



Initial Advice Statement

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Bowen River Utilities Pty Ltd

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Executive Summary

The Mackay, Isaac and Whitsunday Region is one of Queensland's most productive regions. While coastal communities support a strong tourism sector, the regional economy is primarily founded on agriculture and mining in western areas where the region takes in the coal-rich Bowen Basin.

Water security is critical in this part of Queensland, which experiences a highly variable climate and regular droughts and cyclones. Safe, accessible and reliable water supplies are an essential regional resource and underpin both community health and economic growth.

The Urannah Project is being investigated to harness the unallocated water held as strategic reserve for water infrastructure in the Bowen and Brocken sub-catchments under the Water Plan (Burdekin Basin) 2007 (Burdekin Water Plan).

The Urannah Project provides a unique opportunity due to its location and proximity to the electricity grid, topography, catchment hydrology, and landholdings to support a large scale, multifaceted water supply and renewable energy project.

The Urannah Project comprises the proposed construction and operation of a new dam on the Broken River at Urannah in Central Queensland, a water distribution network including connecting water pipelines and instream distribution and storage of water, an irrigation precinct and a pumped hydro-electric scheme, together with supporting ancillary infrastructure and associated works.

The project has the potential to supplement existing water supplies in the Mackay, Isaac, and Whitsunday regions, stimulating irrigated agricultural development and strengthening regional water security. The addition of the PHES to the project offers the potential for reliable disputable power supply during the transition of Queensland's economy from fossil fuelled powered generation to renewables.

The total demand anticipated from demand nodes in the regional water system (excluding Mackay) was modelled at a conservative 136,650 ML per annum.

The Urannah Project's capital expenditure is estimated at \$2.9 billion. The project delivers against three key elements in water, energy and food.

The construction of the project is expected to commence in 2022 and will take approximately two years to complete, generating up to 1,200 employment opportunities. Operational employment is anticipated to be in the order of 675 jobs per year.

Due to the complexity and large scale of the project, the proponent Bowen River Utilities Pty Ltd, is seeking a declaration by the Coordinator-General of the project as a 'coordinated project' under s26 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Subsequently, this Initial Advice Statement has been prepared to provide information, as required under section 27AB of the SDPWO Act, to inform the Coordinator-General in the decision making process on the basis that the project is characterised by:

- Complex approval requirements, including Commonwealth government, state government and multiple local government area involvement
- Strategic significance to the region and state, including water security and related infrastructure, economic and social benefits, and capital investment

- Potential significant environmental effects on matters of national environmental significance, including the Great Barrier Reef World Heritage Area, threatened species and threatened ecological communities and migratory species
- Potential significant environmental effects on matters of state environmental significance, including regulated vegetation, connectivity, wetlands and watercourses, protected wildlife habitat (flora and fauna, protected areas and waterways providing for fish passage

The coordinated project process is well understood and recognised as a transparent process, generally accepted by the public in relation to projects of this nature. It provides clearly defined statutory requirements for environmental assessment and a process through which stakeholders can have their say, including early in the process through development of the project's terms of reference.

The terms of reference provide a statutory basis against which environmental assessment is undertaken. The terms of reference ensure that all necessary and relevant environmental values are accounted for and dictate requirements to demonstrate how the project will avoid, minimise and manage impacts and where impacts are unavoidable offsets

On the basis of preliminary assessments it is predicted that the project has the potential to impact on matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* and will require approval from the Commonwealth Minister for Environment before it can proceed. As a controlled action it is expected that assessment by Environmental Impact Statement is likely to be required. Assessment of the project under the bilateral agreement is considered to provide a streamlined approach and alignment of Commonwealth and State interests for matters of national and state environmental significance.

This IAS is a scoping document and discusses the potential impacts in general terms based on the desktop review of the existing environment of the study area. The project will require detailed environmental assessment as part of the Environmental Impact Statement to quantify or qualify each level of impact on the relevant environmental values and also propose avoidance and adequate mitigation measures for each project component and where avoidance is not possible propose appropriate offsets. An environmental management plan will be developed for construction and operational phases as applicable.



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Appendix A Tenure

Appendix B Existing environment

Appendix C Preliminary likelihood of occurrence assessment

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Glossary.

ABS	Australian Bureau of Statistics
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
AEMO	Australian Electricity Market Operator
AHD	Australian Height Datum
AMTD	Adopted Middle Thread Distance
BBWSS	Bowen Broken Water Supply Scheme
BCE	Bowen Collinsville Enterprises
BFD	Burdekin Falls Dam
BHWSS	Burdekin Haughton Water Supply Scheme
BMP	Burdekin Moranbah Water Pipeline
BREH	Bowen Renewable Energy Hub
Burdekin Water Plan	Water Plan (Burdekin Basin) 2007
BRU	Bowen River Utilities Pty Ltd
CEMP	Construction Environmental Management Plan
CFRD	Concrete Face Rockfill Dam
CG	Coordinator-General
DAF	(Qld) Department of Agriculture and Fisheries
DATSIP	(Qld) Department of Aboriginal and Torres Strait Islander Partnerships
DBC	Detailed Business Case
DEE	(Commonwealth) Department of Environment and Energy
DES	(Qld) Department of Environment and Science
DNRME	(Qld) Department of Natural Resources Mines and Energy
DTMR	Department of Transport and Main Roads
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVNT	Endangered, Vulnerable or Near Threatened
EWP	Eungella Water Pipeline
FIA	Failure Impact Assessment
FSL	Full Supply Level
GBO	General Biosecurity Obligation
GBR	Great Barrier Reef
GBRWHA	Great Barrier Reef World Heritage Area
GDE	Groundwater Dependent Ecosystem
GOSS	Gattonvale Offstream Storage
GWhr	Gigawatt Hour

HR	Hours
IAS	Initial Advice Statement
IRC	Isaac Regional Council
ISP	Integrated System Plan 2020
LGA	Local Government Area
LRET	Large-scale Renewable Energy Target
MCU	Material Change of Use
ML	Megalitres
MNES	Matter of National Environmental Significance
MRC	Mackay Regional Council
MRPS	Mackay Regional Planning Scheme
MSES	Matter of State Environmental Significance
MW	Megawatts
MW hr	Megawatt Hour
NC Act	<i>Nature Conservation Act 1992</i>
NEG	National Electricity Grid
NEM	National Electricity Market
NQRP	North Queensland Regional Plan
NSPS	Nebo Shire Planning Scheme
PBC	Preliminary Business Case
PHES	Pumped Hydro-electric Power Scheme
Planning Act	<i>Planning Act 2016</i>
RCC	Roller Compacted Concrete
RE	Regional Ecosystem
Reef 2050 Plan	Australian and Queensland Reef 2050 Long-Term Sustainability Plan
RET	Renewable Energy Target
REZ	Renewable Energy Zone
ROL	Resource Operations Licence
SA2	Statistical Area 2
SARA	State Assessment and Referral Agency
SBC	Strategic Business Case
SDAP	State Development Assessment Provisions
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SMP	Species Management Plan
SPP	State Planning Policy
SRES	Small-scale Renewable Energy Scheme
TEC	Threatened Ecological Community
UPA	Urannah Properties Association

UWS	Urannah Water Scheme Pty Ltd
VM Act	<i>Vegetation Management Act 1999</i>
VRE	Variable Renewable Energy
Water Act	<i>Water Act 2000</i>
WQIP	Burdekin Region Water Quality Improvement Plan 2016
WRC	Whitsunday Regional Council
WRPS	Whitsunday Regional Planning Scheme
WSSR Act	<i>Water Supply (Safety and Reliability) Act 2009</i>

1. INTRODUCTION

The Urannah Project (the project), located in the upper Broken River Valley south east of Collinsville and approximately 80 km west of Mackay in Central Queensland proposes construction and operation of a new dam (Urannah Dam) on the Broken River, together with a water distribution network, an irrigated agricultural development area (irrigation precinct), and a pumped hydro-electric power scheme (PHES).

An environmental impact assessment is being undertaken to identify environmental, social, cultural and economic values and analyse potential direct and indirect impacts that may arise as a result of the project and to inform environmental and planning approvals for the project.

In accordance with s27 of the *State Development and Public Works Organisation Act 1971* this Initial Advice Statement has been prepared to support Bowen River Utilities Pty Ltd application to the Coordinator-General to be declared a 'coordinated project'.

1.1 Project overview

Urannah, on the Broken River, has long been considered a potential site for a large-scale water supply for the surrounding Mackay, Whitsunday and Isaac regions. A tributary of the Burdekin River, the Broken River drains into the Bowen River sub-catchment and the broader Burdekin Basin, Australia's second-largest river basin. Under the Water Resource (Burdekin Basin) Plan 2007, the Bowen and Broken sub-catchment areas have 150,000 ML of unallocated water held as a strategic water reserve for water infrastructure enabling use by business, industry and the community while still allowing for sufficient environmental flows.

Urannah Dam was first formally proposed by government through the Queensland Irrigation and Water Supply Commission in the 1960s. Non-profit economic development agency, Bowen Collinsville Enterprise Group Inc. (BCE), has been driving investigations since the 1990s. In 2016, the Australian Government committed \$3 million of National Water Infrastructure Development Fund (NWIDF) funding for a 'detailed examination of the economic feasibility of Urannah Dam' as part of a broader suite of 39 feasibility studies for new water infrastructure across Australia. BCE was selected to undertake a three-stage study. BCE has sub-contracted with Urannah Water Scheme Pty Ltd (UWS) to undertake the study.

A strategic business case (SBC) and preliminary business case (PBC) were prepared as part of the feasibility study for the proposed development of Urannah Dam, a water distribution network (pipelines networks to Peter Faust Dam, Eungella Dam and Moranbah) and an irrigated agricultural development, collectively known as the Urannah Water Scheme Project. A concept study for a proposed pumped hydro-electric power scheme (PHES) was included within the PBC.

In 2019, an additional \$10 million in funding through the NWIDF was secured for the Urannah Water Scheme Project's detailed business case (DBC) and Environmental Impact Statement (EIS). The Urannah Water Scheme DBC will not include the PHES as part of the Urannah Water Scheme Project's project definition.

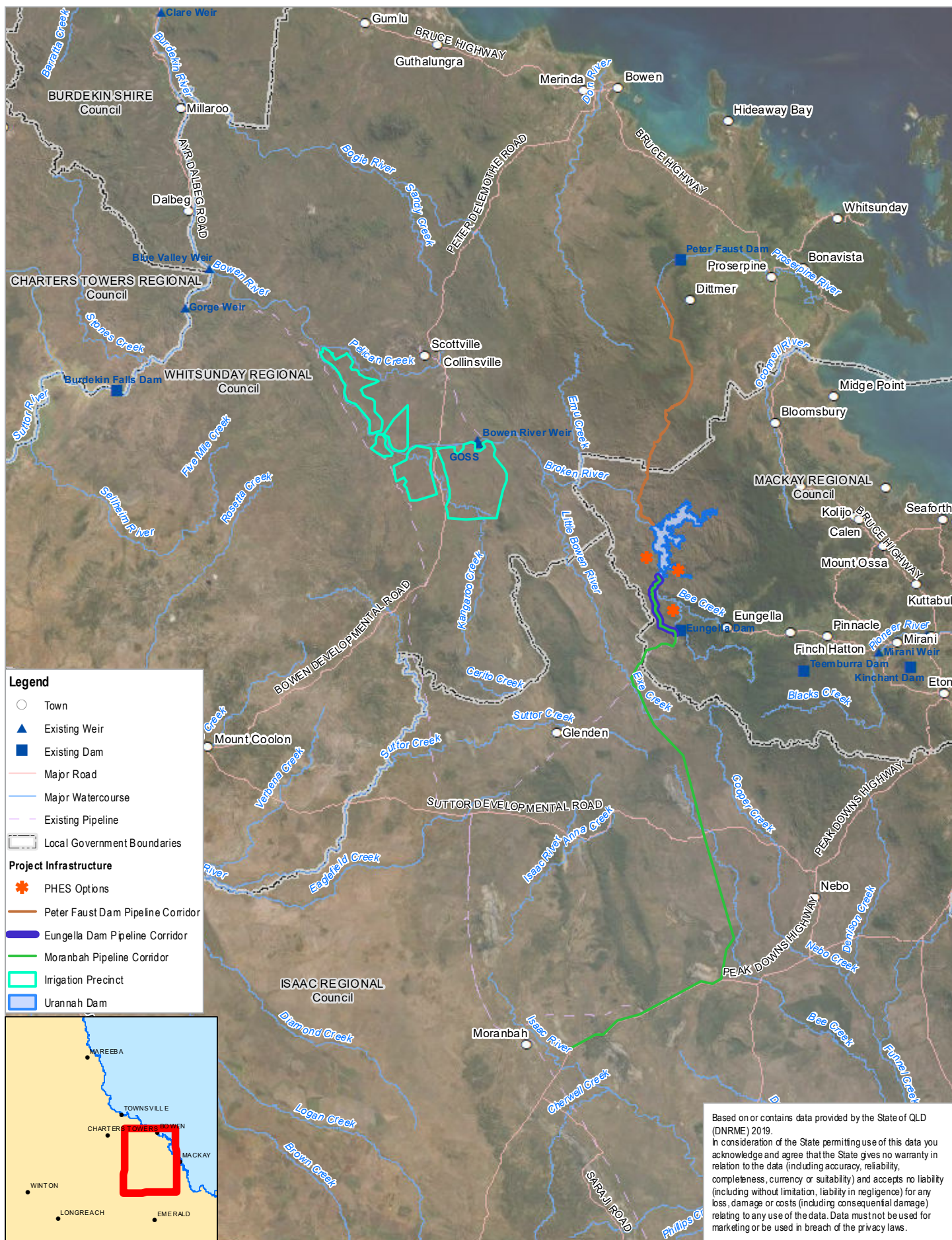
The PHES is being investigated as part of a broader pre-feasibility study for the proposed Bowen Renewable Energy Hub (BREH), comprising 1.5GW+/7GWhr+ of pumped hydroelectric storage, 1300MW of solar PV, 500MW of wind, and a 200MW hydrogen electrolyser. Bowen River Utilities Pty Ltd (BRU) has successfully secured \$2 million from the Australian Government for a pre-feasibility study.

However, it is recognised that co-location of the PHES with Urannah Dam provides a unique opportunity to support a large scale, multifaceted water supply and renewable energy project that combined delivers water security for North Queensland and reliable disputable supply during the transition of Queensland's economy from fossil fuelled powered generation to renewables. Contractual and commercial arrangements are in place to facilitate sharing of information and funds.

Consequently, the Urannah Project (the project), the subject of this Initial Advice Statement (IAS), for which declaration as a coordinated project is sought (Section 1.2) and for which environmental, social, cultural and economic assessments will be prepared comprises:

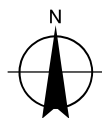
- Urannah Dam – a new gravity fed dam at Urannah storing up to 1,500,000 ML of water
- Water distribution (pipeline) networks from Urannah Dam north to Peter Faust Dam and on to Bowen and Abbot Point, south to Eungella Dam and Moranbah and in-stream flow within the Broken River and Bowen River, together with associated ancillary works, such as pump stations and power supply infrastructure
- Irrigation precinct – an irrigated agricultural development area of up to 25,000 ha and associated in-stream and off-stream storages, trunk delivery works and on-farm infrastructure
- PHES – 1.5 GW+/7GWh+ of pumped hydro-electric storage and power generation infrastructure including power stations (surface and underground), dams and reservoirs, waterways and power transmission infrastructure
- Ancillary works and infrastructure to support the development of the Urannah Project, for example, quarries and borrows, road and access development and upgrades, site establishment areas, laydowns, site amenities and accommodation, services and utilities (including electricity, telecommunications).

The locality of these key project components are shown in Figure 1-1.



Paper Size ISO A4
0 8 16 24 32
Kilometres

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



**Bowen River Utilities
Urannah Project**

Project No. 41-32567
Revision No. 3
Date 30/03/2020

Project location

FIGURE 1-1

1.2 Initial advice statement purpose and scope

Bowen River Utilities Pty Ltd (BRU) is seeking declaration of the proposed Urannah Project as a 'coordinated project' under s26 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Accordingly, this IAS has been prepared to provide information as required under s27AB of the SDPWO Act to inform the Coordinator-General's decision on whether to declare the project a 'coordinated project' for which an EIS is required.

Information has been sourced through freely and publicly available data sources and as reported within the Urannah Water Scheme Project SBC (BCE, 2018) and PBC (BCE, 2019).

The project is characterised by:

- Complex approval requirements
 - Approvals, permits and licences will be required for the project from Federal, State and three local governments and multiple regulatory agencies including the Department of Natural Resources, Mines and Energy (DNRME) (water, vegetation, land), Department of Agriculture and Fisheries (DAF) (agriculture, fisheries and forestry), Department of Environment and Science (DES) (flora and fauna and environmental management), Department of Transport and Main Roads (DTMR), amongst others. Conflicting and competing State interests would be best managed through a coordinated and collaborative approach as facilitated through the coordinated project process
 - On the basis of preliminary assessments it is predicted that the project has the potential to impact on matters of National environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will require approval from the Commonwealth Minister for Environment before it can proceed. As a controlled action it is expected that assessment by EIS is likely to be required. Assessment of the project under the bilateral agreement is considered to provide a streamlined approach and alignment of Commonwealth and State interests for MNES and matters of State environmental significance (MSES), respectively
- Strategic significance locally, regionally and to Queensland more broadly, in particular Northern Queensland
 - Government policies relevant to the proposed project are discussed in Section 6. In general, these policies speak to the need and desire for diversification and growth of local and regional economies, the need to support communities and economies by developing resilient and reliable infrastructure, to protect and sustainably manage natural resources, including land and water.
 - The project supports these interests specifically with regard to security of water supply for urban, industrial and agricultural purposes and divestment to high value agriculture (away from grazing). Combined with the inclusion of the PHES provides for support to emissions reduction targets while maintaining economic security and growth.
- Potential significant environmental effects
 - MNES, being listed threatened species and ecological communities, listed migratory species, World Heritage properties and National Heritage places, namely the Great Barrier Reef World Heritage Area (GBRWHA).
 - MSES, notably vegetation, wildlife habitat, wetlands and waterways, waterways providing for fish passage.
 - The coordinated project process is well understood and recognised as a transparent process. It provides clearly defined statutory requirements for environmental assessment and a process

through which stakeholders can have their say, including early in the process through development of the project's terms of reference.

- The terms of reference provide a statutory basis against which environmental assessment is undertaken. The terms of reference ensure that all necessary and relevant environmental values are accounted for and dictate requirements to demonstrate how the project will avoid, minimise and manage impacts and where impacts are unavoidable offsets

Table 1-1 provides the information requirements that the Coordinator-General must have regard for in making a declaration and provides a cross-reference to where the information is contained within this IAS.

Table 1-1 Coordinator-General's assessment requirements

Information required	Section reference
Detail information about the project by the proponent in an IAS	Section 3.3 Section 3.3.5
Relevant planning schemes or policy frameworks of a local government, the State or the Commonwealth	Section 9
Relevant State policies and government priorities	Section 9
A pre-feasibility assessment of the project, including how it satisfies an identified need or demand	Section 3.2
The capacity of the proponent to undertake and complete the EIS for the project	Section 2

2. THE PROPONENT

The Urannah Project is proposed to be developed by Bowen River Utilities Pty Ltd which owns the Urannah Water Scheme Pty Ltd and Blue Hydro Project companies.

Bowen Collinsville Enterprise Group Inc (BCE) has led the development of a dam on the Broken River at Urannah since the 1990s. Through the National Water Infrastructure Development Fund, BCE secured funding for the feasibility study (a Strategic Business Case and a Preliminary Business Case) and has secured an additional \$10 million for the development of the detailed business case and environmental approvals.

Urannah Water Scheme Pty Ltd is sub-contracted to execute the business case and Environmental Impact Statement (EIS). Contractual arrangements are in place with Renewable Energy Partners to incorporate the pumped hydro-electric power scheme component of the broader Bowen Renewable Energy Hub into the EIS.

BCE, as the leading economic development agency in the Bowen-Collinsville region, has led the project since the mid-1990s.

In 2015, BCE formed a working group to examine regional economic growth opportunities through the construction of a new water storage on the Broken River. A three stage economic feasibility study on the Urannah Water Scheme (previously called the Urannah Dam Feasibility Study) commenced in February 2018 when BCE entered into a Funding Deed with DNRME, which administers the NWIDF in Queensland, on behalf of the Australian Government. Additional funding received in 2019 has facilitated the development of a DBC and EIS.

Renewable Energy Partners is undertaking a feasibility study for the development of the Bowen Renewable Energy Hub (BREH) through Federal funding arrangements.

UWS is sub-contracted by BCE to execute the DBC and EIS. Contractual arrangements between UWS and Renewable Energy Partners facilitates financial contributions to the development of the EIS and collaboration and transfer of project-related information.

Bowen River Utilities Pty Ltd is the project proponent. BRU is a holding company for UWS. Further detail with regard to the Urannah Project's governance, commercial and financial arrangements has been provided to the Coordinator-General separately.

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3. NATURE OF THE PROPOSAL

The Urannah Project is being investigated to harness the unallocated water held as strategic reserve for water infrastructure in the Bowen and Brocken sub-catchments under the Water Plan (Burdekin Basin) 2007.

