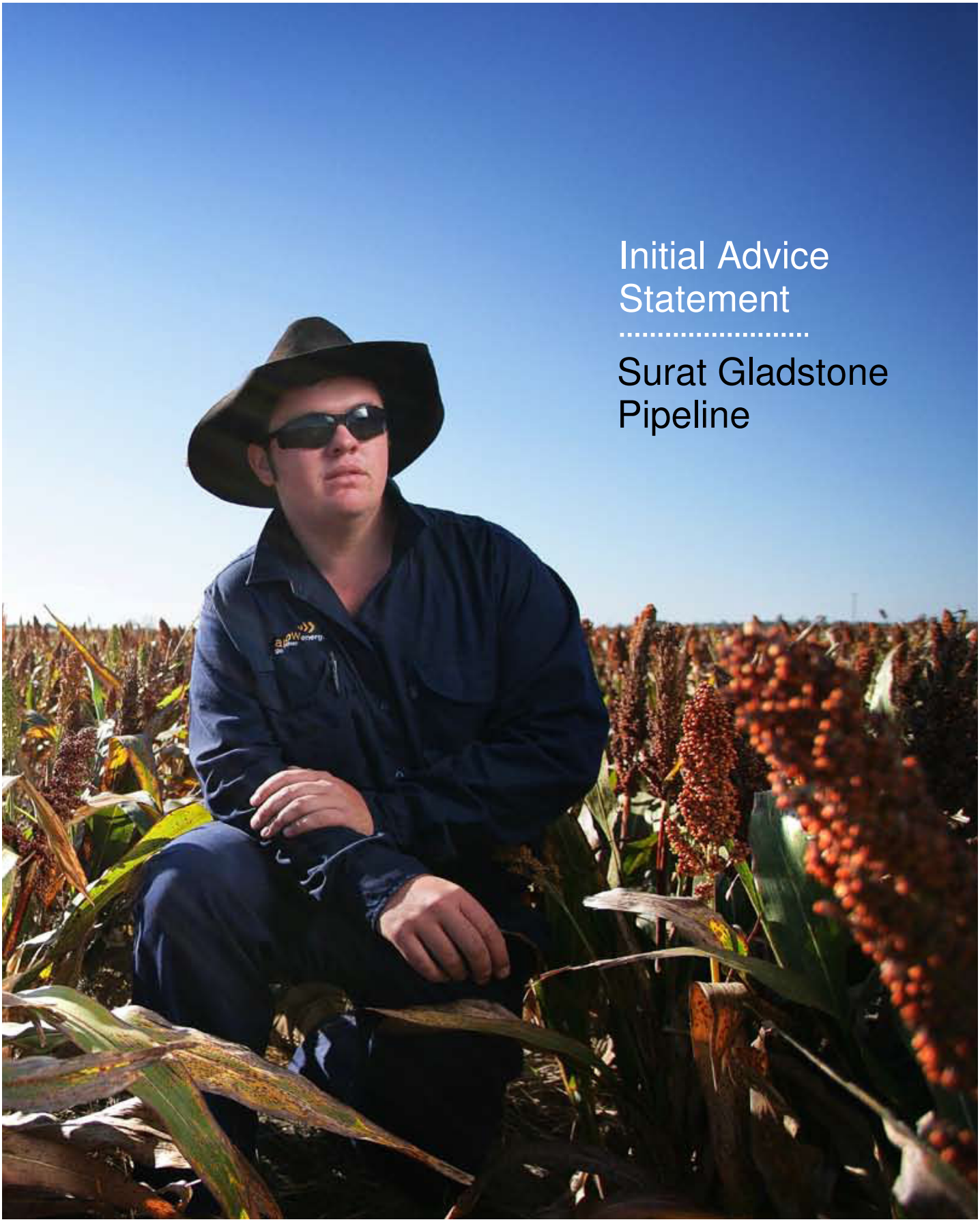
Initial Advice Statement

Surat Gladstone Pipeline



RPS

sgp

SURAT TO GLADSTONE PIPELINE

INITIAL ADVICE STATEMENT

Prepared by:

RPS Environment and Planning Pty Ltd

Suite 5, Level 4, Wickham House
155-157 Wickham Terrace
BRISBANE QLD 4000

T: 617 3236 9172
F: 617 3236 9173
E: admin04@rpsgroup.com.au
W: rpsgroup.com.au

Prepared for:

Surat Gladstone Pipeline Pty Ltd

Level 13
10 Eagle Street
BRISBANE QLD 4000

T: 617 3105 3400
F: 617 3105 3401
E: gleemanwar@arrowenergy.com.au
W: arrowenergy.com.au

Project No: EBO08838
Version/Date: Rev 0, December 2008

Document Status

Version	Purpose of Document	Orig	Review	Review Date	QA Review	RPS Release Approval	Issue Date
Draft A	Working File	LC	LR	14.11.08	GH	14.11.08	14.11.08
Draft B	Client comments captured	LC	LR	21.11.08	GH	24.11.08	24.11.08
Draft C	CH; Route, Client comments captured	LC	LR	26.11.08	AP	05.12.08	08.12.08
Rev 0	Issued to EPA	LC	LR	16.12.08	CR	18.12.08	19.12.08

Disclaimer

SUMMARY

Surat Gladstone Pipeline Pty Ltd (SGP), a wholly owned subsidiary of Arrow Energy (Arrow), is proposing to develop a pipeline that will deliver coal seam gas from Arrow's Surat Basin gas fields (from it's gas processing facility near Kogan) to a proposed Liquefied Natural Gas (LNG) facility located at Fisherman's Landing near Gladstone. The proposed pipeline will be approximately 470km long.

This Initial Advice Statement (IAS) has been prepared by RPS Environment and Planning Pty Ltd (RPS) to provide preliminary desktop information about the physical, ecological and social environment in relation to the proposed Surat to Gladstone Pipeline. The information is envisaged to be used by SGP and relevant Queensland government agencies to help determine if an Environmental Impact Statement (EIS) will be required under state legislation. This information will also be used to determine whether a referral will be made to the Department of Environment, Water, Heritage and the Arts (DEWHA) pursuant to the Federal *Environment and Biodiversity Conservation Act 1999* (EPBC Act).

SGP's planning of environmental, social and constructability constraints has assisted in the selection of a pipeline route that largely avoids sensitive areas, thereby reducing the potential environmental impacts in the planning stages of the project. Wherever possible, the route has avoided environmentally important areas such as state forests, essential habitat, and endangered and threatened ecosystems and communities. The presence of biodiversity corridors and connectivity have also been considered.

Particular attention has been placed on the avoidance of 'Endangered' and 'Of Concern' Regional Ecosystems (REs). At least 98.4% of the area to be cleared is classified as 'Non Remnant' and 'Not of Concern', with a maximum disturbance area of 'Endangered' vegetation calculated to be 0.03% compared to similar status vegetation occurring within a 10km buffer of the preferred alignment.

No internationally or nationally important wetlands will be impacted by the pipeline and the location of the creek crossings and construction methods proposed have been carefully selected to minimise impacts to both riparian vegetation and bank profiles at watercourse crossings.

Thirteen fauna species protected under the EPBC Act and / or the NCA are considered as highly likely to have preferred habitat along the pipeline route.

Certain areas where desktop information is lacking have been identified for further assessment and investigation prior to lodging applications for project approvals. Field assessments will ground-truth areas of interest identified during desktop searches and help determine the distribution, likely impacts and potential additional avoidance options for threatened species, ecological communities and essential habitat.

More detailed environmental assessment documentation will be progressively developed during the approval process to determine the significance of impacts and include the identification of necessary avoidance, mitigation and management strategies. These will be outlined in the Report to Accompany the Level 1 Environmental Authority for the pipeline.

Arrow has a proven track record of successfully implementing gas and associated infrastructure projects in the region. This is due to a strong focus on achieving sound environmental outcomes and maintaining close communication with the EPA throughout all project stages.

SGP is confident that the project can be implemented in a manner that minimises the risks of adverse environment and community impacts.

Considering the relatively few environmental and social sensitivities directly impacted by the project, and the proposed low impact construction approach, SGP believes that, subject to the proposed detailed ecological survey, cultural heritage assessment, transport study and pipeline safety management study, the environmental and cultural heritage impacts by the Surat to Gladstone Pipeline project can be effectively minimised and proactively managed. It is concluded that subject to these proposed detailed studies, a formal EIS is not required.

TABLE OF CONTENTS

Page

SUMMARY I

1.0 INTRODUCTION 1

1.1 PROPONENT 2

1.2 OBJECTIVES OF THE IAS 2

1.3 METHODOLOGY 2

1.4 STUDY AREA 3

1.4.1 LOCAL GOVERNMENT AREAS 3

1.4.2 GLADSTONE STATE DEVELOPMENT AREA 3

2.0 PROJECT DESCRIPTION 5

2.1 PROPOSED PROJECT OVERVIEW 5

2.2 JUSTIFICATION AND ALTERNATIVES 6

2.2.1 PROJECT NEED AND JUSTIFICATION 6

2.2.2 ALTERNATIVES 6

2.3 DESIGN AND ENGINEERING 11

2.4 CONSTRUCTION 12

2.4.1 DETAILED SURVEY 13

2.4.2 FENCING 13

2.4.3 CLEAR AND GRADE 13

2.4.4 TRENCHING 14

2.4.5 STRINGING 14

2.4.6 WELDING 15

2.4.7 NON-DESTRUCTIVE TESTING 15

2.4.8 JOINT COATING 16

2.4.9 LOWERING IN AND BACKFILLING 16

2.4.10 HYDROSTATIC PRESSURE TESTING 17

2.4.11 CLEAN UP, RESTORATION AND REHABILITATION 18

2.4.12 WATERCOURSE CROSSINGS 19

2.4.13 SIGNAGE 23

2.5 OPERATIONS 23

2.6 DECOMMISSIONING 25

2.7 WORKFORCE AND ACCOMMODATION 25

3.0 ROUTE DESCRIPTION 27

4.0 PHYSICAL ENVIRONMENT 46

4.1 CLIMATE 46

4.2 AIR QUALITY AND NOISE 46

4.2.1 AIR QUALITY 46

4.2.2 NOISE 47

4.3 GEOLOGY, SOILS, LANDFORM AND TERRAIN 48

4.3.1 GOOD QUALITY AGRICULTURAL LAND 48

4.4 WATER RESOURCES 49

4.4.1 SURFACE WATER 49

4.4.2 GROUNDWATER 50

5.0 ECOLOGICAL ENVIRONMENT 51

5.1 FLORA 51

5.1.1 REGIONAL ECOSYSTEMS 51

5.1.2 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES 52

5.1.3 ESSENTIAL HABITAT 53

5.1.4 WEEDS 55

5.2 FAUNA 56

5.2.1 THREATENED SPECIES 56

5.2.2 INTRODUCED SPECIES 57

6.0 SOCIAL ENVIRONMENT 58

6.1 POPULATION CENTRES AND NEARBY RESIDENCES 58

6.2 NATIVE TITLE 58

6.3 ABORIGINAL CULTURAL HERITAGE 61

6.4 HISTORIC HERITAGE 62

6.5 COMMONWEALTH REGISTERS 62

6.6 LAND TENURE AND USE 63

6.6.1 AGRICULTURE AND GRAZING 63

6.6.2 OIL, GAS AND MINERAL EXPLORATION AND OPERATIONS 63

6.6.3 TOURISM 64

6.6.4 CONSERVATION 65

6.7 INFRASTRUCTURE 66

7.0 ENVIRONMENTALLY SENSITIVE AREAS 68

8.0 POTENTIAL IMPACTS AND PROPOSED MITIGATION 71

8.1 AIR QUALITY AND NOISE 71

8.1.1 AIR QUALITY 71

8.1.2 NOISE 72

8.2 WASTES 72

8.3 SOIL MANAGEMENT 73

8.3.1 EROSION AND SEDIMENT CONTROL 73

8.3.2 SPILL PREVENTION AND HYDROTEST MANAGEMENT 73

8.4 WATER RESOURCES 74

8.4.1 SURFACE WATER 74

8.4.2 GROUNDWATER 74

8.5 FLORA AND FAUNA 75

8.5.1 HABITAT FRAGMENTATION AND LOSS 75

8.5.2 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES 76

8.5.3 WEEDS 77

8.6 LAND USE AND SOCIOECONOMIC IMPACTS 77

8.7 HERITAGE 79

8.7.1 EUROPEAN HERITAGE 79

8.7.2 ABORIGINAL CULTURAL HERITAGE 79

9.0 AREAS FOR FURTHER INVESTIGATION 80

10.0 ENVIRONMENTAL MANAGEMENT SYSTEM 81

11.0 REGULATORY PROCESS AND APPROVAL STRATEGY 82

11.1 COMMONWEALTH APPROVALS 82

11.1.1 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 82

11.1.2 NATIVE TITLE ACT 1993 83

11.2 QUEENSLAND STATE GOVERNMENT APPROVALS 83

11.2.1 PETROLEUM AND GAS (PRODUCTION AND SAFETY) ACT 2004 83

11.2.2 ENVIRONMENTAL PROTECTION ACT 1994 AND REGULATION 1998 84
11.2.3 ABORIGINAL CULTURAL HERITAGE ACT 2003 85
11.2.4 HERITAGE ACT 1992 86

11.3 SUBSEQUENT APPROVALS 86

12.0 CONCLUSION 87

13.0 REFERENCES 88

14.0 ABBREVIATIONS 90

TABLES

Page

Table 1: Ambient Noise Levels at Daandine Station, Kogan 47

Table 2: Summary of Regional Ecosystems Identified along the Preferred Pipeline Route 52

Table 3: Declared Weeds Identified Along the Preferred Pipeline Route 55

Table 4: Summary of Threatened Fauna Species Identified Within 10 km of the Pipeline 56

Table 5: Summary of Introduced Fauna Species 57

Table 6: Native Title claims (currently registered or registered as of April 2004) who constitute Aboriginal Parties for the preferred pipeline alignment 59

Table 7: Intersected Pipelines and Petroleum Leases along the Preferred Pipeline 64

Table 8: Road & Railway Crossings on the Pipeline Route 67

Table 9: Environmentally Sensitive Areas 68

Table 10: Assessment of EP Act Triggers for an EIS 84

Table 11: Potential Environmentally Relevant Activities 85

FIGURES

Page

Figure 1: General Locality, Key Towns and LGA Overlay of Preferred Route 4

Figure 2: All Proposed Routes for the Surat to Gladstone Pipeline prior to refinement and selection of the preferred route 8

Figure 3: Typical Corridor Layout for Pipeline Construction Source: APIA 2005 12

Figure 4: Ambient Noise Levels at Daandine Station, Kogan 47

Figure 5: Native Title Claims 60

Figure 6: Environmental Constraints (1 of 2) 69

Figure 7: Environmental Constraints (2 of 2) 70

PLATES

Page

Plate 1: Typical ROW 12

Plate 2 and Plate 3: Typical clearing of the ROW and avoidance of sensitive vegetation 13

Plate 4: Trenching machine in operation 14

Plate 5 and Plate 6: Pipeline stringing 15

Plate 7 and Plate 8: Pipeline welding 15

Plate 9: Non Destructive Testing being conducted 16

Plate 10: Coating and wrapping of the weld joint 16

Plate 11: Padding machine in operation – spoil is sieved to produce a “fine” substrate used as padding material around the pipeline 17

Plate 12 and Plate 13: Pipe lowering into trench and spoil backfilled over the laid pipe 17

Plate 14 and Plate 15: Hydrostatic Testing in progress 18

Plate 16, Plate 17, Plate 18 and Plate 19: Rehabilitation of ROW across a road and through rural areas 19

Plate 20, Plate 21, Plate 22, Plate 23 and Plate 24: Rehabilitation of ROW across a road and through rural areas 21

Plate 25: Horizontal directional drill under a watercourse 22

Plate 26 and Plate 27: Thrust bore 23

Plate 28: Typical enclosure around a valve on a rural property 23

Plate 29: Kogan North Central Gas Processing Facility 27

Plate 30 and Plate 31: Back Creek 27

Plate 32: Roma to Brisbane Gas Pipeline easement through Wambo cattle property 28

Plate 33 and Plate 34: Braemar Creek 28

Plate 35: Kogan Creek at KP23 29

Plate 36: North Kogan Road 29

Plate 37: Intersection of Kogan Road and Sixteen Mile Hall Road 30

Plate 38: Cleared cropping land along Kogan Road 30

Plate 39: Cattle feedlot near KP42 30

Plate 40: Cropping land between KP52 to KP89 31
Plate 41: Condamine River 31
Plate 42: Warrego Highway 32
Plate 43: Barakula State Forest 32
Plate 44: Rocky Creek 33
Plate 45: Farm dams at KP131 33
Plate 46: Clear grazing land near KP132 33
Plate 47: Some open patches of Brigalow between KP157.4 and 167 34
Plate 48: Grazing land near KP185 34
Plate 49: Scattered Brigalow remnants near KP210 35
Plate 50 and Plate 51: Track following the boundary to the Rockybar State Forest 35
Plate 52: Open grazing land north of Rockybar State Forest near KP238 36
Plate 53: 'Not of Concern' ironbark, bloodwood and poplar box woodland north of Rockybar State Forest – the route follows the cleared fence line. 36
Plate 54: Crossing of the Eidsvold – Theodore Road near KP247 36
Plate 55: Ironbark woodland near KP250 37
Plate 56: Defence Road 37
Plate 57: 'Endangered' ironbark and poplar box woodland south of KP280 is avoided 38
Plate 58: Rawbelle Road at KP307 38
Plate 59: Pump Creek (dry) 39
Plate 60: Thangool - Lookerbie Road crossing 39
Plate 61: Typical dry watercourse near KP351 39
Plate 62: Mt Scoria Conservation Park 40
Plate 63: Rocky slope at KP388 41
Plate 64: SWER line 41
Plate 65: HV power line 41
Plate 66: Callide Creek 41
Plate 67: Essential habitat adjacent to Coal Road 42

Plate 68: Dawson Highway 43
Plate 69: Existing Queensland Gas Pipeline easement 43
Plate 70: Gladstone State Development Infrastructure Corridor 44
Plate 71 and Plate 72: Fisherman's Landing 45

APPENDICES

APPENDIX 1: SUPPORTING TABLES

APPENDIX 2: SUPPORTING FIGURES

APPENDIX 3: CULTURAL HERITAGE

APPENDIX 4: ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX 5: DCDB MAP SERIES

APPENDIX 6: PIPELINE ROUTE MAP SERIES

1.0 INTRODUCTION

Arrow Energy (Arrow) is listed on the Australian Stock Exchange in August 2000 and has a current market capitalisation of more than $2.5 billion. Arrow is now one of Australia's top 100 publicly-listed companies.

Arrow has equity interest in more than 90,000km^2 of coal seam gas exploration tenements close to Queensland's three key markets – Townsville, Gladstone, and Brisbane. To date, only five percent of this land has been explored. As Australia's largest coal seam gas acreage holder, the company is now driving growth by investing in downstream projects, export Liquefied Natural Gas (LNG) opportunities and international markets to secure higher margin sales.

Surat Gladstone Pipeline Pty Ltd (SGP), a wholly owned subsidiary of Arrow, is proposing to develop a gas pipeline from the Kogan North Central Gas Processing Facility (near Dalby) to deliver coal seam gas from Arrow's Surat Basin gas fields (near Kogan) to their proposed LNG facility to be located at Fisherman's Landing, Gladstone, over a distance of approximately 470km.

This Initial Advice Statement (IAS) has been prepared by RPS Environment and Planning Pty Ltd (RPS) to provide an overview of the physical, ecological and social environment in relation to the proposed Surat to Gladstone Pipeline. The information will be used by SGP and relevant Queensland government agencies to assess the impact of the proposed project, pursuant to the *Environment Protection Act 1994,* and determine if an Environmental Impact Statement (EIS) will be required under state legislation.

This IAS will also assist in identifying potential impacts of the project that will require further investigation prior to the project being granted appropriate approvals. As part of this process, more detailed environmental assessment documentation will be progressively developed, with necessary mitigation and management strategies identified and proposed.

1.1 PROPONENT

Surat Gladstone Pipeline Pty Ltd (ACN 133 104 855) (SGP) is the proponent for this project and is a wholly owned subsidiary of Arrow Energy.

All activities associated with the proposed pipeline (from regulatory approvals, stakeholder liaison, detailed engineering and specialist studies through to construction and maintenance), will be carried out by specialist contractors under SGP's direct supervision.

1.2 OBJECTIVES OF THE IAS

The IAS provides background information and historical details regarding the proposed Surat to Gladstone Pipeline project, including an outline of environmental and social impacts associated with construction and operation phases of the project, and provides recommended mitigation measures.

The objectives of this IAS are to:

- Provide an overview of the potential physical, ecological and social impacts (nature and extent) associated with the proposed project;
- Document the route selection process with the least ecological impact within financial, cultural heritage, landholder and engineering constraints;
- Develop recommendations to avoid, mitigate or offset potential impacts; and
- Provide advice for further detailed field investigations to clarify the potential impacts.

1.3 METHODOLOGY

A desktop assessment of the proposed project area has been undertaken to characterise the existing environment and identify associated sensitivities. This assessment included:

- Interrogation of government databases, including the Environmental Protection Agency's (EPA) Wildlife Online Database (incorporating the EPA's Wildnet database and the Queensland Herbarium HERBRECS database), the EPA's Environmentally Sensitive Area (ESA) Mapping tool, and the Environmental Protection and Biodiversity Conservation (EPBC) Protected Matters online search tool;
- Geographic Information System (GIS) mapping of land tenure, physical, natural, social and cultural environments;
- A review of land information websites, including Google Earth, the Bureau of Meteorology (BoM) and resource plans for the project region; and
- A review of local government websites, planning schemes and tourism websites.

Both the area intersected by the pipeline and general surrounding region were assessed through the desktop study to characterise the existing physical, ecological and social environments at a high level. This analysis included the identification of sensitive receptors and ecological values within 10km of the centreline of the preferred pipeline route and its current options.

No field studies have been conducted for the purposes of this IAS however, detailed specialist ecological studies (including flora and fauna assessments) will be undertaken as part of the project approvals process to verify the project environment (i.e. to ground truth desktop findings), assess potential impacts and develop mitigation measures.

1.4 STUDY AREA

1.4.1 LOCAL GOVERNMENT AREAS

The study area for the preferred route alignment of the pipeline, illustrated on Figure 1, includes the following Local Government Areas (LGA):

- Dalby Regional;
- Banana Shire;
- Gladstone Regional, including the Gladstone State Development Area; and
- North Burnett Regional.

1.4.2 GLADSTONE STATE DEVELOPMENT AREA

The Gladstone State Development Area (GSDA) includes land in the Gladstone region suitable for future large-scale industrial development. Land was included on the basis that it conformed to acceptable engineering, environment and social criteria, as identified in the Gladstone Industrial Land Use Study. This development scheme, supported by a number of policies formulated and administered by the Coordinator-General, is a land use planning instrument for the purpose of guiding future development in the GSDA (DIP 2008). A Common Infrastructure Corridor links the Fisherman's Landing facility to the GSDA and will be the location of the last 4km of the pipeline.

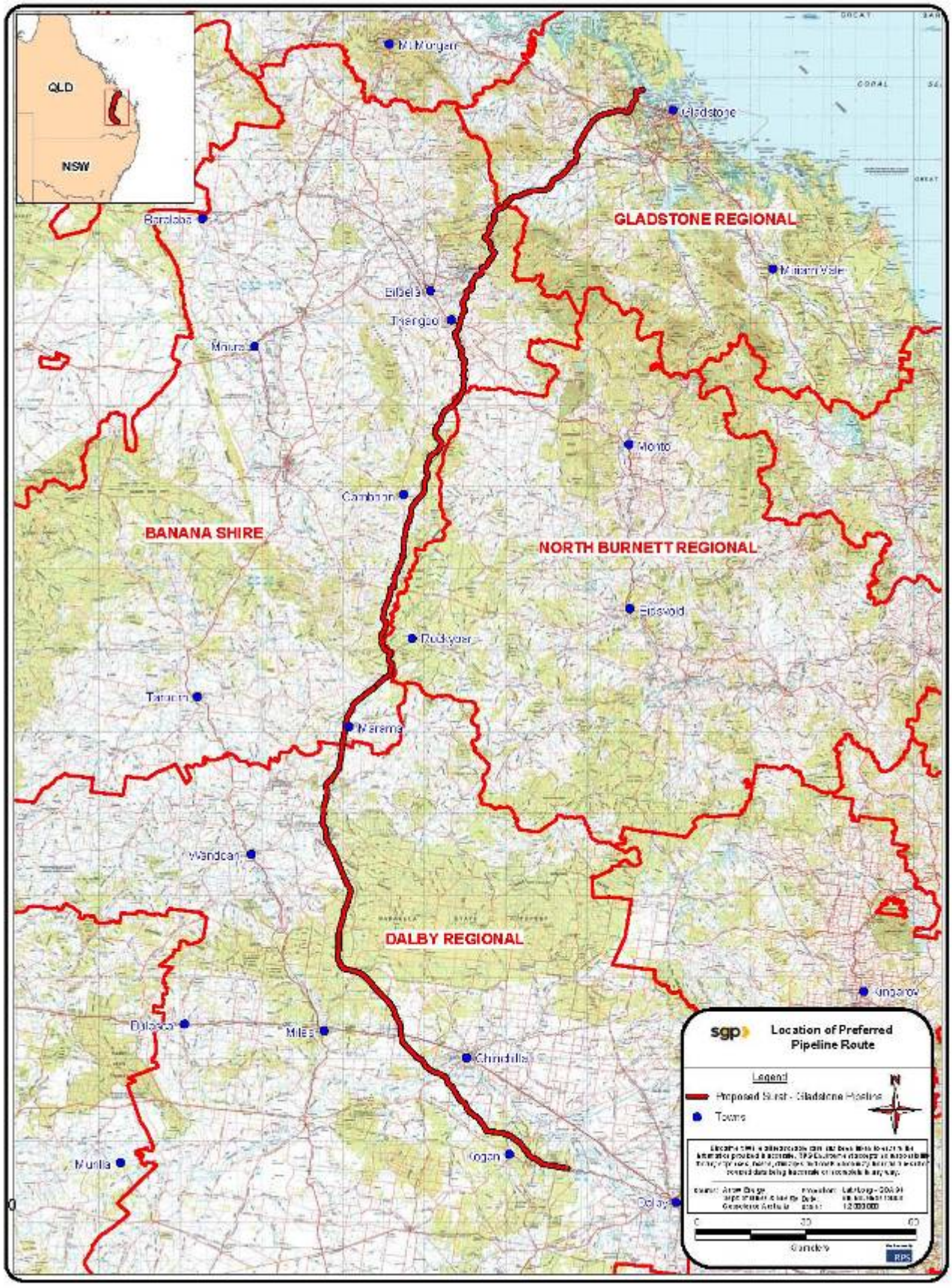


Figure 1: General Locality, Key Towns and LGA Overlay of Preferred Route

2.0 PROJECT DESCRIPTION

2.1 PROPOSED PROJECT OVERVIEW

The proposed 470km long, 600mm nominal diameter high pressure buried steel gas pipeline will deliver coal seam gas (CSG) from Arrow's Surat Basin gas fields to a proposed LNG plant located at Fisherman's Landing in Gladstone.

The LNG plant is proposed by Liquefied Natural Gas Limited (LNG Ltd) with an estimated construction cost of US$400M. The initial single train plant is to be built on reclaimed land at Fisherman's Landing and will be capable of producing 1.5mtpa for first shipment in 2012, with plans for a second 1.5mtpa train for 2013. A separate approval application, including an EIS and referral to the Commonwealth under the EPBC Act, is currently in progress for the LNG Plant by LNG Ltd. LNG Ltd and Arrow Energy are in the process of finalising a gas sales agreement for supply of gas (via the proposed pipeline) to the LNG plant.

The pipeline will have a minimum technical design life of 40 years, however with ongoing integrity management the operational life is expected to be in excess of this figure.

The last 70km of the pipeline route is proposed to follow the existing Alinta natural gas pipeline from Callide to Gladstone, with the final 4km located within the Gladstone Area Regional Development Infrastructure Corridor. The pipeline will be designed and constructed in accordance with AS2885 and, as such, will be buried with a minimum depth of cover of 750mm. The final depth of cover will vary along the route and will be determined by the outcomes of the AS 2885 Safety Management Study. At key infrastructure and watercourse crossings the minimum depth of cover will be increased to at least 1200mm.

2.2 JUSTIFICATION AND ALTERNATIVES

2.2.1 PROJECT NEED AND JUSTIFICATION

The proposed pipeline will connect Arrow's gas reserves in the Surat Basin to markets in Gladstone.

The project will link significant gas reserves to international markets. This will ultimately:

- Assist in delivering competitively priced gas from Queensland's coal seam gas fields to the LNG Limited LNG plant at Fisherman's Landing at Gladstone;
- Assist in reducing Australia's overall dependence on energy derived from greenhouse-intensive fossil fuels by using clean and efficient natural gas; and
- Provide the opportunity for future gas-powered developments and gas-fired power generation growth both locally and internationally.

2.2.2 ALTERNATIVES

There are a range of potential alternatives to the proposed project and selection options occur at a number of levels. For example, the following alternatives have been considered:

- Not developing the project;
- Pipeline route options;
- Project design, construction techniques and environmental impact mitigation measures; and
- Using alternative pipelines.

<u>The "No Project" Alternative</u>

Without the pipeline, several anticipated benefits would not be achieved:

- Increased competition in the gas supply market would not be achieved;
- Potential future international markets for coal seam gas would not be reached; and
- The direct economic benefit from construction expenditure and the longer term benefits from the pipeline operation would be lost.

<u>Route Alternatives</u>

The objective of the SGP project is to cost effectively deliver gas from CSG reserves owned by Arrow in the Surat Basin to markets in Gladstone.

To deliver on this objective, the proposed pipeline must be:

- Located in a pipeline corridor that allows cost effective construction while facilitating rapid and uncomplicated project approvals;
- Optimally configured to efficiently accommodate current capacity requirements while allowing for cost-effective expansion to meet future capacity requirements; and

- Designed and constructed in compliance with all relevant standards while achieving capital and operating cost efficiencies through innovation in design and construction.

SGP examined and considered a number of alternative pipeline route options from Kogan to Gladstone prior to adopting a preferred route. The preferred route has been assessed on the basis of cost, schedule, social and environmental risk and proximity to CSG resources. It will be further refined based on the findings of specialist field assessments, including ecological surveys.

Three primary routes have been examined, these being a western route, central route and an eastern route. A number of configurations of these three route themes can be seen on the attached map (refer Figure 2).

Each route traverses from the Kogan area in a generally northerly direction, skirting to the west of, or through (via gazetted roads), the Barakula State Forest to the north of Chinchilla. All routes converge to the west of Gladstone near Callide, traversing generally east paralleling the Queensland Gas Pipeline into Gladstone. The last 4km of the route are located within the Gladstone Area Regional Development Infrastructure Corridor.

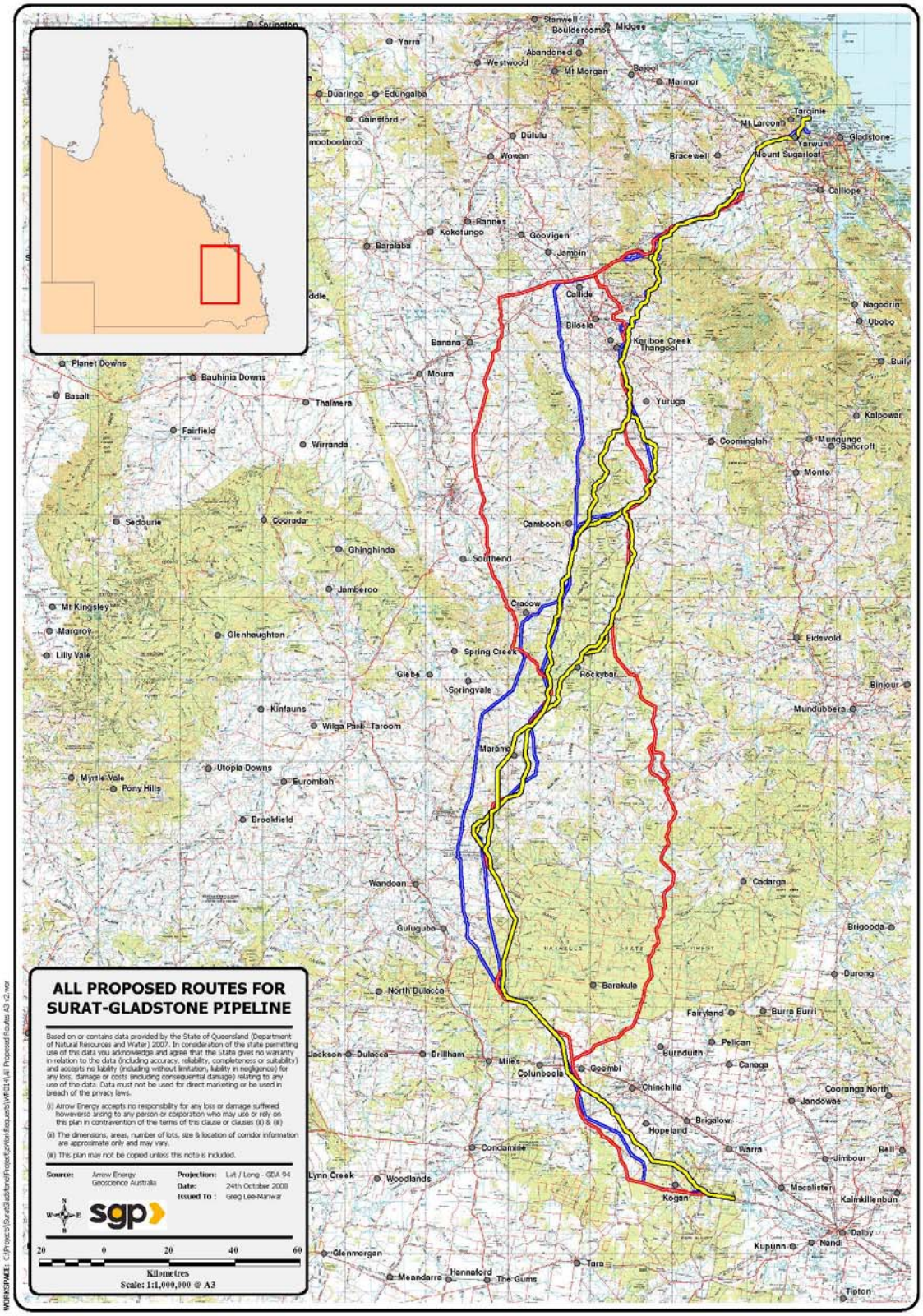


Figure 2: All Proposed Routes for the Surat to Gladstone Pipeline prior to refinement and selection of the preferred route

The pipeline route selection and evaluation methodology considered the following:

- Identification and assessment of the above baseline routes;
- Identification and assessment of potentially affected parties (stakeholders); i.e. land owners / holders, mining and exploration lessees, known and potential heritage and native title sites;
- Identification and assessment of environmental constraints;
- Identification and assessment of European and Cultural Heritage constraints;
- Identification and assessment of land use, tenure and access constraints;
- Identification and assessment of Native Title impacts;
- Identification of major crossings such as roads, railways, watercourses and other buried services;
- Identification and assessment of technical considerations for design, construction and operation;
- Assessment of identified constraints for impact on approvals schedule for each corridor;
- Assessment of Project impact on any identified constraints and route adjustment if warranted; and
- Assessment and comparison of options identified and prioritisation of a preferred route corridor.

The criteria utilised in selecting the preferred pipeline route were:

- Land:
  - Minimise community disturbance;
  - Minimise conflict with mining and petroleum tenements;
  - Minimise interruption to land use;
  - Minimise disturbance to third party infrastructure;
  - Utilise existing usable easements / reserves where practical; and
  - Rationalise the number of tenure negotiations.
- Environment:
  - Avoid protected areas and areas of high ecological value;
  - Minimise disturbance to remnant vegetation;
  - Minimise disturbance to sensitive or unstable landforms;
  - Minimise disturbance to RAMSAR wetlands and State Forests;
  - Utilise previously disturbed areas or corridors where practical; and
  - Minimise regulatory approval timeframes.

- Cultural Heritage and Native Title:
  - Undertake negotiations with registered claimants;
  - Avoid areas of Cultural Heritage significance;
  - Minimise disturbance to Cultural Heritage values; and
  - Minimise disturbance to land subject to Native Title.
- Technical:
  - Optimise pipeline length;
  - Minimise specialised construction activities;
  - Minimise extent of specialised materials / protective measures;
  - Maximise ease of access for construction and operations;
  - Minimise operational / maintenance costs; and
  - Maximise safety to residents and the general public.

The western route option is in the vicinity of the proposed Surat Basin Rail Corridor to Wandoan. However, this option adds approximately an extra 30km to the pipeline route and will result in an increase of approximately AU$40M to the project cost. The eastern option is of a similar length to the centre option, however it traverses a considerable portion of the Barakula State Forest – albeit within or along gazetted roads. Accordingly, environmental and Native Title constraints rated higher for the eastern route option. On this basis, the central route is considered to be the preferred route option.

The above constraints were carefully scrutinised using GIS with avoidance rather than mitigation being the general principle. Further refinement of the preferred route option was made following a helicopter reconnaissance undertaken in October 2008. The preferred central route provides the basis for assessment for this IAS and is described in greater detail in Section 3.0.

The adoption of these criteria has resulted in a proposed project route that minimises environmental and community disruption, while allowing cost-effective construction.

Design and Construction Alternatives

The basic design concepts for a high pressure natural gas pipeline are reasonably fixed and few alternatives that would lead to a different level of environmental impact exist.

A number of alternatives that may affect the environmental outcome exist during the construction phase. For example, although undesirable from a construction viewpoint, the option of narrowing the construction Right of Way (ROW) can be feasible for very short sections and can allow impacts to significant features (such as large trees or areas of essential habitat or endangered ecosystems) to be minimised or avoided. General management and mitigation measures for potential impacts of the project are presented in Section 8.0 of this IAS.

Using Other Pipelines

There are no other existing pipelines that transport gas from the Surat Basin to Gladstone. While a number of other pipelines are currently proposed in a similar area, none are anticipated to be completed in line with SGP's commissioning schedule. SGP are currently in confidential discussions with various companies and the Department of Infrastructure and Planning (DIP) regarding using common infrastructure corridors, where possible, to reduce the overall footprint of pipeline construction activities and proposed CSG expansion in Queensland. At this stage, an economic, timely and flexible solution is not able to be confirmed.

2.3 DESIGN AND ENGINEERING

The proposed pipeline will be typical of a modern, medium diameter gas transmission pipeline that will be designed, constructed and operated in accordance with the Australian Standard series AS 2885 Pipelines – Gas and Liquid Petroleum, particularly:

- AS 2885.1 Part 1 – Design and Construction;
- AS 2885.2 Part 2 – Welding;
- AS 2885.3 Part 3 – Operations and Maintenance; and
- AS 2885.5 Part 5 – Field Pressure Testing.

Final design parameters are yet to be determined, but will most likely feature:

- A buried, high pressure, steel, natural gas pipeline, with a nominal diameter of 600mm;
- A connection to the Kogan North Central Gas Processing Facility, near Dalby;
- Above ground facilities at intervals along the pipeline including mainline valves, cathodic protection systems and marker signs; and
- A connection to a proposed LNG facility to be constructed near Fisherman's Landing, Gladstone.

All materials and workmanship shall be in accordance with the applicable codes and standards referenced in Appendix A of AS 2885.1. In addition, the design shall comply with the specific requirements of:

- The *Queensland Petroleum and Gas (Production and Safety) Act 2004* (P&G Act); and
- Petroleum Pipeline Licence (PPL) to be issued by the Department of Mines and Energy (DME).

The following risk studies will also be conducted by SGP as part of the design process:

- A Pipeline Safety Management Study in accordance with AS 2885.1. This includes developing a fracture control plan; and
- A Hazard and Operability (HAZOP) Study.

2.4 CONSTRUCTION

Construction will require a right-of-way (ROW) with a width of 30m for clear and grade, trenching and spoil placement, stringing, pipeline welding and laying as illustrated in Figure 3 and Plate 1. A narrower construction width may be considered for sensitive watercourse crossings and sensitive ecosystems where rare / endangered or 'Of Concern' vegetation is encountered. As part of construction, the pipeline trench will be backfilled and restored, typically within three months of clear and grade.

