenous)
- Social and economic impact
- Hazard and risk
- Cumulative impacts of energy projects on the region.

Each of the above studies will describe the existing or baseline environment of the Project area, assess any potential impacts of the Project activities, identify mitigation and management measures to address those impacts and provide a framework to help protect the environmental values of the Project area.

10 COMMUNITY AND STAKEHOLDER CONSULTATION

Senex will consult and engage with ‘interested’ and ‘affected’ persons in accordance with EP Act requirements and in consideration of relevant guidelines. Senex will consult with local, Queensland and Commonwealth Government authorities, and potentially affected local communities as well as landholders in the Project area.

A Stakeholder Engagement Plan (SEP) has been developed and will be implemented. The SEP provides for community engagement activities (factsheets, attendance at local events, shop front etc.) timed to coincide with the EIS process and schedule and a stakeholder engagement database to ensure issues are tracked and addressed in the EIS.

The EIS will describe the consultation that has taken place and how the responses from the community and Government authorities have been incorporated into the design and outcomes of the Project as required by the ToR. A public consultation report will be included in the EIS which will identify how the SEP was implemented and will present a summary of results of the EIS consultation process.

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