The Urannah Project provides a unique opportunity due to its location and proximity to the electricity grid, topography, catchment hydrology, and landholdings to support a large scale, multifaceted water supply and renewable energy project.

The Urannah Project comprises the proposed construction and operation of a new dam on the Broken River at Urannah in Central Queensland, a water distribution network including connecting water pipelines and instream distribution and storage of water, an irrigation precinct and a pumped hydro-electric scheme, together with supporting ancillary infrastructure and associated works.

The project has the potential to supplement existing water supplies in the Mackay, Isaac, and Whitsunday regions, stimulating irrigated agricultural development and strengthening regional water security. The addition of the pumped hydro-electric power scheme to the project offers the potential for reliable disputable power supply during the transition of Queensland's economy from fossil fuelled powered generation to renewables.

The total demand anticipated from demand nodes in the regional water system (excluding Mackay) was modelled at a conservative 136,650 ML per annum, split into four major areas:

- Collinsville/Newlands/Byerwen – 9,650 ML per annum
- Collinsville irrigation precinct – 80,000 ML per annum
- Proserpine and Abbot Point – 16,000 ML per annum
- Moranbah – 31,000 ML per annum.

The Urannah Project's capital expenditure is estimated at \$2.9 billion. The project delivers against three key elements in water, energy and food. The capital cost estimates (2018) for the individual components include:

- Water and distribution project made up of \$673 million for the dam and \$416 million in pipelines
- Food precinct (irrigated agriculture) with a development cost of \$265 M
- Renewable hub totalling \$1.582 billion.

The construction of the project is expected to commence in 2022 and will take approximately two years to complete, generating up to 1,200 employment opportunities. Operational employment is anticipated to be in the order of 675 jobs per year.

3.1 Scope of the project

The proposed project involves the construction and operation of a new dam (Urannah Dam) and water storage of up to 1,500,000 ML at Urannah, water distribution infrastructure, a new irrigation precinct and PHES.

The project would become part of the Bowen Broken Water Supply Scheme (BBWSS) and with potential to connect into the Proserpine Water Supply Scheme and supplement the Burdekin Haughton Water Supply Scheme (BHWSS). Subsequently, the project has potential to link these existing water schemes to form a regional water grid.

The project will supply up to 150,000 ML/annum to the following areas:

- Northern Bowen Basin for primarily industrial customers to supplement the existing Eungella Dam supply or direct supply through a new distribution pipeline to Moranbah via Eungella Dam
- Bowen and Abbott Point areas for agricultural, industrial and urban uses via a new pipeline to Peter Faust Dam or direct supply via a new pipeline to Proserpine
- New irrigated agriculture area along the Bowen River, west and south of Collinsville via instream distribution using the Broken and Bowen rivers.

The primary users of the project would be located within the broader Mackay, Isaac and Whitsunday regions.

The project area is generally considered to incorporate the potential areas from Abbot Point and Bowen, south along the coast to Proserpine and inland down to Moranbah and areas surrounding Eungella Dam. This area is generally referred to as Bowen Basin North.

The PHES will be connected into the National Electricity Grid (NEG) and be a participant in the national Electricity Market (NEM), providing on-demand variable, firm power.

Supporting infrastructure associated with the project may include:

- Road and access upgrades
- Development of quarries and/or borrows for the supply of construction resource material
- Site laydowns, stockpiles and processing areas to facilitate construction works
- Construction of site amenities and temporary workers accommodation facilities
- Upgrades to or construction of new services and utilities such as power transmission and telecommunication infrastructure.

3.2 Project need, justification and alternatives considered

3.2.1 Service need

The PBC (BCE, 2019) reports that there is existing unmet demand for water by mining, agriculture and industry in the wider Mackay, Isaac and Whitsunday regions. There is also potential for induced demand for water to support new resources and agricultural projects.

Development of the Urannah Project offers the potential to:

- Supplement existing regional water supplies to meet growth in mining demand in western communities, urban and agricultural demand in coastal Whitsundays communities and industrial demand in Bowen
- Stimulate irrigated agricultural demand on land with high-quality soils in mining buffer areas along the Bowen River
- Strengthen regional water security by improving the reliability and efficiency of existing water schemes.

Urannah Dam and the water distribution network would become part of the BBWSS while also affording the opportunity to connect the existing water schemes, with links to Peter Faust Dam at Proserpine, Eungella Dam and Moranbah and through Collinsville to the BHWSS.

The existing BBWSS supplies water from Eungella Dam to mining customers downstream at Collinsville and Newlands via instream releases into the Broken and Bowen Rivers to Bowen Weir and the Gattonvale Offstream Storage (GOSS) and existing Sunwater pipelines (namely Sunwater's Collinsville pipeline and Newlands pipeline, respectively).

Mining customers at Moranbah receive water via the Eungella Water Pipeline (EWP) and the BMA private pipeline, as well as supply from the Burdekin Falls Dam (BFD) through Sunwater's Burdekin Moranbah Water Pipeline (BMP).

Users in Collinsville and Moranbah secure water through trading exchanges at significant price premiums. Many do not use their full allocation due to water security concerns. Unallocated entitlements by Whitsunday industrial and agricultural users are also high.

Stakeholder consultation during the PBC (BCE, 2019) indicated that users require greater water security and a new water source.

Meeting the service needs would benefit the region by delivering new water for mining and agriculture, providing water security for urban coastal communities, opening up new opportunities through irrigated agriculture to generate employment and greater investment in the region and improving the operational efficiencies within the BBWSS system. The project also supports the changing demand needs of the region and Bowen River Utilities has been working with key customers to complete market testing. The total demand anticipated from demand nodes in the regional water system (excluding Mackay) was modelled at a conservative 136,650 ML per annum, split into four major areas:

- Collinsville irrigation precinct – 80,000 ML per annum. The demand associated with a future irrigation precinct within the Collinsville area was examined as part of the PBC (BCE, 2019). The project has the potential to supply additional water to current and future industrial and agricultural users surrounding Collinsville via instream distribution. The project will also create new jobs within the area and broaden the regional economic base.
- Collinsville/Newlands/Byerwen – 9,650 ML per annum
- Proserpine and Abbot Point – 16,000 ML per annum. While currently an important supply node for the region, the Peter Faust Dam could be used as a conduit to reach the demand node of agricultural, urban and industrial users in the Whitsunday local government area (LGA) from the Urannah Project.
- Moranbah – 31,000 ML per annum. The current coal price has resulted in increased mining exploration within the Moranbah region, with 31 exploration programs currently developing resources to mining lease phases. These projects have expressed interest in new water sources. The project has potential to predominantly address the anticipated increased demand for water within the Moranbah region and allow for expansion of industrial and urban users.

The next study phase will include a detailed water demand assessment, soil suitability and optimised irrigated cropping plan which will address the following:

- Urban, industrial and irrigation demands
- Timeframe for take-up against each demand type
- Water demand profile to inform detailed modelling for assessment against key Water Plan factors i.e. Water allocation security objectives and environmental flow objectives
- Optimised cropping/land development profile
- Capacity and willingness to pay considerations (both initial allocation purchase and ongoing water charges) for all water demands i.e. urban, industrial and irrigation.

The above will involve direct consultation with miners, urban water authorities/Councils, irrigators and agricultural industries.

Further, Urannah Dam provides a unique opportunity due to its location and proximity to the electricity grid, topography of the project site, hydrology of the catchment, and landholdings to support a large

scale, multifaceted energy storage. Three PHES options are being considered (PHES1, PHES4 and PHES7).

The Australian Electricity Market Operator (AEMO) in its Draft Integrated System Plan 2020 (Draft 2020 ISP) shows a clear need for one or more large intra-day PHES operating in Queensland by 2035 as shown in Figure 3-1.



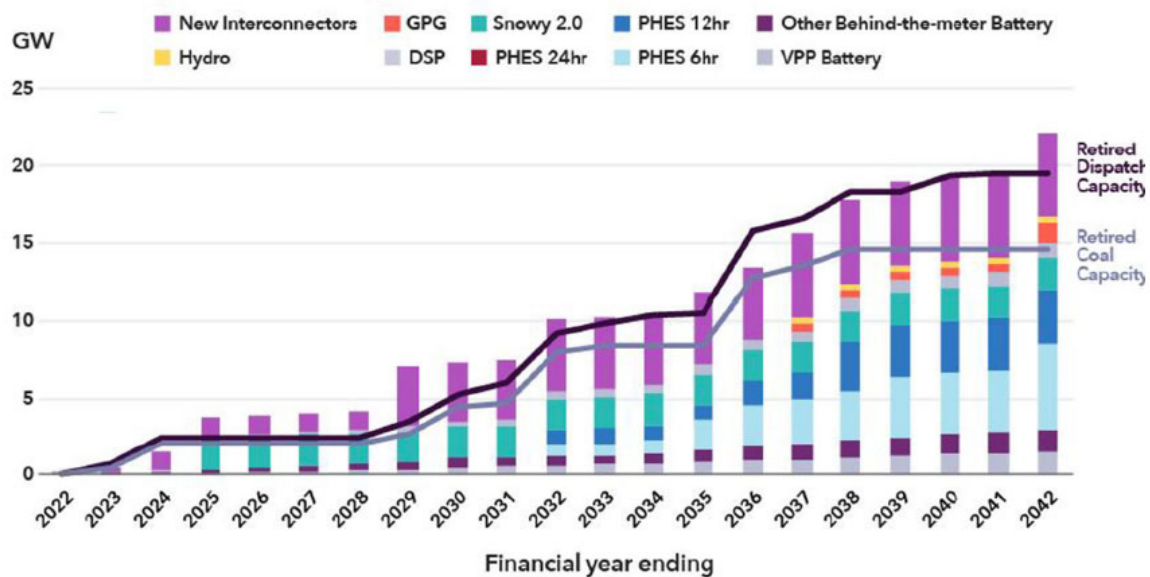
Source: AEMO Draft 2020 ISP

Figure 3-1 Year-to-year works in the 2020 Draft ISP Roadmap

The Draft 2020 ISP also identifies locations within the NEM where this would be feasible. The Urannah Project is in one such location, within Renewable Energy Zone (REZ) 4 – Isaac, which will support the scale and scope of the project and allow it to fulfil a number of roles in the NEM.

The Draft 2020 ISP also accounts for significant growth in Variable Renewable Energy (VRE) generation (i.e. Wind and Solar PV) by 2035. While VRE is not proposed as part of the Urannah Project and is being investigated separately as part of the wider BREH, the Draft 2020 ISP envisages the need for PHES as the penetration of VRE increases toward 50% and beyond.

Some of Central Queensland's coal-fired generators have been confirmed by AEMO to be decommissioned, including Callide B in 2028, and Gladstone in 2035 as shown in Figure 3-2. Mining in the Bowen Basin and industry in Townsville, Mackay and Gladstone are expected to continue to provide a significant local demand load to support base-load power generation north of Gladstone. Significant amounts of VRE have been connected into the NEM north of Gladstone which will require firming.



Source: AEMO Draft 2020 ISP

Figure 3-2 Announced retirements and corresponding builds in Central scenario to help firm VRE

The Draft 2020 ISP incorporates 1.2 GW of 'PHES 6hr' in the Isaac or Fitzroy REZ in Queensland from 2035. This will provide a number of benefits:

- Allow firming of VRE by shifting supply from the period in which it is produced (for solar during the day, or for wind, periodically with intervening periods of calm) to periods of demand (typically in the evenings after sunset), which will add value to the energy produced and continue the incentive for more VRE to be installed
- In doing so to reduce the marginal losses experienced by congested supply from multiple VRE installations during peak generation periods by consuming some of the produced power locally for pumping
- Provide a reliable dispatchable supply during the transition from fossil fuelled power to VRE, particularly as fossil fuelled power stations become less reliable as they approach the end of life
- Enable the more efficient and reliable operation of major coal fired power stations by allowing them to operate with less variation in output
- Provide some degree of reserve against sudden price shocks when major coal fired power stations are withdrawn from service
- Supply essential network support such as voltage and frequency regulation services, system restart, system strength and inertia which are not being supplied by all forms of VRE.

A PHES has been considered for the Urannah Project with the preferred option generating 1.5 GW+ of electricity for 7 hrs+. This scheme would use electricity acquired from the NEM to pump water from the lower storage to an upper reservoir during low power price periods. When prices are higher, at periods of peak demand, the water would be released from the upper reservoir back to the lower storage through one or more turbines to generate electricity to be sold into the NEM via the NEG. This pumped storage water battery will assist the overall operation of the NEG by compensating for the intermittency and variability of renewable energy projects such as wind and solar. The topography of the proposed options and short distance to the NEG provides for a low capital cost when compared to other schemes of similar size in Australia.

3.2.2 Public benefits

A large public benefit will be achieved through the development of the Urannah Project. The construction and operation of Urannah Dam will satisfy an identified and unmet demand for water in the wider Mackay, Isaac and Whitsunday regions, and will strengthen regional water security by improving reliability and efficiency of existing water schemes. This will stimulate existing communities and industry, while allowing for expansion, particularly within the primary production sector and irrigated agricultural development. With the provision of additional water supplies, the strategic development of an irrigated agricultural precinct on land with high-quality soils along the Bowen River will generate further socio-economic benefit for the region. This supports State and regional policies that speak to the need and desire for diversification and growth of local and regional economies, the need to support communities and economies by developing resilient and reliable infrastructure, to protect and sustainably manage natural resources, including land and water. Combined with the inclusion of PHES, the project will support emissions reduction targets and transition a renewable energy future while maintaining economic security and growth.

The PBC social impact baseline (BCE, 2019) identified a number of problems and services needs within the project area. The primary theme related to the limited access and availability of water, limiting economic growth across urban, industrial and agricultural sectors. The majority of the identified corresponding social benefits associated with the project are consequently economic in nature. Creation of economic wealth influences a complex range of social outcomes and has a major bearing on the quality of life able to be achieved. Economic prosperity facilitates investments in health, educational, recreational and social improvement.

Benefits expected to be delivered by the project by addressing the service need include the following and discussed further in Section 7.4:

- Water for agricultural production on buffer mining areas
- Provision of new and reliable water for the Southern and Eastern Moranbah coal fields
- Provision of new and reliable water for the Bowen / Proserpine Irrigators
- Positive impacts in relation to community vitality – increase in employment opportunities help to retain/attract people to the area
- Development of additional community support services and improved community facilities and health
- Opportunities for indigenous business development and employment
- Equitable allocation of additional water may add to a sense of social cohesion
- Enhanced confidence to invest in long term business operations and succession opportunities.

The Social Impact Assessment (SIA) for the project will be further developed in accordance with the Building Queensland's Social Impact Evaluation Guide and consideration of the Coordinator-General's Social Impact Assessment Guideline, in particular benefits identification and management.

3.2.3 Project feasibility

In 2015, BCE formed a working group to examine the regional economic growth opportunities through the construction of a new water storage on the Broken River.

A feasibility study commenced in February 2018 that committed to examining the feasibility of the following as part of a SBC:

- Large water storage (dam) on the Broken River at Urannah (part of the Burdekin River catchment)

- Water supply to support large-scale irrigated agriculture along the Bowen River, west and south of Collinsville, via instream distribution or the construction of a trunk delivery canal
- Water supply to the northern Bowen Basin for primarily industrial uses via supplement supply to the existing Eungella Dam or direct supply via new pipelines.
- Water supply to the Bowen and Abbot Point area for agricultural, industrial and urban uses via supplement supply to the existing Peter Faust Dam or direct supply via new pipelines.

The SBC (BCE, 2018) examined the context, high-level service need, key stakeholders, and benefits sought from Urannah Dam and presented a strategic response to the service need. It also identified key policy considerations and major mining, industrial, agricultural and urban water users in the study area.

The subsequent PBC (BCE, 2019) included an analysis of potential and shortlisted options to address the service need, from reform and demand management measures to capital works that supplement existing systems and large-scale new infrastructure.

A multi-criteria analysis (MCA) was undertaken to generate shortlisted options. Criteria were weighted according to their importance, with operational viability and ability to meet the service need given the highest weightings. Stakeholder consultation was also undertaken following the MCA to verify scores and rankings.

The PBC (BCE, 2019) recommended that the project progress for environment approvals and financial close, through the preparation of an EIS and a DBC.

Project feasibility has been considered with reference to other water infrastructure projects in the same region, in particular the Burdekin Falls Dam Raising Project (BFDRP).

The Urannah Project's feasibility is based on:

- Water demand in the region
- The need to diversify the economies of Collinsville, Moranbah and Newland
- The need for large-scale energy storage to supply firm baseload power in the Northern NEM.

Building Queensland and Sunwater Limited are currently undertaking the BFDRP business case. It is understood that the scope of these studies do not include a duplication of the BMP. On this basis, the Urannah Project does not compromise the BMP. Further:

- The project is located upstream of Collinsville and has an elevation allowing access to the demand nodes of Moranbah, Whitsunday and Collinsville
- There is currently unallocated water within the BFD to meet all short and medium term demand however the capacity to transport to the demand nodes proposed to be served by the Urannah Project are at capacity or held by trading constraints
- BFD can supply up to 22,500 ML per annum via pipeline which is currently fully allocated (Sunwater 2020).

Further the Water Plan (Burdekin Basin) 2007 (Burdekin Water Plan) envisaged a number of development scenarios including development within the Bowen and Broken sub-catchments and for a future raising of the BFD, indicating that the Government envisaged a scenario under which both development options would be required to meet regional water demands. This will be further validated through detailed water demand investigations and consultation as described in Section 3.2.1.

The PBC estimated potential offset costs of approximately \$15 million associated with direct impacts on MSES and MNES for Urannah Dam using the Queensland Government's Financial Offset Settlement Calculator.

Due to the uncertainty of the environmental requirements for a fish passage system, the pre-feasibility cost estimate for each dam type included an estimated \$6 million for fish passage.

Indirect impacts on water quality as a result of the project have been identified through the release of sediment, nutrients and pesticides. Determination of the nature and scale of the impact will be subject to the outcomes of the environmental impact assessment, land suitability assessment, land holder negotiations, the cropping types and mixes proposed and the identification of appropriate land use and management practices, including erosion and soil protection management. Where residual impacts persist, water quality offsets such as riparian area restoration, streambank and gully restoration and constructed or remediated wetlands will be considered.

Environmental and economic impact assessment will inform the development of the cost benefit analysis in the DBC and the EIS. In accordance with the BQ Guidelines, where possible impacts will be quantified and monetised. Where not able to be quantified and/or monetised, qualitative assessment methods will be applied and considered within the project's risk framework. Sensitivity and scenario testing will be undertaken in relation to key inputs and drivers of the cost benefit analysis to determine and understand the results and sensitivity of changes in key parameters may have on the projects' feasibility.

3.2.4 Alternatives considered

In addition to reform and implementing demand management measures to capital works that supplement existing systems and large-scale new infrastructure, multiple development options to address the service need were identified, including:

- Duplication of the BMP at 25,00 ML per annum
- Implementing pricing signals to restrict future water use in the Whitsundays and meet water demand beyond 2025
- Increasing use of ground water in the Bowen and Whitsundays to meet water demand beyond 2025
- A new pipeline from Claire Weir on the Burdekin River to Bowen and Proserpine
- A series of new weirs on the Bowen River and an upgraded pump station
- A series of new weirs on the Bowen River and an upgraded pump station combined with a smaller Urannah Dam
- A new pipeline from Burdekin to Byerwen
- A new pipeline from Burdekin to Collinsville coal mines
- A new Urannah Dam and pipeline to Peter Faust Dam
- A new Urannah Dam yielding 50,000 ML per annum with instream distribution to Collinsville and new pipelines from Urannah Dam to Peter Faust Dam and Eungella Dam duplicating the existing pipeline to provide incremental supply to Moranbah
- A new Urannah Dam yielding 70,000 ML per annum with instream distribution to Collinsville and new pipelines from Urannah Dam to Peter Faust Dam and Eungella Dam duplicating the existing pipeline to provide incremental supply to Moranbah
- A new Urannah Dam yielding 150,000 ML per annum with instream distribution to Collinsville and new pipelines from Urannah Dam to Peter Faust Dam and Eungella Dam duplicating the existing pipeline to provide incremental supply to Moranbah

This long list of options was filtered through a multi-criteria assessment based on financial, regulatory, environmental, land use, public interest and social impact considerations as shown in Figure 3-3.



Source: PBC (BCE, 2019)

Figure 3-3 Selection criteria

A new Urannah Dam yielding 150,000 ML per annum with instream distribution to Collinsville and new pipelines from Urannah Dam to Peter Faust Dam and Eungella Dam duplicating the existing pipeline to provide incremental supply to Moranbah scored highest, followed by a new Urannah Dam yielding 50,00 ML per annum and new Urannah Dam yielding 70,000 ML per annum.

The PBC outlined two options considered in replacement of instream distribution to the Collinsville area. These options were assessed through a multi-criteria analysis and were not shortlisted for progression. A summary of the options, along with the key strengths and weaknesses of each option as identified through the multi-criteria analysis are summarised in the Table 3-1.