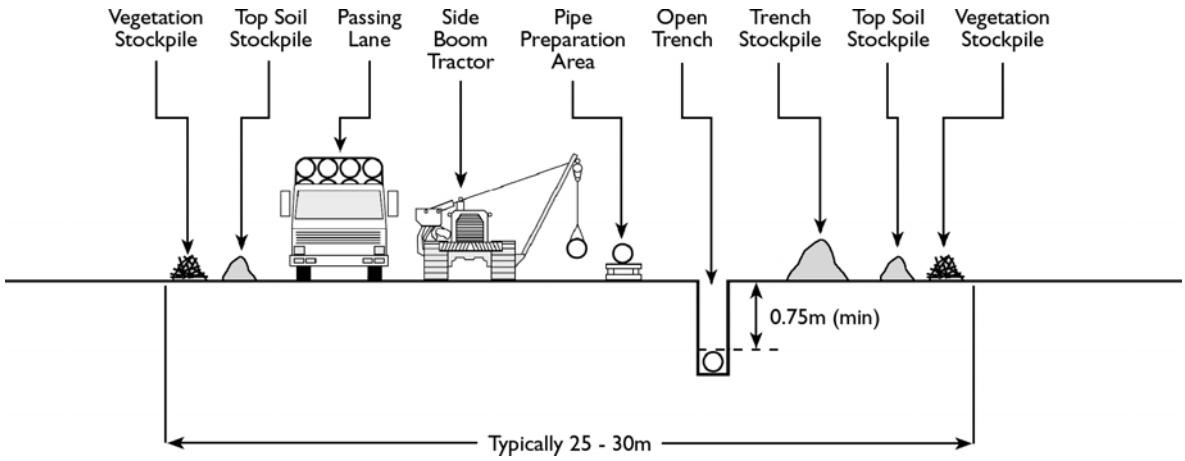


Figure 3: Typical Corridor Layout for Pipeline Construction Source: APIA 2005

On completion of construction, a 15m easement width will be established over the pipeline. This may be reduced at sensitive watercourse crossings and sensitive ecosystems as described above. Above-ground structures will include valve, scraper and meter stations. Typically, these facilities may be located within the 15m wide easement and will be fenced. Pipeline markers will be provided at fences, roads crossings and other locations as required by the pipeline code (AS 2885).

Plate 1: Typical ROW

Proposed construction steps are further described below.

2.4.1 DETAILED SURVEY

The pipe centreline will be surveyed and pegged after detailed geotechnical, engineering, ecological and cultural heritage surveys are completed. Markers will be placed along the entire route to identify the pipeline centreline, ROW and any additional work spaces. Vegetation boundaries will be well defined. Trees to be retained, areas of reduced ROW and any transected Regional Ecosystems (RE) will be flagged. Areas outside the ROW used for extra workspace, truck turnarounds or lay-down areas will be subject to appropriate heritage and environmental assessment and landholder approval.

2.4.2 FENCING

Fences are severed and gates installed where fences are required to be breached prior to clearing of the surveyed ROW for construction access.

2.4.3 CLEAR AND GRADE

Clear and grade (as illustrated in Plate 2 and Plate 3) will be carried out to provide a safe construction ROW for vehicular movement, trenching and other construction activities. A width of 30m will generally be required to enable construction to be safely and efficiently carried out. The ROW may be reduced in width for limited distances through sensitive areas. This is only viable for any significant distance if an existing clearing / track parallels the easement and can be used as part of the construction ROW. The ROW will be cleared of vegetation (although root stock will be left in the ground where practicable to stabilise the area and reduce erosion potential). In scrubby areas, some vegetation will be stockpiled for respreading as part of the restoration process. Breaks will be left in stockpiled vegetation to allow continued access to stock, fence lines, tracks, and drainage lines. Large mature trees will be preserved where practicable. Topsoil will be removed (typically to a depth of 100-150mm) and stockpiled separately for reuse during rehabilitation. The ROW will be levelled to the required gradient using graders, backhoes and bulldozers.

Plate 2 and Plate 3: Typical clearing of the ROW and avoidance of sensitive vegetation

2.4.4 TRENCHING

A wheel trencher, rocksaw or excavator or a combination of the above will be used to excavate the trench as illustrated in Plate 4. The distance covered per day will be dependent on terrain and weather conditions, but typically on projects of this nature, a production rate of 3-5km/day is anticipated.

The depth of the trench is determined by a risk assessment conducted in accordance with AS 2885.1, with the minimum depth of cover being 750mm and 1,200mm for creek and infrastructure crossings. Trench spoil is stockpiled separately to topsoil on the non-working side of the ROW.

Breaks in the trench will be left to facilitate stock and wildlife crossing, agricultural vehicle movements and at drainage lines. In addition, methods will be adopted to minimise fauna entrapment and mortality (e.g. trench breakers, ramped ends of trench, safe havens). These methods will ensure that fauna egress points in the trench will be no more than 750m apart.

Plate 4: Trenching machine in operation

2.4.5 STRINGING

Stringing (illustrated in Plate 5 and Plate 6) is the term used to describe the laying out of the pipe in preparation for welding. Pipe will generally be transported to site on trucks in 18m lengths. The pipe will be laid out adjacent to the trench and held off the ground on skids and sandbags that protect the pipe coating from damage.

Where required, pipe lengths are bent to match changes in either elevation or direction of the route using a hydraulic bending machine.


Plate 5 and Plate 6: Pipeline stringing

2.4.6 WELDING

Once the pipe is strung, a line-up crew will position the pipe using side boom tractors and internal line-up clamps.

Specialised construction crews undertake the welding phase of the project (illustrated in Plate 7 and Plate 8) in accordance with AS 2885.2. Pipes are typically welded into strings of up to one kilometre in length allowing for stock and landholder access breaks where necessary.


Plate 7 and Plate 8: Pipeline welding

2.4.7 NON-DESTRUCTIVE TESTING

Each weld is subjected to a 100% Non-Destructive Testing inspection (X-ray analysis or ultrasonic testing) in accordance with AS 2885.2 to check for compliance to specification, thus ensuring the integrity of each weld. This is illustrated in Plate 9.

Plate 9: Non Destructive Testing being conducted

2.4.8 JOINT COATING

Following welding, the weld joints will be cleaned by abrasive grit blasting and an external coating (compatible with the factory applied external coating) will be applied to prevent corrosion as illustrated in Plate 10.

Plate 10: Coating and wrapping of the weld joint

2.4.9 LOWERING IN AND BACKFILLING

The trench is prepared as necessary by placing padding in the bottom to protect the pipe coating from abrasion damage. Padding machines are generally used to generate this padding by sifting the excavated trench spoil to remove coarse materials, as illustrated in Plate 11. In some instances (e.g. very rocky areas) imported sand may be used. Extraction sites, if required, will be located close to the pipeline and subject to appropriate permits and landholder approval. Excavation sites will not be located in ESAs and vegetation clearing will be avoided to the greatest extent possible. Following excavation, the affected areas will be re-profiled and any cleared vegetation re-spread to encourage natural regeneration.

The pipe coating will be inspected and tested for defects and then lifted off the skids and lowered into the trench using side-boom tractors, as illustrated in Plate 12 and Plate 13.

Where required, impermeable trench blocks (known as trench or sack breakers) will be installed prior to backfilling of the trench to control water movement along the backfilled

trench. Trench breakers are commonly installed in a number of environmental conditions, such as adjacent to watercourses, on steep slopes or where drainage patterns change. The trench will then be backfilled with screened trench spoil, and compacted.

Plate 11: Padding machine in operation – spoil is sieved to produce a "fine" substrate used as padding material around the pipeline

Plate 12 and Plate 13: Pipe lowering into trench and spoil backfilled over the laid pipe

2.4.10 HYDROSTATIC PRESSURE TESTING

All pipe sections will be subject to a hydrostatic pressure test (as shown in Plate 14 and Plate 15). Sections of the pipe will be capped with test manifolds, filled with water and pressurised up to 125% of the maximum allowable operating pressure (MAOP) for a minimum of 4 hours. A 24 hour leak test will then follow. The methodology for hydrostatic testing will depend upon water availability, but may include transferring water from one section of the pipeline to another to minimise the overall volume of water required. The pipeline will be fully lined and hence the use of potable water can be considered without the addition of corrosion inhibiting chemicals (e.g. biocides and/or oxygen scavengers).

Hydrostatic testing procedures, including water sourcing and disposal, will be determined during the detailed design and construction phase. Water is normally sourced from existing sources in the area such as property dams. Where required, approvals will be obtained from the Department of Natural Resources and Water (DNRW) and/or the owner of the water. Source and disposal options will be explored to maximise efficiency of testing, timing of construction and commissioning as well as environmental good practice. Beneficial reuse of CSG associated water may also be considered at this time.

Plate 14 and Plate 15: Hydrostatic Testing in progress

2.4.11 CLEAN UP, RESTORATION AND REHABILITATION

Clean up, restoration and rehabilitation measures will be applied to all areas disturbed during construction, including the ROW, access tracks and camp sites, as soon as practical after pipe laying and backfill. Generally, clean up and rehabilitation will involve removal of foreign material (construction material and waste), surface contouring, re-spreading topsoil, respreading vegetation and reseeding / revegetation (typically with native grass or improved pasture species).

Generally the landscape will be rehabilitated to pre-existing contours with natural drainage lines restored and protected (if required). In certain cases, rehabilitation is tailored to site-specific conditions in consultation with the landholder. To promote vegetation regrowth and protect against the loss of topsoil, the ROW surface will normally be lightly scarified prior to respreading of topsoil.

Rehabilitation, as illustrated in Plate 16 to Plate 19, will be undertaken in accordance with industry practice and will ensure that:

- Topsoil cover is re-established and all land and waterways disturbed by project activities are returned to a stable condition as soon as possible after construction;
- Land is returned as close as possible to its previous productivity;
- Stable landforms are re-established to original topographic contours;
- Natural drainage patterns are reinstated;

- Erosion control measures (e.g. contour banks, filter strips) are installed in erosion prone areas; and
- The pre-construction environment is reinstated and disturbed habitats recreated.

Plate 16, Plate 17, Plate 18 and Plate 19: Rehabilitation of ROW across a road and through rural areas

2.4.12 WATERCOURSE CROSSINGS

Watercourse crossings will be constructed to facilitate pipe laying and the movement of construction equipment across watercourses. To minimise the period of construction and subsequent environmental disturbance, watercourse crossings will be completed within the shortest period practicable.

Common pipeline construction methods available for the crossing of watercourses include:

- Open cut trenching (including flow diversion if applicable); and
- Horizontal Directional Drilling (HDD).

These techniques are further discussed below.

Standard Open Cut / Flow Diversion

The majority of watercourse crossings are expected to be constructed using standard open cut (trenching) construction as illustrated in Plate 20 to Plate 24. This technique is most suited to dry or low flow conditions. The standard open cut method involves establishing a stable working platform either side of the watercourse and creating a trench using excavators. Tie-in points will be located on high ground well away from any water flow. Watercourse bed and bank material and trench spoil will be stockpiled separately.

Trench spoil removed from the watercourse is placed on the ROW above the bank. Trench and backfill activities will be undertaken so as to ensure that bed and bank material is stockpiled separately and will be returned to the trench in the order and depth equivalent to original conditions.

The pipe will be concrete coated for water crossings and areas of significant inundation (as identified by risk assessment in compliance with AS 2885.1) to protect the external coating and reduce buoyancy.

Welded pipe is laid in the trench and spoil material is returned to the trench. Where required, rock protection over the trench line will be installed in the stream bed to prevent potential scouring during flood conditions.

Banks are reinstated as near as practicable to their original profile. Where required, geo-fabric (for example, jute matting), which remains permeable to water and enhances plant growth, is used to hold soil in place during re-establishment.

Vegetation is then reinstated, usually involving initial seeding with sterile grasses (for example, millet or rye corn) to facilitate revegetation and stabilisation of watercourse banks. Subsequent revegetation of the crossing aims to re-establish native plant species.

Following construction, reinstatement is monitored and access is restricted to facilitate rehabilitation.

Flow diversion is a modification of the standard open cut method where higher water volumes and flows (typically 1,000L/s) are present. Techniques include:

- Concentrating the flow through a flume pipe to prevent siltation problems that may be created during trenching, lowering in and backfilling (not suitable for watercourses with broad channels, low gradients and permeable substrates); and
- Pumping water around the work area by constructing barrier dykes / head walls above and below the trenched area keeping the work relatively area dry (suitable for low gradient streams with a discharge < 1,000L/s).

The construction period is minimised to complete the crossings in the shortest period practicable, with small crossings typically completed within one day.

Plate 20, Plate 21, Plate 22, Plate 23 and Plate 24: Rehabilitation of ROW across a road and through rural areas

Horizontal Directional Drilling

HDD, illustrated in Plate , is generally used to cross major watercourses, roads or railways. It is necessary to conduct a detailed geotechnical investigation to determine site suitability as HDD is governed by site conditions such as soil stability, slope, access, available workspace and nature of subsurface ground conditions.

The size of the HDD rig and associated footprint depends on the size of the pipe, subsurface geology and the length of the drill. The installation of the pipeline by HDD involves drilling a hole beneath the surface through which the pipe is pulled. Drilling is conducted by a specially designed drill rig, operated by a specialist contractor. Drilling mud (typically bentonite) is used to hydraulically drive the drilling head, as a coolant, to wash the drill cuttings to the start of the drill and to seal and line the drilled hole to facilitate insertion of the pipe. The returned bentonite is screened and recycled. Once the pipe

string is installed and tied into the main section of the pipeline, the entry and exit holes are remediated and excess material disposed of at an approved disposal site.

HDD generally reduces surface impacts, however, the technique introduces environmental considerations such as drill site sediment control, waste management and noise. Site specific management procedures will be prepared prior to commencing this activity, which typically lasts between a few days to several weeks per crossing.

Plate 25: Horizontal directional drill under a watercourse

Thrust bore

Thrust bores are used for shorter sections, typically under roads or embankments as illustrated in Plate and Plate 26. Thrust bores are generally horizontal or have a single slope as the drill head is not steerable like the HDD.

It is a low impact technique involving drilling short distances from below ground within an enlarged trench area located within the construction ROW. The feasibility of a bore is limited by site conditions, including geology (preferably homogeneous ground conditions), landform and soil type as well as depth and width of the crossing. Thrust bores are typically completed within one to five days.


Plate 26 and Plate 27: Thrust bore

2.4.13 SIGNAGE

Pipeline information markers are erected in line of sight along the pipeline as per AS 2885.1. Signs are placed at regular intervals. They are placed closer together at bends, on either side of road crossings, at fences and at watercourse crossings.

2.5 OPERATIONS

The operation of the pipeline will be in accordance with approval documentation, the Operational Environmental Management Plan (OEMP) that will be developed, AS 2885 and the APIA Code (APIA 2005).

An operational pipeline easement of 15m will be maintained. Above ground structures for pipeline operation and maintenance will likely comprise mainline valve stations which will be generally contained within the 15m easement and will be fenced. A typical enclosure is illustrated in Plate .

Plate 28: Typical enclosure around a valve on a rural property

The pipeline is a high integrity pressure vessel constructed from high strength steel which has been integrity tested by 100% examination of welds and a high pressure hydrostatic test at pressures in excess of the maximum allowable operating pressure. Operational activities are directed at maintaining this integrity over the life of the pipeline.

A routine operation and maintenance program which will include a variety of maintenance activities will be implemented during operations. Aerial and/or ground inspections will include checking vegetation for discolouration (which can be an indicator of a gas leak), detection of erosion, monitoring of rehabilitation success and detection of weed species. Typical operational activities include:

- General Operations – Routine operation and maintenance programs including leak detection surveys, ground and aerial patrols, maintenance and repair of equipment, internal measurement and cleaning of the pipeline (referred to as “pigging”), corrosion monitoring and remediation, and easement and lease area maintenance including access tracks. Aerial and/or ground inspections will include checking vegetation for discolouration which can be an indicator of a minor gas leak, detection of erosion, monitoring of rehabilitation success and detection and control of weed species.
- Gas Metering – All gas flows will be metered with high accuracy metering. This information will be checked against the volume of gas within the pipeline and any significant imbalance will be investigated as indicative of a potential leak after metering errors have been ruled out.
- Pressure monitoring – Pipeline pressure will be continuously monitored for a significant rate of change which could indicate a major leak. Pipeline inlet valves will automatically close on detection of excessive rate of change of pressure and intermediate valves located along the pipeline will allow individual sections to be isolated.
- Prevention of Pipeline Damage – Prevention of damage due to third party activity is achieved through appropriate depth of cover, signposting of the pipeline, one call "Dial Before You Dig" programs, extensive and continuous landholder liaison, regular inspection of the pipeline easement to spot any construction or earthmoving activities in the area, and third party education on the potential dangers of carrying out excavation activities in proximity to the pipeline. In some areas such as crossings, additional protection may be provided to reduce the risk of third party interference (e.g. marker tape buried above the pipeline, physical barriers or thicker wall pipe). The below ground pipe has a minimum thickness of 8.055mm of X70 strength pipe or similar, which provides a high resistance to penetration from third party activities. Heavy wall pipe, security fencing, gates and locks will be provided around all major above ground facilities (e.g. valves) to inhibit accidental or unauthorised tampering.
- Cathodic Protection – External pipeline corrosion is prevented by the protective external coating and cathodic protection systems. The cathodic protection system is checked regularly to ensure that the protection voltages are within limits to protect the pipeline from corrosion at any points of coating damage. The cathodic protection system and external coating system work independently to protect the pipeline from corrosion. The internal surface of the pipeline is protected from corrosion as the

transported gas is a non-corrosive dry gas, consisting mostly of methane with minor amounts of nitrogen and carbon dioxide.

Continued access to the easement will be necessary to follow-up issues identified from inspections. Low level maintenance for erosion, subsidence and weeds is likely to be necessary, particularly during the first year following construction.

Given that the pipeline will be underground, land users will be able to resume previous land use activities on top of the pipeline. The only limitations are generally with regard to excavation and building activities. Deep rooted vegetation will not be encouraged directly above the pipeline centreline due to the potential to damage the corrosion protection coating systems and the need for continued access along the pipeline, but grass and cropping is encouraged to re-establish across the easement. Regular consultation will be maintained with landowners whose properties are traversed by the pipeline and a "dial-before-you-dig" system for excavation and locations initiated. Operational pipelines generally have very little environmental or landholder impact.

2.6 DECOMMISSIONING

When the pipeline is no longer required, it will be decommissioned in accordance with the regulatory requirements and accepted current environmental best practices of the day. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant and all pipeline valves and metering stations) and the restoration of associated disturbed areas.

At the time of decommissioning, a decision will be made regarding the opportunities for future use of the pipeline. The following two options will be considered:

- Moth-balling – this would involve depressurising the pipeline, capping and filling with an inert gas (such as nitrogen) or water with corrosion inhibiting chemicals. The cathodic protection would be maintained to prevent the pipe corroding.
- Abandonment – this could involve purging the pipe of natural gas, disconnecting it from the manifolds and removing all above ground facilities. The pipe would then be filled with water and left to corrode in-situ. Removing the pipe from the ground is unlikely to be an environmentally or commercially viable option. A detailed rehabilitation program would be developed and implemented in consultation with landholders and the regulatory agencies at the time of abandonment.

2.7 WORKFORCE AND ACCOMMODATION

The project is anticipated to directly employ up to 300 people during the construction phase and up to 10 people once fully operational, thereby benefiting local communities. Construction personnel are likely to be accommodated in at least three temporary camps located outside the ROW and adjacent to the pipeline route on a neighbouring rural property within the PPL area. Clearing, earthworks and additional access will be minimised and previous campsite locations or existing cleared areas will be used if possible to reduce the need for additional clearing. Transport from the temporary camp sites to the construction site will be arranged for workers.

Construction camps will require power generation, sewage treatment and potable water and are likely to include construction depots, lay down areas and workshops. Further details regarding construction camps will be outlined in the Environmental Authority (EA) application.

3.0 ROUTE DESCRIPTION

Details of the preferred central route and key environmental aspects are described in this section, while Kilometre Points (KPs) are provided on Figure 6 and Figure 7. Additional details are provided in the 1:100 000 series of satellite imagery maps provided in Appendix 6 (Sheet 1-13). The existing environment of the project area is described in greater detail in:

- Section 4.0 – Physical Environment;
- Section 5.0 – Ecological Environment; and
- Section 6.0 – Social Environment.

The pipeline starts at the Kogan North Central Gas Processing Facility located adjacent to the Roma to Brisbane gas pipeline easement (Plate 29). The preferred route runs parallel to, and north of, the Roma–Brisbane gas pipeline west to near the Kogan–Condamine Road intersection where it diverges to run northwest.

Plate 29: Kogan North Central Gas Processing Facility

Poplar box woodland (*Eucalyptus populnea*), an 'Of Concern' regional ecosystem (RE11.3.2), is encountered near KP0 and KP3 where the woodland is predominantly associated with the ephemeral watercourses of Back Creek (Plate 30 and 31).

Plate 30 and Plate 31: Back Creek

The pipeline route remains within the cleared area of the Roma to Brisbane Gas Pipeline easement (Plate 32).

Plate 32: Roma to Brisbane Gas Pipeline easement through Wambo cattle property

West of Graham Road, the route traverses partially cleared land with isolated trees and stands before Braemar Creek (Plate 33 and 34) is crossed at approximately KP7.5.

Plate 33 and Plate 34: Braemar Creek

North of the Kogan–Condamine Road, the proposed alignment traverses partially cleared open eucalypt woodland. Remnant vegetation comprises extant vegetation and regrowth. The terrain is relatively flat with cattle grazing the primary land-use.

Essential habitat areas north of KP11 and south of KP17 have been avoided (refer Figure 6 and Figure 7). These essential habitat areas protect the 'Vulnerable' perennial shrub species, Philotheca sporadica, specimens of which exist in the Darling Downs Power Station site approximately 400m south of the proposed alignment. Moderately timbered country is encountered between Warra–Kogan Road (KP18.6) and North Kogan Road (KP21.5).

Kogan Creek (Plate 35) is crossed at KP23. Relatively intact stands of poplar box woodland (*Eucalyptus populnea*) and forest red gum (*Eucalyptus tereticornis*), 'Of Concern' RE11.3.2 and RE11.3.4 respectively, are found along Braemar Creek. The watercourse crossing has been chosen to minimise disturbance to this riparian vegetation.

Plate 35: Kogan Creek at KP23

The southern part of Mineral Development Licence (MDL) MDL335, held by Aberdare Collieries Pty Ltd, is traversed between KP19.7 and KP21.4 and again between KP22.6 and KP25. The proposed alignment (KP21.5 to KP24.4) reduces the extent of the impact on MDL335.

Between KP11.2 and KP19.7, the route traverses Petroleum Lease EPP692 held by Origin Energy CSG Limited.

The route follows the northern side of North Kogan Road from KP24.4 to KP30 (Plate 36).

Plate 36: North Kogan Road

Remnant vegetation comprises open eucalypt woodland that has been partially cleared, mainly around established and new residences. A complex of poplar box woodland and false sandalwood (*Eremophila mitchellii*), 'Of Concern' RE11.9.7, is located on the south side of the intersection of North Kogan Road and Sixteen Mile Hall Road (Plate 37). This is avoided by the route occupying the northern side of North Kogan Road. Land use in this section would best be described as rural residential or hobby farming.

Plate 37: Intersection of Kogan Road and Sixteen Mile Hall Road

Northwest of Sixteen Mile Hall Road (KP29.4), the route traverses extensively cleared land (Plate 38). Cropping is the predominant land use with remnant vegetation confined to road reserves and as isolated stands and riparian vegetation. Remnant vegetation is predominantly the 'Endangered' brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) shrubby open forest (RE11.4.3). To reduce further impacts to this endangered community, remnants are avoided where practical and breaks in roadside vegetation have been utilised as road crossing points. With the exception of major streams, watercourses are poorly defined in this section having been reduced to drainage paths by clearing and subsequent cultivation by landholders.

Plate 38: Cleared cropping land along Kogan Road

A major cattle feedlot is encountered in the vicinity of KP42 (Plate 39).

Plate 39: Cattle feedlot near KP42

Between KP27.1 and KP39.7 the route traverses Hopeland No 1 (ML50242) and No 2 (ML50243) mining leases held by Linc Energy Limited.

The route continues to traverse high quality agricultural land from the Chinchilla–Tara Road (KP52) to Ryalls Road (KP89.2) (Plate 40). Scattered remnants of the once ubiquitous brigalow and belah ('Endangered' RE11.4.3 and RE11.9.5) are the predominant native vegetation. 'Of Concern' forest red gum and river red gum (*Eucalyptus camaldulensis*) communities (RE11.3.4/RE11.3.25) are found along watercourses. Gaps in the vegetation have been chosen for these watercourse crossings.

Plate 40: Cropping land between KP52 to KP89

The route crosses Condamine River (KP53.5) (Plate 41) near its junction with Charley Creek at a locality called Greenswamp.

Plate 41: Condamine River

The route then runs south and west of Greenswamp and largely avoids waterholes along Charley Creek (KP54, KP56). It crosses the Warrego Highway at KP73 (Plate 42). The crossing of the highway will be via a directional drill.

Plate 42: Warrego Highway

The route at KP70 avoids MDL247 held by AMH (Chinchilla Coal) Pty Ltd. MDL247 lies north and east of the route at this point. MDL246, also held by AMH (Chinchilla Coal) Pty Ltd is located north of KP53 on the northern side of Chinchilla Weir and is avoided. Origin Energy CSG Pty Ltd petroleum leases EPP692 and PL226 are traversed between KP48.3 and KP74.2.

After crossing Ryalls Road, the route traverses light to moderately timbered country to skirt around the western side of Barakula State Forest (Plate 43). 'Of Concern' poplar box woodland, RE11.3.2, lies south of the proposed crossing of Dogwood Creek (KP97.4) which has been aligned to reduce impacts on the outliers of this vegetation community.

Plate 43: Barakula State Forest

The crossing point of Rocky Creek (KP124) (Plate 44) has been aligned to avoid bends and rock outcrops observed in the sections upstream and downstream of the proposed crossing point.

Plate 44: Rocky Creek

A major and a smaller dam are located adjacent to KP131. The route runs between the dams, east of the wall of the major dam (Plate 45). This alignment avoids stands of 'Endangered' brigalow / belah woodland (RE11.9.5) fringing the major dam.

Plate 45: Farm dams at KP131

At KP132, the route enters predominantly cleared land, although there is evidence of regrowth in parts of this section (Plate 46). The section from KP136 to KP140 is being subject to blade ploughing as the landowner develops the property.

Plate 46: Clear grazing land near KP132

Remnant vegetation in this section comprises isolated stands of the 'Endangered' brigalow (RE11.9.5). There was a strong correlation between mapped remnants and remnants observed during the preliminary site inspection and the route generally avoids these remnants.

The route traverses undulating terrain between KP157.4 and KP167. Scattered brigalow / belah stands (RE11.9.5) are evident and are avoided by following a cleared area adjacent to property fence lines (Plate 47).

Plate 47: Some open patches of Brigalow between KP157.4 and 167

The route takes advantage of cleared land to emerge from remnant vegetation at Big Valley Road (KP177.8) after which it traverses undulating, predominantly cleared land (Plate 48) at the foot of a series of low mesa-shaped hills which extend from KP180 to KP191. The route between Big Valley Road and KP184 has been chosen to avoid dams and isolated hills and between KP186.9 and KP192 to avoid cattle yards and farm outbuildings located adjacent to KP190.5.

Plate 48: Grazing land near KP185

Contour banks have been established between KP196 and KP198 and the cultivated land is currently sown to lukena, a lucerne bush used for cattle fodder. The route crosses Cockatoo Creek at KP192 to avoid a deeply incised watercourse section with rock cliffs on the southern bank and standing water. The Cockatoo Creek crossing takes advantage of an existing stock and vehicle crossing, thus reducing impacts on riparian vegetation.

North of Cockatoo Creek, the route traverses predominantly cleared land with scattered remnants and regrowth. Intact remnants of 'Endangered' brigalow / belah open forest (RE11.9.5) and 'Of Concern' poplar box / false sandalwood shrubby woodland (RE11.9.7) are avoided, with some regrowth and 'Not of Concern' vegetation impacted (Plate 49). Stands of mature old trees adjacent to KP209.5 and KP211.5 are generally avoided.

Plate 49: Scattered Brigalow remnants near KP210

The route skirts around the western edge of the Camboon and Borania State Forests between Eidsvold–Theodore Road and Glencoe. From KP251.1, it continues parallel to and west of Rockybar Road in light to moderately timbered country until approximately KP253, where the route crosses to the east side of the road to avoid Chess Creek and associated gullies, which run close to the road in the section KP254 to KP267.

The route traverses the western side of the Auburn Range before crossing it in the vicinity of Camboon at KP298.2. A key objective in aligning the route in this area was to avoid the Rockybar, Borania and Camboon State Forests which straddle the Auburn Range.

The route generally follows the State Forest boundary. Starting at KP223.7 the route runs in moderately timbered country, down a gentle spur to cross Big Gully following a spur out of the valley, before turning northwest to run to the escarpment before following the Rockybar State Forest boundary fence (Plate 50 and 51).

Plate 50 and Plate 51: Track following the boundary to the Rockybar State Forest

North of the Rockybar State Forest, the route follows partially cleared land in undulating terrain (Plate 52) and a fence north through open country, moderate timber—'Not of Concern' ironbark, bloodwood and poplar box grassy woodland (RE11.12.2) (Plate 53). The route crosses the Eidsvold–Theodore Road at KP247 (Plate 54).

Plate 52: Open grazing land north of Rockybar State Forest near KP238

Plate 53: 'Not of Concern' ironbark, bloodwood and poplar box woodland north of Rockybar State Forest – the route follows the cleared fence line.

Plate 54: Crossing of the Eidsvold – Theodore Road near KP247

North of Eidsvold–Theodore Road, the route runs northeast through cleared land to the southeast corner of a large intact 'Not of Concern' ironbark woodland remnant near KP251 (Plate 55). The route follows a fence along the eastern edge of this remnant.

Plate 55: Ironbark woodland near KP250

Rocky hills west of Defence Road led to the selection of a route that crossed Cracow Creek and skirted around the northern side of the hills before reaching Defence Road at KP260. From KP250, the route traverses a rise through lightly timbered country to cross Fraser Gully at KP252. The 'Endangered' brigalow / semi-evergreen vine thicket patch (RE11.12.21) located at the edge of the large remnant is avoided.

After crossing Fraser Gully, the route turns northeast to cross a spur and gully before reaching Defence Road (Plate 56). The route crosses Defence Road and JP Gully before entering cleared land. After crossing Cracow Creek, the route runs parallel to and east of Defence Road for 1.3km before crossing to the west side to avoid the larger 'Not of Concern' remnant abutting the east side of the road. The route generally runs parallel to and west of Defence Road through predominantly cleared land.

Plate 56: Defence Road

The route traverses predominantly cleared land to KP267.5 where it passes to the south of a dam to enter light to moderately timbered country and cross a watercourse. The route avoids a large intact remnant of the 'Endangered' poplar box woodland (RE11.12.17) and 'Not of Concern' ironbark shrubby woodland (RE11.12.1) that lies to the south.

At KP285, the route avoids 'Not of Concern' and 'Of Concern' remnants, principally ironbark species (RE11.12.1) and poplar box woodland (RE11.3.2), in this section (Plate 57).

Plate 57: 'Endangered' ironbark and poplar box woodland south of KP280 is avoided

North of Keen Creek, the route passes to the west of Montour State Forest and traverses light to moderately timbered country to KP294 where it emerges into cleared land to generally run along the western side of a tributary of Pump Creek to Rawbelle Road at KP307 (Plate 58).

Plate 58: Rawbelle Road at KP307

Essential habitat for the golden-tailed gecko (*Strophurus taenicauda*), which is listed under the EPBC Act as a rare species, is located approximately 2km east of the proposed alignment between KP298 and KP302 in the Montour State Forest.

Further north, 'Of Concern' remnant vegetation (forest red gum RE11.3.4) and 'Not of Concern' narrow-leafed ironbark woodland (RE11.12.1) located east of the route between KP304 and KP305 is avoided. This remnant extends approximately 2km east into the Montour State Forest where it forms part of essential habitat for the vulnerable lizard species, the brigalow scaly-foot (*Paradelma orientalis*). Although the essential habitat is avoided by the proposed route, ground-truthing of remnant vegetation in this section is proposed to establish the presence or absence of suitable habitat for the listed species.

After crossing Pump Creek (Plate 59), the proposed route runs through cleared land.

Plate 59: Pump Creek (dry)

The route crosses the Thangool–Lookerbie Road at KP349.6 (Plate 60). After crossing this road, the route continues to run parallel to, and east of, the road to KP352, where it crosses the road again to run parallel to and west of the road reserve.

Plate 60: Thangool - Lookerbie Road crossing

Several watercourses (Plate 61) with intact 'Not of Concern' native vegetation are crossed (KP354and KP356) in this section.

Plate 61: Typical dry watercourse near KP351

After running along the western side of Thangool–Lookerbie Road for a further 1.6km to avoid steep gullies on the eastern side of the road, the route crosses the road to run along a lightly-timbered ridge and down a spur to a cleared valley where it follows northwest to Thangool–Lookerbie Road, crossing it at approximately KP354.4.

North of Thangool–Lookerbie Road, the route crosses Dismal Creek and Halls Road to break out into cleared land which it traverses to KP370. Contour banks have been established in this section and remnant stands of vegetation are largely avoided. The route runs west of the parcel encompassing the Mount Scoria Conservation Park (Plate 62) before turning northeast to cross Grevillea Creek, Thangool–Lookerbie Road, Tollemaches Road and Kariboe Creek before reaching the Burnett Highway at KP350.

Plate 62: Mt Scoria Conservation Park

Agricultural land associated with the alluvial soils of the Grevillea Creek and Kariboe Creek valleys is traversed between KP347.5 and KP354. After crossing the Burnett Highway, the proposed route continues north-northeasterly through agricultural land to KP370. The proposed route runs east of the rocky hill adjacent to KP369.

At KP375, the proposed route passes close to the 'Endangered' brigalow / belah remnant (RE11.9.5) and 'Of Concern' poplar box remnant (RE11.9.7) that clings to the slopes of the rocky hill to the east. Further remnants of these endangered regional ecosystems (KP377 and KP378) are avoided as the proposed route runs northeast along the face of the rocky hill.

Kroombit Creek is crossed at KP361. Riparian vegetation of this watercourse is the 'Endangered' brigalow / belah complex (RE11.9.5). Ground surveys will establish the most appropriate crossing point of the creek to minimise impacts on this vegetation community, as it functions as an important wildlife corridor.

The route from KP385 follows an access track down a steep rocky slope at the end of a rocky ridge (Plate 63) and south of Callide Creek. After descending the rocky slope, the route follows an access track through cleared land to a single wire earth return (SWER) power line (Plate 64), before running parallel to a high voltage (HV) transmission line (KP394) (Plate 65). The route crosses Callide Creek (Plate 66) and Rainbow Creek at KP396 which support communities of 'Not of Concern' forest red gum and river red gum.

Plate 63: Rocky slope at KP388

Plate 64: SWER line

Plate 65: HV power line

Plate 66: Callide Creek

The Callide Range is encountered between KP385 and KP390. Steep narrow ridges provide the only means of ascending, traversing and descending the range. The range is light to moderately timbered and clearing has occurred on the less steep slopes and crests of ridges. A spur between two prominent ridges to the west of Coal Road was found to offer a potential route up the southern slopes of the range. The route follows a tributary (west branch) of Sunday Creek upstream to the spur. From KP393.5, the route crosses a gully close to its confluence with Sunday Creek at a cattle and vehicle crossing. The route then generally follows cattle tracks.

Adjacent to Coal Road, the route traverses essential habitat (Plate 67) of an 'Endangered' species of cycad, *Cycas megacarpa*. Ground-truthing will be required to establish the presence and extent of any patches of *Cycas megacarpa* and, if found, the route will need to be revised to avoid these patches.

Plate 67: Essential habitat adjacent to Coal Road

On reaching the watershed of the Callide Range, the route crosses Coal Road near its intersection with Specimen Hill Road, after which it crosses Specimen Hill Road to follow that road 600m east around the head of a gully to a broad spur.

The route runs down a cleared broad spur which narrows as it reaches the watercourse. After crossing the watercourse, the base of another spur and a gully, the route climbs steeply up a spur to the high voltage transmission line access track that follows the ridge.

The route generally follows the HV transmission line through cleared land to cross Collards Creek at KP397, after which it veers away from the high voltage transmission line to cross Blacks Road and traverse a saddle in rocky hills at KP400. Between KP400 and KP402, the route traverses cleared land through undulating terrain. Numerous gullies are crossed, as is Bell Creek at KP397.

Several route options down the escarpment of the Calliope Range were investigated including an alignment parallel to the Queensland Gas Pipeline. This pipeline has been constructed down a ridge adjacent to the Dawson Highway. The pipeline has been constructed, in part, in an access track cut into the side of the ridge significantly constraining space for another pipeline. An adjacent watercourse further constrains pipeline alignment options along the existing pipeline. Consequently, the option of crossing the escarpment with an approximately 700m HDD is preferred over other options investigated. There is sufficient space at the base of the escarpment to lay out the pipe

string to be inserted into the HDD borehole. The vegetated eastern face of the escarpment (KP401) is essential habitat for an 'Endangered' species of cycad, *Cycas megacarpa*. HDD would avoid impacts on this endangered species which is also found in the Callide Range near Coal Road.

From the base of the escarpment and proposed HDD site (KP401), the route runs parallel to the Dawson Highway (Plate 68) to KP406 and follows the Queensland Gas Pipeline pipeline easement (Plate 69). The section of the route from the Callide Range to Gladstone is likely to be declared a State Development Area Infrastructure Corridor in the near future as this area will house a number of gas pipelines and a major rail line.

Plate 68: Dawson Highway

Plate 69: Existing Queensland Gas Pipeline easement

At KP412, the route avoids the 'Endangered' poplar box woodland remnant (RE11.12.17) located in the road reserve. At KP441, Larcom Creek is crossed. Riparian vegetation is 'Of Concern' forest red gum (RE11.3.4) and consequently construction methods will aim to reduce impacts on this vegetation community.

The Bruce Highway is crossed at KP446. Alinta's Rockhampton–Gladstone Gas Pipeline connects to the Queensland Gas Pipeline 100m west of the Bruce Highway. A scraper station is located at the connection point. At KP451, the route enters the Gladstone State Development Area Infrastructure Corridor (Plate 70) and follows this corridor to Fisherman's Landing (Plate 71 and 72). At KP453, a 'Not of Concern' remnant (RE11.3.26) and an 'Of Concern' grey box grassy woodland remnant (RE11.3.4) is encountered. At KP454, the route abuts an area of 'Of Concern' forest red gum remnant (RE11.3.4). This remnant abuts the area mapped as essential habitat.

Plate 70: Gladstone State Development Infrastructure Corridor

Between KP452 and KP453, the route passes through outliers of essential habitat for the little pied bat, *Chalinolobus picatus*, which is listed under the *Nature Conservation Act 1992* (NCA) as a rare species. The essential habitat area encompasses a 'Not of Concern' narrow-leafed ironbark remnant (RE11.11.4).

At KP455, the route turns away from the Queensland Gas Pipeline to traverse a 'Not of Concern' narrow-leafed ironbark remnant (RE11.11.4) to enter and run in the 100m wide services corridor to the existing HV power line easement (KP460). After crossing under the high voltage power line, the route runs parallel to and north of the power line as it traverses a narrow valley. The 'Not of Concern' narrow-leafed ironbark (RE11.11.15) and 'Endangered' semi-evergreen vine thicket (RE11.11.18) remnants are located on the north side of the power line.

The route leaves the power line easement in the vicinity of KP461 to run northeast to Calliope River–Targinie Road, avoiding endangered remnants and dams as it descends a spur. After following Calliope River–Targinie Road north through 'Not of Concern' forest red gum vegetation for approximately 300m, the route leaves the road to follow a (disused) railway reserve northeasterly to KP463. At KP463, the route makes a perpendicular crossing of the existing railway line and slurry pipeline to the HV power line easement, which it follows through a 'Not of Concern' narrow-leafed ironbark and lemon scented gum remnant (RE12.11.6) north to Mount Larcom–Gladstone Road at KP466.

The route traverses the perimeter of MDL225, MDL177 and Mining Lease 80081 (Stuart 2), which are held by Queensland Energy Resources Limited, from KP464 to KP467. These mining tenements form part of Queensland Energy Resources Limited's Stuart oil shale project.

Between Mount Larcom–Gladstone Road and Landing Road, the route crosses and runs adjacent to riparian vegetation comprising the 'Not of Concern' forest red gum and melaleuca spp (RE12.3.7). The riparian vegetation adjacent to Mount Larcom–Gladstone Road has been listed as essential habitat of the koala species, *Phascolarctos cinereus*.

After crossing Landing Road, the route follows this road northerly through 'Not of Concern' vegetation to the north side of the cement manufacturing plant. Remnant vegetation approximately 100m east of Landing Road (KP464 to KP465) has been listed as essential habitat for the little pied bat, *Chalinolobus picatus*, the koala, *Phascolarctos cinereus* and

the rusty monitor, *Varanus semiremex*. North of the cement manufacturing plant, the route runs along the north side of the existing access road to Fisherman's Landing, the proposed LNG facility site (Plate 71 and 72).

Plate 71 and Plate 72: Fisherman's Landing

4.0 PHYSICAL ENVIRONMENT

4.1 CLIMATE

The closest meteorological stations to the pipeline are the Miles Post Office (about 25km from the alignment), the Taroom Post Office (about 45km from the alignment), Thangool Airport (about 2km from the alignment) and the Gladstone Airport (about 15km from the alignment). A summary of key climate records for these locations is provided in Appendix 1, Tables A-1, A-2 and A-3.