Table 3-1 Summary of alternative projects considered

Option	Description	Strengths	Weaknesses
Series of weirs on the Bowen River and upgrade of pump station	Weirs to supply industrial demand at Collinsville	<p>Eliminates the need for significant new infrastructure build and therefore limits capital cost</p> <p>Cost effective use of existing infrastructure</p>	<p>Will not need the demonstrated service need</p> <p>Will not be able to supply the identified industrial need</p> <p>Can meet some of the urban requirements in Proserpine and Whitsundays but cannot cater for additional demand in Moranbah</p> <p>Does not increase agricultural production</p>
New pipeline from Burdekin > Collinsville Coal Mines 20,000 ML/year, along with base case (new pipeline from Burdekin > Moranbah at 25,000 ML/annum or pricing signals	Pipeline from Burdekin to service Collinsville industrial (multi-user) and base case or pricing signals to service demand at Whitsundays.	<p>Reduces new infrastructure build and therefore low capital cost</p> <p>Makes better use of existing resources. Shifts water to highest and best use</p> <p>Utilises existing strategic water allocation in the Water Resources Plan</p>	<p>Requires additional pipeline infrastructure to be built at significant capital cost</p> <p>Will not meet all the demonstrated service need</p> <p>Will not service the identified industrial need in the southern demand areas to Moranbah</p> <p>Cannot meet urban requirements nor supply demand nodes in Proserpine, Whitsundays and Moranbah</p> <p>Limited wider economic or social benefits</p> <p>Requires water users to change behaviour</p> <p>Requires review of regulatory framework</p> <p>Does not increase agricultural production</p>

The location of the PHES (as part of the wider BREH including wind and solar) has considered the AEMO REZ selection criteria as described in Table 3-2.

Three PHESs are being considered and will undergo assessment as part of a feasibility study. Further detail is provided in Section 3.3.4.

Table 3-2 AEMO REZ selection criteria

AEMO REZ criteria	Criteria measure	Bowen Renewable Energy Hub
Wind resource	A measure of high wind speeds (>6 m/s)	Wind speeds up to 9.5m/s
Solar resource	A measure of high solar irradiation (> 1,600 kW/m ²)	Solar irradiance levels of >5,700 kW/m ²
Demand matching	The degree to which the local resources correlate with demand	Combining Solar and Wind should give a capacity factor of >70% without storage. Storage allows the shifting of generation to meet demand where required.
Electrical network	The distance to the nearest transmission line	25 km to the Strathmore to Nebo, dual circuit 275KV line. Powerlink has indicated no immediate constraints to the network
Cadastral parcel density	An estimate of the average property size	Low – five large groupings of properties, rural pastoral stations
Land cover	A measure of the vegetation, waterbodies, and urbanisation of areas	Significant vegetation cover but limited urbanisation. Waterbodies are an essential component of the PHES
Roads	The distance to the nearest road	Limited road access. Can be up to 15 km to a gazetted road from within the project area
Terrain complexity	A measure of terrain slope	Areas of high complexity required for pumped storage and areas of low complexity required for a solar farm.
Population density	The population within the area	Low
Protected areas	Exclusion areas where development is restricted	Limited areas where development will be excluded but PHES will require environmental assessment.

3.3 Project components, activities and infrastructure that constitute the declaration

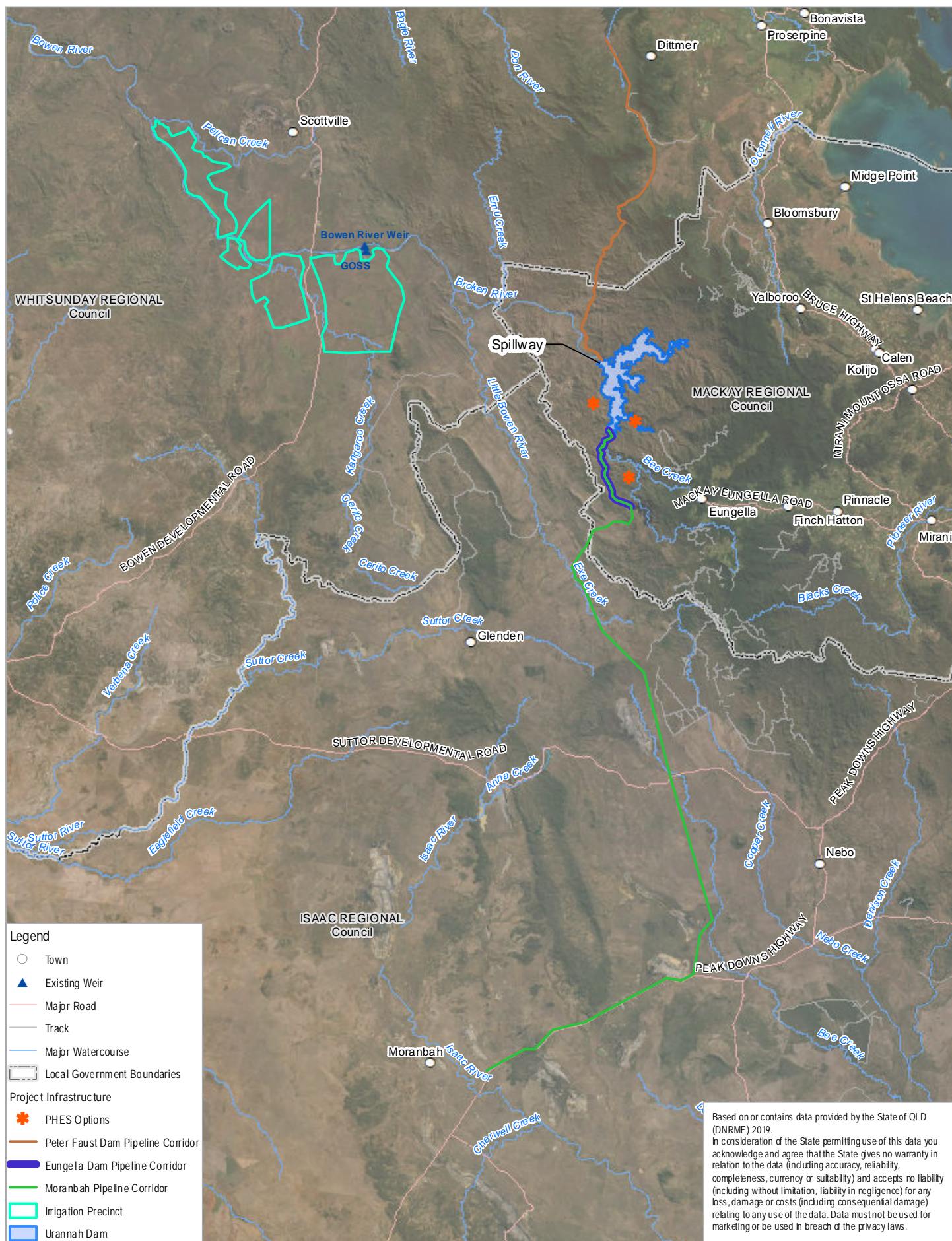
3.3.1 Urannah Dam

Urannah Dam is proposed to be constructed on the Broken River at Urannah as either a concrete face rockfill dam (CFRD) or a roller-compacted concrete (RCC) dam. The dam is proposed to have a full supply level (FSL) in the order of RL 290 m Australian height datum (AHD) and a full supply volume of up to 1,500,000 ML with an annual yield of up to 150,000 ML. The associated storage or inundation area will inundate an estimated 10,500 ha. A flood buffer will be defined and assessed as part of the EIS. Table 3-3 highlights the key design parameters for Urannah Dam. Figure 3-4 shows the location of the proposed Urannah Dam and inundation area.

Table 3-3 Urannah Dam design parameters

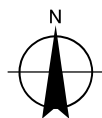
Feature	CFRD design parameter	RCC dam design parameter
Crest Length	1,070 m	1, 070 m
Crest width	7 m	7 m
Upstream slope	1.4H:1V	Vertical
Downstream slope	1.4H:1V, 5 m wide berms at 15 m vertical height	0.7H:1.0V on overflow sections 1.0H:1.0V on non-overflow sections
Crest Elevation	298 m AHD	298 m AHD
Dam height (max section to non-overflow, river bed at RL 218 m)	80 m	80 m
Storage volume	1,390 GL	1,390 GL
Spillway	The spillway structure will be located on the left abutment of the dam. The spillway will comprise a 250 m long, curved ogee crested weir, a concrete lined section of chute 200 m long that contracts from 230 m to 100 m wide, a deflector bucket and plunge pool to dissipate the flow energy, and a 400 m long unlined section of	The spillway structure will be a conventional overflow section centrally positioned in the alignment of the existing river channel. The spillway will comprise a 230 m long, curved ogee crest with concrete training walls on either side to contain the flow. A dissipating structure will be located at the toe

Feature	CFRD design parameter	RCC dam design parameter
	channel that discharges to the river	<p>with a grout enriched downstream face to strengthen the RCC.</p> <p>A concrete stilling basin type structure with concrete apron and downstream sill has been incorporated due to the potential for deep, erodible materials in faults and less durable rock types in the river bed at the dam toe. If further investigation found the rock to be more competent, a 'roller bucket' type spillway may be used</p>
Spillway crest total width (m)	250	230
Outlet works	<p>To pass the predicted maximum irrigation flows of 1,150 ML/day to 2,200 ML/day, 2 x 1,200 mm diameter steel outlet works will be required to be constructed for both the CFRD and RCC dam options. The twin outlets will allow flexibility in managing flows to the river and irrigation precinct in accordance with the Burdekin Water Plan.</p>	
Intake tower	A free standing multi-level intake tower in the dam to selectively draw water from the reservoir.	An intake tower fixed to the upstream face of the dam, with multi-level intakes controlled by penstock gates to provide the means to selectively extract the reservoir water



Paper Size ISO A4
0 6 12 18 24
Kilometres

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



Bowen River Utilities
Urannah Project

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Project components

FIGURE 3-4

Four fish passage options have been considered for Urannah Dam summarised below and described in Table 3-4:

- Vertical slot fishway
- Fish lock
- Fish lift
- Fully manual system (i.e. trap and haul).

Table 3-4 Fish passage options for Urannah Dam

Option	Description
Vertical slot fishway	<p>Vertical slot fishways are designed to accommodate tidal rise and fall on the downstream sides. They generally comprise a rectangular concrete channel with a series of baffles and vertical slots for fish to pass. The slot widths are sized to accommodate the species of fish inhabiting the waterway.</p> <p>These passage, however generally require shallow grades with constant water flow, which is unlikely to be achieved at Urannah due to the height of the dam and steepness of the abutments. Furthermore, ladders of this scale may not be appropriate for the native fish as it may cause exhaustion to the fish. As such, this type of fishway has been considered unsuitable.</p>
Fish lock	<p>This structure functions similarly to a typical weir lock, where the fish are attracted into the chamber and the chamber is then closed. The water within the chamber is lowered or raised to match the upstream or downstream water level (depending on which direction the fish is migrating to). A series of valves and gates are required to operate the fish lock, typically operated by an electro-hydraulic system with the lock operation controlled by PLC with SCADA links for remote controlling.</p> <p>The system comprises more automation and therefore is more susceptible to reliability issues and potentially high operational costs. Fish locks are more complex and are not suitable in situations where the differential in water level is greater than approximately 6 m e.g. The fish lock system was not feasible at Paradise Dam as a result of the significant height (37 m). The Urannah Dam is in the order of 80 m in height, and as such the fish lock system is not suitable and has not been considered further.</p>
Fish lift	<p>The fish lift comprises a hydraulic and electrically powered system controlled by a PLC with remote SCADA access. The fish are attracted to a hopper by flows, where after some time, the hopper chamber closes and gantry crane lifts up the hopper via cables and a set of tracks on the dam wall. Once the hopper is on the other side, the hopper trapdoor opens and the fish are released.</p> <p>This rail and gantry system is more readily constructed on a concrete/RCC dam option. For an earth and rockfill embankment, it is expected that the system would be a greater challenge. The gantry and rail system would require installation of concrete footings along the batter which would be susceptible to the normal settlement of the embankment. It is not known if fish lifts have been successfully installed on an embankment type dam in the past, so it is expected that this option would require some innovation and trialling to be successful. Similar to the fish lock system, automated systems are expected to reduce the reliability and incur higher operational costs.</p>

Option	Description
Fully manual system (i.e. Trap and haul)	<p>The fully manual system is a system which removes any mechanical or otherwise structures built into the dam or surrounds. Essentially the system comprises the following steps:</p> <ul style="list-style-type: none"> • Fish trap installed on either side of the dam • After some period of time a reservoir operator manually removes the fish trap and transfers it to the other side of the dam • The above steps are repeated for the traps on both sides of the dam. <p>The benefit of this option is that all mechanical automation parts are removed, apart from simple fish traps and cables to reel them in. A minor lifting winch mechanism may be installed to assist in reeling/lifting the traps out of the water. This option is likely to be the cheapest, though it is not automated and does require physical presence each time the traps are to be transferred which may make it less efficient and potentially harmful to the fish.</p>

Preliminary evaluation concluded that the preferable fish passage options included both trap and haul and a fish lift.

While further studies and engagement with Queensland Fisheries will be undertaken to determine feasibility of fish passage options, the following high-head dam examples provide important insight into current capabilities and limitations associated with the fish lift and trap and haul types of fishways:

- Hinze Dam, Queensland (height: 93.5 m) – trap and haul
- Paradise Dam, Queensland (height: 37.1 m) – fish lock (adaptation of fish lift)
- Wyaralong Dam, Queensland (height: 93.5 m) – fish lift.

International examples of fish lifts and fully manual fish passage systems include:

- Rocky Reach Dam, Washington (height: 38 m) - fish collection and bypass system (adaptation of trap and haul)
- Upper and Lower Baker Dams, Washington (height: both 86 m) – trap and haul (juvenile downstream passage) and fish lift (adult upstream passage)
- Cushman Dam, Washington (height: 71 m) - trap and haul
- Cougar Dam, Oregon (height: 158 m) – trap and haul.

3.3.2 Water distribution network

The proposed water distribution network includes four main components as shown in Table 3-5.

The instream distribution network would involve instream delivery from Urannah Dam to Bowen Weir via the Broken and Bowen Rivers. New pump sets would be required to lift water from the Bowen Weir pool to piped distribution networks on the right and left banks. The existing GOSS and associated pumps would be used to service the left bank wherever possible. Works would involve:

- River pump stations on both sides of the river banks at Bowen Weir
- Sourcing electricity to the site
- Adding an outlet structure to the existing GOSS.

The precise location of the water distribution network is yet to be determined following additional studies which will identify the most suitable alignments. The current indicative locations are shown in Figure 3-4. For the purpose of the IAS a 500 m corridor has been selected for further studies.

Table 3-5 Summary of water distribution network components

Component	Length (km)	Supply amount (ML/annum)	Users
Instream distribution	Follows natural course of river	90,000	Mining customers at Collinsville and Newlands Proposed new irrigation precinct along the Bowen River near Collinsville
Peter Faust Dam pipeline	66.5	20,000	Industrial Urban Agricultural
Eungella Dam pipeline	17.4	20,000	Industrial
Moranbah pipeline	150.4	20,000	Industrial

3.3.3 Irrigation precinct

The development of an irrigated agricultural development area of up to 25,000 ha is proposed. This is located along the Bowen River around Collinsville producing high-value crops. The irrigation precinct would incorporate on farm infrastructure and trunk delivery infrastructure (distribution channels and distribution pipes) as shown in Figure 3-4. Subject to determination of crop types in stream weirs/pumping pools and/or off-stream storages may be required.

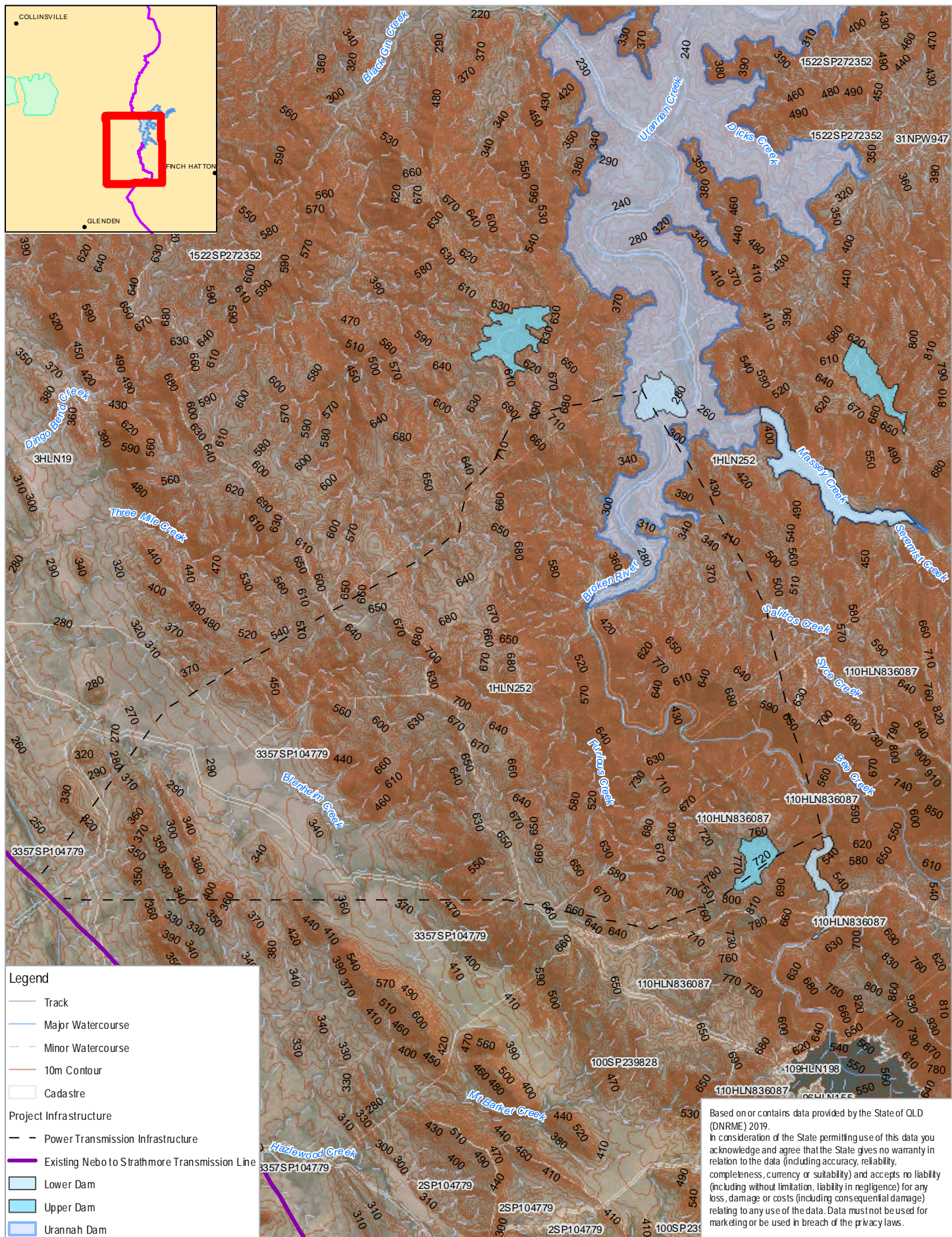
3.3.4 Pumped hydro-electric power scheme

Three locations have been identified for a PHES. Each PHES Figure 3-5 provides concept layouts and Table 3-6 summarises the feasibility of each pumped storage option described below:

Table 3-6 Pumped storage options feasibility

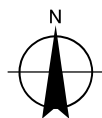
Description	PHES1	PHES4	PHES7
Upper Dam			
Embankment volume (Hm ³)	2	1.4	1.3
Embankment height (m)	68	70	52
Type	CFRD	CFRD	CFRD
FSL (RL)	603	586	744.6
Minimum operating level (RL)	599.3	552	725
Live volume (GL)	4.25	9.9	6.5

Description	PHES1	PHES4	PHES7
Lower Dam			
Embankment volume (Hm ³)	0.09	0.2	0.06
Embankment height (m)	21	20	51
Type	Concrete gravity	Gravity Concrete	RCC
FSL (RL)	279.2	300	473.9
Minimum operating level (RL)	266	280	435
Power Station			
Energy stored/ cycle (MWh)	3,375	6,980	4,333
Waterway length (km)	3	2.9	0.95
Rated head, generating (m)	321.6	273	275.4
Rated flow, generating (m ³ /s)	92	108	108
Rated flow, pumping (m ³ /s)	78.9	95.3	74.3
Rated power x no units (MW)	250 x 2	250 x 4	250 x 2



Paper Size ISO A4
0 1 2 3 4
Kilometres

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



Bowen River Utilities
Urannah Project

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PHES options concept

FIGURE 3-5

3.3.5 External infrastructure requirements

Ancillary works and infrastructure to support the development of the Urannah Project are likely to include, for example, quarries and borrows, road and access development and upgrades, site establishment areas, laydowns, site amenities and accommodation, services and utilities (including electricity, telecommunications).

The most suitable access to the proposed Urannah Dam site is along the left bank from both Eungella and Collinsville. At present, access to the proposed right abutment involves crossing the river downstream of the dam on a damaged causeway, which would be inaccessible during flood events and is in need of replacement. A bridge over the narrower, spillway chute and access to the dam crest between the spillway and river will be required. A 5 m wide multi-span spillway bridge consisting of prestressed concrete beams on concrete piers 12 m apart and concrete deck to provide single lane heavy vehicle access is proposed for the project.

An early works package is proposed to identify the requirement for additional temporary and/or permanent access, with this information to be further considered during project planning and assessed as part of the EIS.

Access to the pipeline corridors, irrigation precinct and PHES will be via existing roads and access tracks as far as practicable. Additional access will be considered in project planning and assessed further as part of the EIS.

The power supply for the dam will be sourced via the existing 11 kV supply line from Eungella Dam. The power supply will be required to operate predominantly the gantry structures for lifting and placing the trash screens and bulk heads as well as actuating valves. Components included for power supply at Urannah Dam comprise the following:

- Mains power supply cables
- Main switchboard
- Control panel
- Switch room housing
- Switch room light and power
- Outlet works cabling
- 50 kVA pole mount substation at storage
- Core 11 kV cables underground at dam.

The above items are essential to the operation of the outlet works including communication of the valve position and Supervisory Control and Data Acquisition telemetry system.

The irrigation precinct will require power supply to irrigation lift pumps proposed for the Bowen River Weir. The area, up to 25,000 ha, requires a pumping electrical load of 5.7 MW (SMEC, 2018).

The existing Ergon Energy network in the Collinsville - Bowen River Weir area is a 33 kV wood pole construction overhead power line. A preliminary review of existing capacity at Bowen River Weir is limited to 2 MW. Given the scheme requires 5.7 MW the existing network cannot support either scheme.

A new dedicated 33 kV feeder from Collinsville Substation is therefore required to get a network supply to the Bowen River Weir for the irrigation scheme and assessment of alignment will be refined subject to consultations with energy providers, detailed design and land tenure, and will be subject to environmental, social and cultural heritage assessments as part of the EIS.

The PHES will require a connection to Powerlink's dual-circuit 275 KV transmission line between Collinsville and Nebo and associated transformation infrastructure.

3.4 Timeframe for the project

For the purpose of the IAS, the construction of the project is expected to commence in 2022 and will take approximately two years to complete. Further specific information relating to potential timeframes for the project will be provided in the EIS for the project.

3.5 Construction and operational processes

3.5.1 Construction

Construction of the project will typically involve the following activities:

- Acquisition or land agreements across various tenures, including exploration and mining tenure as discussed further in Section 4.2.
- Development of suitable access roads which can manage heavy vehicles
- Land clearing in construction areas
- Establishment of batching plants, vehicle service areas and a quarry or borrows for construction materials
- Heavy earthworks and excavation at the proposed Urannah Dam site with creation of diversion channel or conduit to by-pass excavation
- Construction of dam wall, PHES, water distribution networks and associated infrastructure
- Inundation of land within the Urannah Dam water storage area
- Creation of irrigation precinct including field development, fencing, irrigation set-up and associated infrastructure
- Establishment of temporary services including power supply, fuel storage and water supply facilities.

Existing council and state controlled road networks will likely be the main mode of transportation for machinery and infrastructure during construction.

Waste and stormwater management for the construction and operation of the project will be discussed further as part of the EIS and will be managed in accordance with conditions of approval and government guidelines and policies.

The excavation of quarry material will likely be required for the construction of the dam at Urannah. As such, there is intention to require excavation of material on State land under the *Forestry Act 1959* (Forestry Act) (*Quarry Sales Permit*). DAF, through its Forest Products unit, administers the allocation and sale of this State-owned quarry material.

As defined by DAF, State land is defined as State forests; timber reserves; forest entitlement areas; land leased under the *Land Act 1994* (Land Act) in perpetuity or for a term of years and includes pastoral leases, stud holdings, grazing homestead perpetual leases, special leases, development leases (issued on or after 31 December 1991), term leases, perpetual leases, and other lands administered under the Land Act such as trust lands (i.e. reserves and deeds of grant in trust), permits to occupy, occupation licences, roads, including road licences and unallocated State land. The tenure of the project area, specifically the Urannah Dam and inundation area, is lands lease. As such, Quarry material may only be used by the leaseholder, provided the quarry material is not removed from the State land. Use of quarry material for any other purpose may require authorisation and issue of a

sales permit to get quarry material under the Forestry Act. Removal and use of quarry material for other purposes without authorisation is an offence under the Forestry Act.

Additionally, a State forest reserve is located approximately 14 km east of Urannah Dam and State land is mapped approximately 26 km southwest of Urannah Dam (located on Lot on Plan 1CP866146). These areas may also provide suitable material for extraction and transport to the project area.

To gain authority to search for State-owned quarry material administered under the Forestry Act, the proponent will obtain a permit to search from DAF. The permit to search allows the proponent to sample, dig and or drill potential quarry resources to determine the properties and the extent of the resource. However a permit to search does not provide any future rights to a resource and the results of the search need to be made available to the State.

Further specific information relating to construction methods will be provided in the EIS for the project.

3.5.2 Operation

The operation of the project will involve the following:

- Frequent use of access roads by worker and transport vehicles, particularly surrounding the irrigation precinct
- Regular and seasonal agricultural operations within the irrigation precinct including cropping, harvesting and fertilising
- On-going maintenance of infrastructure including PHES, dam and water distribution networks
- Water storage and operational releases
- Generation of hydropower via PHES for on-site and export to the NEM
- Revegetation of cleared areas where applicable.

Further specific information relating to the operational aspects of the project will be provided in the EIS for the project.

3.6 Workforce requirements during construction and operation

A large workforce is predicted to be required for the project with employment opportunities for Traditional Owners, residents and locals from the region during the construction and operational phases of the project, and further opportunities to upskill local employees for future work.

Preliminary analysis indicates that Urannah Project is expected to support up to 675 operational per year from ongoing stabilised operations after the ramp up period. Through the four year construction period the project will support up to an estimated 1,200 jobs per.

Due to the remote locality of the project area, it is anticipated that the primary construction workforce will need to be accommodated in on site workers accommodation.

Workforce accommodation associated with the agricultural development has potential to be accommodated in the longer-term in regional centres such as Collinsville. Subject to crop types and mixes, seasonal fluctuations may be experienced.

Fly-in fly-out (FIFO) and/or drive-in drive-out (DIDO) during construction, through local regional centres will be considered as part of the social impact assessment (SIA) in the EIS and to inform the DBC. Operational housing needs will be quantified.

Additionally, the project has capacity to provide access to a bulk water supply to support the growth of the agricultural industry. The additional resources will increase agricultural productivity creating a number of additional agricultural employment opportunities. This will result in other regional opportunities and will aid in population growth and vitality. Additionally, the project will provide access to a bulk water supply for the mining industry, which in turn will also provide opportunities for employment and growth to the region.

3.7 Economic indicators

3.7.1 Value of project

The Urannah Project's capital expenditure is estimated at \$2.9 billion. The project delivers against three key elements in water, energy and food. The capital cost estimates (2018) for the individual components include:

- Water and distribution project made up of \$673 million for the dam and \$416 million in pipelines
- Food precinct (irrigated agriculture) with a development cost of \$265 M
- Renewable hub totalling \$1.582 billion.

The EIS will apply to all three elements however each area will be financed separately. UWS will discharge its responsibilities under the National Water Infrastructure Development Fund grant for the water infrastructure only.

Further economic analysis and demand assessments will be undertaken for the project during the development of the EIS.

3.7.2 Delivery model

It is expected that the project will be disaggregated with packages of work comprising:

- Construction of Urannah Dam and associated water distribution network
- Development of the irrigated agricultural precinct and associated distribution network
- Construction of a PHES.

Traditional and non-traditional delivery models have been identified and assessed for the project (BCE, 2019). The PBC indicates that there is an appetite for partnering and further investigations are underway and will be reported on in the EIS.

4. LOCATION OF KEY PROJECT COMPONENTS

Project components are located across three local government areas:

- Mackay Regional Council – Urannah Dam, water distribution network and pumped hydro-electric power scheme
- Whitsunday Regional Council - irrigation precinct
- Isaac Regional Council – Water distribution network.

The project will cover a variety of land tenure parcels including leasehold, freehold, reserve and state land. There are also a number of exploration permits and mining leases within the project area.

All land in the proposed Urannah Dam inundation area is currently used for grazing native vegetation. Areas immediately upstream of the inundation area are designated for conservation and include Eungella National Park.

Native title exists over parts of the project area.

4.1 Location

The Urannah Project is located across three LGAs:

- Mackay Regional Council (MRC) – Urannah Dam, water distribution network and PHES
- Whitsunday Regional Council (WRC) – Irrigation precinct
- Isaac Regional Council (IRC) – Water distribution network.

The Urannah Dam is located at adopted middle thread distance (AMTD) 36 km on the Broken River. The township of Collinsville is located approximately 68 km to the northwest. Eungella Dam, an existing dam owned and operated by Sunwater Limited, is located upstream on the Broken River at AMTD 79 km.

The dam site can be accessed using conventional 4WD vehicles via a private property downstream of the dam site and to the east of the Nebo-Collinsville Road. The farm tracks are unsealed and suitable for high clearance 4WD vehicles.

The Urannah Dam inundation area will primarily inundate Urannah Creek, the Broken River and Dicks Creek. Sections of Massey Creek and Ernest Creek will also be inundated, as will a number of lower order streams and creeks. All land in the proposed dam inundation area is currently used for grazing native vegetation. Areas immediately upstream of the inundation area are designated for conservation and include the Eungella National Park.

The location of key project components are shown in Figure 1-1. Real property descriptions for key project components are discussed further in Section 4.2.

4.2 Tenure

Site location and tenure details are shown in Figure 4-1 and described in Appendix A.

Potentially impacted properties are held under a variety of tenure arrangements including freehold, reserve or leasehold tenure, as well as unallocated state land.

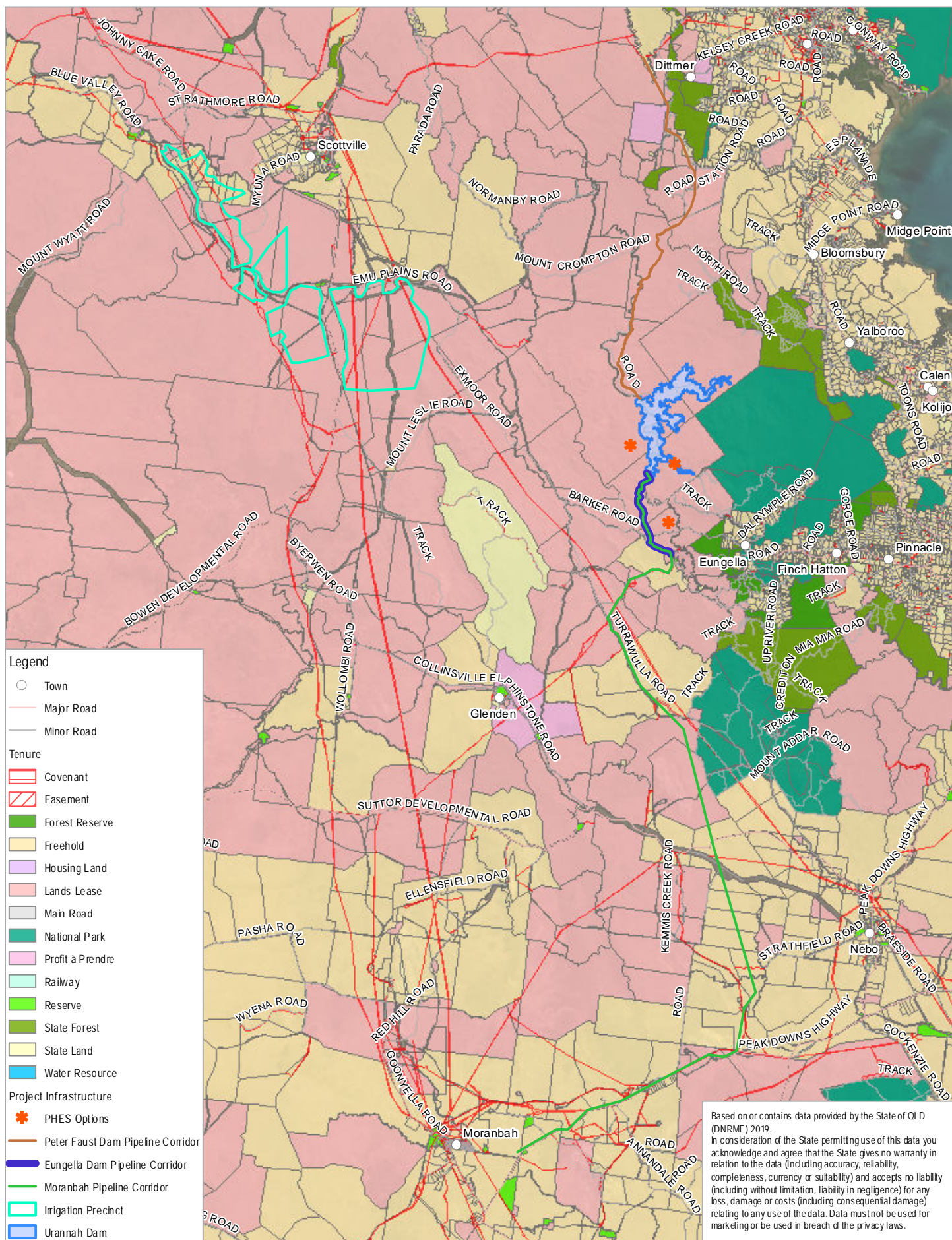
There are multiple exploration permits which exist over the broader area around the proposed project site. These include exploration permits for coal, minerals and petroleum. There are also several mining leases which exist within close proximity to the proposed water distribution network and the PHES. Mining tenure within the project boundary is shown in Figure 4-2.

4.2.1 Native title

Native title continues to exist in relation to the land on which the Urannah Dam is proposed to be located and on some land proposed for the northern and southern pipeline corridors. Native title over the western portion of the project area has been determined in favour of the Birriah People of the Birri Gubba Nation. The Widi People of the Nebo Estate #1 have lodged a native claim over the eastern portion.

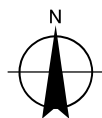
The Birriah People also hold native title over the proposed irrigation precinct.

Native title over the project area will be investigated further as part of the EIS.



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Kilometres

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

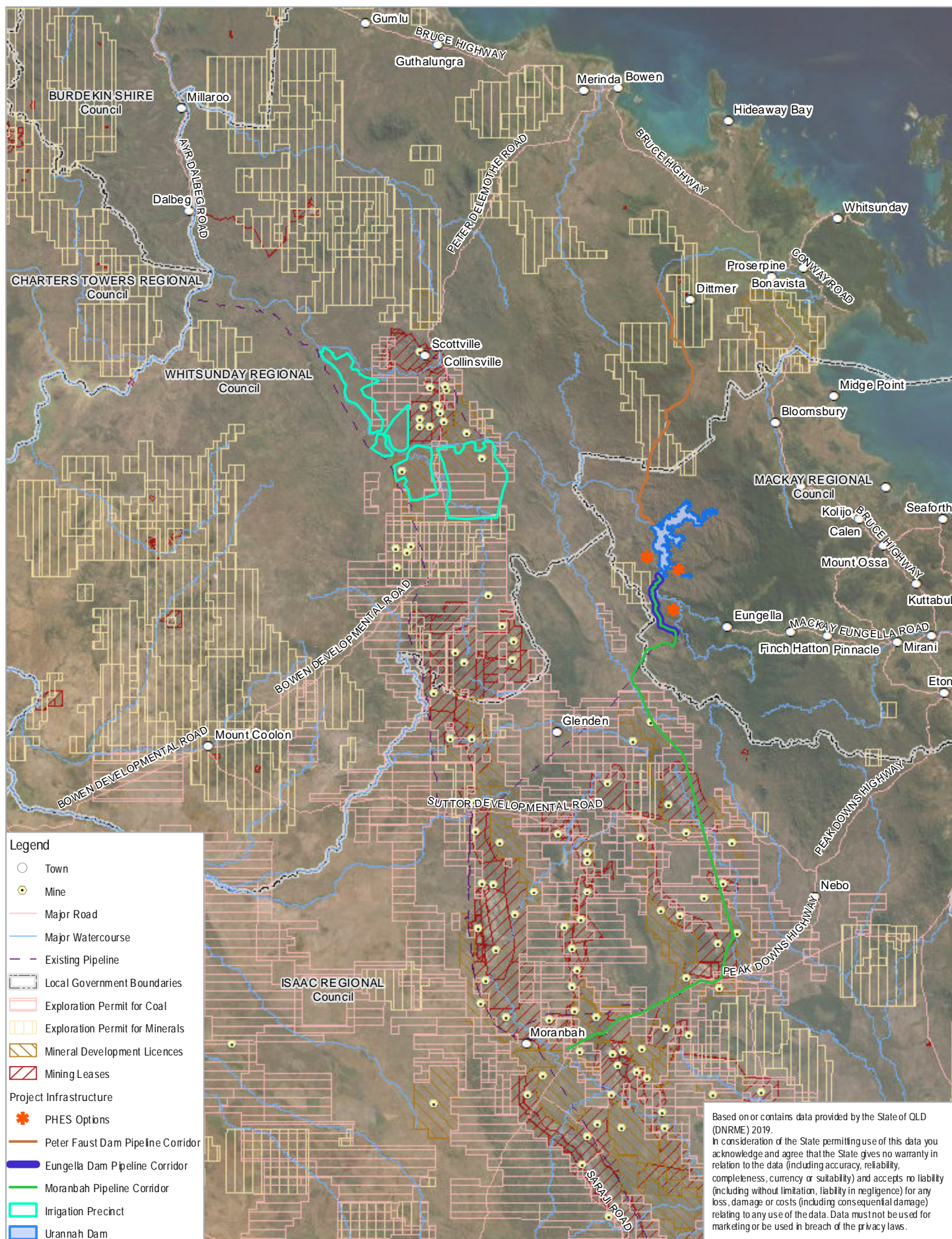


Bowen River Utilities
Urannah Project

Tenure

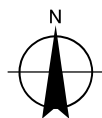
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FIGURE 4-1



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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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Mining tenure

FIGURE 4-2

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

The project is located within the Burdekin region and covers a collective area of more than 34,000 km². The topography includes mountain ranges, low-lying hills, and flood plains, with various geology and soils throughout the project area.

The climate is tropical, sub-humid with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The Burdekin Basin has the largest mean annual discharge in Australia and is a tributary to the Great Barrier Reef.

Matters of State environmental significance predicted to occur within, and in the vicinity of the project areas include:

- Regulated vegetation that comprises prescribed regional ecosystems
- Connectivity areas where prescribed regional ecosystems contain remnant vegetation and cover an area required for ecosystem functioning
- Wetlands and watercourses
- Protected wildlife habitat (for flora and fauna)
- Protected areas, including Eungella National Park located within close proximity to Urannah Dam
- Waterways providing for fish passage where construction, installation or modification of waterway barrier works will limit the passage of fish along the waterway

Regulated regrowth vegetation is mapped within Category C and Category R areas within the project areas.

Matters of National environmental significance predicted to occur within, and in the vicinity of the project areas include:

- World heritage properties and National Heritage places, being the Great Barrier Reef World Heritage Area
- Listed threatened species and ecological communities
- Migratory species.

There is a high probability of Indigenous cultural heritage being present within the project area. A Cultural Heritage Field Assessment will be conducted and a Cultural Heritage Management Plan will be developed in accordance with the provisions of the *Aboriginal Cultural Heritage Act 2003*.

Land use is mainly grazing of native pastures, with dryland cropping, sugarcane, horticulture, mining and urban centres making up the remainder.

5.1 Desktop assessment

The following sections have been developed through desktop assessment of readily available Commonwealth and State databases and mapping, in particular the PBC (BCE, 2019) and supporting technical studies and assessments.

5.1.1 Feasibility study investigations

A number of investigations have been completed as part of the feasibility study and are described in Table 5-1. Additional investigations will be required to facilitate the EIS and subsequent approvals for the project.

Table 5-1 Completed investigations and assessments

Report title	Author	Date	Description
Urannah Water Scheme Draft PBC	BCE	Jan 2019	The draft PBC was completed to evaluate options for the project as an additional water supply for the region.
Urannah Water Social Impact Evaluation	PWC	Jan 2019	The social impact evaluation was prepared to identify the social impacts for the proposed project.
Dam and Spillway Options Report - Urannah Dam Feasibility Study	SMEC	Jan 2019	The dam and spillway report was completed to compare feasibility of dam design and identify acceptable flood capacity.
Final Geology Report - Urannah Dam Feasibility Study	SMEC	Jan 2019	The geology report was prepared to summarise the geological investigations undertaken to support the development of the feasibility dam design and project risk assessment.
Hydropower and Pumped Storage Options Report - Urannah Dam Feasibility Study	SMEC	Jan 2019	The hydropower and pumped storage report was prepared to assess high-level options considered for the project including viability of further development.
Yield Hydrology Report - Urannah Dam Feasibility Study	SMEC	Nov 2018	The yield hydrology report was prepared to assess the yield of Urannah Dam for a range of demands and dam sizes.
Flood Hydrology Report - Urannah Dam Feasibility Study	SMEC	Jan 2019	The flood hydrology report was completed to estimate extreme flows (up to 1% or 1-in-100 year annual exceedance probability) into the dam in order to inform design of the dam and spillway.
Water Distribution Options Report - Urannah Dam Feasibility Study	SMEC	Feb 2019	The water distribution report was prepared to identify and assess preferred options of water distribution for industrial and urban supply.
Review of Environmental Factors - Urannah Dam Feasibility Study	SMEC	Jan 2019	The review of environmental factors (REF) was prepared to identify any significant planning, environmental and social risks associated with the development of the proposed Urannah Dam and

Report title	Author	Date	Description
			the associated agricultural / infrastructure development.