The regional area is predominantly subtropical with temperatures varying from warm to hot in summer, to mild to cool in winter with large diurnal variations (between 7°C and 18°C of mean daily temperature). The average maximum and minimum temperatures at these locations recorded in summer were approximately 32°C and 20°C respectively, and 22°C and 7°C in winter (BoM 2008).

Rainfall also varies seasonally, with wetter summers and drier winters. The mean monthly rainfall across the meteorological stations is approximately 100mm during summer and 33mm in winter. The long term[1] mean annual rainfall at Miles, Taroom and Thangool is similar (between 650mm and 670mm), while Gladstone typically experiences an additional 100mm per year.

Light winds (mean speeds less than 12km/h) are common throughout the year, although Gladstone experiences stronger winds (mean speeds up to 24km/h) particularly in the afternoon. Winter mornings typically have calmer winds (BoM 2008).

4.2 AIR QUALITY AND NOISE

4.2.1 AIR QUALITY

Air quality along most of the pipeline route is likely to be typical of the rural areas of central Queensland and influenced by a range of activities such as:

- Dust from pastoral activities, including stock and vehicle movements;
- Environmental factors (including wind-borne dust, seed, pollen and smoke); and
- Vehicle and equipment exhaust fumes from roads and operating industries and towns.

The EPA has a network of air quality monitoring stations in Queensland (including Toowoomba and Gladstone) chosen to measure pollutants typical of the region and its activities. Pollutants include carbon monoxide, nitrogen dioxide, ozone, particles (PM10), sulphur dioxide, and visibility. Index values for these parameters indicate that the air quality is generally 'Very Good' with only PM10 reporting as 'Good' (50% of targeted maximum) (EPA 2008c). Due to the rural nature of much of the pipeline route, background

[1] Rainfall data recorded over 124 years for the Miles Post Office, 132 years for Taroom Post Office, 77 years for the Thangool Airport and 14 years for Gladstone Airport.

air quality data is not available for much of its length, however air quality is expected to be generally 'Very Good' due to the lack of significant industries in the majority of the pipeline area.

4.2.2 NOISE

The existing noise environment in the region is expected to be typical of sparsely populated pastoral areas, with generally low levels of background noise dominated by natural sources (e.g. wind, animals and insects). Ambient noise levels in the regional area are typically 35 – 54dB(A) during the day (7:00am to 6:00pm). Typical ambient noise levels are indicated in Table 1 and Figure 4 and are considered indicative of the central Queensland area.

Those sections of the pipeline corridor in close proximity to industrial, mining, oil or gas production facilities may be characterised by intermittent background noise from associated infrastructure (e.g. diesel power generators, compressors, and production facilities). For example, ambient noise levels in the Gladstone area are expected to be significantly higher due to traversing primarily industrial land use.

No blasting is expected to be conducted during the project.

Table 1: Ambient Noise Levels at Daandine Station, Kogan

Time Periods	Noise Level (L_{A-90})
Day 7:00am to 6:00pm	35 - 54
Evening 6:00pm to 10:00pm	34 - 40
Night 10:00pm to 7:00am	29 - 40

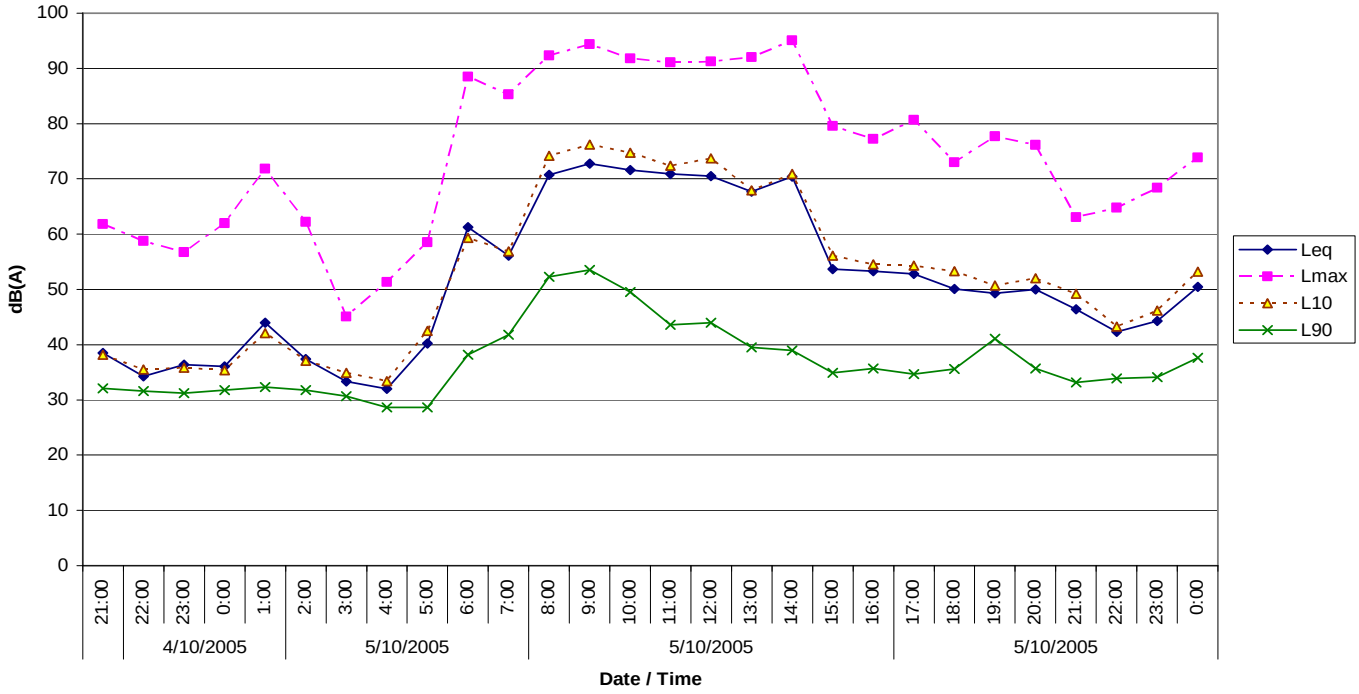


Figure 4: Ambient Noise Levels at Daandine Station, Kogan

4.3 GEOLOGY, SOILS, LANDFORM AND TERRAIN

General terrain across the pipeline route varies from predominantly flat and undulating topography with wide alluvial floodplains inland, (DEWHA 2007b) through the various steep and mountainous ranges (the Great Dividing Range, Auburn Range, Calliope Range and Banana Range) tending towards the coast. Geological formations of interest are presented in Figure A-1 (Appendix 2). Widespread clearing of remnant vegetation is common on the flat plains for agricultural, urban and industrial purposes while the upper ranges are still predominantly densely vegetated (DEWHA 2007b).

Geologically, the pipeline lies over the Surat and Bowen basins. The southern portion of the Bowen Basin lies beneath the Surat and was formed up to 290 million years ago (in the Early Permian to Middle Triassic periods). The Bowen Basin was formed by fluvial and lacustrine sediments and volcanics being deposited in the east, while a thick succession of coals and non-marine clastics were laid in the western portion of the basin (Geoscience Australia 2003). Although laid approximately 90 million years later (between the Early Jurassic to Albian (Early Cretaceous) periods) deposition in the Surat was similarly formed early on by mostly fluviolacustrine deposition until the Middle Jurassic when coal swamp environments predominated over much of the basin (Geoscience Australia 2003). Both basins hold vast hydrocarbon resources like coal and coal seam gas which are continually being explored, assessed and extracted for energy users across Australia.

A review of existing data (DIP 2007) has determined that the most significant soil types in relation to erosion are alkaline and neutral duplex soils (solodised solnetz, solodic soils or sodosols). These soils are prone to dispersions and gully erosion but not susceptible to sheet erosion if the slope is <2%. Soils mapping will be undertaken during the ecological assessment study to describe the soils traversed by the proposed route in order to determine erodibility and appropriate mitigation measures. The pipeline traverses extremely low and low probability acid sulphate soils for almost the entire length of the route (CSIRO 2008). There are some soils classed as high probability for acid sulphate soils in the low lying areas around Gladstone and further investigation may be required during detailed design to avoid or mitigate potential effects in these areas.

4.3.1 GOOD QUALITY AGRICULTURAL LAND

State Planning Policy (SPP) 1/92 Development and Conservation of Agricultural Land seeks to protect good quality agricultural land (GQAL) from subdivision into uneconomic units and to minimize the potential for land use conflicts between agricultural and non-agricultural land uses.

Although GQAL will be avoided wherever possible, the preferred pipeline route will inevitably pass through some lands classified as GQAL as a result of areas currently under cultivation, site specific characteristics and the necessity to avoid vegetation communities of high conservation value. However, impacts are expected to be limited and of short duration as they are only foreseeable during pipeline construction. Normal agricultural activities occur over buried pipelines following construction and thus the presence of a buried pipeline would not create any long term adverse impact upon GQAL. Compensation

is offered to the landowner for any temporary disruption to agricultural production during construction and rehabilitation of the pipeline.

4.4 WATER RESOURCES

4.4.1 SURFACE WATER

The proposed pipeline lies within a number of basins forming two drainage divisions, with rivers lying in the north forming part of the North East Coast Drainage Division and the southern extent draining into the Murray-Darling Drainage Division (DEWHA 2007b).

Water Resource Plans identifying the allocation and sustainable management of water have been developed for the following rivers in the regional area of the proposed pipeline (DEWHA 2007b):

- Condamine – Culgoa Rivers (Murray-Darling Drainage Division);
- Burnett River (North-east Coast Drainage Division);
- Fitzroy River (North-east Coast Drainage Division);
- Boyne River (North-east Coast Drainage Division); and
- Calliope River (North-east Coast Drainage Division).

Watercourses

The main watercourses to be intersected by the preferred pipeline route are as follows:

- Auburn River
- Bells Creek
- Boat Creek
- Bungaban Creek
- Callide Creek
- Calliope River
- Charley creek
- Collards Creek
- Condamine River
- Cockatoo Creek
- Dismal Creek
- Ditz Creek
- Doubtful Creek
- Duck Creek
- Duck Holes Creek
- Gravel Creek
- Grevillea Creek
- Harrami Creek
- Holsworthy Creek
- Kariboe Creek
- Kroombit Creek
- Kroombit Gully
- Larcom Creek
- Lost Spring Creek
- Marvel Creek
- Maxwelton Creek
- Montour Creek
- One Mile Creek
- Police Creek
- Rainbow Creek
- Rawbelle River
- Sandy Creek
- Spring Creek
- Sunday Creek
- The Brook

Most of the watercourses anticipated to be traversed by the pipeline are typical of many Australian inland waters being ephemeral and intermittent with little to no flow during the drier months. Inland watercourses generally meander with slow to moderate flows and

often have long periods of low or zero flows during which the watercourses can become a series of waterholes (DEWHA 2007b). The ecological survey will include an assessment of the riparian vegetation at all significant watercourse crossings.

There are also a number of dams, storages and weirs that have been constructed within each catchment / river basin to supply water for irrigation, urban, stock and industrial uses throughout the region (DEWHA 2007b). These areas have been avoided during the route selection process.

Wetlands

Two Wetlands of International Significance (RAMSAR sites) were identified during desktop searches (DEWHA, 2008): the Narran Lake Nature Reserve (located at the terminus of the Narran River in northern NSW, approximately 600km from the southern extent of the pipeline) and the Shoalwater and Corio Bays Area (with a southern boundary approximately 150km north of Gladstone). Neither wetland will be intersected nor impacted by the pipeline construction or operating activities due to the remoteness of the pipeline to the wetlands.

The Directory of Important Wetlands (DOI) lists 2 places within 10km of the preferred pipeline, namely The Narrows and Port Curtis, both of which are also listed under the Register of the National Estate (RNE). Both sites are located in the waters offshore from Gladstone and will not be intersected or impacted by pipeline construction or operations.

4.4.2 GROUNDWATER

Groundwater in the region lies within two groundwater provinces: the Great Artesian Basin and the Tasman (ANRA 2007). Each province comprises a number of Groundwater Management Units (GMUs). The GMUs that hold most of the region's groundwater are the Surat Basin (in the Great Artesian Basin), the Bowen and the Yarraman Unincorporated Areas (in the Tasman Province). The majority of the groundwater is of marginal or poor quality as is typical of the coal bearing strata particularly in the Bowen Basin Stratigraphy. However, supplies of good quality groundwater are common from the alluvial and basalt aquifers (ANRA 2007).

Groundwater recharges through two primary processes. The first is shallow alluvial groundwater which is intermittently recharged during flood events through river flats and floodplains. In the second, the bedrock aquifers are recharged by incident rainfall and river infiltration. Groundwater is predominantly well below the surface level and therefore not impacted by the construction activities, although some seasonal dewatering may be necessary.

No natural springs are traversed by the pipeline and all artificial bore heads and landholder dams have been avoided to minimise disruption to stock and property facilities. Water drawn from bores for construction purposes will not diminish the supply to landholders.

5.0 ECOLOGICAL ENVIRONMENT

The project area lies within the Brigalow Belt South bioregion. Most of this bioregion (81%) is within Queensland with the remaining area in New South Wales (DEWHA 2007a). Dominant vegetation includes eucalypt woodlands and open forests of ironbark (*Eucalyptus crebra*), poplar box (*Eucalyptus populnea)*, spotted gum (*Corymbia citriodora*), cypress pine (*Callitris glaucophylla*), grasslands (*Dichanthium* spp.), bloodwoods (e.g. *Corymbia trachyphloia, C. hendersonii*), mountain coolibah (*E. orgadophila*), brigalow-belah forests (*Acacia harpophylla, Casuarina cristata*), and semi-evergreen vine thicket (DEWHA 2007a).

Much of the bioregion has been developed for cropping and improved pasture which is generally found on the more fertile plains soils that originally supported brigalow (*Acacia harpophylla*), or grasslands of eastern mid-height (*Dichanthium* and *Bothriochloa* spp.). In Queensland, the remaining rangelands are mostly mixed eucalypt woodland, often occurring as remnant patches due to land clearance, and agricultural and forestry practices. These practices have led to the bioregion experiencing high levels of species decline (DEWHA 2007a).

Areas in the bioregion that were identified as having State, Regional or Local biodiversity significance were consistent with identified Environmentally Sensitive Areas (ESAs - refer Section 6.0) and mapped as Regional Ecosystems (REs, refer Section 5.1.1).

5.1 FLORA

5.1.1 REGIONAL ECOSYSTEMS

The RE Description Database (EPA 2008b) lists the status of regional ecosystems (as gazetted under the *Vegetation Management Act 1999*) as well as their Biodiversity Status (as recognised by the EPA). A search of the database was conducted along the entire length of the pipeline for the 30m-wide ROW, which would be the maximum extent that may be required to be cleared for the pipeline. A maximum area of 1,405ha may be disturbed, assuming the maximum 30m width is used for the pipeline construction (which is unlikely for the entire length of the pipeline). Based on RE mapping, it is estimated that a maximum area of 281.2ha of vegetated / partially vegetated ('Endangered', 'Of Concern' and 'Not of Concern' REs) land may be cleared. As an indication of the local significance of the potential loss of RE communities, the area of each RE occurring within a 10km buffer of the alignment has been calculated and compared to the area of each of these REs to be cleared. The maximum area of REs to be cleared represents 0.30% of the area within a 10km buffer of the pipeline centre line.

The majority of vegetation was classed as Non Remnant and 'Not of Concern' regional ecosystems (comprising 46 REs, 1381.73 ha or 98.4% of the maximum area to be disturbed); however, 17 'Endangered' and 17 'Of Concern' REs were also identified (refer Appendix 1, Table A-4). Table 2 summarises the REs transected by the proposed pipeline easement. Assuming the full 30m wide ROW is cleared:

- Approximately 3ha of 'Endangered' REs will be removed, representing around 0.03% of the ecosystem present within 10km of the preferred pipeline route.
- Approximately 20ha of 'Of Concern' REs will be removed, representing around 0.12% of the ecosystem present within 10km of the preferred pipeline route.
- Approximately 20% of the ROW has been mapped as 'Not of Concern', requiring clearing of 0.18% of this RE type compared to the surrounding 10km corridor.
- The majority of the proposed alignment (80% of the 30m ROW) is classified as 'Non-remnant'.

Table 2: Summary of Regional Ecosystems Identified along the Preferred Pipeline Route

VM Status of RE	Area to be Cleared Assuming 30m Wide ROW (ha)	Proportion of Total Area to be Cleared (%)	Proportion of RE within 10km of Preferred Pipeline (%)[1]
Endangered	2.97	0.21	0.03
Of Concern	20.02	1.43	0.12
Not of Concern	258.23	18.38	0.18
Non-remnant	1,123.50	79.98	0.39
TOTAL	1,404.72	100	0.30

[1] This is calculated as the percentage of the area for each RE status type identified in the ROW (from GIS data using MapInfo) compared to the area for that same RE identified in the 10km buffer as provided in Table A-4.

Fragmentation patterns determined from mapping of REs illustrates that the landscape is generally highly fragmented with majority of the pipeline route previously cleared for other land uses. Larger tracts, less susceptible to ecological edge effects and more likely to sustain viable populations of native flora and fauna than smaller tracts, are mainly restricted to higher elevations.

5.1.2 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

Four endangered and two critically endangered EPBC listed ecological communities have been identified as potentially occurring within 10km of the preferred pipeline route (DEWHA 2008) as follows:

- Endangered:
  - Bluegrass (*Dichanthium spp*) dominant grasslands of the Brigalow Belt Bioregion (North and South);
  - Brigalow (*Acacia harpophylla* dominant and co-dominant);
  - Native species community dependent on natural discharge of groundwater from the Great Artesian Basin; and
  - Semi-evergreen vine thickets of the Brigalow Belt (North and South) Bioregions.
- Critically Endangered:
  - Littoral rainforest and coastal vine thickets of eastern Australia; and

- White Box-Yellow-Box-Blakely's Red Gum Grassy woodland and derived native grassland.

Desktop searches identified 1,395 plants with either species or habitat that may occur within 10km of the preferred pipeline alignment (EPA 2008a; DEWHA 2008). Of these, 54 were listed as protected[2] plants, seven of which were listed as 'Endangered' under either the EPBC Act or NCA (refer Appendix 1, Table A-5). Only twelve of these species were considered highly likely to have preferred habitat in the 10km wide pipeline study area.

Detailed flora studies will be undertaken along the preferred alignment during the project planning stages to verify if these species are present along the pipeline route.

5.1.3 ESSENTIAL HABITAT

Essential habitat, which is vegetation in which a species that is endangered, vulnerable, rare or near threatened has been known to occur, is mapped by the EPA and used by NRW to help determine the habitat status of the vegetation when assessing applications to clear, pursuant to the *Vegetation Management Act 1999* (VMA). The pipeline will be aligned to avoid essential habitat where possible although land mapped as essential habitat does not necessarily prohibit clearing for a relevant purpose under the VMA and construction of a transmission pipeline is considered a relevant purpose and exempt from this regulation (refer Appendix 1, Table A-8).

Between KP11 and KP17 essential habitat for the 'Vulnerable' perennial shrub species, *Philotheca sporadica* was identified through database searches. This species is limited to the Darling Downs Pastoral District, particularly east of Kogan where the recorded sites represent approximately 30% of the total population. It is known to occur in low open forests consisting of species including currawong (*Acacia burrowii*), yellow messmate (*Eucalyptus exserta*), narrow-leafed ironbark (*Eucalyptus crebra*), red ironbark (*Eucalyptus fibrosa ssp nubila*) and white cypress pine (*Callitris glaucophylla*). It occurs in the Origin Darling Downs Power Station site, approximately 400m south of the pipeline route.

Essential habitat for the golden-tailed gecko (*Strophurus taenicauda*), which is listed under the NCA as a rare species, was identified approximately 2km east of the proposed alignment between KP298 and KP302 in the Montour State Forest. This species is found in open woodland and open forests in the Darling Downs and north to coastal central Queensland. It is nocturnal and lives in trees under loose barks or in tree hollows.

Further north, 'Of Concern' remnant forest red gum vegetation (RE11.3.4) and 'Not of Concern' narrow-leafed ironbark woodland (RE11.12.1) located east of the proposed alignment between KP304 and KP306 is avoided. This remnant extends approximately 2km east into the Montour State Forest where it forms part of essential habitat for the the brigalow scaly-foot lizard species (*Paradelma orientalis*), listed under the NCA and EPBC Act as 'Vulnerable'. This legless lizard occurs within the Brigalow Belt Bioregion in a variety of open forest habitats. This species is nocturnal and feeds primarily on the sap of the *Acacia falciformis*.

[2] "Protected" plants refers to those listed as Rare, Vulnerable or Endangered under the EPBC Act or the NCA.

The vegetated eastern face of the escarpment of the Calliope Range has been identified as essential habitat for an 'Endangered' species of cycad, *Cycas megacarpa* which is also found in the Callide Range near Coal Road. This species grows to 6m and occurs in scattered patches which may be locally abundant. Clearing of eucalypt forest threatens populations. Accordingly, clearing has been avoided by the use of a directional drill in this area.

Between KP452 and KP453, the route passes through outliers of essential habitat for the little pied bat, *Chalinolobus picatus*, which is listed under the NCA as a rare species. This species of bat occurs primarily in arid and semi-arid regions of eastern Australia and inhabits a wide variety of woodland and forest habitats. It shelters in tree hollows and requires access to free-standing water. The essential habitat area encompasses a 'Not of Concern' narrow-leafed ironbark remnant (RE11.11.4).

The riparian vegetation adjacent to Mount Larcom–Gladstone Road has been listed as essential habitat of the koala, *Phascolarctos cinereus,* recognised as 'Of Least Concern' outside of south east Queensland under the NCA. Koalas inhabit a variety of habitat types but prefer eucalypt communities as this is their primary food resource. It is recognised internationally as at low risk – near threatened under the IUCN Red List of Threatened Species.

Remnant vegetation approximately 100m east of Landing Road (KP464 to KP465) has been listed as essential habitat for the little pied bat, *Chalinolobus picatus*, the koala, *Phascolarctos cinereus* and the rusty monitor, *Varanus semiremex*. The rusty monitor, a rare small species of goanna is listed under the NCA. It is generally found inhabiting coastal and estuarine mangroves and paperback forests associated with watercourses along the Queensland coast from Gladstone to Weipa.

Although not explicitly reviewed as part of this desktop assessment, an assessment of biodiversity corridors and connectivity will be incorporated into ecological field surveys and more detailed assessment of pipeline impacts. Ecological surveys will be used to ground-truth the desktop findings, with targeted searches for identified Endangered, Vulnerable or Rare (EVR) species.

5.1.4 WEEDS

A total of 193 introduced plants were identified during desktop studies (EPA, 2008). Of these, none are listed as Class 1 Declared Plants, nine are listed as Class 2 and six are listed as Class 3 as shown in Table 3.

Table 3: Declared Weeds Identified Along the Preferred Pipeline Route

Scientific Name	Common Name
Class 2 Declared Plant	
Opuntia stricta	Common Pest Pear
Opuntia streptacantha	Westwood Pear / Cadona Pear
Opuntia tomentosa	Velvety Tree Pear
Lycium ferocissimum	African Boxthorn
Baccharis halimifolia	Groundsel Bush
Bryophyllum delagoense	Mother of Millions
Parthenium hysterophorus	Parthenium
Sporobolus pyramidalis	Giant Rat's Tail Grass
Cryptostegia grandiflora	Rubber Vine
Class 3 Declared Weeds	
Aristolochia elegans	Calico-flower
Cascabela thevetia	Captain Cook Tree or Yellow Oleander
Macfadyena ungis-cati	Cat's Claw Creeper
Celtis sinensis	Chinese Celtis or Chinese Elm
Lantana camara	Common Lantana
Lantana montevidensis	Creeping Lantana

Source: EPA 2008a, DPIF, 2008

5.2 FAUNA

5.2.1 THREATENED SPECIES

A total of 536 fauna species were identified with potential ranges that overlap within 10km of the preferred pipeline route (EPA 2008a and DEWHA 2008). Of these, 51 species are protected under EPBC Act and / or NCA (refer Table 4). Of these, 13 were considered highly likely to have preferred habitat along the proposed pipeline route (refer Appendix 1, Table A-6).

Table 4: Summary of Threatened[3] Fauna Species Identified Within 10 km of the Pipeline

Category	Number of EVR Fauna[1]
Birds	19
Mammals	10
Fish	1
Reptiles	17
Sharks	2
Insects	1
Total	**50**

[1]not including species listed as EPBC migratory or marine as presented in Appendix 1, Table A-7
Source: DEWHA, 2008

An additional 75 migratory and/or marine species were also identified as potentially occurring within 10km of the preferred pipeline[4] (refer Appendix 1, Table A-7). This list included 17 birds, 11 mammals, 14 reptiles and 33 ray-finned fish (EPA 2008a). Of these, five migratory birds were considered highly likely to have habitat within the pipeline area.

[3] Threatened includes species classified as 'Endangered', 'Vulnerable' and 'Rare' under the EBPC Act and NCA.

[4] It should be noted that species listed as migratory and/or marine under the EPBC Act, are also listed as otherwise threatened in Table 4.

5.2.2 INTRODUCED SPECIES

Desktop searches identified 17 introduced fauna species, shown in Table 5 (EPA 2008a).

Table 5: Summary of Introduced Fauna Species

Scientific Name	Common Name
Amphibians	
Rhinella marina	Cane Toad
Birds	
Columba livia	Rock Dove
Streptopelia chinensis	Spotted Dove
Passer domesticus	House Sparrow
Sturnus vulgaris	Common Starling
Mammals	
Bos taurus	European Cattle
Canis familiaris	Dog
Vulpes vulpes	Red Fox
Equus caballus	Horse
Felis catus	Cat
Lepus capensis	Brown Hare
Oryctolagus cuniculus	Rabbit
Mus musculus	House Mouse
Rattus rattus	Black Rat
Sus scrofa	Pig
Fish	
Gambusia holbrooki	Mosquito Fish
Poecilia reticulata	Guppy

6.0 SOCIAL ENVIRONMENT

6.1 POPULATION CENTRES AND NEARBY RESIDENCES

The proposed pipeline passes through the four Local Government Areas: Banana Shire, Chinchilla Shire, Dalby Regional, Gladstone Regional and North Burnett Regional Councils. The main towns in the vicinity of the pipeline are: Miles (approximately 21km to the west, population 1,237); Wandoan (approximately 23km to the west, population 411); Biloela (approximately 10km to the west, population 5,717); Moura (approximately 60km to the west, population 1,890); and Gladstone (population 30,731) (refer Figure 1).

Townships located within 10km of the proposed pipeline include: Kogan; Chinchilla; Goombi; Marama; Rockybar; Yuruga, Thangool; Mt Larcom; Targinie; Yarwun and Mt Sugarloaf. Yarwun is the closest settlement, located approximately 0.5km from the proposed pipeline.

Although most of the area surrounding the pipeline is remote from residential communities, isolated homesteads are expected to be encountered in close proximity to the preferred route. The majority of these homesteads have been avoided by a distance of 500m or greater.

6.2 NATIVE TITLE

SGP has undertaken the necessary searches of the register of native title claims maintained by the National Native Title Tribunal (NNTT) and used various forms of data as follows:

- Digital data of the native title claim boundaries as of April 2004;
- Hard copy extracts of each native title claim; and
- Review of published native title claim maps on the NNTT web site and information provided by relevant claim officers in the NNTT to ensure that no new claims have been excluded from the analysis.

This data has been used to determine which groups constitute the Aboriginal Parties for cultural heritage issues associated with the proposed pipeline and how much of the alignment lies within their respective claim areas. Five registered native title claims have standing as exclusive Aboriginal Parties for that portion of the pipeline that falls within their claim boundaries. Parties will share Aboriginal Party status for that portion of their claim which overlaps another registered claim. The Western Wakka Wakka will have the status of exclusive Aboriginal Party for that area that does not overlap another registered claim, notwithstanding theirs is now an unregistered claim. A couple of short sections where no native title claim has been registered may be anomalies and attempts will be made to resolve these in discussions with the Aboriginal Parties. Table 6 provides the outcomes of this analysis which is illustrated in Figure 5. Additional information is provided in Appendix 3.

Table 6: Native Title claims (currently registered or registered as of April 2004) who constitute Aboriginal Parties for the preferred pipeline alignment

NATIVE TITLE CLAIM	Segment Length (km)
No Native Title Present	1.38
Port Curtis Coral Coast QC01/029	65.99
Gangulu QC97/036	76.67
Gangulu QC97/036 & Wakka Wakka #2 QC99/033	0.00
Wakka Wakka #2 QC99/033	3.78
Wakka Wakka #2 QC99/033 & Wulli Wulli QC00/007	1.13
Wulli Wulli QC00/007	126.10
Iman #2 QC97/055	45.37
Western Wakka Wakka QC99/04	22.85
Barunggam QC99/005 & Western Wakka Wakka QC99/04	124.26

Arrow will ensure that it holds all relevant consents and authorisation with respect to native title rights and interests (as defined under the P&G Act and *Native Title Act 1993* (NT Act) and further described in Section 11.1.2).

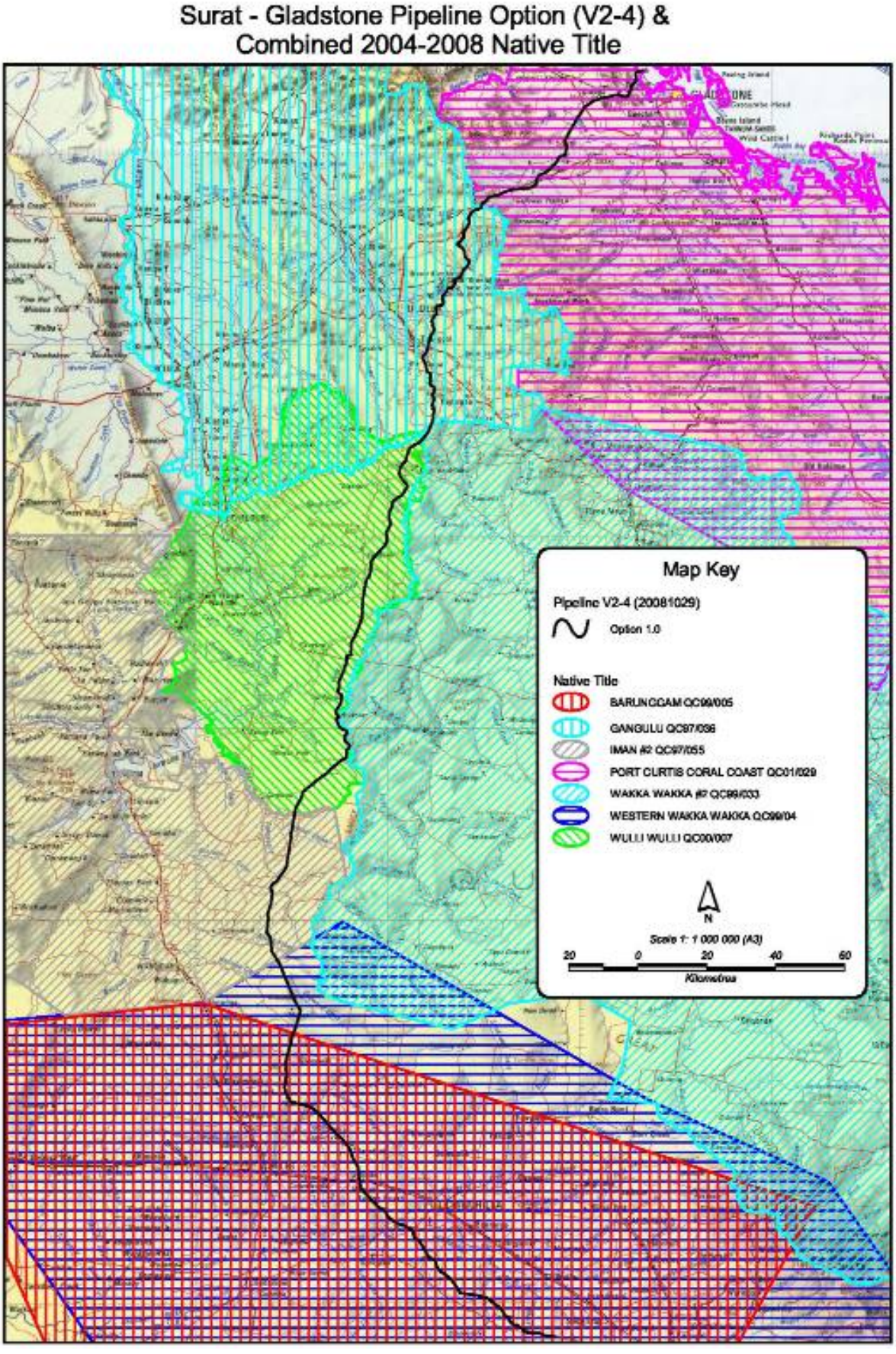


Figure 5: Native Title Claims

6.3 ABORIGINAL CULTURAL HERITAGE

SGP has the capacity for full compliance with the cultural heritage (CH) duty of care by the means specified in s23 of the *Aboriginal Cultural Heritage Act 2003* (ACHA) administered by DNRW as detailed in Section 11.2.3.

The process that SGP has initiated in relation to planned CH management, progress to date and measures to be implemented are described in detail in Appendix 3.

A search has been undertaken of various databases held by State and Commonwealth agencies to identify sites of cultural heritage significance.

A search was made of the Indigenous Cultural Heritage Database (ICHD) maintained by the Cultural Heritage Coordination Unit, DNRW. The initial buffer for this search was a 100km wide corridor. Using the data provided from this search, a more refined analysis of the proposed route has been undertaken using a buffer 2km wide centered on the preferred route. The search and analysis results identified a total of 36 cultural heritage areas or objects that have previously been recorded within the buffer search area (refer Appendix 3).

A diverse range of cultural heritage place-types, including a number that are uncommon and rare have been identified. Places consisting solely of stone artefacts dominate the recorded cultural assemblage of the buffer area. Twenty-two of the places (almost two thirds of the total number) fall into this category. In addition, stone artefacts are associated with a further eight places. These include associations with four quarries containing stone used in artefact manufacture, two places described as ‘Cultural Places’ (associated with traditional ceremony), a well, and an area containing both a pathway and a weir.

Other place-types that have been identified include a set of axe grinding grooves located in the area of the Condamine River, and four scarred trees. On the basis of the currently available information, only two of the identified places lie within 100m of the pipeline alignment. Both of these consist of small scatters of stone artefacts that are located between 50 and 70m from the preferred pipeline alignment.

The cultural heritage areas and objects currently identified within the ICHD are clustered across three general areas. The first is associated with the southern end of the route in the general area of Dalby, Condamine and Miles. Cultural heritage investigations in this area have predominantly been undertaken as part of other gas pipeline projects. The bulk of the currently recorded cultural heritage places are located in the Biloela area of the pipeline route. The remaining cultural heritage places that have been identified lie at the Gladstone end of the pipeline, an area that has been the subject of considerable cultural heritage work owing to the intensity of development activity experienced in the area.

No cultural heritage places have currently been recorded within the buffered alignment between the Condamine River and the Biloela area, a distance in excess of 250km of the central and southern portions of the pipeline route.

6.4 HISTORIC HERITAGE

A formal search was undertaken of the detailed listing notes for all places on the Queensland Heritage Register (QHR) established under the Queensland *Heritage Act 1992* that lie within a buffer of 5km either side of the proposed pipeline alignment. There are no currently registered places located within the buffer search area.

Separate to the Queensland Heritage Register, the EPA has compiled a substantial repository of information regarding historic heritage places and incorporated this into its Cultural Heritage Information Management System (CHIMS).

The search of this database returned a single entry within the buffered alignment. This place is described as being a 'midden' although it is unclear if this relates to an Aboriginal shell midden recorded during an historic heritage survey and then entered on the CHIMS, or an accumulation of historic heritage material (such as a dump), further described in Appendix 3.

6.5 COMMONWEALTH REGISTERS

Searches of the various Commonwealth heritage lists and registers regarding places that were located within the buffer search area (a total corridor width of 2km surrounding the pipeline centreline) were conducted. These searches included the World Heritage List (WHL), the Commonwealth Heritage List (CHL), the National Heritage List (NHL) and the Register of the National Estate (RNE) as described in Appendix 3. Three places were found to be located within the buffered alignment. Towards its southern end, the pipeline route runs adjacent to the western boundary (in two areas, these being approximately 15m from the current centreline) of the Barakula State Forest Area. As discussed in Appendix 3, this place is an 'indicative' listing on the RNE (RNE ID: 18062) and is proposed to be registered for its natural values.

Further to the north, in the Biloela area, the pipeline runs to the west of the Mt Scoria Environmental Park (the entirety of this small park is located within the Project buffer area). This place (RNE ID: 8817) is also inscribed on the Register of the National Estate for its natural values (this place is formally registered). Although not included within the online listing information, this area is known to be of particular importance to the Gangulu People.

At the northern end of the Project lies the Great Barrier Reef region. This is obviously of high significance, being a registered place on the RNE (RNE ID: 8320), a declared property on the WHL (WHL ID: 105060) and entered on the NHL (NHL ID: 105709). Although all of these listings, further described in Appendix 3, note that the area has been inscribed for its natural values, its Indigenous values have also been recognised.

Based on the databases available from DEWHA, the northernmost 1km of the pipeline route enters the Great Barrier Reef area as it is currently registered. The pipeline route in this area follows the Gladstone State Development Area common infrastructure corridor to Fisherman's Landing.

6.6 LAND TENURE AND USE

Land tenure along the preferred ROW comprises a total of 250 land parcels of the following tenure:

Freehold	203 lots	81.2%
Land lease	39 lots	15.6%
Reserve	6 lots	2.4%
State forest	1 lot	0.4%
State land	1 lot	0.4%.

Land tenure and mineral and petroleum tenements are illustrated in Figure A-2 and Figure A-3 respectively, with more details provided in the 1:100,000 DCDB map series (Appendix 5, Sheet 1-13). SGP have identified all landholders along the entire pipeline route, and land agents are engaging with all landholders to ascertain any landholder issues pertaining to the proposed pipeline alignment.

Land use associated with the broader regional area is predominantly for agricultural purposes, oil, gas and mining exploration and production, as well as tourism and conservation. Many of the regional towns have, or are progressing from, a rural-based economy reliant mainly on grain crops to more extensive feedlots, meatworks and broad-acre farming as well as coal, gas and mineral exploration including power generation (Chinchilla Economic and Tourism Development Association 2006; Banana Shire Council 2008; Dalby Regional Council 2008). Some of the larger towns and cities, such as Dalby and Gladstone, are also service centres for the surrounding communities.

6.6.1 AGRICULTURE AND GRAZING

Much of the pipeline route traverses land primarily used for sheep and cattle grazing or cropping of cotton, sugarcane, lucerne, wheat, barley and sorghum (Chinchilla Economic and Tourism Development Association 2006; Banana Shire Council 2008; Dalby Regional Council 2008). Clearing of native vegetation for grazing and cultivation is common in areas where climate and soils allow for regular cropping and grazing.

A variety of pastoral infrastructure is expected to exist along the pipeline including gates, fences, bores, water pipes (polypipe) and stock yards.

6.6.2 OIL, GAS AND MINERAL EXPLORATION AND OPERATIONS

Much of the pipeline traverses the Surat Basin which has been the subject of recent growth and major development as a result of coal and gas exploration, CSG developments, underground coal gasification proposals, and the establishment of new power stations (Chinchilla Economic and Tourism Development Association 2006; Dalby Regional Council 2008).

Consequently, the pipeline route passes through a number of petroleum production and exploration tenements. Numerous seismic lines, oil and gas wells and gathering lines are also located throughout the region, and drilling of new gas wells is ongoing. The preferred

pipeline route will transect four petroleum leases and seven petroleum pipeline licences, as shown in Table 7.

Table 7: Intersected Pipelines and Petroleum Leases along the Preferred Pipeline

Owner	Type	Status	Approximate Location of Intersection
AGL Pipelines Investments Qld Pty Ltd	Gas Pipeline (PPL 56)	Progressing	Near Gladstone
Alinta DQP Pty Ltd	Gas Pipeline (PPL 30)	Operational	Calliope to Gladstone
APT Petroleum Pipelines Limited	Gas Pipeline (PPL 1)	Operational	Near Kogan
Arrow Energy Ltd	CSG Pipeline (PPL 117)	Operational	Near Kogan
Braemar Power Project Pty Ltd	CSG Pipeline (PPL 102)	Operational	Near Kogan
Central Queensland Pipeline Pty Ltd	CSG Pipeline (PPL 121)	Granted	Near Gladstone
Envestra Limited	Gas Pipeline (PPL 60)	Operational	Near Gladstone
ERM Braemar 2 Pty Ltd	Gas Pipeline (PPL 132)	Granted	Near Kogan
Arrow Daandine Pty Ltd	Petroleum lease (PL 230)	Granted	Near Kogan
Australian CBM Pty Ltd	Petroleum lease (PL 185)	Under Application	Near Kogan
Australian CBM Pty Ltd	Petroleum lease (PL 194)	Granted	Near Kogan
Origin Energy CSG Limited	Petroleum lease (PL226)	Under application	Near Chinchilla
Origin Energy CSG Limited	Petroleum lease (PL272)	Under application	Near Chinchilla
Queensland Gas Company Limited	Petroleum lease (PL273)	Under application	Near Chinchilla

Exploration and resource tenure holders are being approached to determine the extent of the delineation as pipelines may constrain development of deeper coal seams. Mineral Development License (MDL) areas have been avoided and Exploration Permits for Coal (EPC) have been considered in order to avoid any areas of known but yet undeveloped coal reserves.