5.1.2 Desktop searches

Desktop searches of environmental databases were carried out for the project area including:

- EPBC Act Protected Matters Search Tool for Commonwealth protected MNES within a 1 km search extent, accessed March 2019
- Queensland Government Wildlife Online Database for previous records of flora and fauna species within 1-3 km search extents, accessed March 2019
- Queensland Government Regulated Vegetation Management Mapping, version 10.1, for mapped regional ecosystems (REs) regulated under the *Vegetation Management Act 1999* (VM Act), accessed March 2019
- Queensland Government Essential habitat mapping, version 4.39, for listed threatened species habitat regulated under the VM Act, accessed March 2019
- Queensland Waterways for Waterway Barrier Works GIS data layer to identify waterways with a risk of impact, which may require approvals under the *Fisheries Act 1994* where structures within the waterway are considered to restrict fish passage, accessed March 2019.
- Department of Science, Information Technology and Innovation RE Description Database, accessed March 2019
- Queensland Government Protected Plants Flora Survey Trigger mapping showing high-risk areas around protected plant records that require a flora survey, accessed September 2019
- DNRME Mines Maps Online for geology and soil type in the area or publically available geological information for the region (including acid sulphate soils), accessed March 2019
- Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) cultural heritage database for known sites of cultural heritage significance, accessed March 2019
- The Queensland Heritage Register and local governments' heritage register, accessed March 2019
- State Planning Policy interactive mapping system to identify MSES, accessed March 2019
- State Assessment and Referral Agency (SARA) online mapping, accessed March 2019.

5.2 Natural environment

The following sections provide an overview of the existing natural environment in the general project area. Appendix B provides further detailed descriptions of the existing natural environment of relevance to each key project components.

5.2.1 Topography, geology and soils

5.2.1.1 Topography

The project is located within the Burdekin region, spanning across the Bowen River drainage sub-basin, Proserpine River drainage sub-basin and Isaac River drainage sub-basin; a collective area of over 34,000 km². The topography of the area is highly variable including mountain ranges, low lying hills and flood plains. The Clarke Range, which forms part of the Great Dividing Range, is situated to

the east of the project area with the proposed dam footprint located within the steep valley on the Clarke Range periphery. The land to the west of the Clarke Range gradually decreases in topographic variability, with the proposed irrigation precinct located primarily within an expansive lowland plain.

Key topographic information for the project area includes:

- Highly variable elevation throughout the entirety of the project area; between approximately 100 m AHD and 700 m AHD
- Elevation is most variable within the irrigation precinct and Peter Faust Dam pipeline corridor
- In most project areas stream flows are constrained by steep valley walls.

The existing topography and landform in the project area will be investigated further as part of the EIS.

5.2.1.2 Geology

Urannah Dam is located on the Broken River, which generally runs parallel to the eastern boundary of the Bowen Basin. The oldest rocks on the eastern limb of this basin are the lower Bowen volcanics of Lower Permian age, and these are exposed for approximately seven kilometres along the Broken River upstream of its confluence with the Bowen River.

The rocks belong to the Carboniferous to Mesozoic aged Urannah Igneous Complex, consisting of various intrusions, including diorite, granodiorite, adamellite and granite, with some basic to ultra-basic components, all intruded by several generations of acid to basic dykes. Most dykes strike north-north-west with steep to vertical dips, but some strike normal to that direction.

Key geological information for the project area includes:

- Surface geology is highly variable throughout all project areas, excluding the PHES which has a relatively small project extent and predominantly granite geology
- Granite and volcanic geological compositions are most common throughout the entirety of the project area.

Geotechnical investigations will be undertaken as part of the EIS to more accurately determine geological formation within the project area to inform design.

5.2.1.3 Soils

The soils in the Burdekin region are varied, with extensive areas of moderately productive but fairly erodible red duplex soils, widespread highly productive black and red clays derived from basalt, and large areas of poor to moderately fertile sands and earths.

Large areas also have highly erodible dispersive soils. The Bowen sub-catchments have the highest rate of erosion due to exposed subsoils, indicating a significant loss of topsoil into the waterways as indicated by tracing data (Lewis et al., 2015).

Key soil information for the project includes:

- Clay-heavy, cracking or non-structured soils are dominant in all project areas
- Soils are most variable across the Moranbah pipeline corridor
- The irrigation precinct is primarily classified as Class A or Class B agricultural land under the *Regional Planning Interests Act 2014*.

The proposed irrigation precinct is located within land nominated as suitable for agriculture. In general, the Mackay, Isaac and Whitsunday Region is one of Queensland's most productive regions. The local

economy is primarily founded on agriculture and mining, with large areas also representing greenfield sites used for grazing in dense, native vegetation.

The Queensland Agricultural Land Audit (2013) (WALI 2.0) maps land within the project's proposed irrigation precinct as being suitable for:

- Potential broadacre cropping
- Potential annual horticulture
- Potential perennial horticulture
- Potential sugarcane area
- Potential intensive livestock
- Potential native forestry.

Current land uses indicate the suitability of an irrigation precinct for agriculture, with this land use consistent with surrounding industry.

Soil investigations will be undertaken as part of the EIS as relevant and across targeted areas to identify soil properties and composition within the project area.

A desktop assessment of potential contaminated lands was also undertaken, with no identified contaminated sites within the project area. Additional contaminated land investigations will be undertaken as part of the EIS to more accurately determine contaminated land and allow for appropriate management.

5.2.2 Surface water resources

5.2.2.1 Hydrology

The Burdekin Basin is the second-largest river basin in Australia; it has the largest mean annual discharge (8,327,681 ML mean annual flow at Clare gauge 1976–2016) and is tributary to the GBRWHA. The waterways in the basin vary from largely sandy, dry ephemeral creek systems to permanently flowing clear-water rivers and creeks originating in mountain rainforest.

The Burdekin drainage basin covers an area of approximately 130,109 km² and comprises four major sub-basins:

- Upper Burdekin 36,244.7 km²
- Suttor 73,935.8 km²
- Bowen 9,451.6 km²
- Lower Burdekin 10,477.4 km².

Urannah Dam and its proposed inundation area are in the Broken River sub-catchment of the Bowen sub-basin. The Broken River, which is the main river that will run through the proposed Urannah Dam, joins the Bowen River at Bowen Weir, approximately 35.6 km downstream of the dam site. The Bowen River joins the Burdekin River at Blue Valley Weir and the Burdekin River then flows north and east into the Great Barrier Reef (GBR). There are five water storages along the Bowen/Broken River, with a total storage capacity of approximately 230,000 ML. The largest of the storages is Eungella Dam, which has a capacity of 112,400 ML and is on the Broken River approximately 20 km upstream of the Urannah dam inundation area and 42 km upstream of the Urannah dam site.

The Broken River and its tributaries are major contributors to the flow of water and water quality into the Bowen and lower Burdekin Rivers. There is a substantial rainfall gradient in the sub-catchment, from more than 4,000 mm a year at the top of Clarke Range (which encompasses Eungella National

Park and is upstream of Urannah Dam), to less than 600 mm a year near the junction of the Bowen and Broken Rivers. The mean annual rainfall at Urannah is 690 mm (43 years of records).

The Burdekin Basin is heavily influenced by variable inter-annual rainfall, with droughts and tropical cyclones (and associated flooding) approximately once every four years (SMEC, 2019a). It is probable that the construction of any dam wall on the Broken River will change the current downstream flow regime. The dam wall will allow small to moderate floods to be captured into storage and released as regulated flows to supply downstream users. Further detailed modelling and optimisation of operations will be required to determine the degree of downstream effects.

The mean annual discharge of the Bowen River upstream of its confluence with the Broken River is 105,278 ML, but downstream of the confluence at the Pump Station Gauge the mean annual discharge is 797,566 ML. The mean discharge of the Broken River at Urannah is 355,712 ML. No months with zero discharge have been recorded at Urannah. The highest monthly discharge recorded at Urannah is 729,948 ML in February 1991 (records from 1962- 1998).

Key hydrological information for the project area includes:

- The Peter Faust Dam pipeline corridor intersects with the O'Connell River and Proserpine River floodplains
- The Moranbah pipeline corridor intersects with the Bowen River and Isaac River floodplains
- The irrigation and instream distribution intersect with the Bowen River floodplain.

Hydrological assessments will be undertaken as part of the EIS to determine existing flows of the waterways within the project area.

5.2.2.2 Waterways

The Burdekin Region contains five river basins (Black, Ross, Burdekin, Haughton and Don) and eight major catchments (Burdekin, Don, Fitzroy, Haughton, O'Connell, Pioneer, Plane, and Proserpine) as shown on Figure 5-1.

The Bowen and Broken Rivers, two main waterways of the basin, are tributaries of the Burdekin River. They start 50 km from the coast and combine to flow north-west for 100 km. The Broken River flows from Mount Bruce, through a valley to Eungella Dam and then joins the Bowen River.

The confluence of the Broken and Bowen Rivers is approximately 35 km southeast of Collinsville. The Broken River has a total catchment area of approximately 2,300 km² and drains some of the high rainfall country in the Clarke Range to the northeast, and the lower rainfall country in the Broken River Range to the southwest.

The Broken River flows for about 113 km in a generally north westerly direction. Approximately 8 km upstream of its confluence with the Bowen River, the Broken River cuts through the Broken River Range and enters relatively mature, gently undulating country. Upstream of this point the topography is much younger, mountainous and highly dissected.

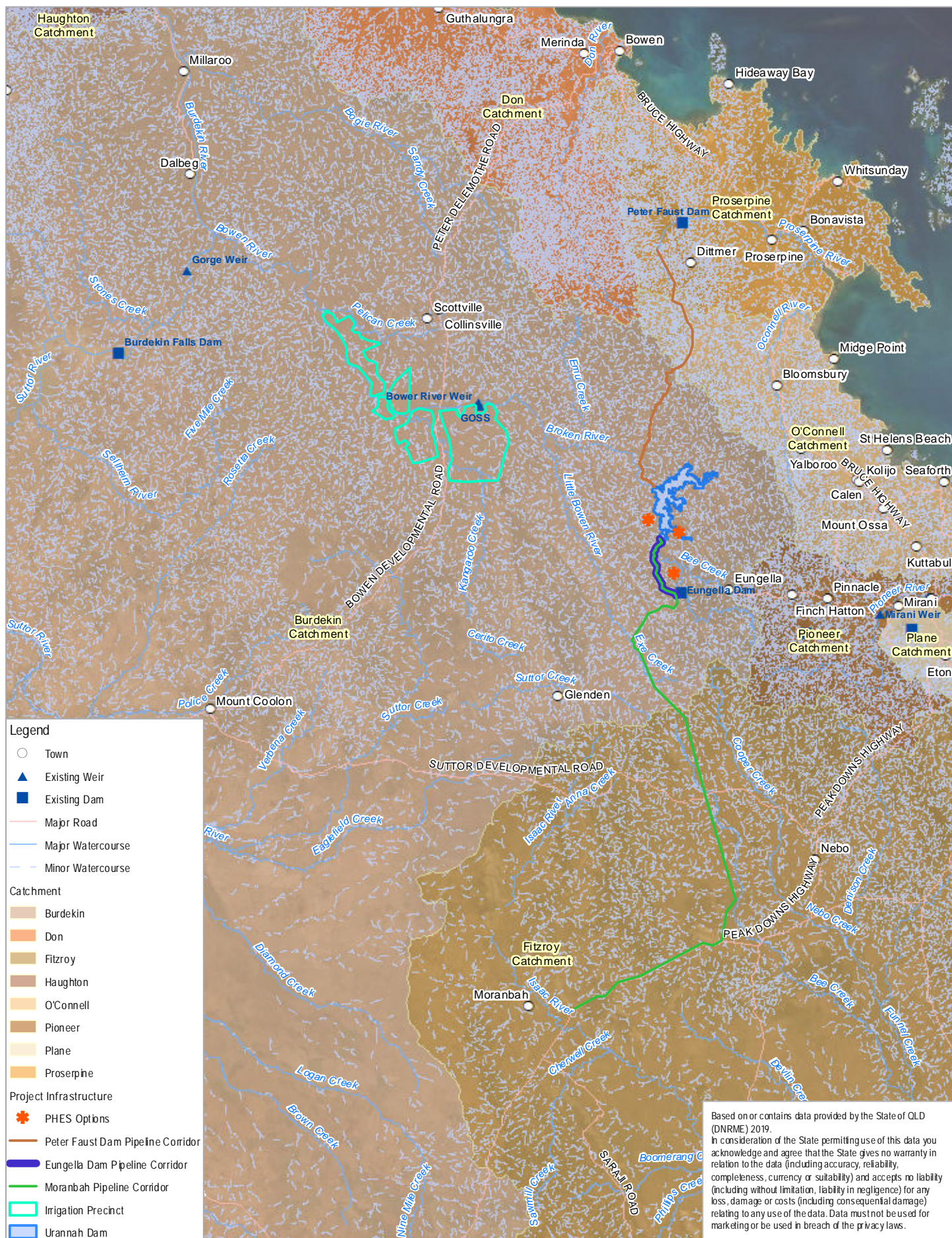
There are four major watercourses (Broken River, Bowen River, Exe Creek and Hail/Bee Creek) and a variety of minor waterways which intersect with the project as shown in Figure 5-1.

The key surface water information for the project area includes:

- The Broken River is the main watercourse which runs through the instream distribution and Urannah Dam and proposed inundation area
- All pipeline corridors span large distances and intersect multiple minor and unnamed waterways

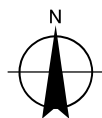
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- The Peter Faust Dam pipeline corridor crosses the Proserpine River and Broken River (major waterways)
 - The Eungella Dam pipeline corridor crosses the Broken River (major waterway)
 - The Moranbah pipeline corridor follows and crosses Exe Creek and meets Hail/Bee Creek (major waterways)
 - The instream distribution to Bowen Weir is proposed via the Broken and Bowen River.

Investigations into surface waterway values within the project area will be undertaken during the EIS process.



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Kilometres

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



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Water resources

FIGURE 5-1

5.2.3 Groundwater

Accessible information on groundwater in the vicinity of the proposed inundation area, and the Broken River sub-catchment, is limited. Past assessment of groundwater in the Bowen sub-basin is generally localised to irrigation, mining, or domestic use areas.

The key groundwater information for the project area includes:

- The proposed dam inundation area is not within a groundwater management area
- No registered bores are located within the Urannah Dam or the PHES areas
- Groundwater bores, both active and inactive, are present within all three pipeline corridors, however, construction and trenching of pipelines will not interfere with groundwater resources
- A large number of groundwater bores have been identified within the proposed irrigation precinct and further investigation will be required.

Investigation into the catchments and values of groundwater within the project area will be undertaken during the EIS process.

5.2.4 Water quality

Within the Burdekin Basin, major sources of sediment appear to be affecting water quality; originating from hill slope erosion along with gully and stream bank erosion. The Burdekin Region Water Quality Improvement Plan 2016 (WQIP) notes that the bulk of fine sediment delivered from the Burdekin Basin to the GBR is derived from a small portion of the basin, primarily the Bowen, Broken, Bogie and Upper Burdekin catchments, with a large proportion of this load from grazing lands.

The BFD traps a large portion of the coarse particles and some of the fine particles, however the Bowen Broken Bogie catchments contribute the highest loads of fine material due to gully erosion.

Water quality assessments, including water quality monitoring where necessary, will be undertaken as part of the EIS to determine existing water quality characteristics to inform the assessment undertaken as part of the EIS.

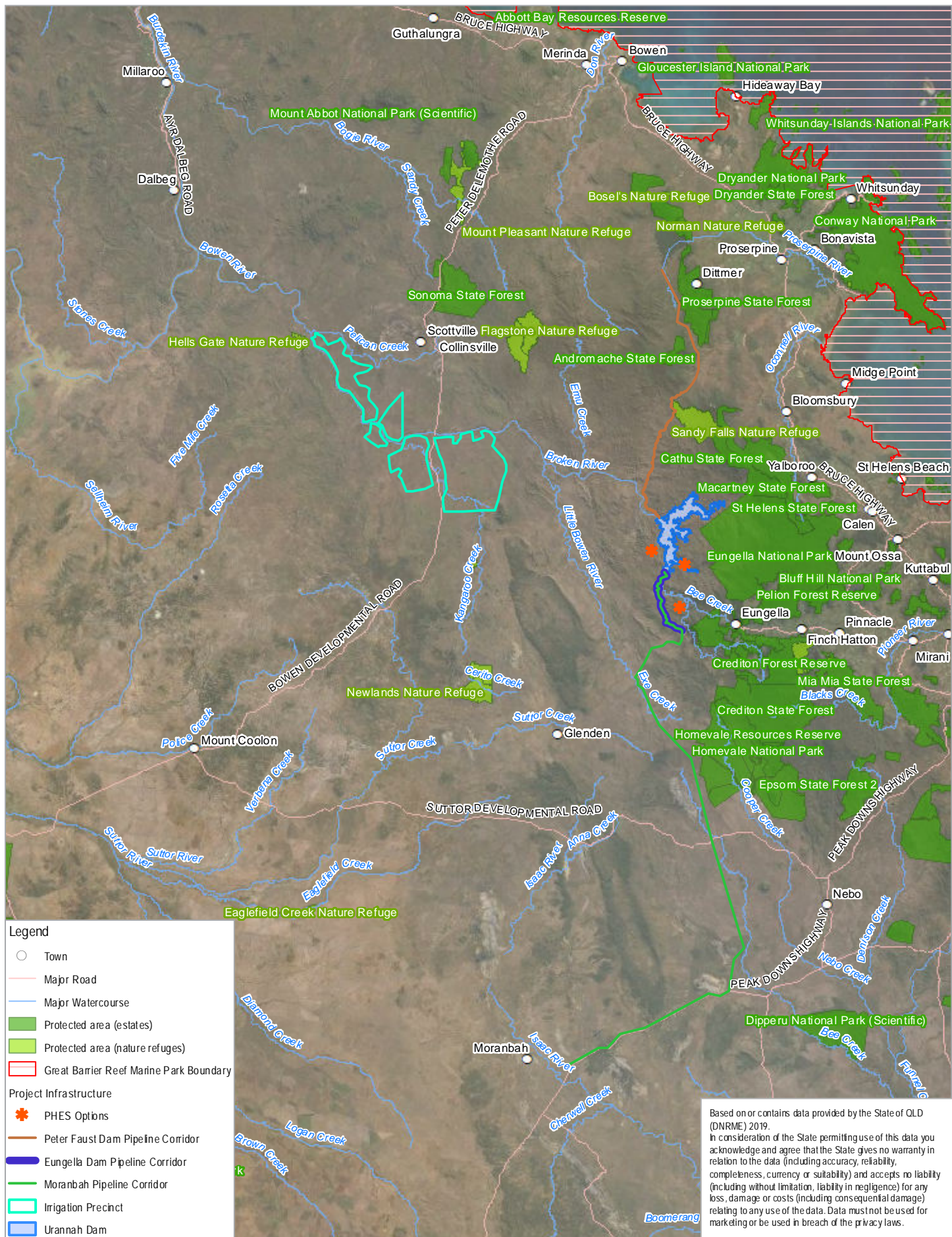
5.2.5 Sensitive environmental areas

5.2.5.1 Protected areas

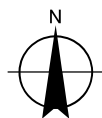
The Eungella National Park is a MSES protected area and is located within close proximity to the proposed Urannah Dam inundation area, approximately 1 km in some locations. All MSES areas proximal to the project boundary are shown in Figure 5-2.

No other protected areas (MSES estates/nature refuges) are located within the project footprint.

Ecology surveys will be undertaken as part of the EIS to evaluate the protected areas within close proximity to the project area.



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



Bowen River Utilities
Urannah Project

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Protected areas

FIGURE 5-2

5.2.5.2 Wetlands

There are no wetlands of international importance (Ramsar) identified in the project area.

The inundation area and lower PHES reservoirs along Urannah Creek, Dicks Creek, Ernest Creek and Massey Creek are mapped under the *Nature Conservation Act 1992* (NC Act) as being of very high riverine conservation significance, and the inundation area along the Broken River is mapped as being of high riverine conservation significance. These creeks and rivers form part of the Broken River, Urannah Creek and Massey Creek Aggregation, which is currently listed in the directory of nationally important wetlands and includes some of the least disturbed examples of riverine wetland in Central Queensland.

Other nationally important wetlands mapped within the vicinity of the project area include:

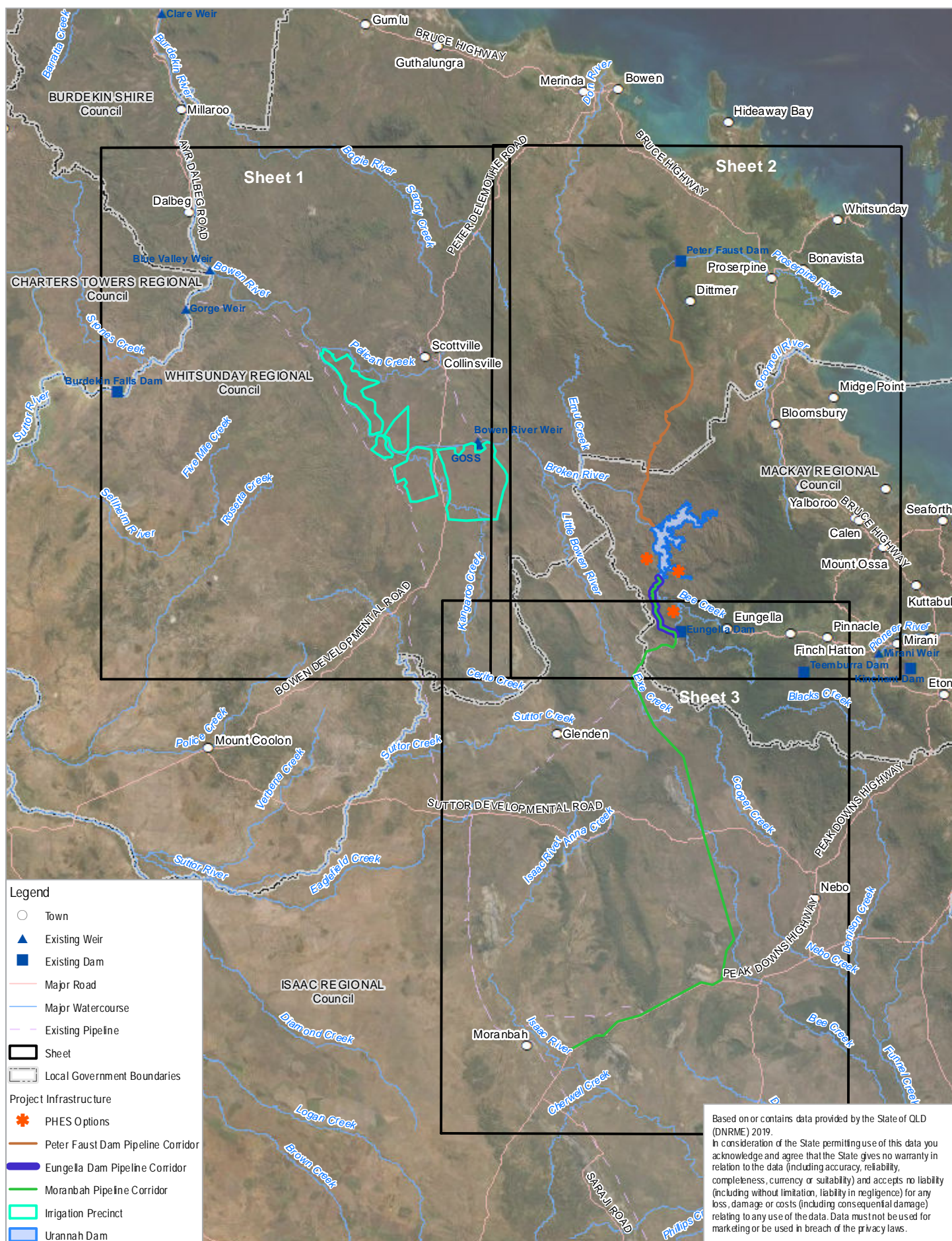
- Eungella Dam
- Bowen River: Birralelee Aggregation - Pelican Creek in the vicinity of the proposed irrigation precinct
- Burdekin-Bowen Junction and Blue Valley Weir Aggregation (irrigation precinct).

Nationally important wetlands within the project area and are shown on Figure 5-3.

Three wetland protection areas are mapped in and within close proximity to the proposed irrigation precinct. No wetlands of high ecological significance are mapped for the project.

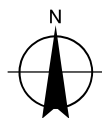
No wetlands or watercourses in high ecological value waters are mapped for the project area

Ecology surveys will be undertaken as part of the EIS to evaluate the wetland areas within close proximity to the project area.



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Kilometres

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

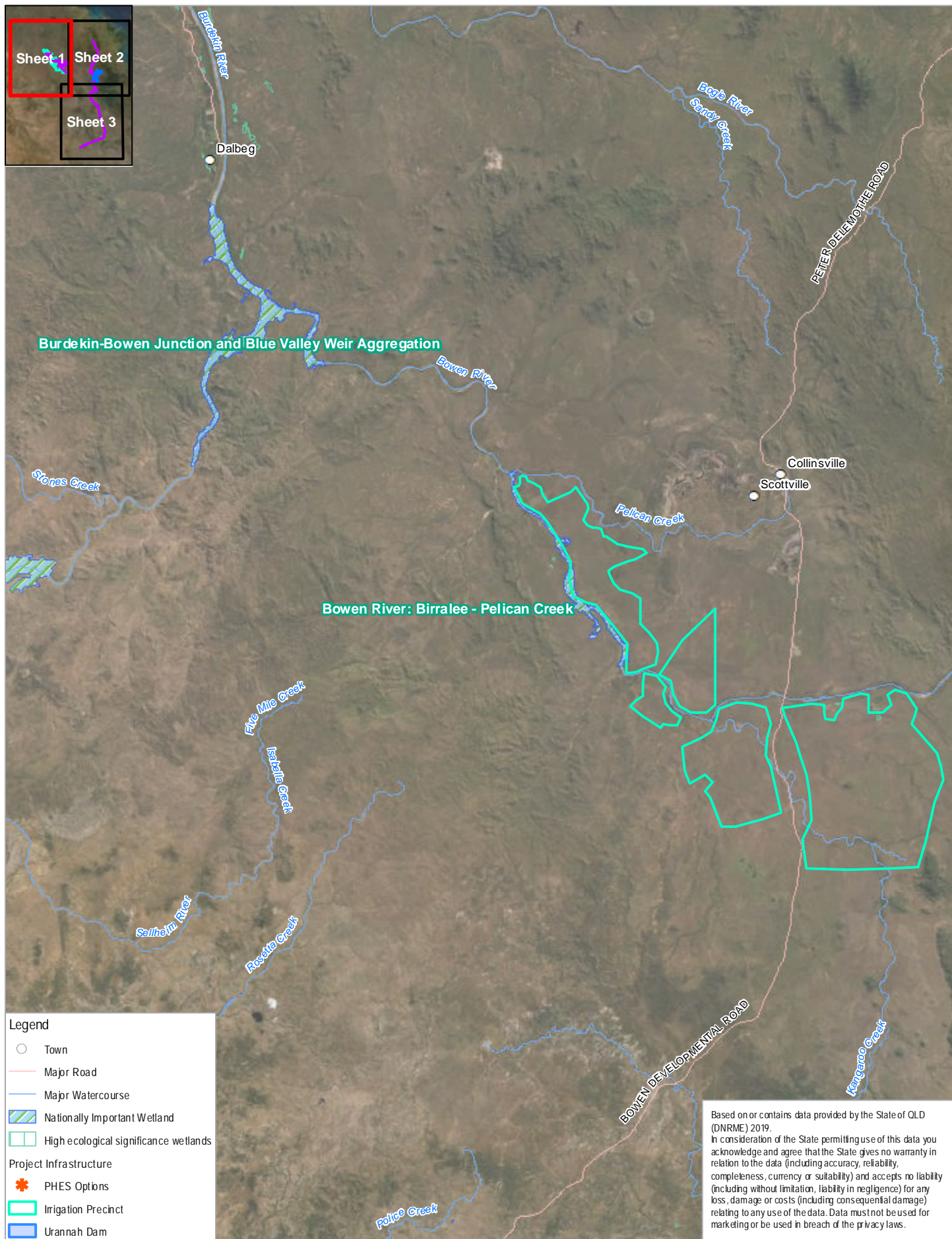


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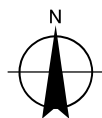
Wetlands - Overview

FIGURE 5-3



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Map Projection: Transverse Mercator
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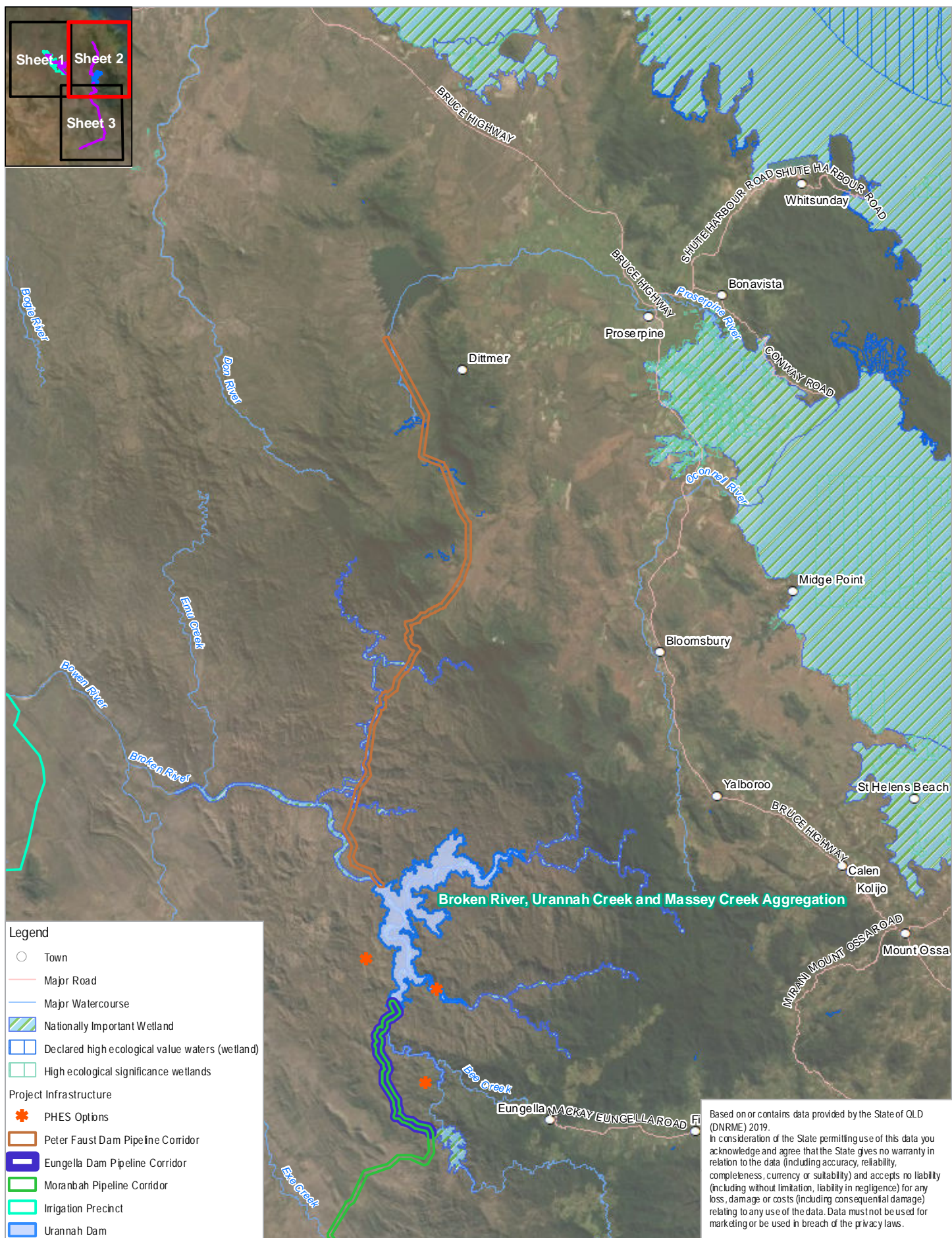


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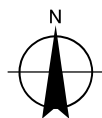
Wetlands

FIGURE 5-3
Sheet 1 of 3



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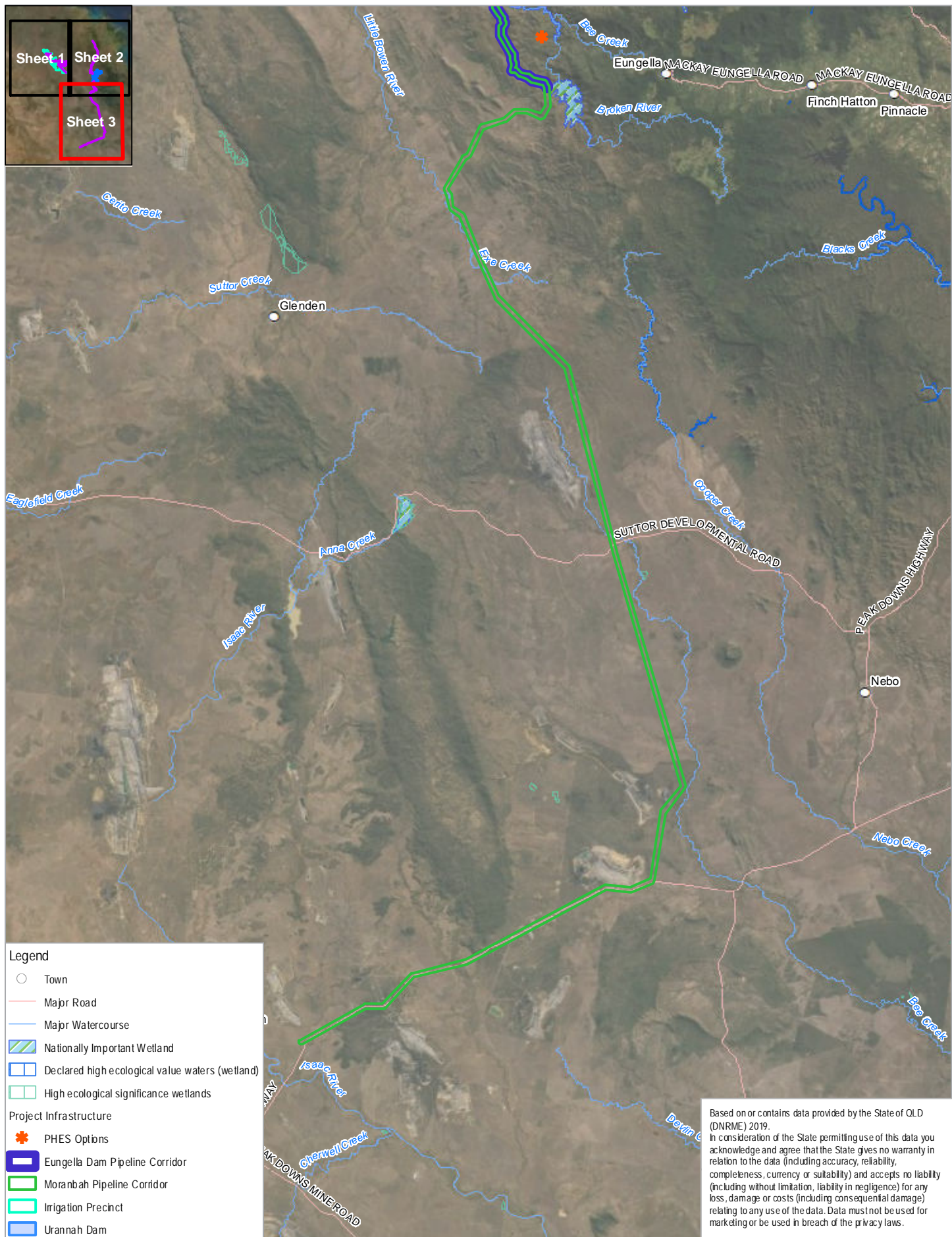


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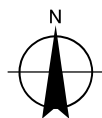
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FIGURE 5-3
Sheet 2 of 3



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Wetlands

FIGURE 5-3
Sheet 3 of 3

5.2.6 Terrestrial Ecology

5.2.6.1 Listed threatened species

An EPBC Protected Matters Search was undertaken in March 2019 for each key project component (2 km radius). The results of this search predict that four threatened ecological communities (TECs), 32 threatened species and 16 migratory species listed under the EPBC Act have the potential to occur in the project area. A preliminary likelihood of occurrence assessment has been undertaken for the project, shown in Appendix C. Table 5-2 summarises the species which are considered likely to occur. Ecology surveys will be undertaken as part of the EIS to confirm presence of listed species and their habitats in the project area.

Table 5-2 EPBC Act TECs and listed threatened species

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
TECs			
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	E	Moranbah pipeline corridor Inundation area	Two corresponding REs (11.3.1 and 11.4.9) are mapped as occurring within the proposed Moranbah pipeline corridor.
Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin	E	Moranbah pipeline corridor Inundation area	One corresponding RE (11.3.21) is mapped as occurring within the proposed Moranbah pipeline corridor.
Birds			
<i>Erythrotriorchis radiatus</i> (Red goshawk)	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Preferred habitat in the form of Eucalypt woodlands and open forest are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting being 19 km south west of the proposed Moranbah pipeline corridor. However, the species was recorded as occurring on the wildlife online search near the proposed Moranbah pipeline corridor.
<i>Geophaps scripta scripta</i> (Squatter pigeon)	V	Whole project area	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed Moranbah pipeline corridor. The closest recorded sighting is within 1 km west of the proposed Moranbah pipeline corridor.

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
			The species was also recorded as occurring on wildlife online within the proposed Moranbah pipeline corridor.
<i>Poephila cincta</i> (Black-throated finch (southern))	E	Moranbah pipeline corridor Irrigation precinct	Two corresponding REs (11.3.25 and 11.3.4) are mapped as occurring within the proposed project pipeline boundary and inundation area. There is a 2015 record of the species within the irrigation precinct (Birddata, 2015).
<i>Rostratula australis</i> (Australian painted snipe)	E	Peter Faust Dam pipeline corridor	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 25 km east of the Peter Faust Dam Pipeline.
Mammals			
<i>Dasyurus hallucatus</i> (northern quoll)	E	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor Inundation area	Preferred habitat in the forms of eucalypt forest and woodlands are likely to be present within the proposed project boundary. The closest recorded sighting of the species is also approximately 6 km east of the proposed Peter Faust Dam pipeline corridor.
<i>Macroderma gigas</i> (ghost bat)	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor PHES Inundation area	Essential habitat for the species is mapped with the proposed project boundary, however, the closest recording to the proposed project boundary is approximately 8 km east of the proposed Moranbah pipeline corridor.
<i>Phascolarctos cinereus</i> (koala)	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting being 1 km east of the proposed Peter Faust Dam pipeline corridor.

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
		Inundation area	Species was also identified on the wildlife online search as occurring within the proposed Moranbah pipeline corridor.
<i>Petauroides volans</i> (greater glider)	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor PHES Inundation area	Essential habitat for the species is mapped within the proposed project boundary and preferred habitat in the form of eucalypt forest and woodlands are likely to be present within the proposed project boundary. However, the closest recorded sighting for the species is approximately 50 km south of the proposed Moranbah pipeline corridor.
<i>Pteropus poliocephalus</i> (grey-headed flying fox)	V	Whole project area	The closest recorded camps are located at Eungella State School near the proposed Eungella Dam pipeline corridor and Kelsey Creek near the proposed Peter Faust Dam pipeline corridor with recorded sightings near both of these camps. Whilst these camps are located 12 km and 11 km east of the proposed project footprint respectively, it is likely that the species will utilise habitat within the proposed pipeline corridors for foraging.
Plants			
<i>Dichanthium setosum</i> (bluegrass)	V	Whole project area	The species preferred habitats of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC and semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions TEC are identified as likely to occur within the proposed pipeline corridors. The closest recorded sighting of this species is also approximately 3 km east of the Moranbah pipeline corridor.
<i>Dichanthium queenslandicum</i> (king blue-grass)	E	Moranbah pipeline corridor	This species is known to occur between Nebo to Monto and west to Clermont and Rolleston. The closest recorded sighting of this species is also approximately 8 km south east of the far southern end of the Moranbah pipeline boundary.

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
<i>Eucalyptus raveretiana</i> (black ironbox)	V	Whole project area	Two corresponding REs (11.3.25 and 8.3.3) are mapped as occurring within the proposed project pipeline boundary and inundation area. The closest recorded sighting is from 2017 and is located along the proposed Moranbah Pipeline at - 21.3013°S, 148.3142°E. This species was also recorded along an ephemeral watercourse approximately 0.5 km west of the proposed Moranbah pipeline. Several <i>E. raveretiana</i> were recorded in the surrounding landscape.
Reptiles			
<i>Denisonia maculata</i> (ornamental snake)	V	Moranbah pipeline corridor	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed pipeline corridor, and the closest recorded sighting is approximately 1 km west of the proposed Moranbah pipeline corridor.
Listed migratory species			
<i>Cuculus optatus</i> (oriental cuckoo)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed Project boundary and surrounding environments, with the closest recorded sighting being 8 km east of the proposed Moranbah pipeline corridor.
<i>Apus pacificus</i> (Fork-tailed swift)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor PHES Inundation area	Preferred aerial habitat for the species is likely to be present within the proposed project boundary, with the closest recorded sighting being approximately 23 km east of the proposed Peter Faust pipeline
<i>Calidris acuminata</i> (Sharp-tailed sandpiper)	M	Peter Faust Dam pipeline corridor	Preferred species habitat, such as dams, is present within the proposed project boundary near Eungella Dam. The closest recorded

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
			sighting is approximately 24 km east of the proposed Peter Faust pipeline.
<i>Rhipidura rufifrons</i> (rufous fantail)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Preferred habitat in the form of eucalypt forests are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting being at the existing Eungella Dam. The wildlife online search identified the species as occurring within the proposed Moranbah pipeline corridor.
<i>Hirundapus caudacutus</i> (White-throated needle tail)	V, M	Moranbah pipeline corridor Eungella Dam pipeline corridor	Preferred species habitat, such as open woodlands and cleared areas, is present within the proposed project footprint. The closest recorded sighting is approximately 17 km east of the proposed Peter Faust pipeline. However, the wildlife online search for the proposed Moranbah pipeline identified the species as occurring
<i>Monarcha melanopsis</i> (Black-faced monarch)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor Inundation area	Preferred species habitat is generally lacking from the proposed project footprint, however, preferred habitat is likely to be present in the surrounding Eungella National Park, Macartney and Cathu State Forests. The closest recorded sighting is approximately 8 km east of the proposed Eungella Dam pipeline. The species was reported in wildlife online desktop search areas for all pipeline options.
<i>Monarcha trivirgatus</i> (Spectacled monarch)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	This species has been extensively recorded around the Eungella Dam. Potentially suitable habitat is also located within the Peter Faust Dam Pipeline and proposed inundation area.
<i>Motacilla flava</i> (Yellow wagtail)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor	Preferred species habitat, such as open woodlands and cleared areas, is present within the proposed project footprint. A 2018 record of this species is located at the Eungella Dam,

Species or community name	EPBC Act status*	Project element	Likelihood of occurrence
			approximately 3 km from the proposed pipeline.
<i>Myiagra cyanoleuca</i> (Satin flycatcher)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting are 5 km from the proposed Eungella Dam and Peter Faust Dam Pipeline pipelines.
<i>Pandion haliaetus</i> (Osprey)	M	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Preferred habitat is generally lacking from the proposed project footprint. The closest recorded sighting is approximately 25 km east of the proposed Peter Faust pipeline.