6.6.3 TOURISM

Tourism and recreational opportunities across central Queensland generally include camping, fishing, bird watching, water sports (such as canoeing and swimming), archaeology and general exploration.

Each of the local government areas have specific natural and anthropological attractions and organised events including:

- Banana Shire Council is home to gorges, rivers and national parks including Glebe Weir and Expedition National Park, Lake Murphy, Kroombit and Mt. Scoria Conservation Parks, and Isla and Cania Gorges. The Dawson River and Callide Dam also provide opportunities for fishing and water sports, and there are 4WD tracks throughout the area (Banana Shire Council 2008).
- Dalby Regional Council hosts a number of community events including: the annual Australian Cotton Week Festival, the Dalby Show and horse racing carnivals. Major

tourist attractions also include the Pioneer Park Museum, Heritage trails and memorial parks as well as Lake Broadwater, the Jondaryan Woolshed, and Bunya Mountains (Dalby Regional Council 2008).

- Gladstone Regional Council also host a number of community events including Boyne Tannum Hookup Annual Fishing Competition, the biannual Old Station Flying & Airshow, Gladstone Harbour Festival, Brisbane to Gladstone Yacht Race to name a few (Gladstone Regional Council 2008).
- North Burnett Regional Council organises a variety of market days, fishing competitions, race days as well as administer natural tourist attractions such as the Kirar Weir (near Eidsvold), Coongarra Rock and Falls and a number of dams with picnic and barbeque facilities (North Burnett Regional Council 2008).

6.6.4 CONSERVATION

Route selection has avoided formally designated conservation areas, including the following state forests:

- Dalby;
- Barakula;
- Quandong;
- Cooaga;
- Mundell;
- Rockybar;
- Borania;
- Camboon;
- Montour;
- Calliope Range;
- Mount Stowe; and
- Callide Timber Reserve.

The location of State forests and timber reserves are illustrated on Figure A-4 (Appendix 2).

Should any part of the alignment be refined and unavoidably intersect a State Forest, the pipeline route will follow existing cleared areas where possible and will be selected in consultation with local Queensland Parks and Wildlife (QPW) officers who administer the forests.

An additional six state reserves were identified during desktop searches as follows (DEWHA 2008):

- Garden Island Conservation Park (the southern extremity of Curtis Island, 5km north of Gladstone);

- Mackay / Capricorn Marine Park (now called the Great Barrier Reef Coast Marine Park, offshore from Gladstone);
- Mount Scoria Conservation Park (5km south-south-east of Thangool, approximately 350 m from the pipeline);
- Rodds Bay Dugong Protection Area (located more than 20km south east of Gladstone within the Great Barrier Reef Coast Marine Park, offshore from Gladstone);
- An Unnamed Scientific Area (no information available); and
- Waaje Wildflower Scientific Area (within the Barakula State Forest, approximately 9km to the east of the preferred pipeline route).

None of the above reserves are expected to be impacted by pipeline construction or operations.

A number of other conservation areas, environmental parks and dams are located within the regional area around the pipeline however, due to the distance from construction activities and the implementation of appropriate erosion and sediment control measures, adverse environmental impacts are unlikely.

The pipeline intersects the following areas listed as restricted on the GIS datasets:

- Callide Dam ponded area;
- Callide Dam catchment area; and
- Castlehope dam site on the Calliope River.

Implications and potential impacts will be assessed during the detailed ecological assessment phase of the project and following consultation with Sun Water.

6.7 INFRASTRUCTURE

The preferred pipeline lies within 10km of five regional airstrips / airports: Cockatoo Airport (two locations within 10km of each other), Mount Larcom Airport, Thangool Aerodrome and Calliope Airport. The pipeline construction and operation will not impact on these facilities.

The pipeline will transect a number of roads (the majority being local government roads) and four railways, which are shown in Table 8.

Although the pipeline generally avoids high voltage power easements, it does intersect some low voltage power lines. Crossing of such community infrastructure lines will be further assessed during Front End Engineering and Design (FEED) studies and “Dial Before You Dig”, with appropriate impact minimisation strategies implemented. Landholder consultation will identify private infrastructure such as water pipelines, sewerage, dams, fences etc. for avoidance or other management.

Table 8: Road & Railway Crossings on the Pipeline Route

KP Point	Name	KP Point	Name
4, 8	Dalby – Kogan Rd	253.75, 260, 263	Defence Rd
11	Beelbee Rd	306.5	Rawbelle Rd
15	Healeys Crossing Rd	319.2	Dingley Dell Rd
18.5	Warra Kogan Rd	326.8, 333 – 333.67	Lookerbie Circle Rd
21.5 – 23.5	North Kogan Rd	333.8 – 340.5, 346.25	Thangool Lookerbie Rd
23.5	Banana Bridge Rd	349	Burnett Hwy
24.5 – 29.5	North Kogan Rd	353.2	Cox Millards Rd
29.5	Sixteen Mile Hall Rd	341	Halls Rd
34.75	Kummerows Rd	348	Tollemaches Rd
37.75	Chinchilla Kogan Rd	349	Burnett Hwy
45	Chinchilla Sixteen Mile Rd / Glenhope Rd	360	Valentine Plains Rd
49	Avenue Rd	366 – 367	Calvale Rd
52	Chinchilla South Rd	367, 377	Coal Rd
55	Nothdurfts Rd / North Nothdurfts Rd	379	Zingaris Rd
58	Un-Named Rd	380	Coal Rd
59	Lebsanfts Rd	387.67	Coal Rd
63.67	The Peak Rd	388	Specimen Hill Rd
63.8	Scoullers Rd	392.5	Blacks Rd
67	Lees Rd	399	Thompsons Rd
67	B Keers Rd	407.5	Unnamed Rd
70	Bidgoods Rd	409.33	Unnamed Rd
70.4	McNulty Rd	411.8	Unnamed Rd
73	Warrego Hwy	414.25	Unnamed Rd
73	Western Rail line	417.5	Moura rail line
73.2	C Keers Rd	417.67	Dawson Rd
74	Isons Rd	427	Mount Alma Rd
77.4	A Grahams Rd / Grahams Rd	428.5	Unnamed Rd
80	Davies Rd	432	Unnamed Rd
80.5	B Tennyson Rd	433.6	Kalunda Rd
85.5	Boort Koi to Ryalls Stock Routs	439.8	Unnamed Rd
89.4	Ryalls to Hookswood Stock Route	444.5	Bruce Hwy
100.67	Hookswood Pelham Rd	449.5	Unnamed Rd
115.5	Greens Rd	451.2	Mylrea Rd
125.8	Archinals Stock Route / Archinals Rd	454.8	Unnamed Rd
135.2	Knights Rd	456	Unnamed Rd
152.67	Roche Creek Rd	457	Calliope River Rd
155.25	Glendoran Rd	458.2	North Coast rail line
174.8	Big Valley Rd	458.3	North Coast rail line
176.33	Moocooraba Rd	458.67	Unnamed Rd
181.8 – 183.8	Ponty Pool Rd	460	Gladstone Mt Larcom Rd
193.2	Red Range Rd	461	Boat Creek Rd
213, 217 – 218	Deearne Rd	462 – 462.5	Landing Rd
247.25	Eidsvold Theodore Rd	463.8	Serrant Rd

7.0 ENVIRONMENTALLY SENSITIVE AREAS

The EPA defines Environmentally Sensitive Areas (ESAs) that require particular attention in environmental assessments, in Appendix C of the Ecoaccess Guideline (EPA 2006). Desktop studies and a search of the Online Ecomap Tool (EPA 2007) have identified a number of ESAs that will be transected by the proposed pipeline alignment. A brief assessment of the ESAs is provided in Table 9 and key constraint areas are graphically presented in Figure 6 and Figure 7.

Table 9: Environmentally Sensitive Areas

Environmentally Sensitive Areas	Pipeline Assessment
Category A	
National Parks, Conservation Parks and Forest Reserves Restricted Areas including Constructed Water Reservoirs Marine Parks Wet Tropics Area Great Barrier Reef Marine Park Region	While the pipeline end point in Gladstone will be within 1km of the Great Barrier Reef Marine Park, impacts of pipeline construction and operation are not expected to be apparent or significant. The pipeline project does not require drilling, dredging or excavation within the harbour or marine park and potential impacts from nearby creek crossings will be carefully managed using HDD to reduce the possibility for potential environmental effects.
Category B	
Areas protected under the Nature Conservation Act 1992 Areas subject to International Conventions General Use Zones of a Marine Park Areas to the seaward side of the Highest Astronomical Tide (HAT) Area of Cultural Heritage Significance; Protected Areas; and Registered Places. Former Designated Landscape Areas Feature Protection Area, State Forest Park or a Scientific Area Fish Habitat Areas and a place in which a Marine Plant is situated Endangered Regional Ecosystem An area of High Nature Conservation Value Essential Habitat	The pipeline transects approximately 3ha of Endangered Regional Ecosystems, as well as a number of areas identified as Essential Habitat. Close to Gladstone, the pipeline may pass through areas considered to the seaward side of the HAT. However, as this portion of the pipeline is located in the Gladstone State Development Corridor (GSDC), on previously disturbed land, impacts are not likely to be significant. The terminal point at Fisherman's Landing is on reclaimed land. Although the pipeline does not directly intersect the registered natural place, Mount Scoria Conservation Park (near Thangool), it passes within 350m and impacts are possible, although considered short term and reversible. Detailed field surveys will aim to verify the presence and significance of these ESAs and to identify options to avoid or reduce the impact of pipeline construction on these areas.
Category C	
Nature Refuge Resources Reserve Declared Catchment Areas Drainage Areas River Improvement Areas Stanbroke DLA State Forests Timber Reserves Coastal Management Control Districts	The pipeline route has been carefully aligned to avoid all state forests and timber reserves. The pipeline terminates on Fisherman's Landing with the last 4km traversing the GSDC and will not impact the Curtis Coastal Management District.

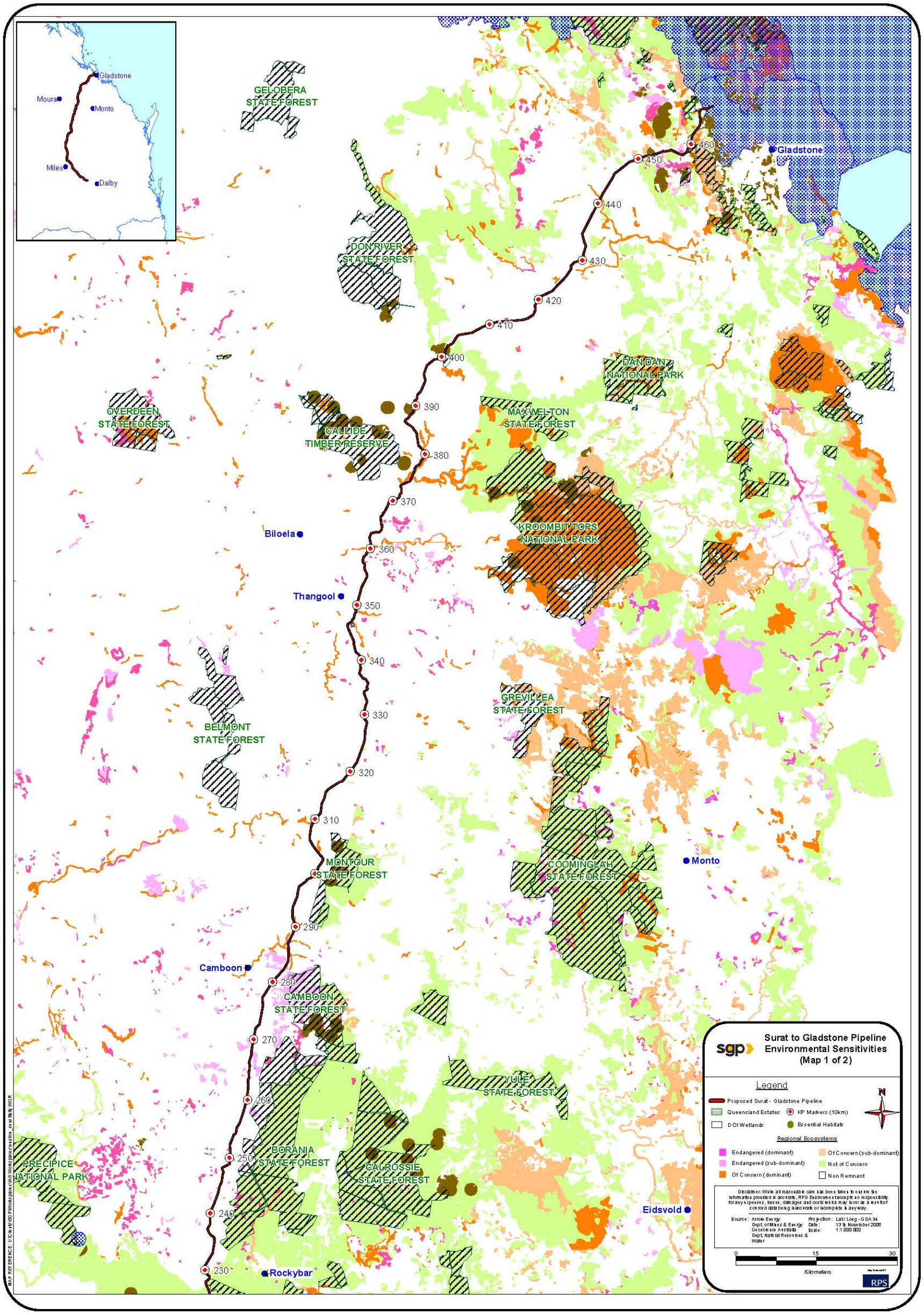


Figure 6: Environmental Constraints (1 of 2)

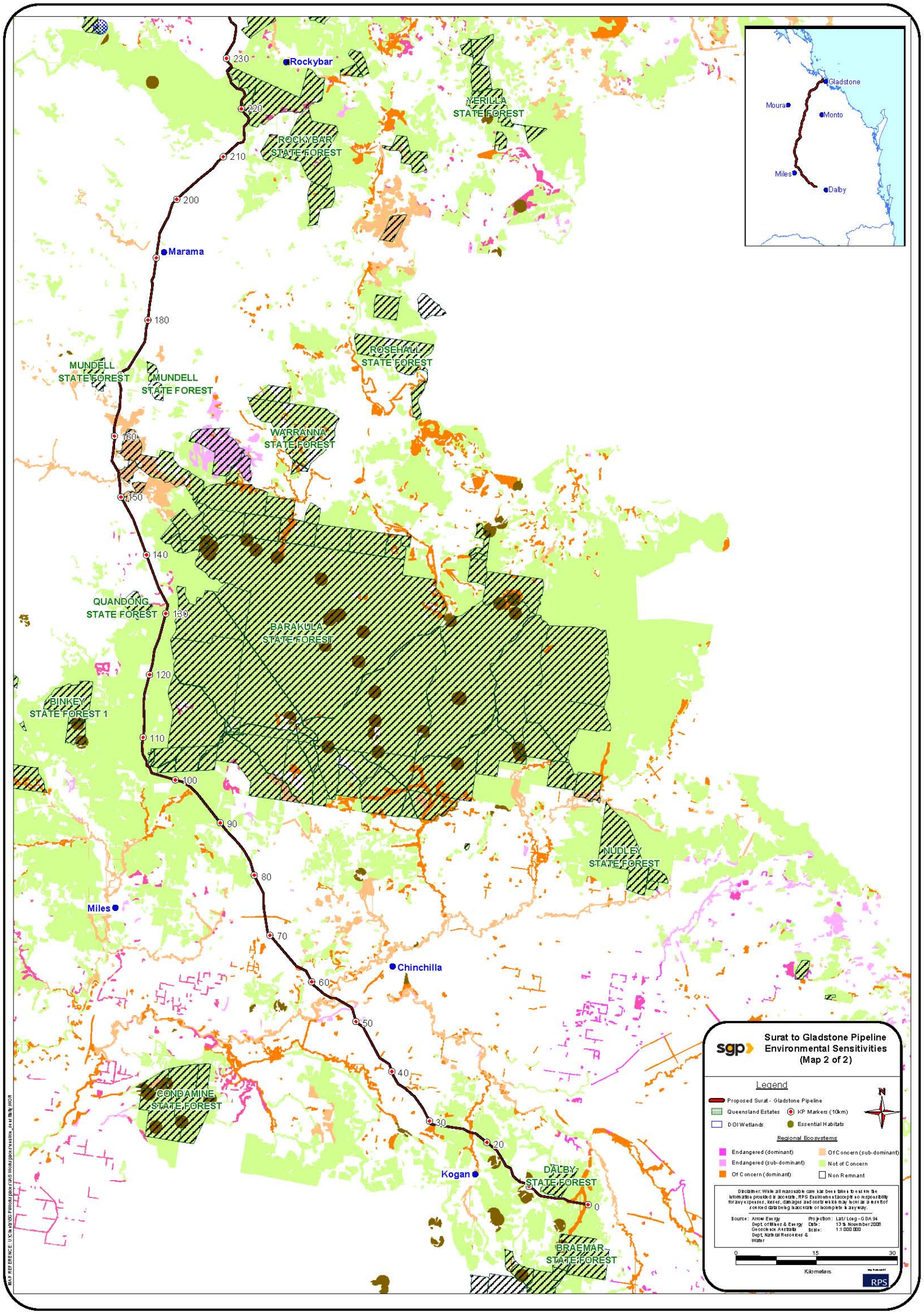


Figure 7: Environmental Constraints (2 of 2)

8.0 POTENTIAL IMPACTS AND PROPOSED MITIGATION

As discussed in Section 10.0, SGP is a wholly owned subsidiary of Arrow Energy which operates a comprehensive Environmental Management System with a proven track record in successfully constructing environmentally sound gas infrastructure in central Queensland (including the Moranbah Gas Project, the Kogan North Project and the Daandine Project).

The same proven construction methodologies will be employed for the Surat to Gladstone Pipeline to minimise environmental risk. This will be further minimised through SGP's planned approach to locate campsites and infrastructure in existing disturbed areas. SGP is consequently confident that construction of the proposed pipeline will not result in significant environmental impacts.

The following sections provide an overview of the potential impacts associated with the pipeline as proposed. While general mitigation measures are described, detailed actions will be further developed after specialist field assessments and FEED and will be addressed in the final approval documents, including the Environmental Management Plan (EMP).

8.1 AIR QUALITY AND NOISE

8.1.1 AIR QUALITY

Atmospheric dust will be the main impact to air quality during the construction of the pipeline. Dust will principally arise from clearing, grading, pipeline trenching and backfill, as well as from general vehicle movements during construction. During operational maintenance, it is expected that rehabilitation will have progressed sufficiently that. After a short period, dust will not represent a potential issue. Dust generation is expected to be generally localised and short-term as construction progresses along the alignment. Measures will be implemented to minimise the nuisance experienced by local residents and the workforce and dust will be managed through the application of water in dry and windy periods (or when working in proximity to residences) and through monitoring in response to any complaints or EPA direction.

Exhaust fumes will be emitted during construction and operations by light vehicles, trucks, machinery and equipment. Such equipment will be fitted with operational exhaust systems that will control these emissions. Emissions during pipeline operations would predominantly arise from venting small amounts of natural gas during routine maintenance and is not expected to result in significant pollutant loads in the local air shed.

Given the context of existing land uses in the region (including pastoral, petroleum production and transport), air quality impacts associated with dust and emissions from pipeline construction, are considered minimal.

8.1.2 NOISE

Construction activities will result in a temporary increase in noise levels within the immediate vicinity of the ROW and access roads from the operation of light vehicles and construction equipment (including excavators, graders and bulldozers). Other sources may include campsites, drilling (HDD or boring) and noise from rock saws in areas where hard rock is present.

Campsites will not be situated in close proximity to sensitive noise receptors, and will be located to minimise impacts to local residents. The residents in close proximity to the pipeline will be kept informed regarding project activities and timing of noisy activities will generally be scheduled between 7am and 6pm Monday to Saturday where practical (as per the EPA Information Sheet – Power Tools and Building Works, August 2007). Likewise, landholders will be advised of any planned venting / blowdown which occur occasionally during commissioning and operation. Given the relative isolation of the pipeline from large communities and the short duration of construction in any given area, construction noise impacts are considered unlikely.

Standard pipeline operation is silent and not typically associated with generating a noise nuisance. Except in an emergency, or for major pipe excavations, the movement of large plant and equipment along the easement will not be required although minor noise will arise from vehicle movements and occasional pipeline surveillance and maintenance activities (e.g. weed or erosion control). Planned maintenance activities will occur during normal working hours and thus operational nuisance is further reduced.

8.2 WASTES

Relatively small amounts of domestic and industrial wastes will be generated during the construction and operation of the proposed pipeline. Waste management will be based on a hierarchy beginning with waste avoidance, minimisation and recycling before disposal. This system is outlined in the Waste Management strategies (Appendix 4) for the management of all wastes associated with construction and operational activities of the pipeline.

Regulated waste such as low volume, low level contaminated soil / gravel (e.g. oil contaminated) may be generated during pipeline operations. Such waste, if produced, may be disposed of at licensed facilities, or treated in-situ on site.

8.3 SOIL MANAGEMENT

8.3.1 EROSION AND SEDIMENT CONTROL

To reduce soil impacts and potential erosion and sedimentation issues, the pipeline ROW may be narrowed and clearing minimised in sensitive areas such as the banks of watercourses containing riparian vegetation and erosion-prone soils. Watercourse banks will be stabilised and drainage patterns re-established at creek crossings within the shortest practical period. The timing between clear and grade and restoration will be limited to reduce the duration of soil exposure, while construction works will be minimised during high rainfall and flood events. In areas of high slope and erosion prone soils, the use of stormwater diversion drains and other erosion control measures as outlined in the EMP (Appendix 4) will be implemented.

Pipeline easement maintenance will be regularly undertaken to ensure that the integrity of soil conservation works installed during restoration are maintained and vegetative cover is promoted to ensure minimal soil loss. Progressive revegetation will occur during construction and operations to reduce potential erosion risk.

An EMP for the operational phase (see Appendix 4) outlines appropriate maintenance requirements with regards to sediment and erosion control along the pipeline route.

8.3.2 SPILL PREVENTION AND HYDROTEST MANAGEMENT

Without appropriate controls, project-related activities may result in localised soil contamination from:

- Minor spills of fuel or chemicals;
- Stormwater / runoff from disturbed areas; or
- Discharged treated sewage effluent and hydrotest water (if required).

Environmental controls, including spill prevention and cleanup measures and quality assurance systems will be implemented throughout construction and operations, including spill prevention and cleanup measures.

Construction activities will use relatively small quantities of chemicals and fuel, thus potential spill volumes are low. Construction equipment will be refuelled by appropriately trained and qualified staff on the pipeline ROW or inside purpose built areas at camps or facility compounds, as applicable. Diesel storage tanks at the construction camps will be designed and operated in accordance with AS 1940:2004 (The Storage and Handling of Flammable and Combustible Liquids). All waste will be periodically removed from site.

The pipeline will be internally lined minimising the need to add corrosion inhibiting chemicals (e.g. biocides and/or oxygen scavengers) to the hydrotest water. This increases the options for hydrotest water disposal as such water will not then require treatment prior to disposal. Detailed procedures for hydrostatic testing will be developed for the pipeline and will address the following disposal options:

- Disposal on-site after assessment or analysis (provided the water meets relevant ANZECC and relevant EPA criteria);
- Containment and/or treatment on site, to existing facilities, or a new evaporation pond in accordance with EPA requirements; or
- Removal from site.

Management of hydrotest water (including discharge) will be in compliance with all regulatory and landholder requirements and will not result in environmental harm.

Packaged sewage treatment units that meet applicable legislation and standards are likely to be utilised at temporary construction camps. Following treatment, effluent will be disposed to land, well away from watercourses, infrastructure, residential dwellings or sensitive areas and in accordance with relevant standards and regulatory water quality limits.

With the implementation of detailed soil protection measures (including those described above), impacts associated with soil contamination should be minimal.

8.4 WATER RESOURCES

8.4.1 SURFACE WATER

A number of watercourses are expected to be unavoidably intersected by the construction of the pipeline. Watercourses are anticipated to be crossed using standard open cut trenching or HDD (where open cut methods are not feasible). By appropriately timing construction activities (i.e. in dry periods) and installing and maintaining appropriate erosion and sediment control structures (e.g. diversion berms and cross ditches) significant long term impacts (including flow diversion and sedimentation) to watercourses, will be prevented.

No internationally or nationally significant wetlands are expected to be impacted by the pipeline construction.

8.4.2 GROUNDWATER

The groundwater structures are unlikely to be affected by the construction of the pipeline. The pipeline is buried at a shallow depth (minimum 750mm cover except at watercourse crossings and road crossings where the minimum depth of cover will be 1200mm) and is unlikely to disrupt any sub-artesian supplies.

The construction of the pipeline is considered to have very little impact on groundwater recharge while the shallow depth of the trench and the physical disturbance of the surface is unlikely to cause groundwater contamination. To prevent contamination through recharge areas, the EMP details construction measures to control water used for hydrostatic testing and watering of access tracks and waste disposal.

Extraction of water for hydrostatic testing, camp use or other construction use (e.g. road maintenance) has the potential to impact groundwater or surface water flows if not appropriately managed. If extraction of water from local rivers or creeks is required, it will be carried out in a manner that will minimise flow impacts (e.g. only extract if water was flowing at a certain rate). Any water extraction will also be subject to obtaining necessary approvals under the *Water Act 2000* and compliance with associated permit conditions. Existing bores would be utilised wherever possible (and where permitted) in preference to installing new bores.

There is also a small but potential risk that project related activities may result in localised groundwater or surface water contamination. The main potential sources of contamination are:

- Minor spills of fuel or chemicals; and
- Discharged hydrotest water.

Providing management procedures related to preventing soil contamination (as described in Section 8.3.2) are implemented, associated impacts to groundwater and surface water resources as a result of pipeline and facility compound activities are considered unlikely.

Groundwater levels in the vicinity of Fisherman's Landing are expected to be high given the low RL of the surrounding terrain. Accordingly, should the trench require dewatering in this area, management strategies are outlined in the EMP (Appendix 4) in the event that possible acid sulphate soils may be encountered.

8.5 FLORA AND FAUNA

8.5.1 HABITAT FRAGMENTATION AND LOSS

Flora communities to be cleared for pipeline construction are largely considered to be 'Not of Concern' and 'Non-Remnant" communities (refer Section 5.1.1). A maximum area of 1,405ha may be disturbed, assuming the maximum 30m width is used for the pipeline construction (which is unlikely for the entire length of the pipeline). Required clearing will be reduced to the greatest extent practicable especially within areas identified with key environmental constraints and sensitivities such as endangered communities and watercourses. Actual habitat loss will be largely temporary as reinstatement of the easement will occur progressively and natural revegetation will be encouraged. Rehabilitation conducted in accordance with proven industry standards, to similar or better than pre-existing conditions (pending site-specific conditions that may be specified by the landholder).

Habitat fragmentation will be minimised by encouraging natural regeneration along the pipeline easement after the pipeline has been installed. Rehabilitation will be undertaken in accordance with relevant authorities and recommendations from environmental specialists, and will include (as a minimum):

- Re-profiling to original or stable contours;

- Re-establishing surface drainage lines and other land features;
- Ripping or scarifying compacted areas where necessary to facilitate vegetation growth (with consideration given to soil type and land system);
- Stockpiling topsoil and vegetation for later use in resinstatement;
- Replacing sub-soil an topsoil in correct soil horizon profile in trench; and
- Spreading stockpiled topsoil and seed stock (i.e. cleared vegetation) in an even layer on graded surfaces.

Subject to landholder property management practices, significant portions of the construction footprint are expected to naturally regenerate over the medium term (10 to 50 years).

8.5.2 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

Flora

Desktop searches identified 54 protected plants and six threatened ecological communities with either species or habitat that may occur within 10km of the preferred pipeline route. Previous experience in the area suggests a degree of inaccuracy in online ecological community classification, and detailed field assessments will be conducted prior to construction to better categorise the floral assemblage.

Significant impacts to threatened species and ecological communities will be reduced where possible by using standard construction management measures (e.g. avoidance of critical areas or reduction of ROW width where possible, pre-clearing surveys, flagging and protection of significant species) as well as implementing vegetation protection measures (such as weed control and fire management) throughout all pipeline activities. Subject to the effective implementation of vegetation management techniques, the potential impacts to listed threatened species and ecological communities will be limited to direct impacts from the proposed clearing footprint. Vegetation regrowth is encouraged across the majority of the ROW, excluding the area immediately above and adjacent to the pipeline, so long term impacts are minimised. Further field investigations are required to determine the distribution, likely impacts, and potential avoidance options for the threatened ecological communities.

Fauna

The main potential impact on fauna arises from habitat loss (particularly of hollow bearing trees that provide a feeding and shelter resource) or mortality from entrapment in the open pipeline trench. Clearing will be minimised where practicable (with habitat trees retained wherever possible) while regular fauna inspections of the open pipeline trench and other excavations will be undertaken throughout construction.

Although 50 species of EVR fauna and an additional 75 migratory and/or marine species were identified as possibly utilising habitat along the pipeline route, 18 have been identified with a high likelihood of occurring along the pipeline corridor. Furthermore, the area to be

cleared represents only a small fraction (0.03% in total,compared to the immediate surrounds) of suitable habitat in the surrounding area. A high proportion of species identified were also either birds (which are highly mobile and can easily avoid areas of disturbance, particularly given the absence of significant breeding and feeding areas such as wetlands), or marine species (whose habitat will not be present along the pipeline and thus are not considered likely to be affected).

Habitat classified as essential for species listed as endangered, vulnerable, near threatened or rare under the NCA has been identified in the vicinity of the pipeline (EPA 2008). Desktop results are to be verified during field surveys to ensure that essential habitat is avoided, where practicable.

Representative fauna surveys (and targeted species surveys where necessary) will be conducted prior to any pipeline construction activities.

8.5.3 WEEDS

Weeds can out-compete and displace native species, altering established habitats and ultimately threatening a broad range of native flora and fauna, as well as land based agricultural industries. As vehicles and machinery may be sourced from a number of areas (including interstate) and may traverse numerous land tenures and properties during construction and maintenance, a wide range of weeds could be potentially encountered and spread.

Existing weeds will be identified (and mapped if necessary) during field surveys and in consultation with landholders. A Weed Management Plan will be implemented to prevent the spread of declared and environmental weeds during construction and operation of the pipeline. Key mitigation measures will include standard environmental precautions such as vehicle inspections, wash-downs and ‘no-go’ areas, as appropriate.

8.6 LAND USE AND SOCIOECONOMIC IMPACTS

Key potential social impacts that may arise from the pipeline prominently relate to the construction phase and may include:

- Employment opportunities;
- Economic benefits from local spending;
- Risks to the health and safety of the community;
- Disruption to existing land uses (including potential damage to third party infrastructure);
- Increased local traffic, use and condition of roads; and
- Reduction in visual amenity.

Potential adverse socioeconomic impacts to the regional communities along the pipeline are likely to be short-term and largely minimal. Communities may benefit both directly and

indirectly from local expenditure and employment opportunities during construction, and to a lesser extent, during operations. Any impact on local tourism is expected to be minimal and of short duration. Training and up-skilling of the local work force will be undertaken prior to and during construction, while significant economic opportunities will be provided to benefit local businesses and community groups through their involvement in the project.

Although pipelines are recognised as a safe and efficient means of transporting natural and coal seam gas, all developments present some level of risk. Adverse risks to the health and safety of the community will be reduced by conducting a detailed risk assessment in accordance with AS 2885.1. The outcome of this process will be a combination of physical and procedural measures that aim to ensure the pipeline design, construction, operation, maintenance and management meet appropriate safety standards and minimise the risk to employees, contractors and local communities.

Pipeline construction has the potential to temporarily disrupt land use due to land disturbance along the ROW and the presence of vehicles and machinery. Of particular note are the potential for impacts from the:

- Introduction, spread or colonisation of weeds;
- Restriction in stock movement;
- Increased access; and
- Potential impacts to third party infrastructure.

The above issues can be successfully managed through the implementation of detailed management plans and procedures, as well as open and transparent dialogue with landholders and the community. Most impacts are temporary, and will cease once construction is complete and the easement is rehabilitated. Existing land uses (such as cattle grazing and cropping) generally continue unaffected over buried, operational pipelines.

The use of existing arterial and local roads for transporting construction equipment and vehicles reduces the need for additional land disturbance. Such transport however, may temporarily increase and disrupt local traffic flow and may reduce road integrity. A Road and Traffic Management Plan may be required to be developed in collaboration with local government and implemented during construction. Where required, existing roads may be upgraded and maintained for heavy vehicle and equipment movement.

Pipeline construction activities will result in minor, and largely short-term, disturbance to the visual amenity of the local environment from vegetation clearing and earthworks and the presence of construction vehicles and equipment. Over the longer term, visual impacts of buried pipelines are typically related to breaks in vegetation, line-of-sight along the linear easement, the periodic presence of above ground facilities and the success of rehabilitation. Considering the progressive nature of construction activities, and the location of the pipeline (i.e. relatively isolated and predominantly within existing clearings and easements), long term visual impacts are expected to be minimal.

8.7 HERITAGE

As further described in Appendix 3, SGP will commission a comprehensive assessment of the historic and cultural heritage of the entire route. The preferred management technique will be site avoidance using practical realignment, with mitigation by relocation a last option. SGP will resource sub-surface investigations involving test pitting and excavation where appropriate. Monitoring of surface disturbing activities will be supported where results of the initial field assessments indicate this is warranted.

8.7.1 EUROPEAN HERITAGE

Although searches of heritage estate databases identified sites of historic significance in the regions surrounding the Surat to Gladstone Pipeline, no significant sites will be intersected and impacts to these features is unlikely.

Any ensuing management program will be agreed with the EPA and the Queensland Heritage Council as appropriate, and discussed with the National Trust of Queensland.

8.7.2 ABORIGINAL CULTURAL HERITAGE

SGP has and will continue to consult with relevant regulatory authorities (including the DME and EPA), as well as Native Title claimants and relevant Aboriginal Groups regarding Native Title and cultural heritage issues in the proposed pipeline area. SGP may choose to develop a voluntary Cultural Heritage Management Plan (CHMP) as a means to satisfy the duty of care. The four options available to SGP are described in Appendix 3.

Proposed construction earthworks (particularly clear and grade operations) have the potential to disturb archaeological material should it be present. Impacts may include damage to shallow artefact scatters, subsurface material or significant vegetation. Any CHMP will be developed in consultation with relevant Aboriginal Groups to ensure consistent management and mitigation measures are applied for the project.

Aboriginal Groups will conduct initial site clearance inspections to identify potential archaeological items that may need to be removed or avoided during construction. Further consultation will be undertaken as required to ensure final pipeline alignment and construction activities do not significantly impact on areas or objects of cultural significance. Cultural heritage monitors will be employed in accordance with the project CHMP for the construction works.

As discussed, cultural material and sites of significance will be located during ground surveys by Aboriginal parties, and appropriate avoidance and mitigation measures developed and implemented in consultation with such parties.

9.0 AREAS FOR FURTHER INVESTIGATION

This IAS and associated desktop research has identified key areas requiring more detailed investigation and assessment, including the need for:

- Targeted ecological surveys particularly to ground-truth flora and fauna results, and identify fauna habitats and presence / absence of threatened species;
- An assessment of watercourse crossings;
- Soil / geotechnical investigations to determine engineering / constructability constraints and identify key areas susceptible to erosion;
- Identification of sensitive receptors, including residential and rural places;
- Cultural heritage assessment;
- Pipeline safety management study; and
- Transport study of local government roads used for the supply of pipe to the ROW.

10.0 ENVIRONMENTAL MANAGEMENT SYSTEM

SGP, as a fully owned subsidiary of Arrow Energy, is committed to responsible environmental management throughout all phases of the Surat to Gladstone Pipeline Project. All planning, construction and operational activities will be conducted in accordance with Arrow's Environmental Policy which states:

> "Arrow Energy's aim is to achieve a high standard of care for the natural environment in all of the activities in which we engage including gas exploration, development, production and decommissioning of gas supply service, planning, design of new infrastructure, management of existing infrastructure, the provision of technical services, and at all times, to minimise the impact of our activities on the environment."

Arrow operates in compliance with Commonwealth, State and Local Government statutes and Industry guidelines and has implemented an Integrated Environmental Management System (IEMS) to manage environmental issues linked with all its activities from exploration and development, through operations to de-commissioning and rehabilitation. Based on this, Arrow has developed an Environmental Management System (EMS) which applies to govern the conduct of environmentally relevant activities in the Surat Basin as presented in Appendix 4. In addition to existing plans and procedures, SGP will prepare project-specific documentation, including an Environmental Management Plan, Construction Environmental Management Plan, Operations Environmental Management Plan and supporting programs.

All personnel will have a duty of care for environmental management and compliance, with SGP, as the holder of the Pipeline Licence and Environmental Authority, taking overall responsibility. SGP will maintain active on-site supervision of construction and environmental performance of potential contractors will be reviewed as part of the construction tender evaluation. Induction programs and training of all personnel involved in construction will ensure that each individual is aware of their environmental responsibility and accountable for their actions.

11.0 REGULATORY PROCESS AND APPROVAL STRATEGY

The pipeline will be designed, constructed, operated and decommissioned in accordance with Australian Standard AS 2885 Pipelines – Gas and Liquid Petroleum.

The pipeline will be licensed under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) and an Environmental Authority (EA) under the *Environmental Protection Act 1994* will be required from the Environmental Protection Agency (EPA) for a Level 1 Environmentally Relevant Activity (ERA) 21C: "The construction of a new transmission pipeline under a pipeline licence issued under any petroleum legislation". Approval for the mini packaged sewerage treatment plant for the proposed two camp sites will also be required. Appendix 1, Table A-8 provides a summary of the regulatory environment and describes the applicability to the project.

11.1 COMMONWEALTH APPROVALS

11.1.1 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects the environment in general, and particularly in relation to matters of National Environmental Significance (NES). Under the EPBC Act, if a development proposal involves an action that may have a significant impact on matters of NES, it must be referred to the Department of Environment, Water Heritage and the Arts (DEWHA) for assessment.

An EPBC referral requests a determination from DEWHA as to whether the project is considered a 'Controlled Action'. A 'Controlled Action' under the Act is determined if the proposed action is likely to have significant impacts on matters of NES. A 'Controlled Action' requires formal assessment and approval and assessment can take a number of forms, one of which is an Environmental Impact Statement (EIS) process.

Formal assessment under this Act is only required if a matter of National Environmental Significance (NES) is threatened. Key values of NES against which the project will be assessed for impacts include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- The Commonwealth marine environment;
- World Heritage properties;
- National Heritage places; and
- Nuclear actions.

There are a number of Commonwealth threatened and migratory species that have been identified through desktop studies. Potential impacts are expected to be minimised so impacts are unlikely to be significant, and the need to submit a referral to DEWHA will be determined from results obtained from the detailed ecological assessment. Designation as a 'Controlled Action' under the EPBC Act is considered unlikely for this project.

11.1.2 NATIVE TITLE ACT 1993

Under the *Native Title Act 1993* (NT Act), indigenous land rights may exist in areas such as vacant or unallocated crown land, some reserve lands, some types of pastoral lease and waters that are not privately owned. Native title can be extinguished by certain actions (for example where the land is held under freehold title).

The native title process will be undertaken in accordance with the legislative requirements of the NT Act, in full consultation with native title claimants and regulatory agencies (as discussed in Appendix 3).

11.2 QUEENSLAND STATE GOVERNMENT APPROVALS

11.2.1 PETROLEUM AND GAS (PRODUCTION AND SAFETY) ACT 2004

A Petroleum Survey Licence (PSL) will be required from the Department of Mines and Energy (DME). The PSL provides land access enabling field assessments to be undertaken for ecological and cultural heritage surveys, and engineering and construction inspections, particularly to refine route selection. An Environmental Authority (EA) for the PSL is required from the EPA before the PSL can be issued.

A Petroleum Pipeline Licence (PPL) will be required from the Department of Mines and Energy (DME). The PPL authorises the construction and operation of the pipeline including all connected facilities that are necessary for pipeline operation such as valve, scraper, meter stations, plant and equipment, and apparatus used for corrosion protection. The PPL also authorises activities that are considered to be incidental[5] to pipeline construction and operation, such as mobile and temporary camps and materials storage, where such activities are carried out within the specified PPL area. Similar to a PSL, an EA is required from the EPA before the PPL can be issued.

Approval under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) exempts some pipeline activities from approval under other Acts, for example vegetation clearing under the *Vegetation Management Act 1999 (*VM Act). Exemptions only apply if works are conducted within the specified PPL area.

[5] Incidental activities are authorised under the PPL to occur if they are reasonably necessary for the construction and operation of the pipeline, and are located within the area of the PPL (P&G Act s.403).

11.2.2 ENVIRONMENTAL PROTECTION ACT 1994 AND REGULATION 1998

Construction of a new transmission pipeline is classified as a Level 1 petroleum activity under the *Environmental Protection Regulation 1998* (EP Regulation). To undertake a Level 1 petroleum activity (which is also defined as Level 1 Environmentally Relevant Activity (ERA) under the EP Act), an EA must be issued by the EPA.

As mentioned above, an EA is required to be granted and issued by the EPA before a PPL can be granted. As part of the EA application, a detailed report and an EMP will be developed and submitted. The EMP will outline the general environmental and social aspects of the project (including associated facilities, construction camps etc) and sets environmental protection commitments for construction and operations.

Following submission of this IAS, the EPA will formally determine if an EIS is required for the project based on the significance of expected impacts under the *Environmental Protection Act 1994* (EP Act). It is anticipated that this IAS will provide adequate information for the EPA to make an initial determination whether a formal EIS for the pipeline is required.

Determination of Requirement for EIS

The EPA bases its decision for and EIS level of assessment on consideration of the standard criteria (as defined in Section 104 (3) of the EP Act) as well as a checklist provided in Appendix B of the EcoAccess Guideline '*Assessment and approval process for environmental authorities for petroleum activities*' (EPA 2006).

An assessment of the project against the EcoAccess EIS Trigger criteria is provided in Table 10.

Table 10: Assessment of EP Act Triggers for an EIS

EP Act Triggers for an EIS	Application to Proposed Pipeline	Potential for Significant Impacts
Impact on Environmentally Sensitive Areas (ESA)	Refer Table 11	Minimal risk of a significant impact, however further assessment and field surveys will be conducted to verify desktop review
Activities in a marine area/ less than 500 metres from highest astronomical tide	The last 4km of the route will be in the Gladstone State Development Area Common Infrastructure Corridor on previously disturbed land. The terminal point is at Fisherman's Landing created from dredged sand.	No potential for significant impact
Construction of a new transmission pipeline under a pipeline licence	This trigger applies, but construction and operation are compliant with all legislation and standards. Other transmission pipelines in Queensland have been approved without the requirement for an EIS.	No potential for significant impact
Construction of a petroleum refining or processing facility	The project does not constitute construction of a petroleum refining or processing facility (ERA 12 or ERA 13, as defined in Schedule 1 of the EP Regulation).	Not applicable

Environmentally Relevant Activities

ERAs are defined under Schedule 1 of the *Environmental Protection Regulation 1998*, and are activities with the potential to release contaminants to the environment and cause environmental harm. The ERAs that are considered to apply to the proposed project are shown in Table 11.

Table 11: Potential Environmentally Relevant Activities

ERA	Description of ERA	Level	Application and Assumptions
21C	The construction of a new transmission pipeline under a pipeline license issued under any of the petroleum legislation.	1	Pipeline construction and operation including ancillary activities.
15(b)	Sewage treatment – Operating a standard sewage treatment works having a peak design capacity to treat sewage of 100 or more equivalent persons but less than 1,500 equivalent persons.	1	Applies to temporary construction camps (anticipated to accommodate up to 300 people).
11(a)	Crude oil or petroleum product storing—storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 10,000L or more but less than 500,000L.	2	Storage of fuel at depot / camp (expected to be in excess of 10,000L).

11.2.3 ABORIGINAL CULTURAL HERITAGE ACT 2003

The dominant piece of legislation relating to Aboriginal cultural heritage is the *Aboriginal Cultural Heritage Act 2003* (ACHA). This legislation has been in place since April, 2004, the significance of which is described in Appendix 3.

The ACHA operates on the basis of a duty of care owed by development proponents and others to Aboriginal cultural heritage. The duty of care can be met in a variety of ways (refer Appendix 3). Where an EIS is a mandatory requirement for a license etc. to operate a project, or it is necessary to comply with a limited range of regulatory processes (see ss87-89), then it is essential to develop a Cultural Heritage Management Plan (CHMP). Alternatively, s86 allows the duty of care to be met by settlement of a native title agreement of a specified form, being an Indigenous Land Use Agreement (ILUA), s31 agreement or by use of the Native Title Protection Conditions.

Where there is no need to comply with ss87-89, then a range of options are available to the development proponent. These include a voluntary CHMP. The mechanisms by which one can meet the duty of care are specified in s23 of the ACHA. These include use of the Duty of Care Guidelines.

Failure to comply with the duty of care can result in a charge of Harm being made against a project sponsor. Substantial fines can arise where a party, individual or corporation is found guilty of harming Aboriginal cultural heritage.

The ACHA also defines those people with whom a proponent must engage. These people are referred to as Aboriginal Parties. There is a descending hierarchy of persons who constitute Aboriginal Parties:

- determined native title holders;
- currently registered claimants;
- claimants who were registered as of April 2004 but whose claims have subsequently failed are also Aboriginal Parties until such time as another claim is registered over the area.

If there are no persons meeting these categories, then any person claiming to meet the criteria specified in s.35(7) of the ACHA is an Aboriginal Party.

11.2.4 HERITAGE ACT 1992

Historic heritage in Queensland is protected under provisions of the *Queensland Heritage Act 1992*. This legislation protects all those places included on the Queensland Heritage Register, being those places that have met the criteria specified in the Act. It also protects archaeological places where there is an expectation of sub-surface material that can provide information regarding the history of Queensland.

11.3 SUBSEQUENT APPROVALS

The project may require additional approvals under other State government and local government (Planning Scheme) approvals through the Integrated Development Approval System (IDAS) established under the *Integrated Planning Act 1997* (IPA).

The pipeline and associated incidental activities authorised under the P&G Act, are exempt from assessment against the local planning scheme under IPA. Should incidental pipeline activities (e.g. temporary construction camps, vegetation clearing, excavation in a watercourse) be undertaken outside the pipeline licence area, development approval under IPA (and other relevant legislation) will be required.

In these circumstances, activities not considered to be an ‘incidental’ under the PPL (including activities located outside the pipeline area), will be assessable under IPA and potentially a local planning scheme. At this stage it is not known if any incidental activities will be conducted outside the pipeline licence area although a list of potential approvals is provided in Appendix 1, Table A-8.

12.0 CONCLUSION

SGP proposes to construct a high pressure buried steel gas pipeline from Surat to Gladstone.

Arrow has a proven track record of successfully implementing gas and associated infrastructure projects in central Queensland due to its strong focus on achieving sound environmental outcomes and maintaining close communication with the EPA and other stakeholders throughout all project phases.

The route selection process has focussed on avoidance rather than impact mitigation with a maximum potential disturbance of 'Endangered' and 'Of Concern' communities, assuming a 30m ROW,representing 0.085% of these regional ecosystems within 10km of the pipeline. Based on desktop assessments, a maximum of 3ha of 'Endangered' REs and 20ha of 'Of Concern' REs will be disturbed, representing 0.03% and 0.12% respectively of these communities within 10km of the ipeline. Similarly, disturbance of 'Not of Concern' REs has been calculated to be 0.18%. Ecological field surveys will verify these results and, considering the highly fragmented and largely non-remnant vegetation communities observed in aerial surveys of the route, are expected to confirm the pipeline route has been located predominantly in existing cleared areas, requiring as little vegetation clearance as practicable.

The final alignment, as well as cultural heritage inspections and management techniques, will minimise impacts to culturally significant values.

Subject to further ecological investigations (both desktop and site surveys), SGP is confident that there is limited potential for the proposed Surat to Gladstone pipeline to have a significant impact on the ecological values of the surrounding environment. It is concluded that subject to the detailed ecological survey, cultural heritage assessment, transport study and safety management study, a formal EIS is unlikely to be triggered either Federally under the EPBC Act or under the Queensland EP Act.

13.0 REFERENCES

ANRA: Australian Natural Resources Atlas (2007) Australia's Groundwater Provinces. Online accessed October 2008 at:
http://www.anra.gov.au/topics/water/overview/index.html

APIA: Australian Pipeline Industry Association, Canberra (2005). Code of Environmental Practice – Onshore Pipelines.

Banana Shire Council (2008). Introducing the Banana Shire. Online accessed October 2008 at: http://www.banana.qld.gov.au/index.php/3

BoM: Australian Government Bureau of Meteorology (2008). Climate Data Online. Online accessed in October 2008 at: http://www.bom.gov.au/climate/averages/

Chinchilla Economic and Tourism Development Association (2006). Welcome to Chinchilla. Online accessed October 2008 at: http://www.chinchilla.org.au/index-tess1.php

CSIRO (2008) ASRIS: Australian Soil Resource Information System. Online accessed October 2008 at: http://www.asris.csiro.au/index_ie.html

Dalby Regional Council (2008) Council Website. Online accessed October 2008 at: http://www.dalby.qld.gov.au/

DIP: Department of Infrastructure and Planning (2007). Coordinator-General's Report - Central Queensland Gas Pipeline. Report evaluating the Environmental Impact Statement, pursuant to Section 35 of the State Development and Public Works Organisation Act 1971 (Qld), October 2007. Online accessed at:
http://www.dip.qld.gov.au/projects/energy/gas/central-queensland-gas-pipeline.html

DIP: Department of Infrastructure and Planning (2008). Online accessed November 2008 at: http://www.dip.qld.gov.au/land/gladstone.html

DEWHA: Department of Environment, Water, Heritage and the Arts (2007a). Australian Natural Resources Atlas, Biodiversity Assessment, Brigalow Belt South. Online accessed October 2008 at:
http://www.anra.gov.au/topics/vegetation/assessment/qld/ibra-brigalow-belt-south.html

DEWHA: Department of Environment, Water, Heritage and the Arts (2007b). Australian Natural Resources Atlas, Water Resources, Quality, Queensland. Online accessed October 2008 at: http://www.anra.gov.au/topics/water/quality/qld/index.html

DEWHA: Department of Environment, Water, Heritage and the Arts (2008). Environmental Protection and Biodiversity Act, Protected Matters Search Tool. Online accessed in October 2008 at: http://www.environment.gov.au/erin/ert/epbc/index.html

DPIF: Department of Primary Industries and Fisheries (2008). Declared Plants of Queensland, Invasive Plants and Animals Fact Sheet. Online accessed at:
http://dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_7005_ENA_HTML.htm

EPA: Environmental Protection Agency (2006). Assessment and approval process for environmental authorities for petroleum activities. Ecoaccess Guideline dated 07/02/06, Environmental Protection Agency, Queensland.

EPA: Environmental Protection Agency (2007). Maps of Environmentally Sensitive Areas. Online accessed in October 2008 at:
http://www.epa.qld.gov.au/ecoaccess/maps_of_environmentally_sensitive_areas/#cord

EPA: Environmental Protection Agency (2008a). Wildlife Online Database. Online accessed October 2008 at:
http://www.epa.qld.gov.au/nature_conservation/wildlife/wildlife_online/#selected_area

EPA: Environmental Protection Agency (2008b). Copy of the certified regional ecosystem map for the purpose of the Vegetation Management Act 1999. Online RE Maps, Environmental Protection Agency, Brisbane. Online accessed October 2008 at: http://www.epa.qld.gov.au/REMAP

EPA. Environmental Protection Agency (2008c) Air Quality Index. Online accessed November 2008 at: http://www.epa.qld.gov.au/projects/air/

Gladstone Regional Council (2008). Council website. Online accessed October 2008 at: http://www.gladstonerc.qld.gov.au/index.html

Geoscience Australia (2003) Surat and Bowen Basins. Online accessed October 2008 at:

North Burnett Regional Council (2008) Council website. Online accessed October 2008 at: http://www.northburnett.qld.gov.au/index.php?go=1

14.0 ABBREVIATIONS

ACHA	*Aboriginal Cultural Heritage Act 2003*
ANZECC	Australian and New Zealand Environment and Conservation Council
APIA	Australian Pipeline Industry Association
AS	Australian Standard
BoM	Bureau of Meteorology
CHIMA	Cultural Heritage Investigation and Management Agreement
CHMP	Cultural Heritage Management Plan
CHMS	Cultural Heritage Management System
CSG	Coal Seam Gas
DEWHA	Department of the Environment, Water, Heritage and the Arts
DIP	Department of Infrastructure and Planning (Qld)
DME	Department of Mines and Energy (Qld)
DNRW	Department of Natural Resources and Water
DOI	Directory of Important Wetlands
EA	Environmental Authority
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1994*
EPA	Environmental Protection Agency (Qld)
EPC	Exploration Permit for Coal
EPBC	Environment Protection Biodiversity and Conservation
ESA	Environmentally Sensitive Areas
EVR	Endangered, Vulnerable or Rare
FEED	Front End Engineering and Design
GDP	Ground Disturbance Permit
GIS	Geographic Information System
GMU	Groundwater Monitoring Unit
GQAL	Good Quality Agricultural Land
GSDA	Gladstone State Development Area
HAZOP	Hazard and Operability
HDD	Horizontal Directional Drill
HERBRECS	Queensland Herbarium records system
HV	High Voltage
IAS	Initial Advice Statement
ICHA	Initial Cultural Heritage Assessment
ICHD	Indigenous Cultural Heritage Database (maintained by DNRW)
IDAS	Integrated Development Approval System

ILUA	Indigenous Land Use Agreement
KP	Kilometre Point
LGA	Local Government Areas
LNG	Liquefied Natural Gas
MAOP	Maximum Allowable Operating Pressure
MDL	Mineral Development License
NCA	Nature Conservation Act 1992
NES	(Matters of) National Environment Significance
NHL	National Heritage List
NNTT	National Native Title Tribunal
NT Act	*Native Title Act 1993*
OEMP	Operational Environmental Management Plan
P&G Act	*Petroleum & Gas (Production & Safety) Act 2004*
PCCC	Port Curtis Coral Coast
PCHA	Post Construction Heritage Agreement
PPL	Petroleum Pipeline Licence
PSL	Pipeline Survey Licence
QHR	Queensland Heritage Register
QPW	Queensland Parks and Wildlife
RE	Regional Ecosystems
RNE	Register of the National Estate
ROW	Right-of-way
SGP	Surat Gladstone Pipeline Pty Ltd
SPP	State Planning Policy
SWER	Single Wire Earth Return
VMA	*Vegetation Management Act 1999*
WHL	World Heritage List

APPENDIX 1

SUPPORTING TABLES

Table A-1: Temperature Records for Meteorological Stations near the Pipeline

Maximum Temperature (°C)	J	F	M	A	M	J	J	A	S	O	N	D	Annual	Operating Years
Miles (# 042023)	33.2	32.3	30.8	27.5	23.2	19.8	19.3	21.4	25.1	28.6	31.2	32.9	27.1	95
Taroom (# 035070)	33.7	32.8	31.7	28.7	24.5	21.4	20.9	22.9	26.9	29.9	31.8	33.4	28.2	56
Thangool (# 039089)	33.7	33.1	32.5	29.9	26.6	23.5	23.2	24.7	28.1	30.4	31.5	33	29.2	16
Gladstone (# 039326)	30.6	30.5	29.8	28	25.7	23.3	22.8	23.6	25.9	27.5	28.6	29.9	27.2	15
Minimum Temperature (°C)														
Miles (# 042023)	19.5	19.3	17	12.4	7.9	5	3.6	4.9	8.5	13.1	16.3	18.4	12.2	96
Taroom (# 035070)	20.6	20.4	18.1	14.1	9.7	6.3	5.1	6.4	10.3	14.7	17.4	19.6	13.6	56
Thangool (# 039089)	19.8	19.9	17.6	13.9	10.1	7	5.5	6.3	9.6	13.7	16.3	18.6	13.2	16
Gladstone (# 039326)	23	23	21.6	18.9	15.6	13.3	11.8	12.6	15.5	18.7	20.4	22.1	18	15

Source: BOM, 2008

Table A-2: Rainfall Records for Meteorological Stations near the Pipeline

Mean Rainfall (mm)	J	F	M	A	M	J	J	A	S	O	N	D	Annual	Operating Years
Miles (# 042023)	95.2	75	58.6	36.6	39.1	39.6	37.6	29.3	30.8	54	66	88.6	650.2	124
Taroom (# 035070)	98.9	87.1	62.1	34.9	40.8	36.5	33.8	28.1	31	55.4	75	89.4	672	132
Thangool (# 039089)	96.5	95.4	59.9	35.2	40.5	33.3	29.5	22.9	24	57.8	77	90.4	661.1	77
Gladstone (# 039326)	113.7	170.8	49.9	35.8	37.9	47.6	23.2	37.1	31.6	66.7	56.3	106.4	776.9	14

Source: BOM, 2008

Table A-3: Wind Speed Records for Meteorological Stations near the Pipeline

Mean 9am Wind Speed (km/h)	J	F	M	A	M	J	J	A	S	O	N	D	Annual	Operating Years
Miles (# 042023)	11.1	11.5	11.7	10.1	8.7	8.5	8.9	10.9	13.5	13.9	12.9	12.3	11.2	45
Taroom (# 035070)	9.6	8.8	8.1	6.6	6.3	6.1	6.4	7.5	10.2	10.8	10.1	9.5	8.3	49
Thangool (# 039089)	9.7	9.7	10.4	9.9	7.1	6.6	5.6	7.1	8.7	10.3	9.7	9.8	8.7	17
Gladstone (# 039326)	16.8	15.9	16	14.6	13.1	12.4	12.1	12.4	14	15.5	16.1	16	14.6	14
Mean 3pm Wind Speed (km/h)														
Miles (# 042023)	10.6	11.5	11.7	10.9	10.1	11.5	11.2	12.5	12.5	12.4	12.1	11.4	11.5	39
Taroom (# 035070)	10.2	9.9	9.1	8.1	9	9.2	9.8	10.7	11.2	11	10.5	9.5	9.8	48
Thangool (# 039089)	11	10.3	11.2	10.5	9.3	9.6	9.9	10.4	11.2	11.4	11	10.6	10.5	16
Gladstone (# 039326)	23.9	22.8	23.8	22	17.9	17	16.8	19.7	21.3	22.4	22.9	23.3	21.2	14

Source: BOM, 2008

Table A-4: Regional Ecosystems within 10km of the Preferred Pipeline Route

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
Endangered	Endangered	11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Yes	Yes	
	Endangered	11.3.11	Semi-evergreen vine thicket on alluvial plains	Yes	Yes	
	Endangered	11.4.3/3a	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	Yes	Yes	
	Endangered	11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	No	Yes	
	Endangered	11.4.10	*Eucalyptus populnea* or *E. pilligaensis*, *Acacia harpophylla, Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	No	Yes	
	Endangered	11.4.12	*Eucalyptus populnea* woodland on Cainozoic clay plains	Yes	Yes	
	Endangered	11.8.13	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks. Lowlands	No	Yes	
	Endangered	11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	No	Yes	
	Endangered	11.9.4a/4b	Semi-evergreen vine thicket on fine grained sedimentary rocks	Yes	Yes	
	Endangered	11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	Yes	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Endangered	11.9.6	*Acacia melvillei* ± *A. harpophylla* open forest on fine-grained sedimentary rocks	No	Yes	
	Endangered	11.9.12	Dichanthium sericeum grassland with clumps of *Acacia harpophylla* on fine-grained sedimentary rocks	No	Yes	
	Endangered	11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Yes	Yes	
	Endangered	11.12.17	*Eucalyptus populnea* woodland on igneous rocks. Colluvial lower slopes	No	Yes	
	Endangered	11.12.21	*Acacia harpophylla* open forest on igneous rocks. Colluvial lower slopes	No	Yes	
	Endangered	12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	Yes	Yes	
	Endangered	12.3.3	*Eucalyptus tereticornis* woodland to open forest on alluvial plains	Yes	Yes	
Subtotal Endangered REs				**2.97ha**	**9,920.16ha**	**0.03**
Of Concern	Of Concern	11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Yes	Yes	
	Of Concern	11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	Yes	Yes	
	Of Concern	11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus spp*. tall woodland on alluvial plains	Yes	Yes	
	Endangered	11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains	No	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Of Concern	11.4.2	*Eucalyptus spp*. and/or *Corymbia spp*. grassy or shrubby woodland on Cainozoic clay plains	No	Yes	
	Of Concern	11.9.7	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	Yes	Yes	
	Of Concern	11.9.10	*Acacia harpophylla, Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Yes	Yes	
	Of Concern	11.10.8	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	No	Yes	
	Of Concern	11.11.10	*Eucalyptus melanophloia* woodland on deformed and metamorphosed sediments and interbedded volcanics	No	Yes	
	Of Concern	11.12.15	*Allocasuarina torulosa, Livistona drudei* woodland on igneous rocks. Coastal hills	No	Yes	
	Of Concern	11.12.18a	Montane shrubland on igneous rocks. Mountain tops	No	Yes	
	Of Concern	12.2.2	Microphyll/notophyll vine forest on beach ridges	No	Yes	
	Of Concern	12.3.11	*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains usually near coast	No	Yes	
	Of Concern	12.3.12	*Eucalyptus latisinensis* or *E. exserta, Melaleuca viridiflora* on alluvial plains	No	Yes	
	Of Concern	12.11.12	Araucarian complex microphyll vine forest on metamorphics ± interbedded volcanics; usually northern half of bioregion	No	Yes	
	Of Concern	12.11.14	*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics	No	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Of Concern	12.11.17	*Eucalyptus acmenoides* or *E. portuensis* open forest on metamorphics ± interbedded volcanics	No	Yes	
Subtotal Of Concern REs				**20.02ha**	**17,086ha**	**0.12**
Subtotal Endangered and Of Concern REs				**29.99ha**	**27,006.16ha**	**0.085**
Not Of Concern	Not Of Concern	11.1.1	*Sporobolus virginicus* grassland on marine clay plains	No	Yes	
	Not Of Concern	11.1.2a	*Samphire forbland* on marine clay plains	No	Yes	
	Not Of Concern	11.1.4a/4b/4c/4d	Mangrove forest/woodland on marine clay plains	No	Yes	
	Not Of Concern	11.3.6	*Eucalyptus melanophloia* woodland on alluvial plains	Yes	Yes	
	Not Of Concern	11.3.9	*Eucalyptus platyphylla, Corymbia spp*. woodland on alluvial plains	No	Yes	
	Not Of Concern	11.3.14	*Eucalyptus spp., Angophora spp., Callitris spp*. woodland on alluvial plains. Sandy soils	Yes	Yes	
	Not Of Concern	11.3.18	*Eucalyptus populnea, Callitris glaucophylla, Allocasuarina luehmannii* shrubby woodland on alluvium	Yes	Yes	
	Not Of Concern	11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Yes	Yes	
	Not Of Concern	11.3.26	*Eucalyptus moluccana* or *E. microcarpa* woodland to open forest on margins of alluvial plains	Yes	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Not Of Concern	11.3.29	*Eucalyptus crebra, E. exserta, Melaleuca spp*. woodland on alluvial plains	Yes	Yes	
	Not Of Concern	11.5.1/5a	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces	Yes	Yes	
	Not Of Concern	11.5.4	*Eucalyptus crebra, Callitris glaucophylla, C. endlicheri, E. chloroclada, Angophora leiocarpa* on Cainozoic sand plains/remnant surfaces. Deep sands	Yes	Yes	
	Not Of Concern	11.5.8a	*Melaleuca spp., Eucalyptus crebra, Corymbia intermedia* woodland on Cainozoic sand plains/remnant surfaces	No	Yes	
	Not Of Concern	11.5.9d	*Eucalyptus crebra* and other *Eucalyptus spp*. and *Corymbia spp.* woodland on Cainozoic sand plains/remnant surfaces. Plateaus and broad crests	No	Yes	
	Not Of Concern	11.5.20	*Eucalyptus moluccana* and/or *E. macrocarpa / E. pilligaensis* ± *E. crebra* woodland on Cainozoic sand plains	Yes	Yes	
	Not Of Concern	11.5.21	*Corymbia bloxsomei* ± *Callitris glaucophylla* ± *Eucalyptus crebra* ± *Angophora leiocarpa* woodland on Cainozoic sand plains/remnant surfaces	Yes	Yes	
	Not Of Concern	11.7.2	*Acacia spp*. woodland on lateritic duricrust. Scarp retreat zone	Yes	Yes	
	Not Of Concern	11.7.4/4c	*Eucalyptus decorticans* and/or *Eucalyptus spp*., *Corymbia spp., Acacia spp., Lysicarpus angustifolius on lateritic duricrust*	Yes	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Not Of Concern	11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Yes	Yes	
	Not Of Concern	11.7.6	*Corymbia citriodora* or *Eucalyptus crebra* woodland on lateritic duricrust	Yes	Yes	
	Not Of Concern	11.7.7	*Eucalyptus fibrosa subsp. nubila* ± *Corymbia spp.* ± *Eucalyptus spp*. on lateritic duricrust	Yes	Yes	
	Not Of Concern	11.8.3	Semi-evergreen vine thicket on Cainozoic igneous rocks. Steep hillsides	No	Yes	
	Not Of Concern	11.8.4	*Eucalyptus melanophloia* woodland on Cainozoic igneous rocks. Hillsides	Yes	Yes	
	Not Of Concern	11.9.2	*Eucalyptus melanophloia* ± *E. orgadophila* woodland on fine-grained sedimentary rocks	No	Yes	
	Not Of Concern	11.9.9	*Eucalyptus crebra* woodland on fine-grained sedimentary rocks	No	Yes	
	Not Of Concern	11.10.1	*Corymbia citriodora* open forest on coarse-grained sedimentary rocks	Yes	Yes	
	Not Of Concern	11.10.4	*Eucalyptus decorticans, Lysicarpus angustifolius* ± *Eucalyptus spp., Corymbia spp., Acacia spp*. woodland on coarse-grained sedimentary rocks. Crests and scarps	No	Yes	
	Not Of Concern	11.10.7	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks	Yes	Yes	
	Not Of Concern	11.10.9	*Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	Yes	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Not Of Concern	11.10.13/13a	*Eucalyptus spp*. and/or *Corymbia spp*. open forest on scarps and sandstone tablelands	Yes	Yes	
	Not Of Concern	11.11.3	*Corymbia citriodora, Eucalyptus crebra, E. acmenoides* open forest on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	No	Yes	
	Not Of Concern	11.11.4/4a/4c	*Eucalyptus crebra* woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	Yes	Yes	
	Not Of Concern	11.11.5/5a	Microphyll vine forest ± *Araucaria cunninghamii* on old sedimentary rocks with varying degrees of metamorphism and folding	Yes	Yes	
	Not Of Concern	11.11.9	*Eucalyptus populnea* or *E. brownii* woodland on deformed and metamorphosed sediments and interbedded volcanics	No	Yes	
	Not Of Concern	11.11.15/15a	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics. Undulating plains	Yes	Yes	
	Not Of Concern	11.12.1	*Eucalyptus crebra* woodland on igneous rocks	Yes	Yes	
	Not Of Concern	11.12.2/2b	*Eucalyptus melanophloia* woodland on igneous rocks	Yes	Yes	
	Not Of Concern	11.12.3	*Eucalyptus crebra, E. tereticornis, Angophora leiocarpa* woodland on igneous rocks especially granite	Yes	Yes	
	Not Of Concern	11.12.4	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	Yes	Yes	

VM Act (1999) Status	Biodiversity Status	Regional Ecosystem	RE Description	Presence within 30m wide ROW	Presence within 10km of pipeline	Proportion of RE within 10km of Preferred Pipeline (%)[1]
	Not Of Concern	11.12.6/6b	*Corymbia citriodora* open forest on igneous rocks (granite)	Yes	Yes	
	Not Of Concern	12.1.2	Saltpan vegetation including grassland and herbland on marine clay plains	No	Yes	
	Not Of Concern	12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	No	Yes	
	Not Of Concern	12.3.7	*Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana* fringing forest	Yes	Yes	
	Not Of Concern	12.5.1	Open forest complex with *Corymbia citriodora* on subcoastal remnant Tertiary surfaces. Usually deep red soils	No	Yes	
	Not Of Concern	12.11.6	*Corymbia citriodora, Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics	Yes	Yes	
	Not Of Concern	12.11.7	*Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics	No	Yes	
Subtotal Not Of Concern				**258.23ha**	**145,641.51ha**	**0.18**
Subtotal Non Remnant Areas				**1,123.50ha**	**288,400.38ha**	**0.39**
TOTAL (Endangered, Of Concern, Not of Concern, Non-Remnant)				**1,404.72ha**	**461,048.08ha**	**0.30**

Table A-5: EVR Flora Species Previously Recorded within the Pipeline

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Acacia chinchillensis	-	Likely	Grows in shrubby forests on undulating hills in sandy or gravelly soils in subhumid tropical climates. Majority of plants found in Barakula SF on eastern side of the southern end of the pipeline.	Highly likely	EPBC		V
Acacia grandifolia	-	Likely	Grows in hilly terrain on disturbed ground such as roadsides in the Gayndah area. It occurs in Ironbark and Spotted Gum Woodlands and Forests	Low - site at edge of species range	EPBC		V
Acacia pedleyi	-		Grows in Open Eucalypt Forest or woodland on slopes and ridgetops in red loamy soils.	High – known from northern part of pipeline	Wildnet	R	-
Acacia pubicosta	-		Restricted to rocky slopes in the Biggenden area.	Low – grows in Biggenden area away from pipeline	Wildnet	R	-
Acacia tenuinervis	-		Grows in Brigalow or Eucalypt Woodland in ironstone gravel.	Low to moderate	Wildnet	R	-
Actephila sessilifolia	-		No Information available		Wildnet	R	-
Alyxia magnifolia	Large-leaf Chain Fruit		Grows in Wet Sclerophyll Forest, complex notophyll vine forest and araucarian microphyll vine forests in south eastern QLD.	Moderate	Wildnet	R	-
Alyxia sharpei	-		No Information Available		Wildnet	R	-

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Aponogeton queenslandicus	-		This is an aquatic plant that grows in ephemeral freshwater situations such as gilgai on floodplains.	Moderate	Wildnet	R	-
Atalya collina	-	Likely	Little Information Available	Low – occurs on coast	EPBC, Wildnet	E	E
Atalaya rigida	-		No Information Available		Wildnet	R	-
Bosistoa selwynii	Heart-leaved Bosistoa	Likely	Prefers to grow on alluvial flats in rainforest	Low – pipeline traverses only one river which is unlikely to support rainforest	EPBC		V
Bosistoa transversa	Three-leaved Bosistoa	Likely	Prefers to grow on alluvial flats in rainforest	Low – pipeline traverses only one river which is unlikely to support rainforest	EPBC, Wildnet	C	V
Bulbophyllum globuliforme	Miniature Moss-orchid	Likely	Grows on Hoop Pine in subtropical rainforest at altitudes of 300 to 600 metres.	Unknown – depends of presence of suitable rainforest habitat	EPBC		V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Cadellia pentastylis	Ooline	Likely	Usually occurs on undulating terrain on a variety of soil types, between 300m and 450m.	High – grows in dry sclerophyll forest and woodland	EPBC	V	V
Calytrix gurulmundensis	-	Likely	Grows on ridgetops in scrubland on sandy clays, gravelly soils and sandstone.	High – known from the Barakula area	EPBC		V
Cerbera dumicola	-		Grows in vine thicket and lancewood thickets throughout Central QLD.	Moderate	Wildnet	R	-
Commersonia sp. Cadarga (G.P. Guymer 1642)	-	Likely	No information available		EPBC		V
Cossinia australiana	Cossinia	Likely	Grows in vine forests as a small tree or shrub north from Kingaroy.	Moderate	EPBC, Wildnet	E	E
Cryptandra ciliata	-		Grows in Gurulmundi area	High – known from area	Wildnet	R	-
Cupaniopsis shirleyana	Wedge-leaf Tuckeroo	Likely	Grows in dry rainforest near Brisbane	Low – grows near Brisbane	EPBC, Wildnet	V	V
Cycas megacarpa	Cycad		Grows on clay loam soils on slopes in wet Eucalypt Forest or rainforest.	Moderate	Wildnet	E	-
Dansiea elliptica	-		Grows in sandy granitic soils on rainforest margins, dry rainforest and vine thickets.	Low to moderate	Wildnet	R	-
Denhamia parvifolia	-	Likely	No information available		EPBC		V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Dichanthium queenslandicum	King Blue-grass	Likely	Grows in woodland and grasslands	High – has an extensive range in project area.	EPBC		V
Digitaria porrecta	Finger Panic Grass	Likely	Grows on rich soils in grasslands, grassy woodland or grassy forests.	Moderate to high	EPBC		E
Diuris sheaffiana	Tricolour Diuris	May	Grows in sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises.	Moderate to high	EPBC	-	V
Ericaulon carsonii	Salt Pipewort, Button Grass	Likely	Grows in running water and forms mats in moist soil around shallow springs and especially mound springs.	Low to moderate – dependant on presence of springs within project area.	EPBC		E
Eucalyptus decolor	-		No information available		Wildnet	R	-
Grevillea hockingsii	-		Grows in the shrubby understorey of Eucalypt woodland or open forest around rocky sandstone breakaways.	Moderate – dependant on soil substrate	Wildnet	V	-
Grevillea singuliflora	-		Grows in open dry eucalypt forest in sandy soils, usually close to watercourses.	Moderate – may occur in riparian corridor	Wildnet	R	-
Gonocarpus urceolatus	-		Grows in the Chinchilla area with Bulloak	Moderate – depends on presence of Bulloak Woodland	Wildnet	V	-

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Hernandia bivalvis	Cudgerie		Grows in rainforest near Biggenden.	Low to Moderate	Wildnet	R	-
Homopholis belsonii	-	May	Grows in dry woodland on poor soils	Moderate	EPBC		V
Homoranthus decumbens	-	Known	This shrub grows in shrubland near Barakula on sandy soils and sandstone cliff edges.	High – known from project area	EPBC		V
Leuconpogon cuspidatus	-	Likely	No Information Available		EPBC		V
Melaleuca groveana	-		No information available		Wildnet	R	-
Myriophyllum artesium	-		No information available		Wildnet	E	-
Parsonsia larcomensis	-	Likely	Grows in Brigalow and semi-evergreen vine thickets in the northern section of the pipeline.	Moderate – depends on vegetation	EPBC, Wildnet	V	V
Parsonsia lenticellata	Narrow-leaved Parsonsia		This vine grows in Vine thickets in gullies and moist areas.	Moderate	Wildnet	R	-
Philotheca sporadica	-	Likely	This shrub grows in low open forest on poor soils with *Acacia burrowii, Eucalyptus exserta, E. crebra, E. fibrosa* and *Callitris glaucophylla* at southern end of pipeline.	Moderate to high	EPBC, Wildnet	V	V
Polianthion minutiflorum	-		No Information Available		Wildnet	V	-

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Pterostylis cobarensis	Cobar Greenhood Orchid	Likely	Grows in eucalypt woodland, open mallee and Callitris shrublands on stony ridges and slopes with sandy loam soils.	Moderate to high	EPBC		V
Quassia bidwillii	Quassia	Likely	Grows in rainforest or the margins of rainforest adjacent to water courses.	Low to Moderate – grows in rainforest	EPBC, Wildnet	V	V
Rhaponticum australe	-		Grows in grasslands in the Darling Downs area	Moderate – dependant on presence of grassland habitat	Wildnet	V	-
Solanum papaverifolium	-		Grows in heavy clay soils and can be a weed of cereal crops.	Moderate to high dependant on soil types	Wildnet	E	-
Sophora fraseri	-	Likely	Grows in moist situations such as rainforests.	Moderate	EPBC		V
Stemmacantha australis	Austral Cornflower, Native Thistle	Likely	No Information available		EPBC		V
Taeniophyllum muelleri	Minute orchid, Ribbon-root Orchid	Likely	Epiphytic vine that grows on the outer branches of rainforest trees in coastal ranges and on the coast.	Low to Moderate – development mainly inland	EPBC		V
Thesium australe	Austral Toadflax, Toadflax	Likely	Grows in damp woodland and grassland and is parasitic on grasses, especially on Kangaroo Grass.	High	EPBC		V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Trymalium minutiflorum	-	Likely	No Information available		EPBC		V
Westringia parvifolia	-	Likely	Grows with *Eucalyptus bakeri* and *E. viridis* on sandy and stony soils	Moderate	EPBC		V
Zieria actites	-	Likely	No Information available but known to occur in Calliope Shire	Moderate	Wildnet	V	-

Status: NCA: Nature Conservation Act 1992 R: Rare; V: Vulnerable; E: Endangered.

EPBC: Environmental Protection and Biodiversity Conservation Act 1999; R: Rare; V: Vulnerable; E: Endangered.

Source: Wildnet: EPA Wildlife Online database incorporating Wildnet and HERBRECS (buffer distance of 10km around alignment assessed)

EPBC: Environmental Protection and Biodiversity Conservation Search Tool (DEWHA 2008) (buffer distance of 10km around preferred alignment)

Table A-6: EVR Fauna Species Previously Recorded within the Pipeline

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Birds							
Accipiter novaehollandiae	Grey Goshawk		Inhabits rainforest and tall wet Eucalypt Forest	Low	Wildnet	R	-
Calyptorhynchus lathami	Glossy Black-Cockatoo		Inhabits areas of Casuarina and Allocasuarina Forest and Woodland	Moderate – dependant on vegetation present	Wildnet	V	-
Erythrotriorchis radiatus	Red Goshawk	Likely	Inhabits swamp forests and along watercourses and frequent the edges of dense forest.	Moderate – may occur along river that pipeline crosses	EPBC		V
Ephippiorhynchus asiaticus	Black-necked Stork		Inhabits permanent wetlands and shallow waters	Low – the pipelines does not cross any wetlands	Wildnet	R	-
Esacus magnirostris	Beach Stone-curlew		Inhabits beaches and estuarine ecosystems	Low – the development does not include coastal country	Wildnet	V	-
Falco hypoleucos	Grey Falcon		Inhabits shrubland, grassland, woodlands but prefers wooded watercourses.	Moderate	Wildnet	R	-
Geophaps scripta scripta	Squatter pigeon (southern)	Likely	Inhabits grassy woodlands and plains on sandy soils near water.	Moderate to high	EPBC, Wildnet	V	V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Grantiella picta	Painted Honeyeater		Inhabits Boree, box-gum woodlands, box-ironbark forests and Brigalow.	Moderate to high	Wildnet	R	-
Lathamus discolor	Swift Parrot	May	Inhabits Eucalypt woodlands in south eastern Qld in winter.	Moderate	EPBC		E
Lophoictinia isura	Square-tailed Kite		Inhabits coastal and subcoastal timbered areas, especially timbered watercourses.	High	Wildnet	R	-
Macronectes giganteus	Southern Giant-petrel	May	A common visitor off the eastern coast of Australia.	Low	EPBC		E
Melithreptus gularis	Black-chinned Honeyeater		Inhabits dry open eucalypt forest and woodland in small groups of up to 12 birds.	Moderate to high	Wildnet	R	-
Neochmia ruficauda rificauda	Star Finch (eastern), Star Finch (southern)	Likely	Inhabits woodlands that are inundated	Low	EPBC		E
Ninox strenua	Powerful Owl		Inhabits woodland, forest, rainforest and requires large tracts of land to sustain a population.	Moderate to high	Wildnet	V	-
Numenius madagascariensis	Eastern Curlew		Inhabits mudflats, estuaries and lagoons	Low – no such habitat in corridor	Wildnet	R	-
Pterodroma neglecta neglects	Kermadec Petrel (western)	May	Ranges over subtropical and tropical waters breeding on Lord Howe Island	Low	EPBC		V
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)		Inhabits Eucalypt woodland and riparian vegetation preferring areas close to water with a dense understorey of seeding grass and shrubs.	Moderate to High	Wildnet	V	E

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Rostratula australis	Australian Painted Snipe	May	Inhabits swamps, dams and marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Low to moderate – no wetlands in corridor	EPBC		V
Turnic melanogaster	Black-breasted Button-quail	Likely	Inhabits rainforest and forests in areas with 770 to 1200mm rain.	Low to Moderate	EPBC, Wildnet	V	V
Mammals							
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	May occur, found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland to Bungonia in the NSW Southern Highlands.	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel), frequenting low to mid-elevation dry open forest and woodland close to these features.	Moderate to high	EPBC	R	V
Chalinolobus picatus	Little Pied Bat		Inhabits dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, Bimbil box.	High	Wildnet	R	-
Dasyurus hallucatus	Northern Quoll	May	Inhabits rocky eucalypt forests where small caves, hollow logs, rock crevices or tree hollows are available to shelter in.	Moderate	EPBC		E

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Hipposideros semoni	Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe Bat	May	Inhabits tropical rainforest, monsoon forest, wet sclerophyll forest and open savannah woodlands.	Low	EPBC		V
Megaptera novaeangliae	Humpback Whale	Breeding known	Inhabits oceans	No	EPBC		E
Nyctophilus timoriensis (South-eastern form)	Eastern Long-eared Bat	May	Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland.	Moderate to high	EPBC	V	V
Petrogale penicillata	Brush-tailed Rock-wallaby		Inhabits rocky outcrops, cliffs and escarpments with a preference for complex sites that face north.	Low to moderate	Wildnet	V	V
Pteropus poliocephalus	Grey-headed Flying-fox		Inhabits rainforest, tall sclerophyll forest, swamps, woodlands, heaths, gardens and cultivated fruit crops within 200km of the coast.	Moderate in sections of pipeline within 200km of coast	Wildnet	C	V
Taphozous australis	Coastal Sheathtail Bat				Wildnet	V	-
Xeromys myoides	Water Mouse, False Water Rat	Likely	Inhabits wetlands, swamps and mangroves.	Low – no wetlands along pipeline	EPBC		V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Fish							
Maccullochella peelii peelii	Murray Cod, Cod, Goodoo	May	Occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	Low	EPBC	-	V
Reptiles							
Anomalopus mackayi	Five-clawed Worm-skink, Long-legged Worm-skink	May, known to occur west of Toowoomba	Adapted to digging, occurring in burrows in open paddocks with few trees, cropped grass and black soil	High	EPBC	E	V
Caretta caretta	Loggerhead Turtle	May	Oceanic species	No	EPBC		E
Chelonia mydas	Green Turtle	May	Oceanic species	No	EPBC		V
Denisonia maculate	Ornamental Snake	Likely	Inhabits leaf litter and fallen timber close to waterways in dry sclerophyll forest and woodland.	Moderate	EPBC		V
Dermochelys coriacea	Leathery Turtle, Leatherback Turtle, Luth	May	Oceanic species	No	EPBC		V
Egernia rugosa	Yakka Skink	Likely	Usually found in open dry sclerophyll forest or woodland where groups of skinks inhabit hollow logs, rock crevices and complex burrow systems.	Moderate to high	EPBC, Wildnet	V	V
Eretmochelys imbricata	Hawksbill Turtle	May	Oceanic species	No	EPBC		V

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Furina dunmalli	Dunmall's Snake	May	Preferred habitat, especially on Darling Downs is Brigalow (*Acacia harpophylla*) forest and woodland growing on cracking black clay and clay loam soils	Moderate to high	EPBC	V	V
Hemiaspis damelii	Grey Snake		Inhabits woodlands on cracking clays near waterways	Low to Moderate	Wildnet	E	-
Lepiodochelys olivacea	Pacific Ridley, Olive Ridley	May	Oceanic species	No	EPBC		E
Natator depressus	Flatback Turtle	Breeding known	Oceanic species	No	EPBC		V
Ophioscincus cooloolensis	-		Inhabits Wallum and Rainforest habitat	Low	Wildnet	R	-
Paradelma orientalis	Brigalow Scaly-foot	Likely	Found in a wide variety of open forest habitats on several soil types including, amongst others, remnant Brigalow (*Acacia harpophylla*) woodland with sparse tussock grasses on grey cracking clay soils.	Moderate	EPBC, Wildnet	V	V
Rheodytes leukops	Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle	May	Inhabits moderately shallow, fast flowing sections of river.	No – restricted to Fitzroy River and tributaries	EPBC		V
Strophurus taenicauda	Golden-tailed Gecko		This arboreal gecko inhabits humid and dry woodlands where it shelters in tree hollows and under peeling bark.	Moderate to high	Wildnet	R	

Scientific Name	Common Name	Records Along Pipeline	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
						NCA	EPBC
Tympanocryptis pinguicolla	Grassland Earless Dragon	May	Inhabits open structured grasslands with partially buried rocks, bare patches and insect or spider holes for shelter.	Low to moderate dependant on habitat	EPBC		E
Varanus semiremex	Rusty Monitor		Inhabits coastal and subcoastal mangroves and papaerbark forests.	Low	Wildnet	R	-
Sharks							
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	May	Oceanic species	No	EPBC		V
Rhincodon typus	Whale Shark	May	Oceanic species	No	EPBC		V
Insects							
Jalmenus evagoras eubulus	Imperial Hairstreak (northern subspecies)	Unlikely	Inhabits juvenile Acacia trees	Low – range occurs south of pipeline corridor	Wildnet	V	-

Status: NCA: Nature Conservation Act 1992 R: Rare; V: Vulnerable; E: Endangered.