* E = endangered; V = vulnerable; M = migratory

A wildlife online search, was undertaken in March 2019 for each key project component (1 km radius) to identify species listed under the NC Act recorded within 1 km of the project area: A preliminary likelihood of occurrence assessment has been undertaken for the project, based on the wildlife online results (Appendix C). Table 5-3 summaries species likely to occur. Ecology surveys will be undertaken as part of the EIS to confirm presence of listed species and their habitats in the project area.

Table 5-3 NC Act listed threatened species

Species or community name	NC Act status*	Project element	Likelihood of occurrence
Birds			
<i>Calyptrorhynchus lathamii</i> erebus (glossy black-cockatoo, northern)	V	Inundation area	Essential habitat for the species is mapped within the proposed project boundary. Preferred habitat is generally lacking from the project area, however species may utilise eucalypt woodlands. The closest recorded sighting is approximately 20 km east of the inundation areas, within the Crediton Forest Reserve.
<i>Bolemoreus Hindwoodi</i> (Eungella honeyeater)	V	Inundation area	Essential habitat for the species is mapped within the proposed project boundary. Preferred habitat is available in the rainforest areas of Eungella National Park and Crediton Forest Reserve. The closest recorded sighting is located at the Eungella Dam, approximately 5 km from the project area.
<i>Ninox strenua</i> Powerful owl	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	Suitable habitat for this species is located within the project area and the species has been previously recorded within the Eungella National Park.
<i>Hydroprogne caspia</i> Caspian tern	SL	Moranbah pipeline corridor Eungella Dam pipeline corridor Peter Faust Dam pipeline corridor	There are 15 sightings of the species within Eungella dam. Multiple sightings have also been recorded within Lake Proserpine and the Peter Faust Dam Pipeline.
<i>Plegadis falcinellus</i> Glossy ibis	SL	Moranbah pipeline corridor	Preferred habitat for the species is generally lacking from the proposed project footprint, however, the closest recorded sighting (2018) is

Species or community name	NC Act status*	Project element	Likelihood of occurrence
			located 2 km east of the proposed Moranbah pipeline.
Mammals			
<i>Ornithorhynchus anatinus</i> (platypus)	SL	Moranbah pipeline corridor Eungella Dam pipeline corridor	Preferred habitat for the species is likely to be present within the proposed project footprint. The closest recorded sighting is located at the Eungella Dam, near the proposed Eungella Dam pipeline corridor.
<i>Tachyglossus aculeatus</i> Short-beaked echidna	SL	Whole project area	There are five 2006 Wildlife Online records of this species within 1 km the irrigation precinct and the species has been recorded 0.4, 1.6 and 2.3 km from the proposed Moranbah Pipeline. Considering the array of habitat types utilised by this species, the short-beaked echidna is likely to occur in all areas of the project
Reptiles			
<i>Acanthophis antarcticus</i> (common death adder)	V	Moranbah pipeline corridor Eungella Dam pipeline corridor Irrigation precinct	Preferred habitat for the species is likely to be present within the proposed project footprint. The closest recorded sighting is within the proposed irrigation precinct.
Plants			
<i>Bertya pedicellata</i>	NT	Moranbah pipeline corridor	This species has been previously recorded at several scattered locations near Moranbah and Coppabella, approximately 0.3, 1.2 and 1.3 km from the Moranbah Pipeline. Potential habitat occurs in the dam inundation area and along the proposed Peter Faust pipeline.
<i>Brachychiton guyeri</i> (Bottle tree)	E	PHES	There are five Wildlife Online records for the species within in 5 km of the PHES works area.

* E = endangered; V = vulnerable; NT = near threatened; SL = special least concern

There are five high-risk areas on the flora survey trigger map for threatened plant species (MSES) under the NC Act located along the Moranbah pipeline corridor, at the northern and southern ends of the corridor. The species covered by these high risk areas include:

- *Bertya pedicellata* (NT) located at (-21.91, 148.39); (-21.92, 148.36); (-21.92, 148.34); (-21.98, 148.24); (-22.00, 148.21).

Ecology surveys will be undertaken as part of the EIS to confirm presence of listed species and their habitats in the project area.

5.2.6.2 Essential habitat

MSES mapping indicates no essential habitats are mapped within the proposed dam inundation area or PHES footprints, however, the Eungella National Park is located within close proximity and essential habitat for various species are mapped. Essential habitat for koala is mapped directly downstream of the inundation area.

MSES mapping indicates the proposed pipeline corridors and irrigation precinct intersects with essential habitat for the following species:

- Eungella honeyeater
- Ghost bat
- Glossy black cockatoo
- Greater glider
- Koala
- Ornamental snake
- Proserpine rock-wallaby
- Spectacled flying-fox
- Squatter pigeon.

Essential habitat of relevance for each project component is provided in Appendix B and shown in Figure 5-4. Ecology surveys will be undertaken as part of the EIS to confirm presence of essential habitat in the project area.

5.2.6.3 Regional ecosystems

Mapping indicates that the inundation area for the Urannah Dam and PHES upper and lower reservoirs is predominantly Category B Least Concern and Of Concern REs. Two small polygons of Category C Of Concern RE and Category R vegetation are mapped within the Urannah Dam inundation area. In the order of 10,500 ha of vegetation is mapped within the Urannah Dam and associated storage area.

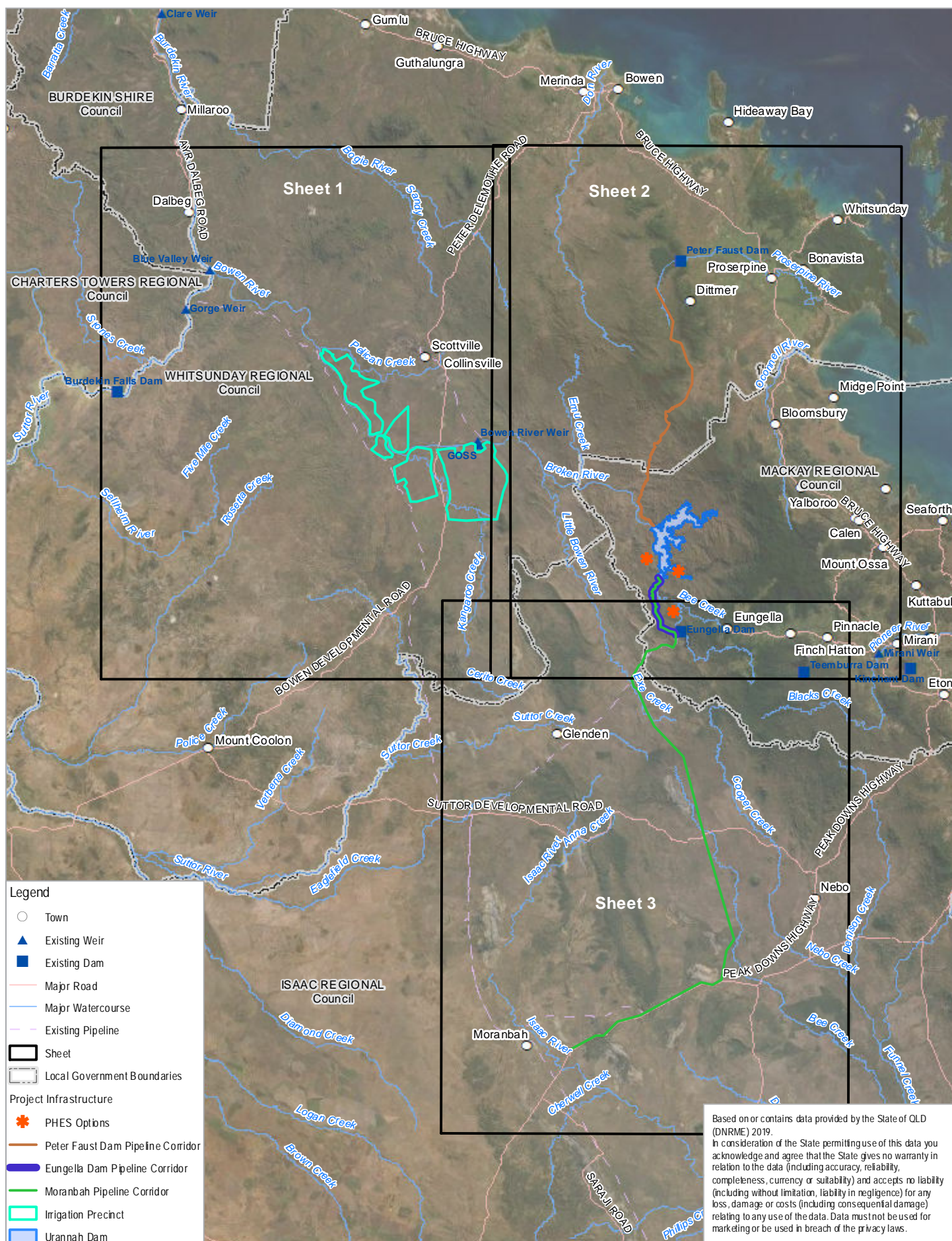
The proposed irrigation precinct is predominantly mapped as Category B regulated vegetation comprising Endangered, Of Concern and Least Concern REs. Small, scattered polygons of Category C regulated vegetation is mapped. Category R regulated vegetation is mapped for creek and drainage lines. In order to avoid and minimise impacts on remnant vegetation associated with agricultural development the following are proposed:

- Areas mapped as non-remnant vegetation will be targeted as priority
- Category C and Category R vegetation will not be cleared for the purposes of irrigated agriculture.

Regulated vegetation mapped along the pipeline corridors comprise:

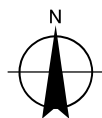
- Eungella Dam pipeline corridor – Category B Endangered, Of Concern and Least Concern REs
- Peter Faust Dam pipeline corridor – Category B Endangered, Of Concern and Least Concern REs. Category C Of Concern REs are mapped for areas where the pipeline is proposed to cross a waterway or drainage channel

-
- Moranbah pipeline corridor - Category B Endangered, Of Concern and Least Concern REs. Category C and Category R regulated vegetation is mapped for areas where the pipeline proposes to cross a waterway or drainage channel.



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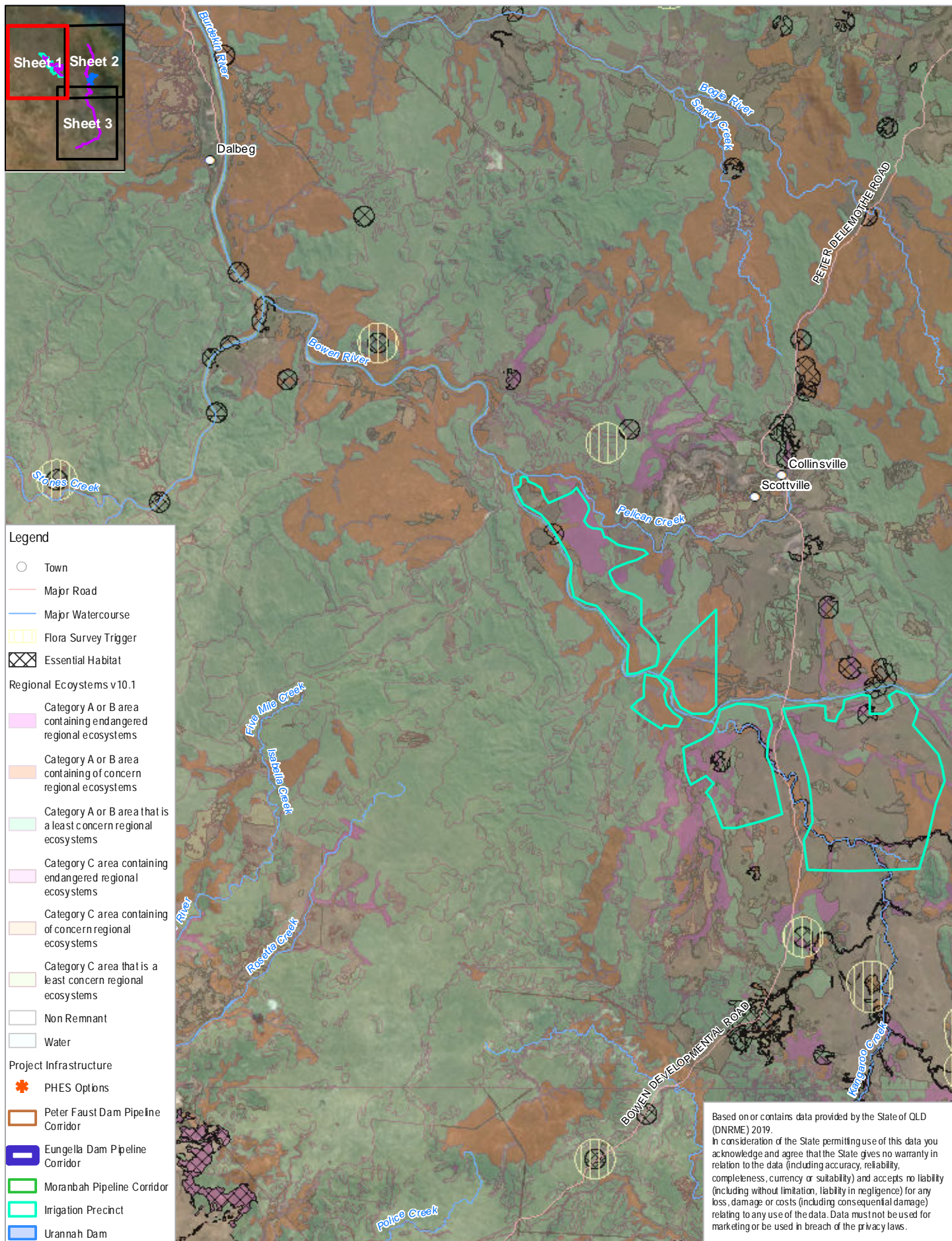


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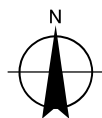
Regional ecosystems - overview

FIGURE 5-4



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Kilometres

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

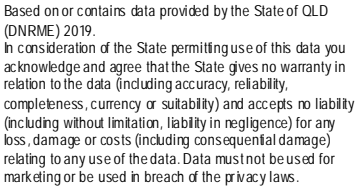


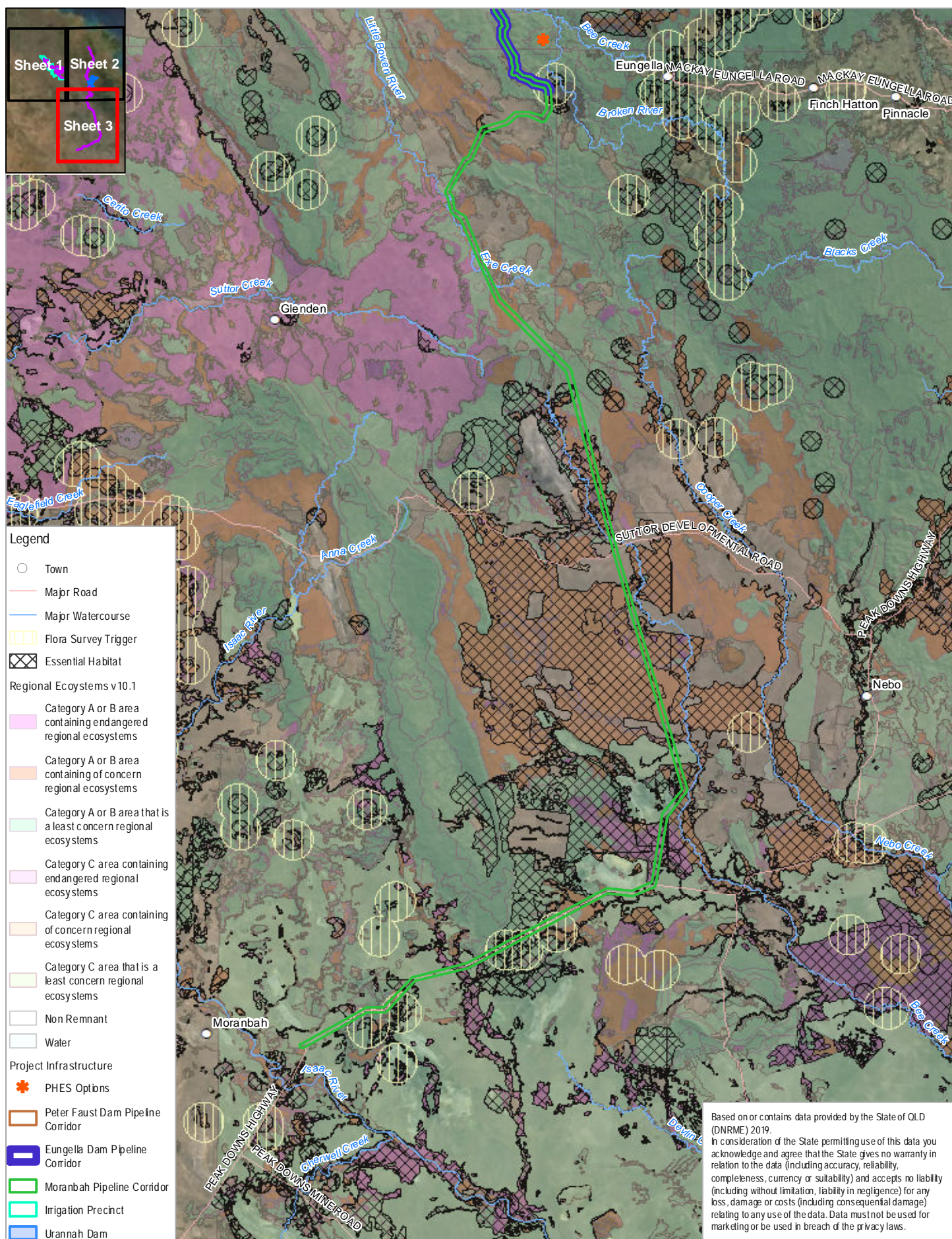
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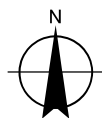
Regional ecosystems

FIGURE 5-4
Sheet 1 of 3





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Grid: GDA 1994 MGA Zone 55



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Regional ecosystems

FIGURE 5-4
Sheet 3 of 3

Regulated vegetation within a defined distance from the defining banks of relevant watercourses is mapped for watercourses throughout the project area. On-ground assessment is required to validate the presence or absence of representative vegetation.

REs mapped within each project component are shown in Figure 5-4, with a list of REs provided in Appendix B. Ecology surveys will be undertaken as part of the EIS to verify regulated vegetation in the project area.

5.2.6.4 Biosecurity

A number of introduced species listed under the EPBC Act and Weeds of National Significance are either known to occur or may occur in the project area, including parthenium weed (*Parthenium hysterophorus*), water hyacinth (*Eichhornia crassipes*), and salvinia (*Salvinia molesta*) (Appendix B). Ecology surveys will be undertaken during the EIS to identify introduced species present within the project areas.

5.2.7 Aquatic ecology

5.2.7.1 Aquatic habitat

Reliable rainfall in the project area provides high quality water and a range of aquatic habitat types, supporting higher aquatic flora and fauna diversity than elsewhere in the catchment (ACTFR, 2002).

Key findings of the feasibility studies undertaken for the PBC included:

- The upper reaches of the Broken sub-catchment are critical spawning habitat for many fish species
- Aquatic habitat in areas used for grazing or downstream of Eungella Dam may be in poorer condition when compared to aquatic habitat in the headwaters. However, drone footage undertaken during feasibility studies of the proposed dam site shows high quality and varied aquatic habitat that includes deep pools, riffles, bedrock, and large sand bars. This is consistent with the rocky bottom and shore and unconsolidated river bed and shore areas described as occurring in the Broken River, Urannah Creek and Massey Creek Aggregation.