EPBC: Environmental Protection and Biodiversity Conservation Act 1999; R: Rare; V: Vulnerable; E: Endangered.

Source: Wildnet: EPA Wildlife Online database incorporating Wildnet and HERBRECS (buffer distance of 10km around alignment assessed)

EPBC: Environmental Protection and Biodiversity Conservation Search Tool(DEWHA 2008) (buffer distance of 10km around alignment assessed)

Table A-7: Migratory / Marine Species Previously Recorded within the Study Area

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Birds						
Anseranas semipalmata	Magpie Goose	Inhabits tropical floodplains, dams, irrigated crops and the swampy well vegetated margins of deep waterways.	Low	EPBC		OM
Apus pacificus	Fork-tailed Swift	Varied, airspace over habitat ranging from rainforest to semi-desert	High	EPBC	J, C	MM, OM
Ardea alba	Great Egret, White Egret	Floodwater, rivers, shallows of wetlands, intertidal mudflats	Low – no wetlands along pipeline	EPBC	J, C	MW, MM, OM
Ardea ibis	Cattle Egret	Pasture, shallows of freshwater wetlands.	Low – no wetlands along pipeline	EPBC	J, C	MW / MM, OM
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Low rank vegetation around shallows of wetlands, reeds, sedges, saltmarsh. Summer migrant, breeds in Japan.	Low – no wetlands along pipeline	EPBC	J, C, B	MW, OM
Haliaeetus leucogaster	White-bellied Sea-Eagle	Commonly sighted in coastal and near coastal areas of Australia. Normally seen perched high in a tree, or soaring over waterways and adjacent land. Birds form permanent pairs that inhabit territories throughout the year.	High at northern edge of corridor	EPBC	-	MT, OM
Hirundapus caudacutus	White-throated Needletail	Are aerial birds that roost in trees. Birds are migratory and arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August.	High – follows storms through Australia	EPBC	-	MT, OM
Hirundo rustica	Barn Swallow	Inhabits open country and towns near water.	High	EPBC	-	MT, OM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Lathamus discolor	Swift Parrot	Inhabits Eucalypt woodlands in south eastern Qld in winter.	Moderate	EPBC		OM
Macronectes giganteus	Southern Giant-petrel	Inhabits airspace over seas of southern Australia	Low	EPBC		MM, OM
Merops ornatus	Rainbow Bee-eater	Open country, most vegetation types, sand dunes and banks.	High	EPBC	B	MT, OM
Monarcha melanopsis	Black-faced Monarch	Inhabits mangroves, rainforest, eucalypt forests and woodland.	Moderate dependant on habitat	EPBC		MT, OM
Monarcha trivirgatus	Spectacled Monarch	Inhabits rainforest, mangroves and moist gullies within wet eucalypt forests.	Low to Moderate dependant on habitat	EPBC		MT, OM
Myiagra cyanoleuca	Satin Flycatcher	Inhabits woodland and forest, mangroves and coastal heaths – prefers moist dense gullies in eucalypt forest for breeding.	Low to moderate dependant on habitat.	EPBC		MT, OM
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose	Inhabits coastal wetlands and densely vegetated swamps but will move into floodplain swamps and pools when they fill.	Moderate – dependant on habitat	EPBC, Wildnet		MW, OM
Numenius minutus	Little Curlew, Little Whimbrel	Bare dry subcoastal plains, floodplains, billabongs, freshwater swamps, sports fields and lawns	Moderate	EPBC	J, C, B	MW, OM
Rhipidura rufifrons	Rufous Fantail	Inhabits rainforest, dense wet eucalypt forests, paperbark and or mangrove swamps and riparian vegetation.	Low to moderate dependant on	EPBC		MT, OM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
			habitat			
Rostratula benghalensis s. lat.	Painted Snipe	Usually found in shallow inland wetlands, either freshwater or brackish, that are either permanently or temporarily filled. It is a cryptic bird that is hard to see and often overlooked.	Low	EPBC	-	MW, OM
Sterna albifrons	Little Tern	Inhabits coastal estuaries, bays, islets, swamps and lakes.	Low	EPBC		MM, OM
Mammals						
Balaenoptera acutorostrata	Minke Whale	Oceanic species	No	EPBC		MM
Balaenoptera edeni	Bryde's Whale	Oceanic species	No	EPBC		MM
Delphinus delphis	Common Dolphin	Oceanic species	No	EPBC		MM
Dugong dugon	Dugong	Oceanic species	No	EPBC, Wildnet		MM
Grampus griseus	Risso's Dolphin, Grampus	Oceanic species	No	EPBC		MM
Megaptera novaeangliae	Humpback Whale	Oceanic species	No	EPBC		MM
Orcaella brevirostris	Irrawaddy Dolphin	Oceanic species	No	EPBC		MM
Orcinus orca	Killer Whale, Orca	Oceanic species	No	EPBC		MM
Sousa chinensis	Indo-Pacific Humpback Dolphin	Oceanic species	No	EPBC		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Stenella attenuate	Spotted Dolphin, Pantropical Spotted Dolphin	Oceanic species	No	EPBC		MM
Tursiops aduncus	Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	Oceanic species	No	EPBC		MM
Tursiops truncates s. str.	Bottlenose Dolphin	Oceanic species	No	EPBC		MM
Reptiles						
Acalyptophis peronii	Horned Seasnake	Oceanic species	No	EPBC		MM
Aipysurus duboisii	Dubois' Seasnake	Oceanic species	No	EPBC		MM
Aipysurus eydouxii	Spine-tailed Seasnake	Oceanic species	No	EPBC		MM
Aipysurus laevis	Olive Seasnake	Oceanic species	No	EPBC		MM
Astrotia stokesii	Stoke's Seasnake	Oceanic species	No	EPBC		MM
Caretta caretta	Loggerhead Turtle	Oceanic species	No	EPBC		MM
Chelonia mydas	Green Turtle	Oceanic species	No	EPBC		MM
Crocodylus porosus	Estuarine Crocodile, Salt-water Crocodile	Oceanic species	No	EPBC, Wildnet		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Dermochelys coriacea	Leathery Turtle, Leatherback Turtle, Luth	Oceanic species	No	EPBC		MM
Disteira kingii	Spectacled Seasnake	Oceanic species	No	EPBC		MM
Disteira major	Olive-headed Seasnake	Oceanic species	No	EPBC		MM
Emydocephalus annulatus	Turtle-headed Seasnake	Oceanic species	No	EPBC		MM
Eretmochelys imbricata	Hawksbill Turtle	Oceanic species	No	EPBC		MM
Hydrophis elegans	Elegant Seasnake	Oceanic species	No	EPBC		MM
Lapemis hardwickii	Spine-bellied Seasnake	Oceanic species	No	EPBC		MM
Laticauda colubrine	A Sea Krait	Oceanic species	No	EPBC		MM
Laticauda laticaudata	A Sea Krait	Oceanic species	No	EPBC		MM
Lepiodochelys olivacea	Pacific Ridley, Olive Ridley	Oceanic species	No	EPBC		MM
Natator depressus	Flatback Turtle	Oceanic species	No	EPBC		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Pelamis platurus	Yellow-bellied Seasnake	Oceanic species	No	EPBC		MM
Sharks						
Rhincodon typus	Whale Shark	Oceanic species	No	EPBC		MM
Ray-finned Fishes						
Acentronura tentaculata	Hairy Pygmy Pipehorse	Oceanic species	No	EPBC		MM
Campichthys tryoni	Tryon's Pipefish	Oceanic species	No	EPBC		MM
Choeroichthys brachysoma	Pacific Short-bodied Pipefish, Short-bodied Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys amplexus	Fijian Banded Pipefish, Brown-banded Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys flavofasciatus	Yellow-banded Pipefish, Network Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys haematopterus	Reef-top Pipefish	Oceanic species	No	EPBC		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Corythoichthys intestinalis	Australian Messmate Pipefish, Banded Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys ocellatus	Orange-spotted Pipefish, Ocellated Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys paxtoni	Paxton's Pipefish	Oceanic species	No	EPBC		MM
Corythoichthys schultzi	Schultz's Pipefish	Oceanic species	No	EPBC		MM
Doryrhamphus excisus	Indian Blue-stripe Pipefish, Blue-stripe Pipefish	Oceanic species	No	EPBC		MM
Festucalex cinctus	Girdled Pipefish	Oceanic species	No	EPBC		MM
Filicampus tigris	Tiger Pipefish	Oceanic species	No	EPBC		MM
Halicampus dunckeri	Red-hair Pipefish, Duncker's Pipefish	Oceanic species	No	EPBC		MM
Halicampus grayi	Mud Pipefish, Gray's Pipefish	Oceanic species	No	EPBC		MM
Halicampus nitidus	Glittering Pipefish	Oceanic species	No	EPBC		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Halicampus spinirostris	Spiny-snout Pipefish	Oceanic species	No	EPBC		MM
Hippicchthys cyanospilos	Blue-speckled Pipefish, Blue-spotted Pipefish	Oceanic species	No	EPBC		MM
Hippichthys heptagonus	Madura Pipefish, reticulated Freshwater Pipefish	Oceanic species	No	EPBC		MM
Hippichthys penicillus	Beady Pipefish, Steep-nosed Pipefish	Oceanic species	No	EPBC		MM
Hippocampus bargibanti	Pygmy Seahorse	Oceanic species	No	EPBC		MM
Hippocampus kuda	Spotted Seahorse, Yellow Seahorse	Oceanic species	No	EPBC		MM
Hippocampus planifrons	Flat-face Seahorse	Oceanic species	No	EPBC		MM
Hippocampus zebra	Zebra Seahorse	Oceanic species	No	EPBC		MM
Lissocampus runa	Javelin Pipefish	Oceanic species	No	EPBC		MM
Micrognathus andersonii	Anderson's Pipefish, Shortnose Pipefish	Oceanic species	No	EPBC		MM

Scientific Name	Common Name	Preferred Habitat	Preferred Habitat Likely in Corridor	Source	Status	
					Migratory	EPBC
Micrognathus brevirostris	Thorn-tailed Pipefish	Oceanic species	No	EPBC		MM
Nannocampus pictus	Painted Pipefish, Reef Pipefish	Oceanic species	No	EPBC		MM
Solegnathus hardwickii	Pipehorse	Oceanic species	No	EPBC		MM
Solenostomus cyanopterus	Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Oceanic species	No	EPBC		MM
Solenostomus paradoxus	Harlequin Ghost Pipefish, Ornate Ghost Pipefish	Oceanic species	No	EPBC		MM
Syngnathoides biaculeatus	Double-ended Pipehorse, Alligator Pipefish	Oceanic species	No	EPBC		MM
Trachyrhamphus bicoarctatus	Bend Stick Pipefish, Short-tailed Pipefish	Oceanic species	No	EPBC		MM

Status: Migratory Status: Listed under international agreements: J = Japan-Australia Migratory Bird Agreement (JAMBA), C = China-Australia Migratory Bird Agreement (CAMBA), B = Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

EPBC: Environmental Protection and Biodiversity Conservation Act 1999; MT: Migratory Terrestrial species; MW: Migratory Wetland species; MM: Migratory Marine species; MO: species that Overfly Marine Areas

Source: EPBC: Environmental Protection and Biodiversity Conservation Search Tool for SWQP portion of pipeline route (DEWHA 2008)

Table A-8: Relevant Legislation and Possible Approvals

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
Local			
Local Planning Scheme	Under IPA, aspects of development authorised under a Pipeline Licence are exempt from approval under a local planning scheme. However activities not authorised under the pipeline licence (or outside of the pipeline licence area) will be assessable against the local planning scheme, where relevant.	Local Authority	Relevant permits / applications discussed below.
Local Government Act 1993 (and other relevant acts e.g. Sewage Act)	Potentially may include: Approval for water or sewerage connections to local authority utilities. Permit / consents to carry out blasting. Permits /consents to interfere with council roads.	Local Authority	The sewage treatment system will be approved and conditioned under the EA. Once the camp location is known, the local council should be advised and consulted about their requirements including discussions about, for example, any storm water management or building permit requirements. Discussions re: engineering requirements for burial of the pipe under local roads, working in local road reserves and traffic impacts / control measures should be addressed with Council directly by the Construction Contractor. Council should be advised of blasting and request information on any specific requirements or consents. Advice should be provided re camp locations.
Building Act 1975 and Regulations	Development approval for building work may be required. Application may be assessed by a private certifier if the building work is the only assessable development under application.	Local Authority or private certifier.	Building approval may be required for permanent structures regardless of location within or outside of PPL.

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
State			
Dangerous Goods Safety Management Act 2000	Flammable and Combustible Liquids (FCL) licence is required for fuel storage in quantities greater than 10,000L. Under the Act if diesel if stored in quantities equal to or greater than listed below, then the premises is classified as a 'dangerous goods location' (DGL): 10,000L in a tank, or 50,000L in packages or 50,000L in tanks and packages combined provided the quantity of C1s in tanks does not exceed 10,000L If these limits are exceeded then the premises is considered to be a large dangerous goods location (LDGL) and require notification to the Department of Emergency Services. If storages are below these limits then the premises is considered a minor storage workplace (MSW). A MSW, DGL and LDGL all have specific compliance requirements under the Act and AS 1940	FCL Licence devolved to Local Authority, all other aspects administered by the Department of Emergency Services	Needs to be addressed for the camp locations with the relevant local authorities. Can really only be finalised upon completion of the site selection for the camps, and finalisation of the quantities of diesel that will be stored.
Environmental Protection Act 1994	A new environmentally relevant activity (ERA) (i.e. for activities not authorised under the pipeline licence (P&G Act), requires a development application under IPA. This may apply to, but is not limited to activities that may be undertaken at the construction camp (if the camp is not located within the PPL area, and the ERA's are not included on the relevant EA) for example:	Environmental Protection Agency (EPA)	Only applies to activities that are not authorised under the PPL.

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
	ERA 7 – Chemical storage (volume more than 10m3) ERA 11 (a) - Storage of crude oil and petroleum products (total capacity of 10,000L – 500,000L) ERA 15 (b) – Sewage treatment (with peak design capacity of 100 – 1,500 persons) ERA 17 – Fuel burning (including for example a standby power generator/s capable of burning 500kg or more of fuel an hour in aggregate)		
	Similarly, a development approval under IPA may be required in relation to contaminated land under the EP Act if activities are conducted outside of the pipeline licence area on land that is listed on the Environmental Management Register (EMR) or Contaminated Land Register (CLR)6, or currently used for a notifiable activity. Contaminated soil must not be removed from sites listed on the EMR or CLR, or determined by analysis of soil samples to be contaminated, without a disposal permit (s.424 of EP Act).	EPA Contaminated Land Unit	Only possibly applicable if works are undertaken outside pipeline licence area. Unlikely to be triggered.
	Registration certificate required to be held by the operator of Abrasive Blasting activities as a mobile and temporary environmentally relevant activity (ERA 23(b)), where the activity is commercially undertaken.	EPA	Typically devolved to a specialist subcontractor who would undertake this activity.
	Notification of 'notifiable activities' may be required for activities that meet the threshold levels under Schedule 2 of the EP Act (i.e. regulated dam, significant fuel storage). Any	EPA Contaminated Land Unit	May be applicable for fuel storage of more than 200L in an underground tank or between 2500L and 25,000L in above ground tanks depending on the type of fuel.

[6] Under IPA, making a material change to the use of premises is not assessable against the requirements of the EP Act in relation to contaminated land if the land that is listed on the EMR or CLR is used for a petroleum activity (IPA, Schedule 8, Part 1, Table 2, items 5, 6 and 7).

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
	such notifications may result in the subject property being listed on the EMR.		
Environmental Protection (Waste Management) Regulation 2000	Beneficial re-use of waste may be required if hydrotest water is intended for some beneficial re-use. Also may apply if wastewater is used for hydrotesting	EPA	Hydrotest source water and end location of disposal to be confirmed.
Fire and Rescue Services Act 1990	A permit to light fires is required to light an open fire larger than 2m in any direction. Lighting of fires is prohibited if a local fire ban is in place under this Act.	Dept of Emergency Services / Rural Fire Service	Construction Contractor to obtain permit if necessary.
Fire and Rescue Services Act 1990	Buildings to comply with the Act and the Building Fire Safety Regulation 1991 in relation to fire safety, including for example evacuation plans.		Construction Contractor to obtain permit if necessary.
Fisheries Act 1994	Waterway barriers are required for open-cut watercourse crossings in a wet / flowing watercourse. Development Approval under IPA is required for waterway barriers placed for open-cut watercourse crossings with a stream order greater than 2. As a consequence, barriers placed on large watercourses are likely to require development approval. Some works are classed as self assessable development 7.	Department of Primary Industries and Fisheries (DPIF)	Crossing technique to be evaluated for each watercourse. Horizontal Directional Drilling (HDD) crossings do not require waterways barriers and therefore the associated permits.

[7] Development approval is not required if the barrier works are considered self assessable development under the IP Act (Schedule 8, Part 2, table 4, item 2) which applies to: 1. temporary barriers on freshwater streams (placed for not longer than 28 days) that are a maximum of 3 metres high and 20 metres long; or 2. permanent barriers that are not higher than 1m, and constructed on first and second order streams more than 100km from the coastline. In these circumstances, the relevant DPIF Code for self-assessable development (either Code WWBW01 - Minor waterway barrier works on low order inland waterways or Code WWBW02 - Temporary waterway barrier works in freshwater) must be complied with, or otherwise a development approval is required. Erection of signage and notification of the works to DPIF 5 working days in advance is required.

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
Forestry Act 1959	Sales Permit to extract material from State Lands within or outside the Pipeline Licence area is required under section 56 of the Act.	Department of Natural Resources and Water (DNRW)	To be confirmed. May be required for any borrow pits created on Crown Land
Integrated Planning Act 1997	Under the IPA, all aspects of development for activities not authorised under the pipeline licence (outside of the pipeline licence area) will be assessable against the local planning scheme, where relevant. Development Applications under IPA trigger payment of Portable Long Service Leave Levy for the project (equates to 0.35% of total project cost).	Local Authority	Relevant permits / applications discussed in this table (e.g. vegetation clearing, ERAs, excavation in a watercourse).
Nature Conservation Act 1992 and Regulations	Any person taking, using or interfering with protected fauna is required to have an appropriate permit, and have the training and skills to do this activity. A Wildlife Rehabilitation Permit8 (spotter - catcher) is typically required during construction.	EPA / Queensland Parks and Wildlife (QPW)	Construction Contractor to employ people who hold or will obtain an appropriate permit.
Nature Conservation Act 1992 and Regulations	Any person taking, using or interfering with protected flora is required to have an appropriate permit, and have the training and skills to do this activity. A clearing permit is likely to apply.	EPA	Construction Contractor to obtain permit if necessary.
Petroleum and Gas (Safety and Production) Act 2004	Required to obtain Pipeline Survey Licence (PSL) and Petroleum Pipeline Licence (PPL).	Department of Mines and Energy (DME)	Required.

8 A Rehabilitation Permit (spotter/catcher) for animals is to allow a person to rescue and release: (a) a sick, injured or orphaned protected animal; or (b) a protected animal whose habitat has been, or will be, destroyed by human activity or a natural disaster.

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
	Notice to the relevant public road authority is required at least 10 business days before a notifiable road use9 commences, whether the road is within the area of the pipeline licence or not (s. 516 P&G Act).	Local Authority (local roads) or Department of Main Roads (state-controlled roads)	Need to determine if haulage required for construction exceeds threshold for a notifiable road use.
Transport Infrastructure Act 1994	Approval (for ancillary works and encroachment) to work on or interfere with State Owned roads or railways.	Dept of Main Roads / Qld Transport / Qld Rail	Presence of State owned roads to be confirmed.
	Notification of Qld Transport if burning off in a road reserve.		Unlikely to be applicable as burning is prohibited. If burning is undertaken then Construction Contractor to undertake notifications.
Vegetation Management Act 1999 (and Land Act 1994)	Clearing of native vegetation on freehold and most leasehold land (under the Land Act 1994) requires a development approval under IPA. However, petroleum activities approved under the pipeline licence are exempt from requiring a development approval for vegetation clearing10. If clearing related to incidental activities (such as camps and borrow pits which involve vegetation clearing) occur outside of the pipeline licence area, a development approval will be required.	DNRW	Only applicable if works are undertaken outside pipeline licence area. Recommend that no clearing activities be undertaken outside of PPL area.
Water Act 2000 and	A permit to take water is required to source water from a watercourse, lake, spring or an	DNRW	Water permit is required to take water for HDD, hydrotesting

9A notifiable road use is the use of a public road at more than the threshold rate for haulage associated with pipeline construction (s.515 of P&G Act). The threshold rate for state controlled roads is 50,000 T/yr and another public road is 10,000 T/yr.

10 The proposed pipeline is defined as a 'specified activity' under the IPA, making it exempt from assessment against the Vegetation Management Act 1999 (as per Schedule 8 Part 1, Table 4 of the IP Act).

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
Regulations	aquifer for an activity of a temporary nature (s.237) (separate to IPA and regardless of the pipeline licence).		or potable camp water. A water permit: relates to the location or locations stated on the permit; and must be granted for a stated period (with a reasonably foreseeable conclusion date); and can not be transferred, amended, renewed or suspended; and must be for a stated activity. The application must be: made to the chief executive in the approved form; supported by sufficient information to enable the chief executive to decide the application; accompanied by the fee prescribed under a regulation. An application for a Water Permit requires: the maximum rate of extraction (L/s), the volume (ML) and frequency (number of days) extraction is required the maximum volume of water required (ML) a sketch plan showing the source and location where the water is proposed to be taken. Include property boundaries, Lot/Plan descriptions, existing water facilities (e.g. pump, bore), location of any watercourse, lake or spring Construction Contractor to confirm water usage plans.
	Activities involving vegetation destruction, excavation and fill in a watercourse are exempt under ss. 49, 50 and 51 of the Water Regulations, as long as they are authorised under a pipeline licence. Development Approval under IPA will be required if these activities are undertaken outside the pipeline licence area. Excavation and removal of material (e.g. for padding) from watercourses may require a	DNRW	Only applicable if works are undertaken outside pipeline licence area.

Legislation	Activity and Potential Approvals	Agency	Applicability / Required Action
	Riverine Protection Permit under the Act, if works are outside the pipeline licence area. Riverine Protection requires written consent of the registered owners of the applicable land.		
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Proposed projects may be referred to the Commonwealth Environment Minister under the EPBC Act if the development has the potential to impact on matters of national environmental significance (NES). Matters of NES on the pipeline are the Endangered REs and the threatened flora and fauna identified during desktop assessments.	Department of Environment, Water, Heritage and the Arts (DEWHA)	Significant impact to matters of NES is not likely as the current alignment intersects only a small portion of Endangered REs. However the development will still be referred to DEWHA although is considered unlikely to be assessed as a controlled action requiring more detailed Commonwealth assessment.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Permission to disturb/ destroy archaeological areas or objects.	Department of Environment, Water, Heritage and the Arts (DEWHA)	Applicability needs to be assessed by archaeologist. Negotiation of Indigenous Land Use Agreement to be undertaken by SGP.

APPENDIX 2

SUPPORTING FIGURES

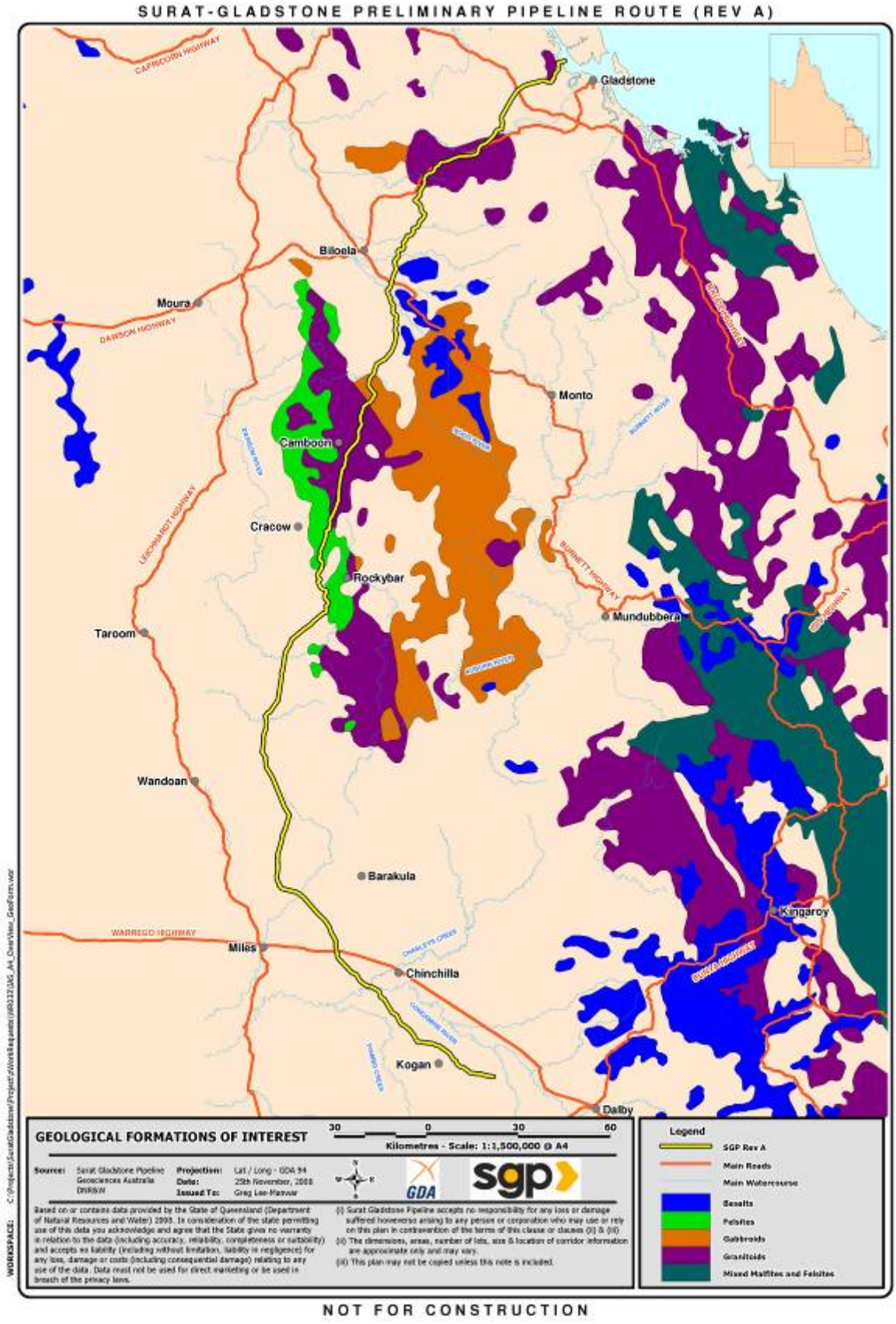


Figure A-1: Geological Formations of Interest

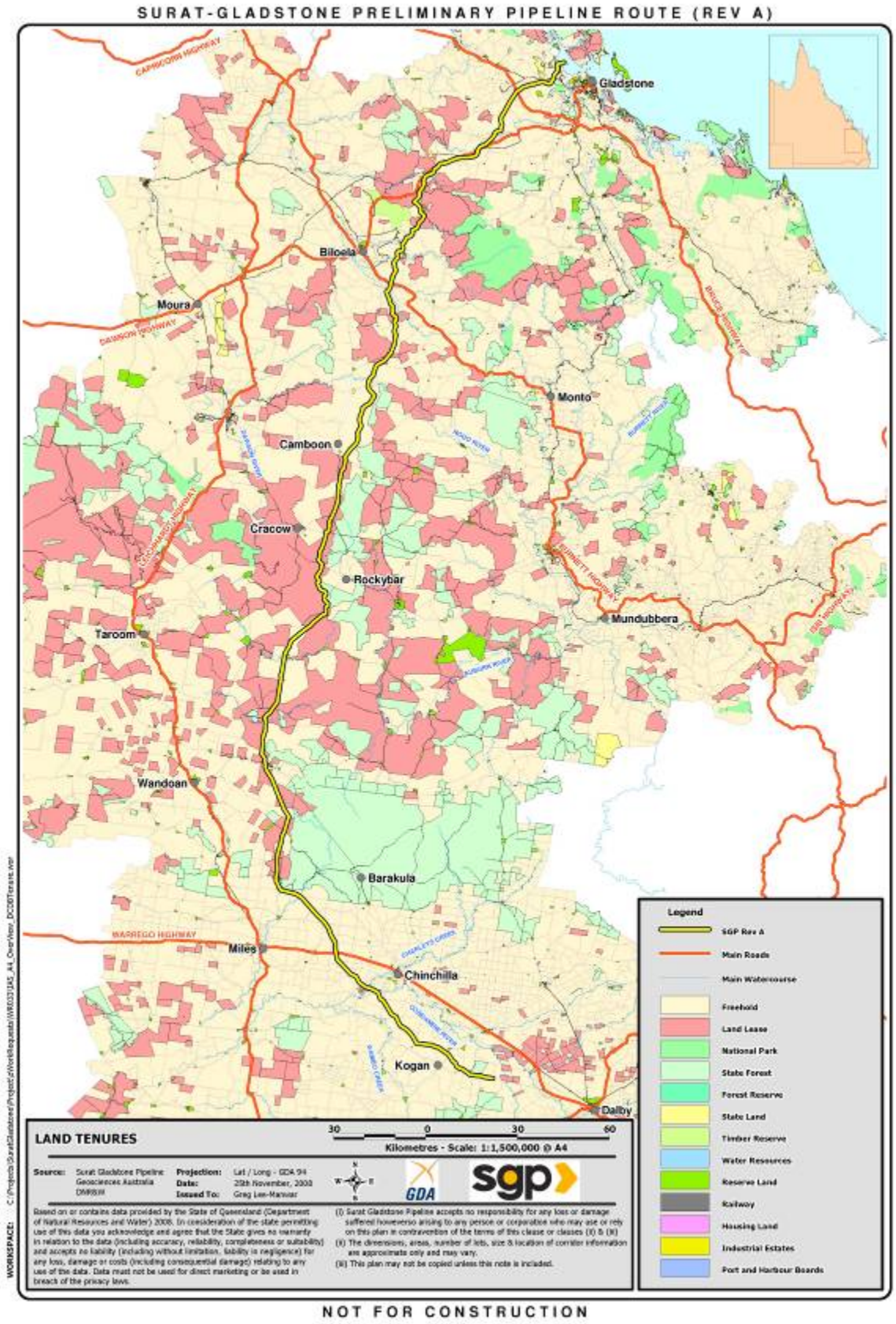


Figure A-2: Land Tenures

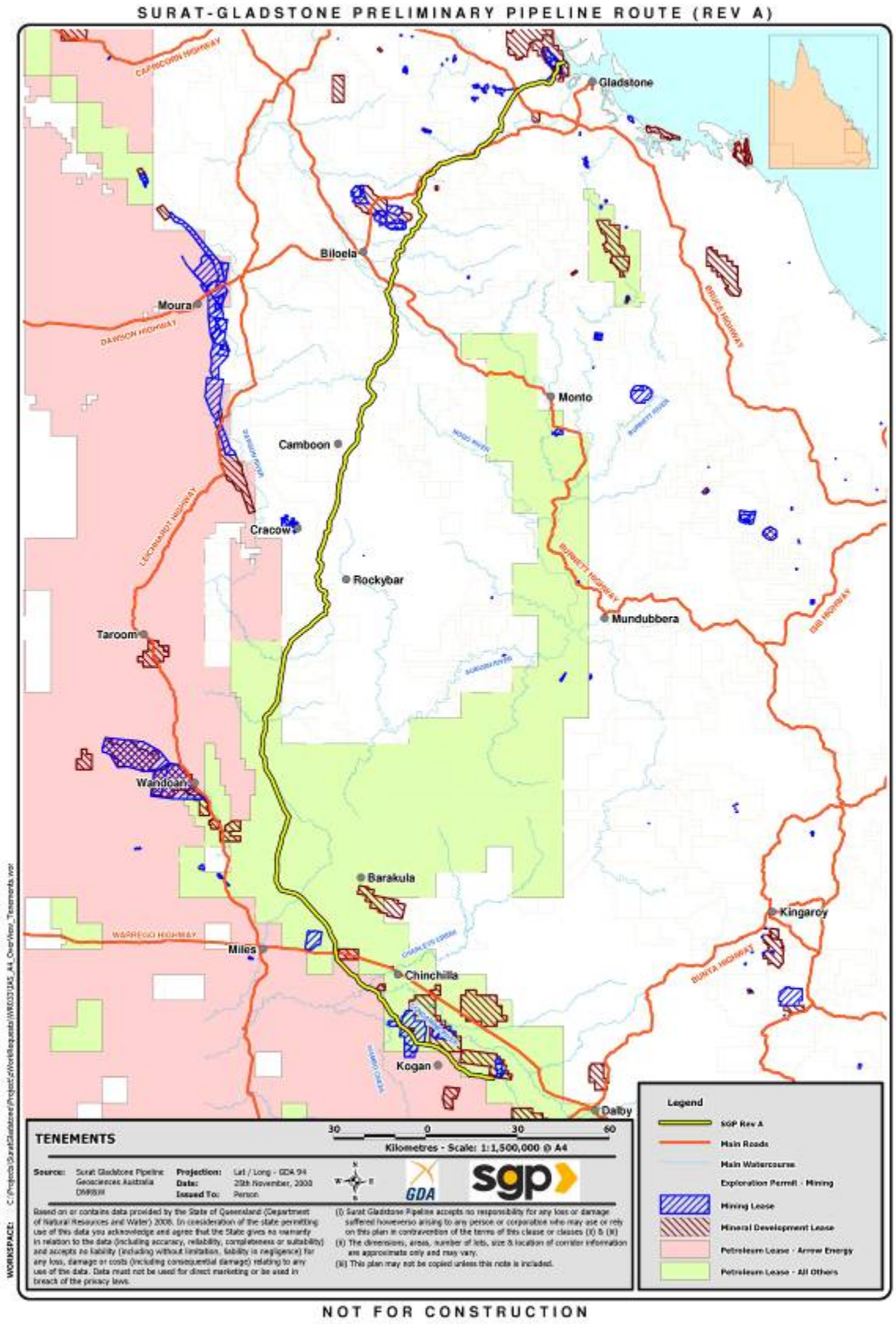


Figure A-3: Tenements

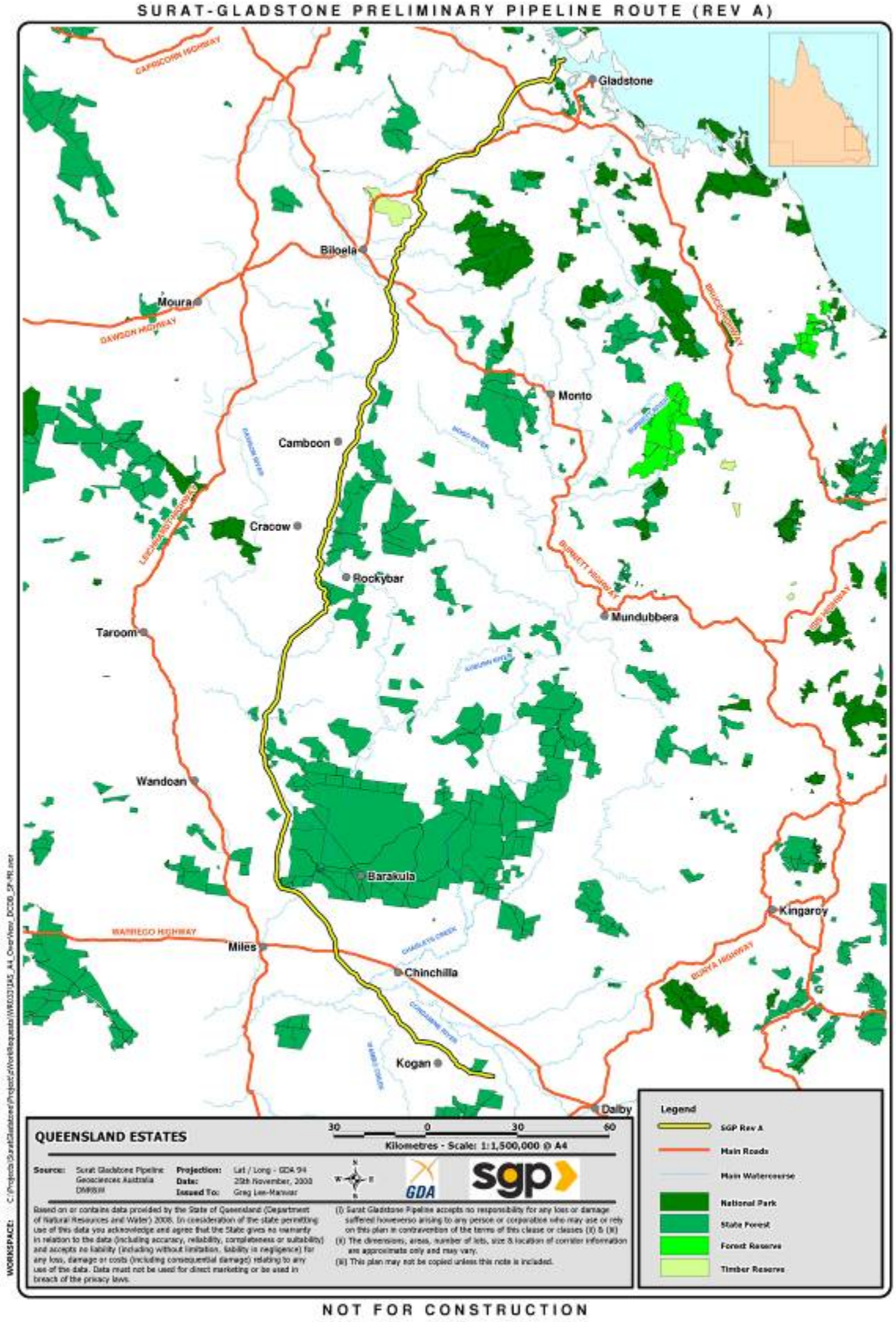


Figure A-4: Queensland Estates

APPENDIX 3

CULTURAL HERITAGE

CULTURAL HERITAGE

REPORT FOR INITIAL ADVICE STATEMENT

1. ABORIGINAL CULTURAL HERITAGE

1.1 Introduction

SGP is aware that it is required to comply with the cultural heritage duty of care. It is also aware that to do so it must address this issue by one of the means specified in s23 of the *Aboriginal Cultural Heritage Act 2003* (ACHA).

SGP has available to it the complete range of options for compliance with the duty of care as specified in s23. SGP intends to reserve to itself this facility. Notwithstanding this, however, it is favouring use of Part 7 on a voluntary basis.

The remainder of this report sets forth the process that SGP has initiated in relation to this. It describes that stages that have been reached, and what measures remain to be implemented.

1.2 Legal Background

The dominant piece of legislation relating to Aboriginal cultural heritage is the Aboriginal Cultural Heritage Act 2003 (ACHA). This legislation has been in place since April, 2004. This is a significant fact when reviewing engagement in the context of cultural heritage.

The ACHA operates on the basis of a duty of care owed by development proponents and others to Aboriginal cultural heritage. The duty of care can be met in a variety of ways (see below). Where an EIS is a mandatory requirement for a license etc to operate a project or it's necessary to comply with a limited range of regulatory processes (see ss87-89), then it is essential to develop a CHMP. Alternatively, s86 allows the duty of care to be met by settlement of a native title agreement of a specified form, being an ILUA, s31 agreement or by use of the Native Title Protection Conditions.

Where there is no need to comply with ss87-89, then a range of options are available to the development proponent. These include a voluntary CHMP. The mechanisms by which one can meet the duty of care are specified in s23 of the ACHA. These include use of the Duty of Care Guidelines.

Failure to comply with the duty of care can result in a charge of Harm being made against a project sponsor. Substantial fines can arise where a party, individual or corporation, is found guilty of harming Aboriginal cultural heritage.

The ACHA also defines those people with whom a proponent must engage. These people are referred to as Aboriginal Parties. There is a descending hierarchy of persons who constitute Aboriginal Parties: determined native title holders; currently registered claimants; claimants who were registered as of April 2004 but whose claims have subsequently failed

are also Aboriginal Parties until such time as another claim is registered over the area. If there are no persons meeting these categories, then any person claims to meet the criteria specified in s35(7) of the ACHA is an Aboriginal Party in the absence of any of the above categories.

1.3 Aboriginal Parties

SGP has undertaken the necessary searches of the register of native title claims maintained by the National Native Title Tribunal. Various forms of data have been used:

- Digital data of the native title claim boundaries as of April 2004 (the date of implementation of the ACHA, and the relevant date for determining native title Aboriginal Parties), June 2006, and August 2008 – the most recent data set available;
- Hard copy extracts of each native title claim identified in the above analysis;
- Review of published native title claim maps on the NNTT web site and information provided by relevant claim officers in the NNTT to ensure that no new claims have been excluded from the analysis.

This data has been used to determine which groups constitute the Aboriginal Parties for cultural heritage issues associated with the proposed pipeline and how much lies within their respective claim areas. Table A3-1 provides the outcomes of this analysis.

On the basis of criteria specified in ss34 and 25 of the ACHA, the following registered native title claims have standing as exclusive Aboriginal Parties for that portion of the pipeline that falls within their claim boundaries:

- PORT CURTIS CORAL COAST QC01/029
- GANGULU QC97/036
- IMAN #2 QC97/055
- WAKKA WAKKA #2 QC99/033
- WULLI WULLI QC00/007

It should be noted that they hold exclusive status notwithstanding the presence of any unregistered claim, irrespective of whether that claim was registered as of April 2004 or not.

The following have the status the of exclusive Aboriginal Parties for that portion of the pipeline that lies within their now unregistered claim, but which does not overlap with any other registered claim:

- WESTERN WAKKA WAKKA QC99/04

The following registered claims will share Aboriginal Party status for that portion of their claim that overlaps with another registered claim:

- GANGULU QC97/036 & WAKKA WAKKA #2 QC99/033
- WAKKA WAKKA #2 QC99/033 & WULLI WULLI QC00/007

With regard to Gangulu and Wakka Wakka, the amount of overlap is miniscule (about 1m) and certainly represents a minor issue that will be addressed during negotiations with these groups. It is probably a minor digitising error of the claim boundary. The overlap for

Wakka Wakka and Wulli Wulli represents a real overlap of approximately 1.13kms. SGP will negotiate a set of arrangements that provides for these groups to jointly participate in the cultural heritage process for this project in this short section of the route.

The following claims, now unregistered, but registered as of April 2004 will share the status of Aboriginal Party for that portion of their claim that overlaps with the following claims, now unregistered, but registered as of April 2004:

- BARUNGGAM QC99/005 & WESTERN WAKKA WAKKA QC99/04

This is an extensive section of overlap and SGP will negotiate a set of arrangements that provides for these groups to jointly participate in the cultural heritage process for this project.

There are two short sections where no native title claim is or ever has been registered. In both cases, these are anomalies that no doubt arise from minor errors in describing or digitising the claim boundaries. These will be resolved in discussions with the relevant Aboriginal Parties. There is a third section at the eastern end of the PCCC claim where the pipeline extends just beyond the registered claim boundary. To the extent necessary, this will be discussed with PCCC claim group and they will be engaged to undertake any necessary management measures.

It should also be noted that the proposed alignment does not intersect with the Djaku-Nde and Jangerie Jangerie (QC00/010) native title claim. The route lies to the west of the Barakula State Forest which forms the western boundary of their claim.

Table A3-1: Native Title claims (currently registered or registered as of April 2004) who constitute Aboriginal Parties for the preferred pipeline alignment

NATIVE TITLE CLAIM	Segment Length (m)	Kms
No Native Title Present	1370.03	1.37
PORT CURTIS CORAL COAST QC01/029	65985.61	65.99
No Native Title Present	1.34	0.00
GANGULU QC97/036	76673.23	76.67
GANGULU QC97/036 & WAKKA WAKKA #2 QC99/033	1.26	0.00
WAKKA WAKKA #2 QC99/033	3783.55	3.78
WAKKA WAKKA #2 QC99/033 & WULLI WULLI QC00/007	1135.13	1.13
WULLI WULLI QC00/007	126086.06	126.1
IMAN #2 QC97/055	45369.27	45.37
No Native Title Present	9.34	0.00
WESTERN WAKKA WAKKA QC99/04	22854.95	22.85
BARUNGGAM QC99/005 & WESTERN WAKKA WAKKA QC99/04	124258	124.26

1.4 Duty of Care

There are four possible options available to SGP in the current circumstances:

- Duty of Care Guidelines

- S23(3)(a)(iii) 'another agreement'
- CHMP (voluntary or mandatory)
- ILUA that does not exclude cultural heritage

As there will be a need to settle a native title agreement, this option of meeting the duty of care can be pursued.

After review, SGP's preferred option is to develop agreements with the Aboriginal Parties. These may take the form of a native title agreement (SGP's preferred vehicle), 'another' agreement or a CHMP.

SGP may choose to develop a voluntary CHMP as a means of satisfying the duty of care. The CHMP process stipulates certain steps that must be taken and the time lines adhering to each. Should SGP opt to develop a voluntary CHMP, the stipulated timeframes will be met.

SGP will develop process agreements. As well as settling various general principles, such as rights and responsibilities of parties to the agreement, ownership of cultural heritage, mechanisms for dispute resolution, and 'boilerplate' conditions, the agreements will also stipulate the processes that will be adopted at each stage of the exercise, i.e. initial cultural heritage assessment (commonly called a survey but really needing to consider issues beyond a simple field inspection given the definition of cultural heritage in the ACHA), agreement of necessary management measures; implementation of management measures prior to and during construction and post-construction requirements (if any).

SGP recognises the full suite of options available under s23 of the ACHA. The circumstances in which SGP opts to adopt any one option over the others will be identified to the Aboriginal Parties at the start of the process of engagement. These will include compliance with general project timeframes, SGP's assessment of the likelihood of securing a registered ILUA, and the general attitude of any Aboriginal Party to settling any particular form of agreement in a timely fashion.

SGP does not expect to table an agreement of any form at the initial meetings. Rather, SGP will provide a draft set of principles for the consideration of the Aboriginal Parties. These are to inform the preparation of the agreement, once they are agreed. A copy of the draft principles is included in Table A3-2. Independent legal and technical advisers will be resourced to assist the Aboriginal Parties in this regard.

Draft agreements will be provided to the Aboriginal Parties prior to the second meeting. These documents will be reviewed in detail with these groups, and with independent legal advice resourced by SGP for this purpose. Dates for finalisation and signing will then be set.

Table A3-2: Draft Principles of the Cultural Heritage Management Process

ELEMENTS AND PRINCIPLES OF THE

CULTURAL HERITAGE MANAGEMENT PROCESS –

ABORIGINAL CULTRUAL HERITAGE

Core principle

SGP is committed to the following principles to guide the management of Aboriginal cultural heritage. It is the wish of SGP to meet the cultural heritage duty of care by settlement of agreements with the Aboriginal parties. SGP's preferred option is to situate such agreements within the framework of ILUA's to be negotiated with the Aboriginal native title parties. However, where SGP concludes that an ILUA will not be registered within the required project timeframe, or other contingencies arise such that SGP concludes this preferred option is not feasible, SGP reserves the right to pursue any other option available to SGP to meet the duty of care. This may include, but is not limited to, negotiation of another form of agreement.

CHIMA

The base agreement will be known as a Cultural Heritage Investigation and Management Agreement (CHIMA). This terminology is used to reinforce the process nature of the document. The CHIMA will consist of five major sections, with four of them being substantive in nature and the fifth consisting of standard boilerplate conditions. The four substantive sections include:

1. The principles that are to be adopted in relation to cultural heritage. These include ownership of cultural heritage, management of information, responses to cultural issues that might arise (e.g. death and bereavement issues), dispute resolution, general administrative arrangements, etc;

2. The process for undertaking the Initial Cultural Heritage Assessment (ICHA) and the outcomes expected from this. This will relate to the identification of significant areas and objects that exist along the proposed route. This will be covered in the Terms of Reference agreed for the fieldwork and which will also be included in the CHIMA;

3. The development of a Cultural Heritage Management Strategy (CHMS) and the implementation of this in the context of construction. This will relate to how the significant areas and objects identified in the ICHA are to be managed. The strategy will have two major elements: pre-construction measures; and construction-related activities. Provision for cultural induction processes, subsequent management of cultural material, and other contingencies will also be covered. The CHMS will constitute a formally agreed component of the CHIMA;

4. Provision will also be made for development of a Post-Construction Heritage Agreement (PCHA) if this should prove necessary. This will cover those steps that need to be implemented for the management of cultural places on a regular basis or in the context of emergencies associated with general maintenance, other uses (e.g. recreation) of the infrastructure, or expansion of projects as required. The PCHA will constitute a formally agreed subsidiary agreement to the CHIMA.

Principles to be adopted by SGP

SGP is committed to adopting a range of principles with respect to cultural heritage management. These will be refined in the course of developing the CHIMA. The following outlines those principles that are to be adopted by SGP for the Surat to Gladstone Pipeline Project.

1. SGP will not act to the strict timelines of the ACHA with respect to the development of the CHIMA as a CHMP where SGP decides to develop a CHMP unless project timeframes or other issues at SGP's discretion require;

2. SGP will develop and implement the CHIMA in partnership with the Aboriginal parties, or (on provision of appropriate authorisation) the nominees of the Aboriginal Parties as per s.102 (2) of the ACHA if there is a CHMP (but see Contingencies below).

3. SGP is conscious that this project may be the catalyst for tensions and stresses within Aboriginal communities. To minimise this, SGP will not act in a partisan fashion (and avoid the perception of this to the extent it can), and will not enter into group or inter-group politics;

4. SGP will use current best practice in the measures implemented as against base compliance and will work with the Aboriginal Parties to develop key performance indicators to ensure that it is best practice;

5. SGP will seek agreement of Aboriginal Parties on the core and subsidiary principles that influence the design of the process and its implementation;

6. SGP will initially draft agreements in accordance with the agreed principles, and these will then be negotiated between the parties;

7. SGP accepts as a base principle underwriting the entire cultural heritage exercise is the recognition of the different imperatives and interests of the parties, and their roles in relation to cultural heritage. This can be encapsulated as follows:

   The core business of SGP is the supply of energy (gas and associated services) to their customers, with those tasks to be undertaken in a commercially feasible and environmentally responsible fashion.

   The core business of Aboriginal Parties is to manage their cultural heritage in a culturally appropriate fashion in the context of the proposed developments proceeding.

8. SGP accepts that the selection of technical advisers to assist in conducting field investigations and preparing reports on same lies with the Aboriginal Parties. A process will be developed that will allow the Aboriginal Parties to nominate technical advisers with their appointment to be subject to SGP's agreement;

9. SGP will retain the right to commission peer review of reports, as well as for any proposed management strategy in advance of its implementation with

their appointment to be subject to consultation with the Aboriginal Parties;

10. SGP proposes to adopt an agreement-based process between the parties for authorization of all ground-disturbing activities. This will be given expression such that any ground disturbing activities may require the issue of a Ground Disturbance Permit (GDP) issued within SGP and that may require independent assessment in advance by the relevant endorsed party. The primary authority for the GDP will be the CHMS negotiated after the ICHA has been completed. The GDP process will be linked to the project's GIS to allow auditing of the process.

11. SGP expects cultural heritage data will be integrated into a Geographic Information System (GIS). The GIS will be developed in fashion that recognizes and gives expression, to the extent practical, to the other principles included herein;

12. SGP accepts that the Aboriginal Parties are the owners of all cultural heritage areas and objects that may exist in the areas to be affected by these developments, and will use all reasonable endeavours to give effect to this, and the implications arising from it, to the extent possible under existing legislation;

13. SGP accepts that all cultural information generated or collated (other than that which is already in the public domain), and subsidiary documents relating to the cultural heritage program (other than agreements or management strategies) produced in the course of these projects will remain the property of the relevant Aboriginal Parties;

14. SGP accepts that it may not be necessary for SGP to hold any primary or 'raw' cultural heritage information. Rather, SGP requires data that makes clear the constraints or management requirements with which SGP must comply to implement the agreed management strategy;

15. SGP must be guaranteed access to such information and it must be available in a timely fashion. To that it end, SGP will only agree to data management processes that SGP considers will guarantee this access in the format SGP considers necessary and in a timely fashion;

16. SGP will enter into access and use protocols with the Aboriginal Parties relating to the cultural heritage data generated or collated as part of this project;

17. A dispute resolution processes will constitute a component of the CHIMA and, other than in exceptional circumstances, the steps in this process will be exhausted before any party makes any use of any other legal mechanisms;

18. SGP expects, once agreement is reached with the Aboriginal Parties, that the Aboriginal Parties will assist SGP where third parties challenge the agreed process and will not support any claims made by the third parties;

19. SGP believes the CHIMA should provide a formal mechanism for investigation of alleged breaches of the CHIMA and subsidiary agreements, and should make provision for appropriately graded sanctions for those who

breach the CHIMA;

20. SGP accepts that there is a requirement for a formal cultural heritage induction process that makes reasonable provision for all project personnel to be made aware of the cultural heritage values associated with the project, and of their responsibilities under terms of the CHIMA and subsidiary agreements and that SGP ensures that, wherever possible, Aboriginal Parties or their nominees should convene and participate in any cultural awareness processes;

21. Provision will be made in the CHIMA for review or variations if there is variation of any of the existing project components or if additional project elements emerge that were not anticipated in the original project concept;

22. Provision will be made in the CHIMA to allow parties have a right to review and vary provisions of the CHIMA at regular intervals (probably on an annual basis) for the duration of the CHIMA or if particular issues arise at any time.

Contingency

SGP reserves the right to terminate the negotiation of the CHIMA or the implementation of the CHIMA subject in the latter case to the provisions of the agreement in this regard, and to meet the duty of care through some other means. The circumstances where this would apply include:

where Aboriginal Parties decide that they will not engage with SGP in negotiation of a CHIMA or otherwise unreasonably attempt to delay the development of the CHIMA;

where the Aboriginal Parties fail to comply with responsibilities and processes freely agreed in the CHIMA, or the parties fail to reach agreement on the implementation of the same after reasonable attempts;

where project timeframes require adoption of a more timely process to meet the cultural heritage duty of care.

In these circumstances SGP may choose to pursue other means of compliance with statutory or regulatory requirements. In doing so, SGP will not initiate any other actions provided for in the ACHA without first advising the Aboriginal Parties of its intention to do so, SGP will continue to seek negotiated agreement in the event that SGP does initiate such actions, and SGP will cease any action provided for under the ACHA once negotiated agreement is reached.

1.5 Preliminary Constraints Analysis

1.5.1 Analysis

A search has been undertaken of various databases held by State and Commonwealth agencies.

A search was made of the Indigenous Cultural Heritage Database (ICHD) maintained by the Cultural Heritage Coordination Unit, Department of Natural Resources and Water (DNRW). The initial buffer for this search was a 100km wide corridor. Using the data provided from this search, a more refined analysis of the proposed route has been undertaken using a buffer 2km wide created on the preferred route alignment. The search and analysis results identified a total of 36 cultural heritage areas or objects that have previously been recorded within the buffer search area (see Figure A3-1, Table A3-3).

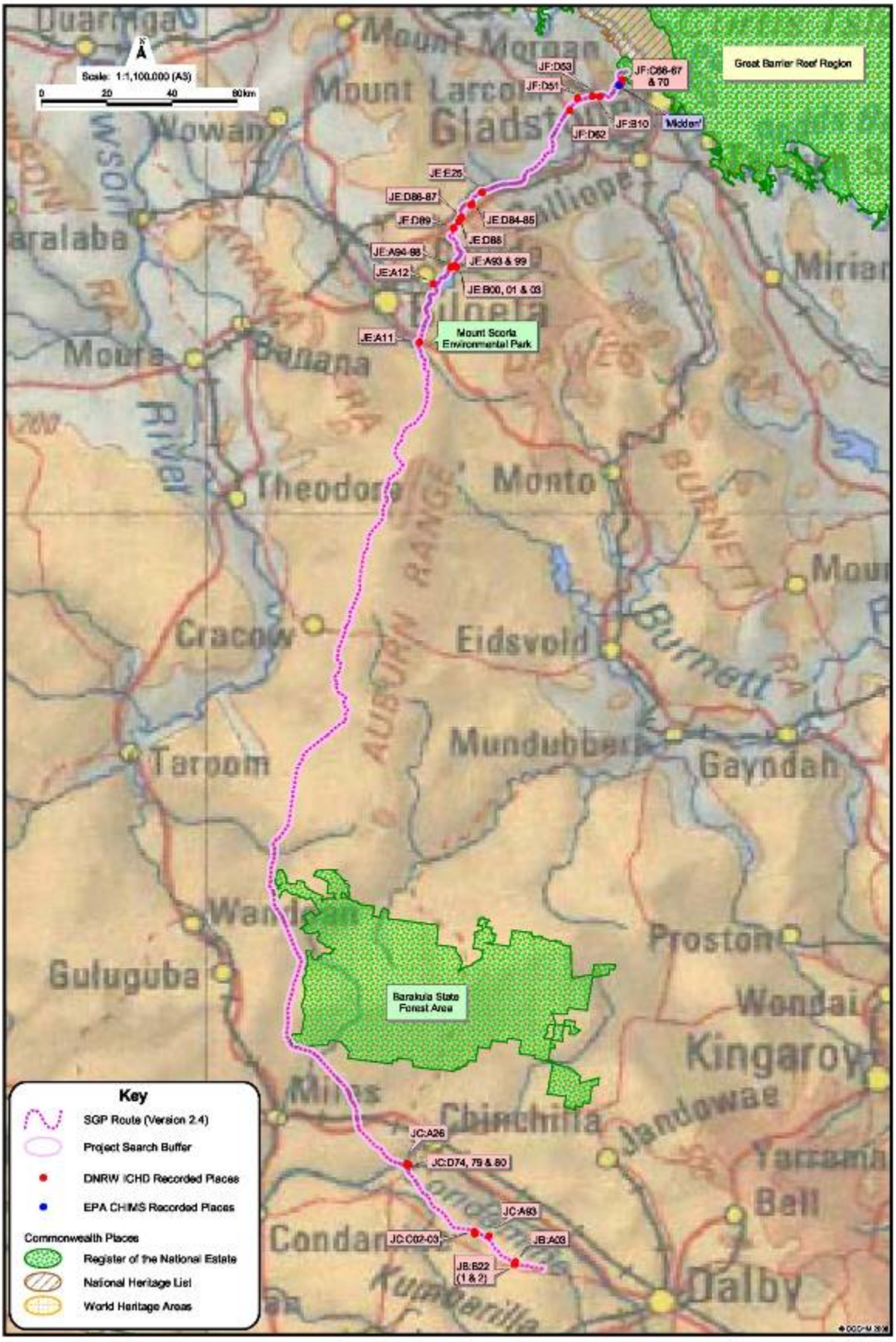


Figure A3-1: State and Commonwealth cultural heritage list and register searches

The search results of this database, as provided by DNRW, contains only minimal information regarding each of the places, listing only the place-type in a broad classificatory sense, the State ID and locational information for the place. Where any other additional information has been available from other sources, this has been included within Table A3-1 and/or discussed within the text.

Firstly, it should be observed that only two sites have been identified within 100m of the proposed pipeline alignment. The pipeline right of way itself will only be 30m in width.

A diverse range of cultural heritage place-types, including a number that are uncommon and rare have been identified. As would be expected, places consisting solely of stone artefacts dominate the recorded cultural assemblage of the buffer area. Twenty two of the places (almost two thirds of the total number) fall into this category. In addition, stone artefacts are associated with a further eight places. These include associations with four quarries containing stone used in artefact manufacture, two places described as 'Cultural Places' (discussed further below), a well, and an area containing both a pathway and a weir.

Although they are described in a variety of ways, two areas containing stone arrangements have been recorded within the buffer. These are highly significant places to Aboriginal people being associated with traditional ceremony. Additionally, such places are rare in the context of the broader study area. The first of these (JC: A93) was recorded by Crosby in 1992 and is described as being a pathway. As outlined above, this place is also associated with a weir (again a rare place-type in its own right) and stone artefacts. The location information provided for this area places it well clear (between 750m and 1km) of the preferred pipeline centreline.

The second stone arrangement (JE: A11) is located within the Mount Scoria Environmental Park. This place is ascribed within the register as being identified by Porter (1997). Porter's work was undertaken as a component of the first stage of the Bowen Basin Aboriginal Cultural Heritage Project - a regional cultural heritage study undertaken in Central Queensland between 1995 and 1998. This place was known prior to Porter's study as follows:

> "Mount Scoria is said to be a place of special significance to the Gangulu people of the Dawson Valley (Palmtree Wutaru Corporation for Land and Culture 1996). The exact nature of this significance is not clear. The site is recorded on Minarch (Site JE: A11) as a 'stone arrangement' - no further information is given. Whether there is meant to be an arrangement of stones here, in the traditional meaning of a stone arrangement is unclear. This site designation may represent the natural rock formations at Mount Scoria".

In either case, this location provided for this place is located some considerable distance (between 500 and 750m) from the pipeline centreline.

A second Cultural Place was recorded by Strong in 1998 (JF: C70). This has been described as relating to the High Hill area. No additional information is available about this place at the current time but it is well clear (between 750-1000m) of the pipeline centreline.

Place JE: D89 was recorded as a Landscape Feature during investigations of a proposed powerline between Calvale and Aldoga in 2001. This feature was in the form of a waterfall. Again, this is a considerable distance from the pipeline centreline (between 750 m and 1000 m).

Other place-types that have been identified include a set of axe grinding grooves located in the area of the Condamine River, and four scarred trees. Three of these were recorded in close proximity to the Condamine River axe-grinding grooves while the fourth is located at the northern end of the pipeline route in the Gladstone area. While the axe grinding grooves are located between 500 m and 750 m away from the pipeline alignment, all four of the scarred trees are further away again, being between 750 m and the edge of the buffer.

On the basis of the currently available information, only two of the identified places lie within 100 m of the pipeline alignment. Both of these (JC: C03 and JE: A95) consist of small scatters of stone artefacts that are located between 50 and 70 m from the preferred pipeline alignment.

The cultural heritage areas and objects currently identified within the ICHD are clustered across three general areas. The first is associated with the southern end of the route in the general area of Dalby, Condamine and Miles. Cultural heritage investigations in this area have predominantly been undertaken as part of other gas pipeline projects.

The bulk of the currently recorded cultural heritage places (n=19) are located in the Biloela area of the pipeline route. This is reflective of the intensity of both cultural heritage assessments that have been undertaken in this area (including large-scale mining development and associated infrastructure), as well as the area as a focus of Aboriginal occupation, being particularly rich in a range of subsistence resources. This is reflected, for example, in the size and composition of many of the stone artefact scatters identified throughout the area in general and within the buffer area specifically. Four of the stone artefact scatters in this area cover areas up to 2.8 ha in size. The largest of these (JE: A94) extends over more than half a kilometre in length and contain many thousands of stone artefacts. It should be noted that cultural material was observed to extend across considerably larger areas than these beyond the development study area (which in case of these four sites, was for a water pipeline).

The identification of and potential for sub-surface material to exist in this area has also been frequently reported. Of interest amongst these studies, and of particular relevance to the current project, are the results of a small excavation undertaken at an open stone artefact scatter some 6km to the west of the pipeline route. An unpublished date of 2,480±60 b.p. was obtained for a charcoal sample submitted from this place (M. Morwood pers comm.). Interpretations of the results of work undertaken in this area have been

suggestive of repeated Aboriginal use of the area, quite possibly over a substantial time period.

The remaining cultural heritage places (n=7) that have been identified lie at the Gladstone end of the pipeline. Again, this is an area that has been the subject of considerable cultural heritage work owing to the intensity of development activity experienced in the area.

Between the Condamine River and the Biloela areas, a distance in excess of 250 km of the central and southern portions of the pipeline route, no cultural heritage places have currently been recorded within the buffered alignment. This no doubt reflects the limited fieldwork that has been undertaken in this section.

1.5.2 Management of Aboriginal Cultural Sites

SGP will be commissioning comprehensive cultural heritage assessments of the entire route. The preferred management technique will be site avoidance using tactical realignment, with mitigation by relocation a last option. SGP also will resource sub-surface investigations involving test pitting and excavation where appropriate. Monitoring of surface disturbing activities will be countenanced where results of the initial field assessments indicate this is warranted.

Table A3-3: Recorded cultural heritage areas and objects located within the buffered pipeline alignment. Source: Queensland Indigenous Cultural Heritage Database.

Place ID	Place Type	Place Survey Name / ID	Recorder	Year	Proximity to Pipeline C/L
JB:A03	Stone Artefact/s / Well	Braemer Creek Well	Unknown	1974	500-750m
JB:B22 (1)	Stone Artefact/s	Braemer Creek Precinct - Kogan East	S. L'Oste-Brown	2000	100-250m
JB:B22 (2)	Stone Artefact/s	Braemer Creek Precinct - Kogan East	S. L'Oste-Brown	2000	250-500m
JC:A26	Axe-grinding Grooves	Condamine Grooves	R. Robins	1977	500-750m
JC:A93	Stone Artefact/s / Pathway / Weir	EPC464 Stone Arrangements and Weir	E. Crosby	1992	750-1000m
JC:C02	Stone Artefact/s	KC 36: Kogan Creek artefact scatter	A. Wallin	2001	500-750m
JC:C03	Stone Artefact/s	KC 37: Kogan Creek artefact scatter	A. Wallin	2001	<100m

Place ID	Place Type	Place Survey Name / ID	Recorder	Year	Proximity to Pipeline C/L
JC:D74	Scarred Tree	Sefton Park 4	J. Craib	1999	750-1000m
JC:D79	Scarred Tree	Sefton Park 9	J. Craib	1999	750-1000m
JC:D80	Scarred Tree	Sefton Park 10	J. Craib	1999	750-1000m
JE:A11	Stone Artefact/s / Cultural Place	Mt. Scoria Stone Arrangement	C. Porter	1997	500-750m
JE:A12	Stone Artefact/s	Unknown	G. Billings	1982	750-1000m
JE:A93	Stone Artefact/s	19 - Callide Creek	CQCHM	1999	250-500m
JE:A94	Stone Artefact/s / Quarry	20 - Callide Creek	CQCHM	1999	250-500m
JE:A95	Stone Artefact/s	21 - Callide Creek	CQCHM	1999	<100m
JE:A96	Stone Artefact/s	22 - Callide Creek	CQCHM	1999	100-250m
JE:A97	Stone Artefact/s	24 - Callide Creek	CQCHM	1999	100-250m
JE:A98	Stone Artefact/s / Quarry	25 - Callide Creek	CQCHM	1999	250-500m
JE:A99	Stone Artefact/s / Quarry	29 - Callide Creek	CQCHM	1999	250-500m
JE:B00	Stone Artefact/s / Quarry	30 - Callide Creek	CQCHM	1999	250-500m
JE:B01	Stone Artefact/s	31 - Callide Creek	CQCHM	1999	500-750m
JE:B03	Stone Artefact/s	34 - Callide Creek	CQCHM	1999	750-1000m
JE:D84	Stone Artefact/s	Calliope Range to Calvale 1	S. L'Oste-Brown	2001	500-750m
JE:D85	Stone Artefact/s	Calliope Range to Calvale 2	S. L'Oste-Brown	2001	500-750m
JE:D86	Stone Artefact/s	Calliope Range to Calvale 3	S. L'Oste-Brown	2001	250-500m
JE:D87	Stone Artefact/s	Calliope Range to Calvale 4	S. L'Oste-Brown	2001	100-250m
JE:D8	Stone Artefact/s	Calliope Range to	S. L'Oste-	2001	100-250m

Place ID	Place Type	Place Survey Name / ID	Recorder	Year	Proximity to Pipeline C/L
8		Calvale 5	Brown		
JE:D89	Landscape Feature	Calliope Range to Calvale 6	S. L'Oste-Brown	2001	750-1000m
JE:E25	Stone Artefact/s	Calvale - Aldoga AS21	D. Johnston	2001	250-500m
JF:B10	Stone Artefact/s	Aldoga	G. Alfredson	1992	250-500m
JF:C66	Stone Artefact/s	Boat Creek 2	M. Strong	1999	750-1000m
JF:C67	Stone Artefact/s	Bashfords Sand Ridge	I. Lilley	1996	750-1000m
JF:C70	Stone Artefact/s / Cultural Place	High Hill	M. Strong	1998	750-1000m
JF:D51	Scarred Tree	Calvale - Aldoga AS11	D. Johnston	2001	750-1000m
JF:D53	Stone Artefact/s	Calvale - Aldoga AS14	D. Johnston	2001	250-500m
JF:D62	Stone Artefact/s	Unknown	Unknown	-	Unknown

2. HISTORIC HERITAGE

2.1 Background

Historic heritage in Queensland is protected under provisions of the *Queensland Heritage Act 1992*). This legislation protects all those places included on the Queensland Heritage Register, being those places that have met the criteria specified in the Act. It also protects archaeological places where there is an expectation of sub-surface material that can provide information regarding the history of Queensland.

2.2 Preliminary Constraints Analysis

2.2.1 Queensland Heritage Register and CHIMS

A formal search was undertaken of the detailed listing notes for all places on the Queensland Heritage Register (QHR) established under the *Queensland Heritage Act 1992* that lie within a buffer of 5km of either side of the proposed pipeline alignment. There are no currently registered places are located within the buffer search area.

Separate to the Queensland Heritage Register, the EPA has compiled a substantial range of information regarding historic heritage places and incorporated this into its Cultural Heritage Information Management System (CHIMS). Currently, this database is largely for information purposes as a summary of reported places and is intended to be used as a

source of heritage information to support both possible future listings and to feed into Local Government development control planning schemes. Entries in CHIMS derive from a great variety of sources, but come principally from heritage reports. It has not at this stage been the subject of a systematic audit and as a result is an incomplete record both of known places and the specific information about places that have been included.

The search of this database returned a single entry within the buffered alignment. This place is described as being a 'midden' (CHIMS ID: 24287). It is unclear if this relates to an Aboriginal shell midden recorded during an historic heritage survey and then entered on to CHIMS, or an accumulation of historic heritage material (such as a dump). It is unknown who reported this place and no additional information is available regarding either it or the report that it comes from. On the basis of the information in hand however, it is well clear of the proposed development being located some 600m away from the pipe centreline. This place is located around 270m from ICHD Place JF: C70 (the High Hill cultural place and stone artefact/s outlined above - see Table 1) at the Gladstone end of the pipeline route.

As a general point, it should be noted that a number of places within CHIMS do not have any locational attributes that allow for inclusion in the analysis that has been undertaken within this report. Currently, these places have no current statutory management requirements.

2.2.2 *Management of Historic Heritage*

SGP will commission a comprehensive assessment of the historic heritage of entire route. The preferred management technique will be site avoidance using tactical realignment, with mitigation by relocation a last option. Any such management program will be agreed with the EPA and the Queensland Heritage Council as appropriate, and discussed with the National Trust of Queensland. In commissioning the comprehensive assessment of the route, SGP will consult with the relevant Local Governments and Historical Societies as to the presence and management of any heritage places along the proposed route. SGP also will resource sub-surface investigations involving test pitting and excavation where appropriate. Monitoring of surface disturbing activities will be countenanced where results of the initial field assessments indicate this is warranted.

3. COMMONWEALTH REGISTERS

Searches were conducted of the various Commonwealth heritage lists and registers regarding places that were located within the buffer search area (a total corridor width of two kilometres surrounding the pipeline centreline v2.4). These searches included the World Heritage List, the Commonwealth Heritage List, the National Heritage List and the Register of the National Estate. Datasets made available through the Heritage Division of the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), and current as at 18 November 2008, were used in this analysis.

Three places were found to be located within the buffered alignment (Figure A3-1).

Towards its southern end, the pipeline route runs adjacent to the western boundary (in two areas, these being approximately 15m from the current centreline) of the Barakula State Forest Area. This place is an 'indicative' listing on the Register of the Nation Estate (RNE ID: 18062). This means that at the current time, only the basic information regarding this place has been provided to or obtained by the Australian Heritage Council and has been entered into their database. The place is at some stage in the assessment process and a decision on whether the place should be entered in the Register has not been made. This place is proposed to be registered for its natural values. No additional information regarding the values of this area is available within the online listing information.

Further to the north, in the Biloela area, the pipeline runs to the west of the Mt Scoria Environmental Park (the entirety of this small park is located within the Project buffer area). This place (RNE ID: 8817) is also inscribed on the Register of the National Estate for its natural values (this place is formally registered). Although not included within the online listing information, this area is known to be of particular importance to the Gangulu People. There is also a known Indigenous cultural heritage place associated with this area (see above for further details).

At the northern end of the Project lies the Great Barrier Reef region. This obviously of high significance, being a registered place on the RNE (RNE ID: 8320), a declared property on the World Heritage List (WHL ID: 105060) and entered on the National Heritage List (NHL ID: 105709). Although all of these listings note that the area has been inscribed for its natural values, its Indigenous values have also been recognised. Its RNE listing significance statement includes the following:

> "The Commission has determined that the place has Indigenous values of National Estate significance. The Commission is currently consulting with relevant Indigenous communities about the amount of information to be placed on the public record. … Significant Indigenous values are known to exist in this area".

Additionally, both its World and National heritage listing inscriptions state that:

> "The World Heritage property is also of cultural importance, containing many middens and other archaeological sites of Aboriginal or Torres Strait Islander origin".

Based on the databases available from DEWHA (see Figure A3-1), the northernmost 1km of the pipeline route enters the Great Barrier Reef area as it is currently registered. The pipeline route in this area follows the Gladstone State Development area common infrastructure corridor to Fisherman's Landing.

APPENDIX 4

ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan

1.0 MANAGEMENT SYSTEMS

1.1 Environmental Policy

SGP as a fully owned subsidiary of Arrow Energy, is committed to complying with Arrow's environmental policy which states:

"Arrow Energy's aim is to achieve a high standard of care for the natural environment in all of the activities in which we engage including gas exploration, development, production and decommissioning of gas supply service, planning, design of new infrastructure, management of existing infrastructure, the provision of technical services, and at all times, to minimise the impact of our activities on the environment.

Our vision is to supply these services in an environmentally sustainable manner, with due regard to community values and heritage. Through the implementation of the Arrow Environmental Management System and site-based Environmental Management Plans, we will:

- Conduct our operations in compliance and consistent with all relevant environmental legislation, regulations, licences, permits, standards, approvals and authorities;
- Clearly allocate responsibilities for environmental performance at all levels within Arrow and its business associates, and build environmental competency through provision of structured environmental training to its employees, contractors and other service providers;
- Seek continuous improvement in environmental performance through setting objectives and targets for improved environmental performance, providing sufficient financial and human resources to meet these objectives and targets, applying research and development and cleaner production principles and, where applicable, using environmentally sustainable products and resources;
- Apply best industry practice in the management, supply and delivery of coal seam gas;
- Communicate with our customers and the community about our commitments to this vision, its application and their view of our performance; and
- Report annually on our environmental performance".

1.2 Responsibilities

Construction Manager

The pipeline Construction Manager will direct work in a manner that complies with all relevant environmental procedures adheres to all legislative requirements and ensures that the requirements of this Environmental Management Plan (EMP) and the environmental authority are implemented. The Construction Manager has “stop task” and “stop work” authority.

Environmental Officer

The Environmental Officer is responsible for monitoring and reporting the implementation of the EMP. The Environmental Officer will also be responsible for implementation of the Cultural Heritage Management Plan, Complaints Register and for setting up compliance audits and monitoring programs. Construction compliance auditing will be conducted against the requirements of this EMP, the Construction Safe Work Method Statements, Licence and Permit Conditions.

1.3 Training

The success of the EMP depends on all those responsible for implementation and review being thoroughly conversant with its contents, interpretation and performance measurements. SGP and its contractors will be responsible for ensuring that project personnel have sufficient knowledge and awareness to identify potential environmental issues, and that they are trained to take appropriate corrective action.

It is essential that all personnel are familiar with the procedures for reporting on issues that may result in environmental degradation. This includes informing key personnel within SGP and relevant regulatory authorities.

1.4 Induction

All staff, including construction and field staff, will complete a comprehensive Project induction prior to commencing work on the Project. The induction will include safety, access and a comprehensive review of environmental requirements. All Project personnel from supervisory to managerial level will have an additional detailed training session on the use and implementation of the EMP. It is the responsibility of the Construction Manager to ensure records of training are maintained.

1.5 Toolbox Meetings

The Construction Manager will ensure that supervisors hold weekly toolbox talks with staff and crews to discuss issues associated with the scheduled work.

This will include highlighting and discussing relevant environmental and safety issues as required. The sessions will include discussion of strategies to be implemented as identified in Job Hazard Analysis (JHA) of current work activities.

1.6 Job Hazard Meetings

A JHA is a simple tool that is used in helping personnel identify, analyse and manage the hazards that exist in the work they undertake. It formalises the process of hazard identification and risk management that most people follow when working. The JHA requires personnel to examine the task they are about to undertake and;

- Break the job down into separate, defined steps;
- For each step identify the potential hazards (including potential environmental or cultural heritage hazards) that could occur within that job step;
- For each potential hazard list the method to be followed to prevent the hazard causing an injury, loss, damage or environmental incident.

Weekly job hazard meetings will be held in conjunction with the Toolbox meetings.

1.7 Reporting and Auditing

During construction, there will be continuous review of the construction area and individuals and work crews will be required to demonstrate that the pertinent requirements of the EMP are being adhered to. Each supervisor will be required to record daily activities, on which relevant EMP requirements will be addressed (daily check sheets to be prepared by the construction contractor). Audits will include as a minimum, two construction audits (the first within 2 months of commencement) and two post construction audits.

1.8 Incident Reporting and Non-conformance

Incident reporting will be implemented to record any safety or environmental non-conformances, incidents or complaints. These shall be recorded on an incident report form and forwarded to the Construction Manager for reporting within the SGP system and for a process of continuous improvement to be implemented.

All such incidents shall be investigated in a timely manner and any necessary steps implemented to minimise likelihood of recurrence. If required, the EMP shall be reviewed and updated in accordance with Section 1.11.

1.9 Reporting

Section 320 of the *Environment Protection Act* 1994 requires that any person who becomes aware of an event that may or has caused environmental harm, reports the event/incident to their employer. Details of the nature and circumstances of the event must be provided.

Any such incidents must be immediately reported to the Construction Manager and recorded on an Incident Report Form. The Construction Manager will ensure that the appropriate external agencies are notified within the appropriate timeframe.

All such incidents shall be investigated in a timely manner and any necessary steps implemented to minimise likelihood of recurrence. If required, the EMP shall be reviewed and updated in accordance with Section 1. 11.

1.10 Complaints Procedure

All complaints about the Project will be directed to, and recorded by, the Community Liaison Officer. Contact details for the Community Liaison Officer will be provided to all affected landowners. A Register will be kept recording details of all complaints received, the action taken in response (where necessary), and any corrective actions or procedural changes implemented to prevent recurrence.

The initiator of the complaint will be advised of the results of all actions taken.

The Community Liaison Officer will review the register daily and advise the Environmental Officer of any relevant complaints. The Environmental Officer will then investigate the complaint and instigate any corrective action required.

The register will be regularly audited by the Construction Manager to ensure adequate and timely response to any verified complaint is occurring.

1.11 Review and update

The EMP will be reviewed as required to ensure that it addresses environmental issues and changes in legislation, policies and guidelines including work practices.

As details of design, construction methodology and access needs are refined, so too will the EMP and site specific plans. The 'living' nature of the document means that it will progressively improve and will continue to provide appropriate direction for environmental protection.

1.12 Implementation of the EMP

The EMP incorporates the requirements of the Australian Pipeline Industry Association (APIA) *Code of Environmental Practice – Onshore Pipelines*. The Construction Contractor will be responsible for implementing the EMP for the whole project and ensuring compliance with the performance requirements in the EMP. The Construction Contractor will also be responsible for ensuring appropriate corrective action is taken for any failure to meet stated performance requirements.

The construction contractor will appoint a full-time Environmental Officer during construction who is independent of those having direct responsibility for the works being performed. This officer will have the necessary responsibility to ensure compliance with the EMP and monitoring performance requirements for each of the pre-construction and construction phases of the Project.

Where contractual agreements are entered into for work associated with this Project, SGP will:

- ❑ Include the EMP in contract documents for all field work to be undertaken by the contractors
- ❑ Ensure that all contractors comply with the requirements of the EMP and nominate an environmental site representative with the necessary authority.

1.13 Legislative and other considerations

The following legislation and standards shall be used as the basis for decision-making and complaint resolution in respect of the EMP.

Table 1: Environmental legislation, policies and standards relevant to the Project

Element	Legislative and Other Requirements
Construction—General	❑ *Environmental Protection Act 1994* (Qld) ❑ Environmental Protection Regulation 1998 (Qld) ❑ *Workplace Health and Safety Act 1995* (Qld) ❑ Workplace Health and Safety Regulation 1997 (Qld)
Noise and Vibration	❑ *Environmental Protection (Noise) Policy 1997 (Qld)* ❑ *Workplace Health and Safety Act 1995 (Qld)* ❑ *AS 1055.1 & .2: Acoustics—Description and measurement of environmental noise* ❑ *AS 2436: Guide to noise control on construction, maintenance and demolition sites*
Air Quality	❑ *Environmental Protection (Air) Policy 1997 (Qld)* ❑ *National Health and Medical Research Council Guidelines 1985* ❑ *Draft National Environmental Protection Measures and Impact* ❑ *Statement for Ambient Air Quality 1997*
Water Quality	❑ *Environmental Protection (Water) Policy 1997 (Qld)* ❑ *Australian Water Quality Guidelines for Fresh and Marine Waters, ANZECC 2002* ❑ *Water Act 2000 (Qld)*
Erosion and Sedimentation Control	❑ *Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites—IEAust (Qld) 1996*
Contaminated Land	❑ *Environmental Protection Act 1994 (Qld)*
Storage and Handling of Dangerous Goods	❑ *Environmental Protection Act 1994 (Qld)* ❑ *Environmental Protection Regulation 1998 (Qld)* ❑ *Workplace Health and Safety Act 1995 (Qld)* ❑ *AS1940 – The Storage and Handling of Flammable and Combustible Liquids*
Transport of dangerous goods	❑ *Australian Code for Transport of Dangerous Goods by Road and Rail*
Waste Management	❑ *Environmental Protection (Waste Management) Policy 2000 (Qld)* ❑ *Environmental Protection (Waste Management) Regulation 2000 (Qld)*
Flora and Fauna	❑ *Environment Protection and Biodiversity Conservation Act 1999 (Cwth)*

Element	Legislative and Other Requirements
	❑ *Nature Conservation Act 1992 (Qld)* ❑ *Nature Conservation Regulation 1994 (Qld)* ❑ *Vegetation Management Act 1999 (Qld)* ❑ *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)*
Cultural Heritage	❑ *Native Title Act 1993 (Cwlth)* ❑ *Native Title (Queensland) Act 1993* ❑ *Queensland Heritage Act 1992* ❑ *Queensland Heritage Regulation 2003* ❑ *Aboriginal Cultural Heritage Act 2003 (Qld)*
Land Use	❑ *Integrated Planning Act 1997(Qld)* ❑ *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)*

2.0 CONSTRUCTION EMP

2.1 Access

Policy

To utilise, to the extent practicable, the pipeline Right of Way (ROW) shall be used for access. Existing cleared areas and access tracks shall be used to access the ROW so as to minimise the impact on vegetation and existing land use.

Performance Objectives

- ❑ Minimise impacts to native flora and fauna
- ❑ Minimise impacts to soil and water
- ❑ Avoid adverse impacts on cultural and historic heritage sites
- ❑ Reduce the likelihood of the spread of weeds
- ❑ Minimise any new access tracks and the number of access tracks
- ❑ Minimise disruption to landholder activities
- ❑ Manage road and track usage, and achieve satisfactory road and site rehabilitation
- ❑ Minimise damage to existing road networks

Management Strategies

- ❑ Existing roads and tracks will be used where practicable
- ❑ New access tracks and any diversions will generally be avoided, but if necessary, will be selected to minimise impacts on sensitive vegetation, erosion-prone soils and watercourse crossings; avoid any significant cultural heritage sites in accordance with the CHMP and minimise noise to nearby residents. New access tracks and diversions will only be used by agreement with the landholder
- ❑ Where practical, access to the ROW will be from where existing public roads cross the pipeline.
- ❑ Erosion and sediment control measures will be used as and where required
- ❑ Impacts to landholders will be minimised (e.g. installation of gates and cattle grids to allow access to pipeline easement, and temporary fencing to control livestock)
- ❑ Speed and weight restrictions will be applied to project vehicles as appropriate
- ❑ Harvesting seeds of vulnerable native species for replacement during rehabilitation.
- ❑ Any damage to existing tracks shall be repaired regularly

Performance Indicators

- ❑ Access readily manageable and able to be rehabilitated using standard techniques
- ❑ Complaints from land owners, authorities and public are minimised
- ❑ Erosion and sediment control in place

Monitoring	❑ Condition of existing roads and tracks are maintained ❑ Photographic records ❑ Complaint register ❑ Daily check sheets

2.2 Campsite

Policy	To minimise the impact on the environment from campsites and construction compounds providing workspace, accommodation and provisions for construction teams.
Performance Objectives	❑ Minimal impact on the natural environment, ❑ Compliance with Local Government requirements for provision of infrastructure and waste disposal. ❑ Reinstatement of site to equivalent surrounding conditions following Project use. ❑ Functional waste minimisation, segregation and recycling systems operational at all worksites. ❑ Ensure activities do not encourage vermin or mosquito breeding ❑ High standard of site management and general housekeeping
Management Strategies	❑ Campsites will be located following agreement with landholders and/or local government. ❑ Campsites and construction compounds will be selected to minimise impacts on sensitive vegetation, erosion-prone soils and watercourse crossings; avoid any significant cultural heritage sites and to minimise noise to any nearby residents. ❑ Effluent to be treated in a mini packaged sewage treatment plant. ❑ All other wastes will be disposed of in accordance with the requirements of the local government. ❑ Following use, campsites and construction compounds will be reinstated and revegetated to as near as practical to their original condition. ❑ Waste will not be burnt.
Performance Indicators	❑ Clean and tidy camp site ❑ Waste management, waste disposal and waste recycling measures in place ❑ Camp site and construction compounds successfully rehabilitated following completion of the project
Monitoring	❑ Photographic records ❑ Complaint register ❑ Daily check sheets

2.3 Clear and Grade

Policy

To minimise the impact of site clearing and disturbance to flora/fauna communities along the ROW and to simplify rehabilitation of cleared areas as part of the restoration process.

To separate seedstock and topsoil from trench spoil to enhance rehabilitation of disturbed areas.

Performance Objectives

- ❑ Minimise disturbance to native flora and fauna
- ❑ Optimise rehabilitation success
- ❑ Ensure stability of ROW
- ❑ Minimise soil, particularly topsoil, degradation
- ❑ Minimise sedimentation and associated impacts on water quality
- ❑ Minimise impacts on sites of cultural and historic heritage significance
- ❑ Minimise impacts on visual amenity
- ❑ Minimise disruption to landholders and third parties

Management Strategies

- ❑ All clearing boundaries will be clearly shown on project drawings. Where the ROW is to be reduced (e.g. sensitive watercourse crossings or sensitive habitat areas) this will be recorded on alignment sheets and physically marked on the ground
- ❑ Individual trees to be retained or preserved on the ROW will be clearly marked in the field, prior to the commencement of clearing activities
- ❑ Toolbox meetings will be held to describe and discuss key environmental features of upcoming works
- ❑ Cleared vegetation and spoil will be stockpiled outside of watercourses
- ❑ Cleared vegetation to be placed in wind rows as necessary at the edge of the ROW for respreading back across the ROW during rehabilitation as required
- ❑ Wildlife spotter retained during clear and grade to relocate native fauna
- ❑ Large mature hollow bearing trees to be retained where practicable or placed at edge of ROW for use by wildlife
- ❑ Access for landholders will be maintained at all times
- ❑ Aboriginal monitors to be used for clear and grade activities where required by the CHMP
- ❑ Topsoil containing seedstock will be graded off the

ROW and stockpiled at the side of the ROW for later return and spreading across the ROW during rehabilitation

- ❑ Graded soil will be stockpiled where it can be readily recovered for respreading and where loss through wind, or water erosion or other means will be minimised
- ❑ Soil stockpiles will be placed away from the bed or banks of watercourses of medium to high sensitivity
- ❑ The stockpiles will be breached in appropriate locations (coinciding with designated access roads or tracks, fence lines) to allow vehicular, stock and wildlife access. Vehicular movement over stockpiled soil will not be allowed
- ❑ Soil and surface stability will be maintained at all times (e.g. temporary erosion control berms, cut-off drains and sediment barriers shall be installed as necessary and maintained until final construction clean-up is completed)

Performance Indicators

- ❑ No unplanned or unapproved damage to flora and fauna communities
- ❑ Demonstration of Cultural Heritage monitoring during clear and grade as required by the CHMP.
- ❑ Installation and maintenance of erosion control devices
- ❑ Soil and vegetation stored to allow for restoration of disturbed areas to be equivalent to the surrounding area following construction
- ❑ Number of complaints from landholders

Monitoring

- ❑ Photographic records
- ❑ Daily Check Sheets

2.4 Trenching

Policy

To avoid damage to third party infrastructure or undue disruption to landholder activities

Performance Objectives

- ❑ Minimise adverse impacts to water and landholder activity
- ❑ Minimise impacts to sites of cultural and historic heritage significance
- ❑ Avoid damage to third party buried services
- ❑ Trapped native fauna released to surrounding environment

Management Strategies

- ❑ The location of existing third party infrastructure in the ROW will be accurately identified on alignment

sheets and marked on the ground or exposed by hand prior to trenching activities

- ❑ No mixing of spoil (sub-soils) with topsoil or cleared vegetation
- ❑ Spoil will be stockpiled outside watercourses, and / or behind containment structures so as to prevent siltation of any land or surface water or blockage of any existing drainage channels
- ❑ Trench plugs will be utilised at appropriate intervals to minimise erosion and allow access across the ROW
- ❑ The pipe trench will be left open for the minimum time practicable
- ❑ Ramps will be installed in the trench to allow the easy egress of fauna from the trench at a minimum of 750m intervals, and at any other locations consistent with track crossings etc. In areas of high fauna density, additional ramps and the use of branches, hessian sacks or similar devices to enable small fauna to exit the trench may be used.
- ❑ Native wildlife trapped in the open trench will be captured and released to the surrounding environment away from the open trench on a daily basis.
- ❑ Major road crossings will be bored.
- ❑ Open cut crossing of roads and watercourses will be managed in consultation with landholders and third parties. Installation of by-pass tracks or detours will be undertaken as required.

Performance Indicators

- ❑ Spoil segregated from topsoil and vegetation
- ❑ No spoil at surface on completion of back filling
- ❑ Minimise time between excavation and backfilling occurring
- ❑ Ramps and fauna exit points installed and maintained
- ❑ Access for landholders and third parties maintained

Monitoring

- ❑ Daily Check Sheets

2.5 Pipe Stringing and Welding

Policy

To carry out pipe stringing and welding in a safe and responsible manner with minimal interference to the landholder or risk to the environment

Performance Objectives

- Minimise disruption to landholders and third parties
- Minimise the risk of bushfire associated with construction activities

Management Strategies

- Pipe will be strung, allowing gaps for access across the line of pipe. Gaps will coincide with access roads or tracks, boundary fences and gaps in stockpiled vegetation, and will be located in consultation with relevant landholders.
- Dust and noise impacts related to pipe transport traffic will be minimised by scheduling of deliveries to daylight hours.
- All pipe delivery packaging (e.g. ropes, straps) will be removed from the ROW daily and disposed of appropriately.
- When necessary, pipe trucks will queue in a safe location to avoid traffic nuisance
- All welding, welding procedures, welder qualifications, the use of welding consumables, and the removal of weld defects will conform to relevant Australian Standards.
- The following precautions will be taken to minimise the possibility of fire due to welding activities
  - The actual strip of land along the ROW over which welding will take place will be cleared of combustible vegetation and therefore reduce the risk of fire
  - Stockpiled vegetation will be separated from welding activity
  - Water trucks (also used for dust suppression) will be available for use as fire trucks in the event of fire
  - Fire extinguishers and a water cart will be available to the welding crew. All appropriate crew members will be trained in the use of fire fighting equipment
  - The pipeline contractor will liaise with local Rural Fire Service representatives during periods of high fire danger.
- 'Night caps' will be placed over the open pipe string ends to prevent the ingress of dust, wildlife or other objects into welded pipes.
- All welding waste will be managed appropriately and removed from the ROW on a daily basis

Performance Indicators

- No fires
- No complaints from landholders
- Debris absent from ROW

Monitoring

- Daily Check Sheets
- Adherence to welding procedures and SWMS

2.6 Pipe Laying and Backfilling

Policy	To install the pipeline to minimise the likelihood of erosion or subsidence, and to preserve topsoil for rehabilitation
Performance Objectives	❑ Minimise adverse impacts to soil through mixing or burial ❑ Minimise impacts to water, stock and wildlife ❑ Reinstate any temporary deviations to landholder tracks and reinstate any third party services in a manner that minimises the likelihood of erosion
Management Strategies	❑ Appropriate means such as trench blocks (i.e. trench/sack breakers) and compaction of backfilled soils will be used to prevent erosion along the backfilled trench ❑ Pipe laying crews will prepare for identified third party crossings and will have materials and equipment available ❑ Adequate compaction of trench backfill by wheel rolling and a gentle crown to be left over the trench line to allow for future settlement of soils, with appropriate breaks to allow for natural surface water flows across the ROW ❑ Topsoil will only be reinstated after the excavated spoil has been backfilled and compacted
Performance Indicators	❑ Subsoil returned to trench prior to topsoil ❑ No inversion of subsoil and topsoil ❑ Well compacted trench line with appropriately installed trench breakers and contour banks
Monitoring	❑ Daily Check Sheets

2.7 Hydrostatic Testing

Policy	To protect the quality of local water resources during the pipeline hydrostatic testing
Performance Objectives	❑ Minimise water use ❑ Ensure no detrimental impacts on soils, land use or surrounding water quality
Management Strategies	❑ The source of hydrostatic test water shall be approved in advance by the Construction Manager and Environmental Officer ❑ Relevant permits to draw water shall be obtained as required ❑ Pipe sections crossing water bodies (directional drilled crossings particularly) shall be pre-tested prior to

	installation ❑ Inspection of all pipeline section welds or hydro-testing of pipeline sections before installation under watercourses, will be performed in accordance with construction specifications/procedures ❑ The Environmental Officer will check and approve hydrostatic test water discharge work methods ❑ Prior to discharge of hydro-test water, the Environmental Officer shall be consulted about requirements for water quality testing. Where the water source and water quality is known, and no chemicals have been added, water quality testing may not be required ❑ Test water shall be discharged to a holding pond (for evaporation or subsequent treatment and beneficial use) and will be in compliance with regulatory and landholder requirements
Performance Indicators	❑ No existing water sources depleted to provide hydro-test water ❑ No adverse impacts on soil or surface water as the result of discharging hydro-test water ❑ No high level of turbidity (visible plume for > 5m) in any farm dam (if discharged to a farm dam) ❑ No erosion at site of hydro-test water discharge
Monitoring	❑ Check Sheet

2.8 Flora and Fauna Management

Policy	To minimise the effect on vegetation and habitat and to promote groundcover regeneration on the ROW
Performance Objectives	❑ Minimise impacts to native vegetation ❑ Where practicable, avoid disturbance to endangered, vulnerable and rare flora species ❑ Minimise habitat fragmentation ❑ Weeds not spread as a result of construction activities
Management Strategies	❑ Flag individual significant plant species (including habitat trees) which are located on the ROW so they may be avoided during construction ❑ Placement of physical barriers around significant vegetation areas in order to restrict access and avoid disturbance ❑ Harvesting seeds for replacement during easement rehabilitation, where natural regeneration is not successful

	❑ Respreading of cleared native vegetation over the ROW following construction ❑ Ensure installation of fauna escape ramps or ladders in areas of high fauna population ❑ Spray environmental weeds along the ROW prior to clear and grade, following consultation with respective land owners. This should be undertaken at least 2 weeks prior to construction work commencing in the respective areas ❑ Ensure declared plants along the ROW are removed / sprayed prior to construction in the respective areas.
Performance Indicators	❑ Minimum impact to ecosystems of National Environmental Significance ❑ Minimal disturbance of terrestrial flora and fauna during construction of the pipeline and associated access tracks and campsites ❑ Restoration of disturbed areas to promote groundcover following construction ❑ No exotic grass species introduced into pristine native grass communities ❑ No failure of rehabilitation measures ❑ No damage to protected species without relevant permit ❑ No presence of exotic grasses in pristine native grass communities ❑ Ensure relevant permit is in place before removing any protected species ❑ Declared plants along ROW removed
Monitoring	❑ Photographic records ❑ Complaint register ❑ Daily check sheets

2.9 Watercourse Management

Policy	To avoid degrading water quality and to minimise the impact and degradation to watercourses
Performance Objectives	❑ Minimise impacts on riparian and aquatic flora and fauna ❑ Minimise erosion and sedimentation ❑ Maintain existing water quality and water flow regimes ❑ Minimise impacts on cultural and heritage sites ❑ Maximise rehabilitation success of achieving long-term site stability ❑ Prevent the spread of noxious weeds

Management Strategies

- The crossings will typically be at right angles to the direction of water flow. This will minimise scour potential. This will include vehicular and maintenance tracks
- Watercourse banks will be reinstated as near as possible to their former profile, stabilised and revegetated as necessary to prevent scouring
- Stormwater diversion drains (Whoa-Boys) are to be placed near to the top of the banks of the watercourse
- Additional stormwater diversion drains (Whoa-Boys) are to be placed at a distance of 10m back from each side of the top of the watercourse embankment
- Consideration will be given to seeding watercourse embankments with a fast growing native grass seed (e.g. *Themeda Australis*) or other suitable fast growing species or the use of hydro mulching (in the event of dry conditions) to aid in rehabilitation
- If the watercourse contains a sandy substrate, consideration will be given to the use of rock stabilisation for addition to the channel and embankments to prevent scour
- Watercourse crossings will be completed promptly and with due regard to the weather
- The disturbance corridor for the bed, bank and approaches to watercourses will be the narrowest practicable for safe construction
- Where an access track is required through a watercourse, this should be placed on the downstream side of the pipeline to minimise the potential for future erosion over the pipeline
- Where practicable, large trees will be retained. Root stock will, wherever practicable, be retained for stabilisation of the banks
- In the event of flooding, remedial action will be taken in accordance with the Construction Emergency Response Plan where necessary

Performance Indicators

- Watercourse banks and channels effectively reinstated to prevent scouring
- Watercourse flows and channel crossings not altered
- Erosion and sediment control techniques implemented onsite where necessary
- Water quality control maintained

	❑ Success of rehabilitation measures
Monitoring	❑ Records maintained of all actions and controls ❑ Photographic Records ❑ Complaint Register ❑ Daily Check Sheets

2.10 Erosion and Sediment Control

Policy	To provide effective erosion and sediment practices to mitigate the potential effects of construction on watercourses, land use and the general environment
Performance Objectives	❑ Minimise soil erosion ❑ Minimise sedimentation of land ❑ Minimise modification to drainage patterns ❑ Prevent as far as practical, sediment transport to adjacent watercourses
Management Strategies	❑ Minimise the quantity and duration of soil exposure ❑ Protect topsoil, root and seed stock ❑ Protect critical areas during and after construction by reducing the velocity of stormwater flow and redirecting runoff onto undisturbed areas ❑ Install and maintain temporary erosion and sediment control measures during construction ❑ Re-contour modified landforms to their original condition as soon as practicable including any erosion controls established prior to construction ❑ Replace topsoil and seed stock to facilitate revegetation as soon as practicable following construction ❑ Inspect the ROW and maintain erosion and sediment controls as necessary during and after construction until stabilisation is achieved ❑ Should the trench require dewatering in wet weather, then this is to be pumped out and disposed across grass and not directly discharged to any stormwater drain or creek ❑ Strict implementation of permanent stormwater diversion drains on all hilly slopes (approximately 20m intervals, depending on slope). ❑ Strict implementation of silt mesh fencing, hay bales and stormwater diversion drains on the banks of all waterways containing flowing water during construction.

Areas with highly erodible soils

Highly erodible soils are identified by visual inspection of the site to identify the extent and location of existing soil erosion.

Where highly erodible soils are identified, and if the area cannot be reasonably avoided, the following controls should be implemented:

- ❑ Keep the work area to a minimum so that the smallest possible ground area is disturbed.
- ❑ Place erosion control structures such as diversion drains and silt fences at key locations to capture the suspended sediment.
- ❑ Divert stormwater away from the exposed soil to reduce overland flow or channel flow on the vulnerable soils

For wet crossings, the following sediment controls should be implemented:

- ❑ Place erosion control structures such as silt fences, flotation curtain, sand bags and hay bales in the channel to capture suspended sediment
- ❑ Divert stormwater away from disturbed channels or swales to minimise the flow of water and erosion potential
- ❑ Minimise disturbance to the existing channel. This may involve constructing a temporary access across small swales and channels
- ❑ If flow modification is necessary during construction, reinstate the channel on completion of works
- ❑ Reinstate all existing erosion control structures on completion of works

Stormwater Diversion

In areas which are subject to erosion potential (slopes >5%), stormwater diversion drains (Whoa-Boys) should be placed diagonally across the ROW to divert stormwater to adjacent undisturbed grassed areas following completion of construction. Spacing of such diversion drains can be approximately 50m to 70m apart. Where slopes are >5%, then more frequent spacing is required.

Placement of diversion drains to divert stormwater away from the restored pipeline easement may also be required.

Adequate monitoring and follow-up work following

construction to ensure any initiated erosion is arrested early.

Performance Indicators

- ❑ No large scale erosion or sedimentation caused to adjacent land uses as a result of construction activities
- ❑ No evidence of additional sedimentation in watercourses as a result of erosion from construction activities
- ❑ Reinstatement of watercourses to original profile
- ❑ Adequate spacing of stormwater diversion drains in areas of erosion potential

Monitoring

- ❑ Photographic records
- ❑ Complaint register
- ❑ Daily Check Sheets

Construction audits will include all watercourse crossings

A post-construction audit which will evaluate revegetation, erosion control, weed control, water course bank stability will be conducted annually for two years following completion of construction

2.11 Management of Flammable and Combustible Substances

Policy

To ensure that storage and handling of flammable and combustible substances onsite does not cause environmental harm or harm to persons.

Performance Objectives

- ❑ To minimise potential for land contamination
- ❑ To ensure the on-going safety of construction personnel

Management Strategies

- ❑ An Emergency Response Plan shall be in place and employees inducted in its application
- ❑ Flammable and combustible substances are stored, handled, separated and signed as required by the Flammable and Combustible Liquids Regulations and AS1940
- ❑ Transportation of dangerous goods will be in accordance with the Regulations and with AS1678, AS2809 and AS2931
- ❑ A qualified person will be appointed as Site Safety Officer
- ❑ An on-site set of the relevant MSDS for all flammable and combustible substances and dangerous goods used during construction will be maintained and available
- ❑ Waste flammable and combustible substances which cannot be recycled will be transported to a

	designated disposal site as approved by Local Government ❑ No refuelling of plant and equipment over or within 100m of watercourses ❑ Spill kits containing absorbent and containment material (e.g. absorbent matting) will be available where hazardous materials are used and stored and personnel trained in their correct use ❑ Spills of flammable and combustible substances will be rendered harmless and collected for treatment and / or remediation or disposal at a designated site, including cleaning materials, absorbents and contaminated soils and reinstatement made to the affected area ❑ Personal protective equipment (PPE) appropriate to the materials in use, will be provided ❑ Relevant Local Government permits will be held and conditions of permits met
Performance Indicators	❑ No hazardous goods contamination of the environment. ❑ Cut off flowpath to drains / watercourses e.g. sand bags, earthen bund, in the event of a spill. ❑ Ensure appropriate remedial action has been implemented for any spills. ❑ Major incidents reported to relevant authorities and their directions followed ❑ Spill kits and PPE available and used as appropriate
Monitoring	❑ Audit ❑ Regular inspection of storage facilities and work practices in the handling of flammable and combustible substances or other dangerous substances

2.12 Noise and Vibration

Policy	To minimise the impact of construction noise nuisance and vibration to nearby residences
Performance Objectives	❑ Minimise noise nuisance generated by construction activities ❑ Minimise any vibration nuisance to nearby residences
Management Strategy	❑ Provide advance notice of any scheduled atypical noise events to nearby residents. ❑ Ensure campsites are located a sufficient distance form

	residences to limit any noise nuisance ❑ Equipment maintained in accordance with manufacturer's specifications. ❑ Schedule atypical noise events for appropriate times. ❑ Maintain liaison with nearby residents ❑ Condition survey to be conducted for any homesteads within 100m of the pipe centerline ❑ Normal construction activities in proximity to homesteads to be limited to 7:00am to 6:00pm Monday to Saturday.
Performance Indicators	❑ Number of noise related complaints received from residents during construction ❑ Evidence of repair and replacement of faulty equipment as soon as possible ❑ Evidence of condition surveys
Monitoring	❑ Complaint register ❑ Noise survey in the event of complaint ❑ Preconstruction audit of any premises located in areas containing hard rock

2.13 Air Emissions

Policy	To complete the installation of the pipeline in a manner to maintain ambient air quality of the local area.
Performance Objectives	❑ To maintain acceptable limits of vehicular and machinery operating emissions and to receive zero complaints from local landholders regarding air quality ❑ To minimise the generation of fugitive dust emissions produced during construction
Management Strategies	❑ Vehicles and machinery shall be maintained in accordance with manufacturer's specifications ❑ Watering of construction site and access tracks will be carried out on an as required basis, particularly on dry and windy days ❑ Avoid smoke generation by a strict no burning policy ❑ Implement fire control measures during welding operations
Performance Indicators	❑ Visual observations of dust emissions during windy/dry periods ❑ Receipt of dust nuisance complaints from nearby residents ❑ Excessive visual dust cloud during construction activities
Monitoring	❑ Complaint Register ❑ Daily Check Sheets

2.14 Waste Management

Policy	To minimise waste generation and maximise reuse and recycling of construction waste products
Performance Objectives	❑ Minimise impacts related to waste management ❑ No evidence of litter or refuse generated from construction related activities
Management Strategies	❑ Stockpiling and salvaging reusable and recyclable wastes, such as timber skids, pallets, drums and scrap metals. (Circumferential fibre/nylon rope spacers used in pipe transport shall be collected for recycling) ❑ Collecting and removing waste oil and solvents from site for recycling, reuse or disposal at approved locations ❑ Disposing of sewage and sullage from camp sites via a packaged mini sewerage treatment plant ❑ Collection of chemical wastes (e.g. spent pipeline x-ray film developer chemicals) in 200 litre drums (or similar sealed container), appropriately labelled, for safe transport to an approved chemical waste depot or collection by a liquid waste treatment service ❑ All binding material and dunnage from transport vehicles and unloading areas is to be collected and transported off the easement to designated disposal areas ❑ Collecting and transporting general refuse to a Local Government approved disposal site ❑ Ensure wastes are not accessible by stock or wildlife ❑ Refuse containers will be located at each worksite ❑ Where practical, wastes will be segregated and reused/recycled (e.g. scrap metal) ❑ All personnel shall be instructed in project waste management practices as a component of the environmental induction process
Performance Indicators	❑ Clean and waste-efficient construction site ❑ Percentage of waste recycled ❑ Litter left onsite during construction
Monitoring	❑ Waste audit ❑ Daily check sheets

2.15 Management of Potential Acid Sulphate Soils

Policy	To effectively manage acid sulphate soils which may be found in low lying areas in the vicinity of Fisherman's Landing
Performance Objectives	❑ Minimise impacts related to potential acid sulphate soils ❑ No environmental harm cause by dewatering of the trench in areas containing acid sulphate soils
Management Strategies	❑ In areas where acid sulphate soils (ASS) are located, the trench shall not remain open for extended periods

	without prior treatment for ASS. ❑ Treatment shall include testing for pH and addition of lime ❑ Stockpiles of spoil will be checked for pH and the pH adjusted using lime. ❑ Should the trench require dewatering, the pH of the water shall be checked, adjusted to neutral using hydrated lime and the neutralised water disposed over grassed or vegetated areas and not directly to any watercourse or drain**.**
Performance Indicators	❑ No environmental harm (e.g. fish kills) as the result of exposure of acid sulphate soils ❑ ASS neutralised if the trench is to be left open greater than 8 hours ❑ ASS spoil neutralised
Monitoring	❑ pH checked ❑ Daily check sheets

2.16 Fire Management

Policy	To minimise the potential for vegetation to catch fire from construction activities
Performance Objectives	❑ No fires deliberately lit or allowed to remain alight along the ROW or other project related worksites ❑ No build-up of flammable material during construction near hot work areas
Management Strategies	❑ Open fires will be banned on the project. Fires include open barbeques, billy fires, brush burning and rubbish burning ❑ Unnecessary build-up of flammable material near working areas will be prevented, with vegetation and other flammable material being stockpiled well clear of hot work activities ❑ Water trucks (also used for dust suppression) will be available for use as fire trucks in the event of fire ❑ All vehicles will be equipped with portable fire extinguishers ❑ Fire extinguishers and a water cart will be available to the welding crew. All appropriate crew members will be trained in the use of fire fighting equipment ❑ Emergency Response Plan shall include details on local contacts for fire fighting assistance ❑ Construction management liaison with local Rural Fire Service personnel during high fire periods

Performance Indicators	❑ Fires along the ROW ❑ Build-up of flammable material near hot work areas ❑ Emergency Response Plan in place ❑ Permits and approvals as required
Monitoring	❑ Daily check sheets

2.17 Clean up and Rehabilitation

Policy	To restore land to surrounding condition and restore land use as far as practicable compatible with pipeline operation.
Performance Objectives	❑ Minimise soil erosion ❑ ROW stable ❑ Minimise modification of drainage patterns ❑ Minimise weed invasion ❑ Minimise visual impact ❑ Minimise adverse impacts on other land uses
Management Strategies	❑ Stockpiled topsoil and seed stock will be respread on graded surfaces in an even layer to assist natural regeneration. Minor surface roughness will be encouraged when spreading topsoil to trap water and seed ❑ Flagging, used to identify clearing boundaries and sensitive features, will be removed ❑ Native vegetation will be respread over the ROW to assist in the distribution of seed stock and provide shelter for fauna ❑ Cleared vegetation, not respread across the ROW, may be removed and disposed of in consultation with the appropriate landholder ❑ Compaction relief will be undertaken where required by scarifying soils along the contours ❑ The pipeline construction area will be re-profiled to original or stable contours, re-establishing surface drainage lines and other land features ❑ Erosion and sediment control measures will be installed where necessary. Existing soil erosion measures will be reinstated to a condition at least equal to the pre-existing state ❑ Above ground infrastructure (e.g. valves) shall be fenced to discourage third party and stock entry ❑ Fences or other barriers shall be installed where appropriate and where approved by the landholder to minimise unauthorised easement access ❑ Permanent pipeline warning signs shall be erected along

	the easement ❑ All waste materials and equipment will be removed from the pipeline construction area once backfilling and tie-ins are completed ❑ Subsoil displaced by the pipe, and not utilised, may be stockpiled in locations approved by the landholder for later use ❑ Imported topsoil, of an appropriate quality and weed free, may be required for easement repairs, and will only be used with landholder approval ❑ Where disturbed areas are to be re-planted or re-seeded, preference will be given to the use of local provenance native species. However, non-native and non-invasive grass seed stock may be used where approved by the landholder to provide environmentally acceptable short term surface stability ❑ Seed mixtures will be formulated for the conditions of the area ❑ Where applied, seed will be evenly dispersed over the entire disturbed area ❑ Seeding will take place as soon as practicable during clean up ❑ Fertilisers and soil supplements will be used only as necessary (and only with land holder approval), and shall be minimised to reduce the risk of increasing nutrient levels in watercourses
Performance Indicators	❑ No new weed species introduced ❑ Weed Management implemented ❑ Groundcover re-established ❑ No change in drainage pattern leading to soil erosion ❑ Stable ROW
Monitoring	❑ Photographic Records ❑ Complaint Register ❑ Post Construction Audits ❑ Regular Easement Inspections

3.0 OPERATIONAL EMP

3.1 Access and Landholder Relationships

Policy

To utilise the pipeline easement access track so as to minimise the impact on surrounding vegetation and land use.

Performance Objectives

Liaison with landholders maintained

- ❑ Minimise impacts to adjoining native flora and fauna
- ❑ Reduce the likelihood of the spread of weeds
- ❑ Minimise disruption to landholder activities
- ❑ Maintain regular liaison with landholders along the route

Management Strategies

- ❑ Utilise pipeline easement access track
- ❑ Maintain regular liaison with landholders
- ❑ Landholder concerns are addressed promptly
- ❑ Landholders advised in advance of any maintenance activities on their property
- ❑ Erosion and sediment control measures will be maintained as required
- ❑ Impacts to landholders will be minimised (e.g. ensure access gates are closed after traversing)
- ❑ Ensure gates are locked where access can be obtained from a road (to ensure unauthorised users are excluded)

Performance Indicators

- ❑ Complaints from land owners minimised
- ❑ Erosion and sediment control in place

Monitoring

- ❑ Complaint register
- ❑ Easement inspection check sheet

3.2 Flora Management

Policy

To promote groundcover and a stable easement

Performance Objectives

- ❑ Promote the establishment of ground cover (grass) along the easement
- ❑ Remove young tree seedling regrowth from within 3.5m each side of the pipe centre line
- ❑ Ensure that weeds are not spread along the easement

Management Strategies

- ❑ Promote grass establishment along the easement. This may require spreading native grass seed following rain.
- ❑ Removal of seedling regrowth as required to comply with the above objective

	❑ Where required, annual program of spraying of weeds along the ROW implemented.
Performance Indicators	❑ Easement grassed ❑ Seedling regrowth controlled ❑ Weeds minimised
Monitoring	❑ Complaint register ❑ Easement inspection check sheet

3.3 Watercourse Management

Policy	Watercourse crossings stabilised
Performance Objectives	❑ Watercourse crossings stabilised ❑ Minimise erosion and sedimentation ❑ Prevent the spread of weeds
Management Strategies	❑ Watercourse banks are stabilised and contain vegetative cover as necessary to prevent scouring ❑ Stormwater diversion drains (Whoa-Boys) in place and stable ❑ Sufficient cover maintained over pipeline
Performance Indicators	❑ Watercourse banks stable ❑ Erosion and sediment control measures in place and effective ❑ Sufficient cover maintained over pipe
Monitoring	❑ Complaint Register ❑ Easement inspection check sheets

3.4 Erosion and Sediment Control

Policy	To ensure erosion and sediment control measures along the pipeline route are effectively maintained
Performance Objectives	❑ Minimise soil erosion ❑ Minimise sedimentation of land ❑ Minimise modification to drainage patterns ❑ Prevent as far as practical, sediment transport to adjacent watercourses
Management Strategies	❑ Inspect the ROW and maintain erosion and sediment controls as necessary to ensure a stabilised easement ❑ Place additional erosion control structures such as diversion drains (Whoa-Boys) at key locations if additional erosion is detected along the pipeline ❑ Divert stormwater away from the pipeline easement if necessary, following consultation with the landholder ❑ Ensure replacement of any erosion control

	measures following any pipeline maintenance or dig-ups
Performance Indicators	❑ No large scale erosion or sedimentation caused to adjacent land uses as a result of construction activities ❑ No evidence of additional sedimentation in watercourses as a result of erosion from operational activities
Monitoring	❑ Complaint register ❑ Easement inspection check sheets

3.5 Management of Flammable and Combustible Substances

Policy	To ensure that storage and handling of flammable and combustible substances onsite does not cause environmental harm or harm to persons.
Performance Objectives	❑ To minimise potential for land contamination ❑ To ensure the on-going safety of operational personnel
Management Strategies	❑ An Emergency Response Plan in place and employees inducted in its application ❑ Flammable and combustible substances are stored, handled, separated and signed as required by the Flammable and Combustible Liquids Regulations and AS1940 ❑ Relevant MSDS for all flammable and combustible substances and dangerous goods maintained ❑ Waste flammable and combustible substances which cannot be recycled will be transported to a designated disposal site as approved by Local Government ❑ Spill kits containing absorbent and containment material (e.g. absorbent matting) will be available where hazardous materials are used and stored and personnel trained in their correct use ❑ Spills of flammable and combustible substances will be rendered harmless and collected for treatment and/or remediation or disposal at a designated site, including cleaning materials, absorbents and contaminated soils and affected area reinstated ❑ Personal protective equipment (PPE) appropriate to the materials in use, will be provided ❑ Relevant Local Government permits will be held and conditions of permits met

Performance Indicators	❑ No hazardous goods contamination of the environment. ❑ Ensure appropriate remedial action has been implemented for any spills ❑ Spill kits and PPE available for use
Monitoring	❑ HSE inspections

3.6 Noise

Policy	To minimise the impact of noise nuisance from pipeline maintenance activities to nearby residences
Performance Objectives	❑ Minimise noise nuisance generated by maintenance activities
Management Strategy	❑ Provide advance notice of any scheduled maintenance activities to nearby residents. ❑ Schedule noisy maintenance activities to appropriate times. ❑ Maintain liaison with nearby residents ❑ Advise nearby residents in advance if any planned venting or other noisy activities are to be undertaken.
Performance Indicators	❑ Number of noise related complaints received from residents
Monitoring	❑ Complaint register

3.7 Waste Management

Policy	To minimise waste generation and maximise reuse and recycling of waste products
Performance Objectives	❑ Minimise impacts related to waste management ❑ No evidence of litter or refuse generated from maintenance activities
Management Strategies	❑ Collecting and removing waste oil and solvents for recycling, reuse or disposal at approved locations ❑ Where practical, wastes will be segregated and reused/recycled (e.g. scrap metal) ❑ All maintenance personnel shall be instructed in waste management practices as a component of their induction process
Performance Indicators	❑ Percentage of waste recycled ❑ Litter left onsite after maintenance activities
Monitoring	❑ Easement inspection check sheets

4.0 DECOMMISSIONING PHASE

In the event that the pipeline is no longer required, it will be decommissioned in accordance with the following:

- Moth-balling – this would involve depressurising the pipeline, capping and filling with an inert gas such as nitrogen or water with corrosion inhibiting chemicals. The cathodic protection would be maintained to prevent the pipe corroding
- Abandonment – this could involve purging the pipe of natural gas, disconnecting it from the manifolds and removing all above ground facilities. The pipe would then be filled with water and left to corrode in-situ.

Removing the pipe from the ground is unlikely to be an environmentally or commercially viable option. A detailed rehabilitation program would be developed and implemented in consultation with landholders and the Regulator at the time of abandonment.

Abandonment of the pipeline is unlikely as the pipeline feeds a LNG plant, and can source gas from multiple locations. The pipeline will be subject to ongoing rehabilitation over its planned life, so remediation at any time of abandonment will be minimised.

Pipeline abandonment will involve:

- Purging the pipe of natural gas with water or compressed air
- Filling the pipe with water and leaving to corrode in-situ
- Disconnecting the pipe from the manifolds and removing all above ground facilities.

The above ground facilities associated with this pipeline comprise:

- Main line valves
- Scraper stations.

The above ground facilities will be returned to their pre-use state, i.e. open grassed grazing land.

APPENDIX 5

DCDB MAP SERIES

APPENDIX 6

PIPELINE ROUTE MAP SERIES