Aquatic ecology surveys will be undertaken as part of the EIS to confirm the status of aquatic habitat within the project area.

5.2.7.2 Riparian and aquatic vegetation

Key findings of the feasibility studies undertaken for the PBC included:

- Sections of the Broken River have wide, high banks that are formed from high volumes of water during peak flow periods. The riparian zone is often within the river bed and adjacent to the low flow channel, rather than starting from the higher riverbanks. The condition of the riparian vegetation varies within the Broken sub catchment from good to very poor.
- Riparian communities are generally dominated by *Melaleuca fluviatilis*, but include other melaleuca, eucalyptus, casuarina, and callistemon species. Riparian vegetation close to permanent waterholes or sections of year-round river flow provides important dry season refuge for various fauna, including species more widely dispersed at other times of the year (e.g. woodland birds and/ butterflies).

- *Eucalyptus raveretiana* is a prominent riparian vegetation species throughout the Broken River, Urannah Creek and Massey Creek Aggregation, particularly on larger streams. The Aggregation is a stronghold for this species and supports more than one percent of its total population.
- A number of aquatic or semi-aquatic plant species, including wetland indicator species, are known to or may occur in the Bowen River basin and/or the Broken River, Urannah Creek and Massey Creek Aggregation.

Aquatic ecology surveys will be undertaken as part of the EIS to confirm the extent of riparian and aquatic vegetation within the project area.

5.2.7.3 Fish and aquatic fauna

Listed threatened species under the EPBC Act and NC Act are discussed in Section 5.2.6. The preliminary likelihood of occurrence assessment undertaken indicates that none of the conservation significant aquatic species are likely to occur.

A total of 47 native fish species have been recorded in the Bowen River sub-basin and while some species do not currently have records detailing specific locations, 13 native species have been recorded from the Broken River, Urannah Creek and Massey Creek Aggregation. Of these 13 species, eight have been recorded in the vicinity of the dam inundation area. Native species recorded within and near to project areas are listed in Table 5-4.

Table 5-4 Native fish species

Scientific name	Common name	Bowen River sub-basin	Broken River and Aggregation	Inundation area	Downstream
<i>Ambassis agassizi</i>	Olive perchlet	Y	Unknown	Unknown	Unknown
<i>Ambassis agrammus</i>	Sailfin glassfish	Y	N	N	Y
<i>Amniataba percooides</i>	Barred grunter	Y	N	N	Y
<i>Amniataba percooids</i>	Banded grunter	Y	Unknown	Unknown	Unknown
<i>Anguilla obscura</i>	Pacific shortfin eel	Y	Y	N	N
<i>Anguilla obscura</i>	South-pacific eel	Y	Unknown	Unknown	Unknown
<i>Anguilla reinhardtii</i>	Longfin eel	Y	Y	N	Y
<i>Arius graeffei</i>	Fork-tailed catfish	Y	Unknown	Unknown	Unknown
<i>Arius leptaspis</i>	Salmon catfish	Y	Unknown	Unknown	Unknown
<i>Arrhamphus sclerolepis</i>	Snub-nosed garfish	Y	Unknown	Unknown	Unknown
<i>Carcharhinus leucas</i>	Bull shark	Y	Unknown	Unknown	Unknown

Scientific name	Common name	Bowen River sub-basin	Broken River and Aggregation	Inundation area	Downstream
<i>Craterocephalus stercusmuscarum</i>	Flyspecked hardyhead	Y	Y	Y	Y
<i>Elops hawaiiensis</i>	Giant herring	Y	Unknown	Unknown	Unknown
<i>Gambusia Holbrooki</i>	Mosquito fish	Y	Unknown	Unknown	Unknown
<i>Gerres filamentosus</i>	Threadfin silverbiddy	Y	Unknown	Unknown	Unknown
<i>Gerres subfasciatus</i>	Silverbiddy	Y	Unknown	Unknown	Unknown
<i>Glossamia aprion</i>	Mouth almighty	Y	Unknown	Unknown	Unknown
<i>Hephaestus fuliginosus</i>	Sooty grunter	Y	Y	Y	Y
<i>Hypseleotris compressa</i>	Empire gudgeon	Y	Unknown	Unknown	Unknown
<i>Hypseleotris gallii</i>	Firetail gudgeon	Y	Unknown	Unknown	Unknown
<i>Lates calcarifer</i>	Barramundi	Y	Y	N	Y
<i>Leiopotherapon</i>	Unicolor spangled perch	Y	Y	Y	Y
<i>Lutjanus argentimaculatus</i>	Mangrove jack	Y	Unknown	Unknown	Unknown
<i>Macquaria ambigua</i>	Golden perch	Y	Unknown	Unknown	Unknown
<i>Megalops cyprinoids</i>	Oxeye herring	Y	Unknown	Unknown	Unknown
<i>Melanotaenia splendida</i>	Eastern rainbowfish	Y	Y	Y	Y
<i>Mogumda adspersa</i>	Southern purple spotted gudgeon	Y	N	N	N
<i>Mugil cephalus</i>	Striped mullet	Y	Unknown	Unknown	Unknown
<i>Nematalosa erebi</i>	Bony bream	Y	Y	Y	Y
<i>Nematalosa erebi</i>	Bony herring	Y	Unknown	Unknown	Unknown
<i>Neoarius graeffei</i>	Blue catfish	Y	Y	Y	Y
<i>Neosilurus ater</i>	Black catfish	Y	N	N	Y

Scientific name	Common name	Bowen River sub-basin	Broken River and Aggregation	Inundation area	Downstream
<i>Neosilurus hyrtl</i>	Hyrtl's catfish	Y	Y	Y	Y
<i>Neosilurus mollespiculum</i>	Soft-spined catfish	Y	Unknown	Unknown	Unknown
<i>Notesthes robusta</i>	Bullrout	Y	Unknown	Unknown	Unknown
<i>Ophieleotris aporos</i>	Snakehead gudgeon	Y	Unknown	Unknown	Unknown
<i>Oxyeleotris lineolata</i>	Sleepy cod	Y	Y	N	Y
<i>Platycephalus fuscus</i>	Dusky flathead	Y	Unknown	Unknown	Unknown
<i>Porochilus rendahli</i>	Rendahli's catfish	Y	Unknown	Unknown	Unknown
<i>Pseudomugil signifer</i>	Pacific blue eye	Y	Y	Y	N
<i>Scortum parviceps</i>	Small-headed grunter	Y	Unknown	Unknown	Unknown
<i>Selenotoca multifasciata</i>	Striped butterflyfish	Y	Unknown	Unknown	Unknown
<i>Strongylura kreftii</i>	Freshwater longtom	Y	Unknown	Unknown	Unknown
<i>Tandanus</i>	Eel-tail catfish	Y	Unknown	Unknown	Unknown
<i>Toxotes chatareus</i>	Sevenspot archerfish	Y	Y	N	N

Eungella Dam has been stocked with sooty grunter, sleepy cod, barramundi and very low numbers of *Scleropages leichardti* (southern saratoga). These species may be transported downstream during flood events which occur approximately once every four years (SMEC, 2019a).

Key findings of the feasibility studies undertaken for the PBC included:

- Fish have adapted to the intermittent flow of the Broken River sub-catchment, and populations tend to boom during wet years. They retreat to refuge areas created by in-stream pools and nearby wetlands (especially deeper, more permanent ones) during dry periods.
- Permanent waterholes along river channels are of critical importance in maintaining aquatic diversity as they act as recruitment sources for downstream areas during disturbances.

Irwin's turtle (*Elseya irwini*) has been recorded in the Bowen River sub-basin, is known to occur in the Broken River (SMEC, 2019a) and suitable habitat for the species is present within the inundation area. While not currently listed under the EPBC Act or NC Act, Irwin's turtle is locally significant and listed as high priority on the Queensland Government's Back on Track Priority Framework.

Aquatic ecology surveys will be undertaken as part of the EIS to confirm presence of listed and conservation significant species and their habitats in the project area.

5.2.7.4 Macroinvertebrates

Key findings of the feasibility studies undertaken for the PBC included:

- The macroinvertebrate fauna of the Broken River sub-catchment has generally been poorly studied, but the catchment has high diversity overall.
- Sections of headwaters within the catchment are in predominantly pristine condition, but in areas of water infrastructure, land clearing, or grazing, habitats have been adversely affected.
- Edge habitats are particularly important for overall macroinvertebrate diversity in the Broken River sub-catchment. Erosion, cattle tramping, riparian clearing, weed invasion, or alterations to flow levels (i.e. extraction and / or releases from impoundments) can damage these habitats. It is likely that there has been an impact on macroinvertebrate communities in the Broken River due to agricultural contaminants entering Eungella Dam and affecting water quality.

Aquatic ecology surveys will be undertaken as part of the EIS to confirm presence of macroinvertebrates and their habitats in the project area.

5.2.7.5 Groundwater dependant ecosystems

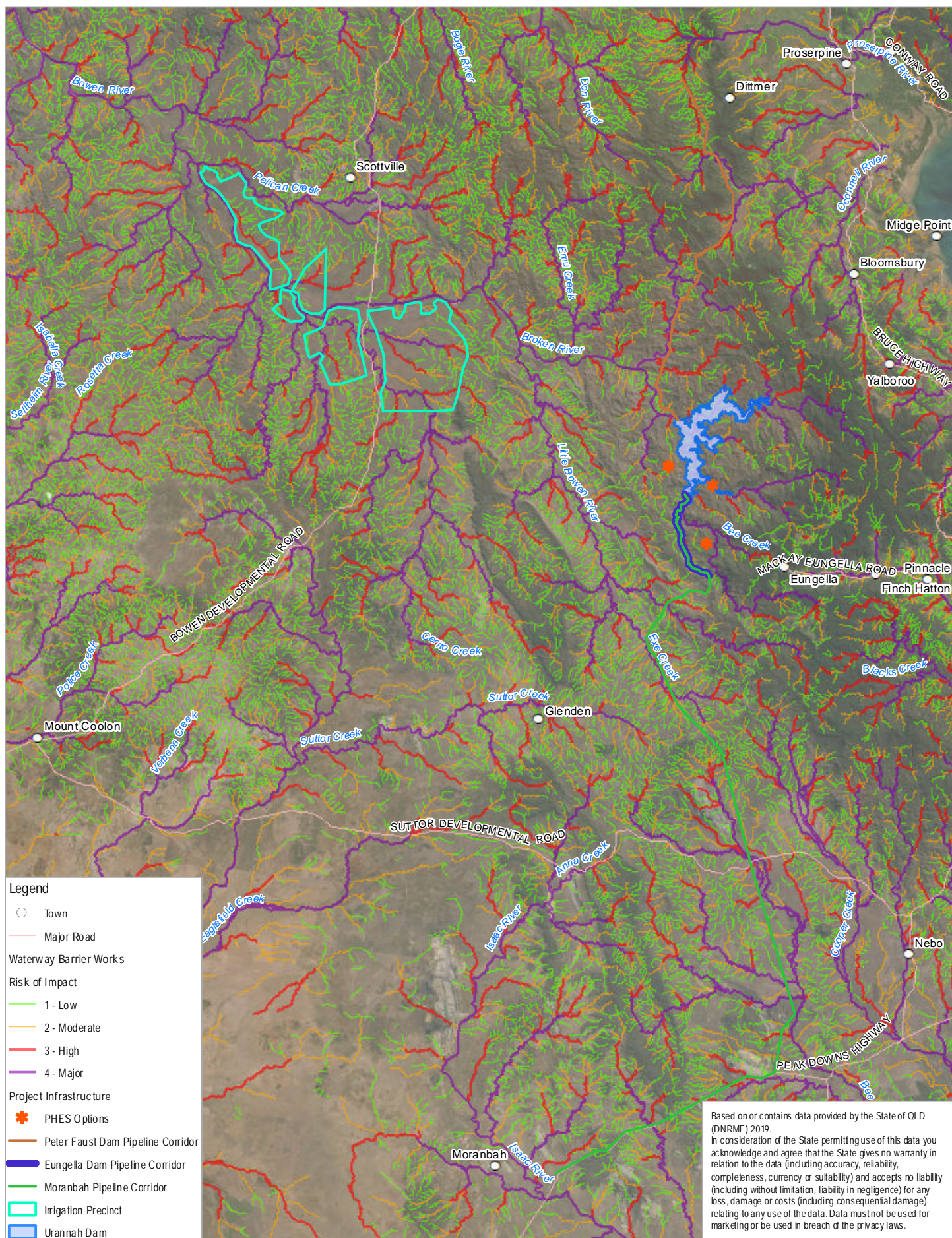
The Bureau of Meteorology's Groundwater Dependant Ecosystem (GDE) Atlas identifies the Broken River and Urannah Creek as having high potential for terrestrial and aquatic GDEs in the inundation area. Massey Creek also has a high potential for aquatic GDEs. The GDE Atlas does not identify any subterranean GDEs in the inundation area.

The presence of GDE will be assessed as part of the EIS for the project.

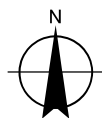
5.2.7.6 Waterways providing for fish passage

Under the DAF waterway barrier works spatial layer (MSES), the waterways in the inundation area are primarily classified as major or high risk of impact from development, as shown in Figure 5-5. The primary waterways of the project, specifically the Bowen River, Broken River, Massey Creek, Pelican Creek and Urannah Creek, are all classified as having major risk of impact from development.

The movement of fish and fish habitat will be assessed as part of the EIS for the project.



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Kilometres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Waterways providing for fish passage

FIGURE 5-5

5.3 Amenity

5.3.1 Climate

The project area, as part of the Burdekin River Basin, experiences tropical sub-humid climates with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, with droughts and tropical cyclones (and associated flooding) approximately once every four years (SMEC, 2019a).

The Burdekin region has an average annual rainfall range of between 500 mm and 1500 mm. The higher altitude coastal ranges have wet tropical climate and rainfall is distributed across the seasons. Further inland the rainfall gets progressively lower and increases in variability.

5.3.2 Noise and air

Within the project area there are a range of land uses which generate noise and air emissions. The most pronounced sources within the project area would be generated from mining or agricultural activities and traffic. Within more remote regions of the project, the existing noise and air environment would be typical of rural areas, with most noise and air emissions associated with insects, birds and other local wildlife or the interaction of weather and vegetation or crops.

5.3.3 Visual amenity

The landscape within the Burdekin Basin is complex, including grazing and agricultural lands, native forests, mining and industry with limited urban centres. Multiple dams and water distribution infrastructure also exist within the region, with visual amenity being typical of Australian rural areas.

5.3.4 Sensitive receptors

The project is located within proximity to a number of sensitive receptors including mine sites, large rural residential properties and terrestrial ecosystems (national parks).

Amenity information, including noise, air and visual amenity, of relevance for each project area is provided in Appendix B, with key details including:

- A number of sensitive receptors, primarily mining activities and facilities, are within close proximity to the Moranbah pipeline corridor and irrigation precinct and may be impacted by air quality and noise and vibration factors.
- The Peter Faust Dam pipeline corridor, Eungella Dam pipeline corridor, proposed Urannah Dam and PHES intersect with predominantly grazing land and subsequently, no impacts to sensitive receptors are anticipated from the project.

An assessment of amenity, including climate, noise and air, and visual amenity will be undertaken as part of the EIS process to determine the existing sensitive receptors within the surrounding environment.

5.4 Cultural heritage

5.4.1 Indigenous cultural heritage

Searches of the DATSIP cultural heritage database identified multiple recorded Aboriginal cultural heritage sites or registered places within the proposed irrigation precinct. While no other registered places or Aboriginal cultural heritage sites have been identified within the remainder of the project areas, high risk landscape features such as ephemeral water sources are commonly identified as places of importance to Aboriginal people and may include the Broken River and Massey Creek. Over such an extensive area, there is a high chance of Indigenous cultural heritage being present.

Numerous Aboriginal cultural heritage sites have been recorded in the surrounding region including:

- Rock shelters containing paintings and / or cultural deposits
- Camp sites and openstone artefact scatters
- Isolated stone artefacts
- Quarry extraction sites
- Scarred trees
- Native wells and significant water sources
- Walking tracks
- Burial places (pre and post European settlement)
- Ceremonial sites
- Story places and / or landforms of Aboriginal cultural sensitivity
- Culturally-significant landscape features (waterholes, old growth vegetation, habitat areas, bush tucker, bush medicine, etc.)
- Post-contact story places and camps.

In order to determine Aboriginal parties for the project area, a review of Native Title claims has been undertaken. Native Title over the western portion of the project area has been determined in favour of the Birriah People of the Birri Gubba Nation. The Widi People of the Nebo Estate #1 have lodged a Native Title claim over the eastern portion. The Birriah People hold Native Title over the proposed irrigation precinct.

Aboriginal cultural heritage investigations will be undertaken within the EIS to determine the extent of cultural heritage within the project area. A Cultural Heritage Field Assessment will be conducted and a Cultural Heritage Management Plan will be developed in accordance with the provisions of the *Aboriginal Cultural Heritage Act 2003* (ACH Act).

5.4.2 Non-indigenous cultural heritage

According to the National Heritage Register, no areas or objects are identified within 5 km of the project area. European cultural heritage sites, as relevant, will be investigated as part of the EIS to determine areas of importance within the project area.

5.5 Social and economic environment

5.5.1 Social character

The Urannah Dam is located within the 'Statistical Area (SA2)' of Eungella Hinterland as defined by the Australian Bureau of Statistics (ABS). The land which is likely to be established for the irrigation precinct is located within the Lower Broken River Catchment that stretches south west of the town of Collinsville and forms part of the key service center that would support the project. Therefore, the local study area encompasses the SA2 of Eungella Hinterland and the Collinsville SA2. The regional study area for the project comprises of the postal area of Bowen SA2 and three LGAs (Isaac, Mackay and Whitsunday).

The following Table 5-5 identifies the key social characteristics that define the local and regional study areas based on the 2016 census (ABS, 2019). Table 5-5 highlights the importance of the agricultural and mining industries within these regions as they provide the highest amount of employment.

Table 5-5 Social context

Study area	Population	Unemployment rate (%)	Highest industry of employment
Local			
Collinsville SA2 Irrigation Precinct	3,456	7.2	Beef cattle farming 13.0% (following by coal mining – 12.6%)
Eungella Hinterland SA2 Urannah Dam Irrigation prescient	15	nd	nd
Regional			
Isaac LGA	20,940	4.9	Coal Mining – 35.4%
Mackay LGA	114,969	8.6	Coal Mining – 10.6^
Whitsunday LGA	33,778	6.7	Accommodation – 9.7% (followed by coal mining – 5.5%)

5.5.2 Social impact baseline

The social impact baseline (SIB) (BCE, 2019) describes the social environment in the absence of the project. Table 5-6 below describes the SIB for the project, which is the benchmark that the social impacts have been compared against.

Table 5-6 Social impact baseline

Problems, opportunities, service needs	Key drivers
There is an increasing demand for water for urban and tourism uses (new demand greater than 30,000 ML+) and agriculture needs (potential new demand 100,000 ML+).	Limited availability and limited capacity of water supply
The potential agriculture capacity and suitability of high-quality soils (suitable for irrigation) may not be realised because of a lack of water supply in the region.	Limited access to bulk water supply systems Requirement for high quality soils suitable for irrigation
Future development in the region is inhibited by a lack of secure and affordable water	Limited availability and capacity of water Limited availability of affordable water
There are potential limitations for urban and industrial growth	Limited availability and capacity of water supply
There are fewer farmers able to work at maximum capacity	Limited access to bulk water supply systems

The project largely addresses each of the problems identified in the SIB by addressing the key drivers. A bulk water supply system would provide a secure water supply for urban populations, long term agriculture certainty, a more affordable water supply and economic development through the development of additional community support services

As part of the PBC a social impact evaluation was undertaken to identify the preliminary social impacts from the project, relative to the existing social environment. Based on that assessment four negative social impacts (costs) and 11 positive (benefits) were identified for the social environment; Section 7.4 provides further details.

A report investigating the social aspects of the project area will be prepared during the EIS process.

5.5.3 Accommodation and housing

The project is located within a predominantly rural area, largely utilised for cattle grazing and mining activities, with limited accommodation availability. The main service facility in the area is the historic mining town of Collinsville approximately 70 km west of the proposed Urannah Dam site. It is anticipated that the primary workforce during the construction phase would need to be accommodated in fit-for-purpose temporary camp style accommodation, with some long-term workforce personnel potentially residing in the town of Collinsville. Due to the extensive length of the pipeline corridors, it is anticipated that workers will be housed in temporary camp style accommodation located at either end of the construction, with fly camps located at pipeline corridor mid-points.

The preparation of a SIA within the EIS stage of the project will further consider the effects of accommodation camps and housing availability within the area.

5.6 Built environment

5.6.1 Land use

The project area is typical of a rural setting in terms of existing infrastructure, including homesteads, local roads and multiple mine sites and agricultural properties with associated urban development.

The land within the proposed Urannah Dam inundation area is a greenfield site, currently used for grazing in dense, native vegetation.

One current coordinated project is identified within the region, located towards the south-east of Moranbah. Listed as the Olive Downs project, it proposes a greenfield metallurgical coal mine for steel production.

Land uses within the project area are shown in Figure 5-6 and will be detailed further in the EIS.

5.6.2 Urban areas

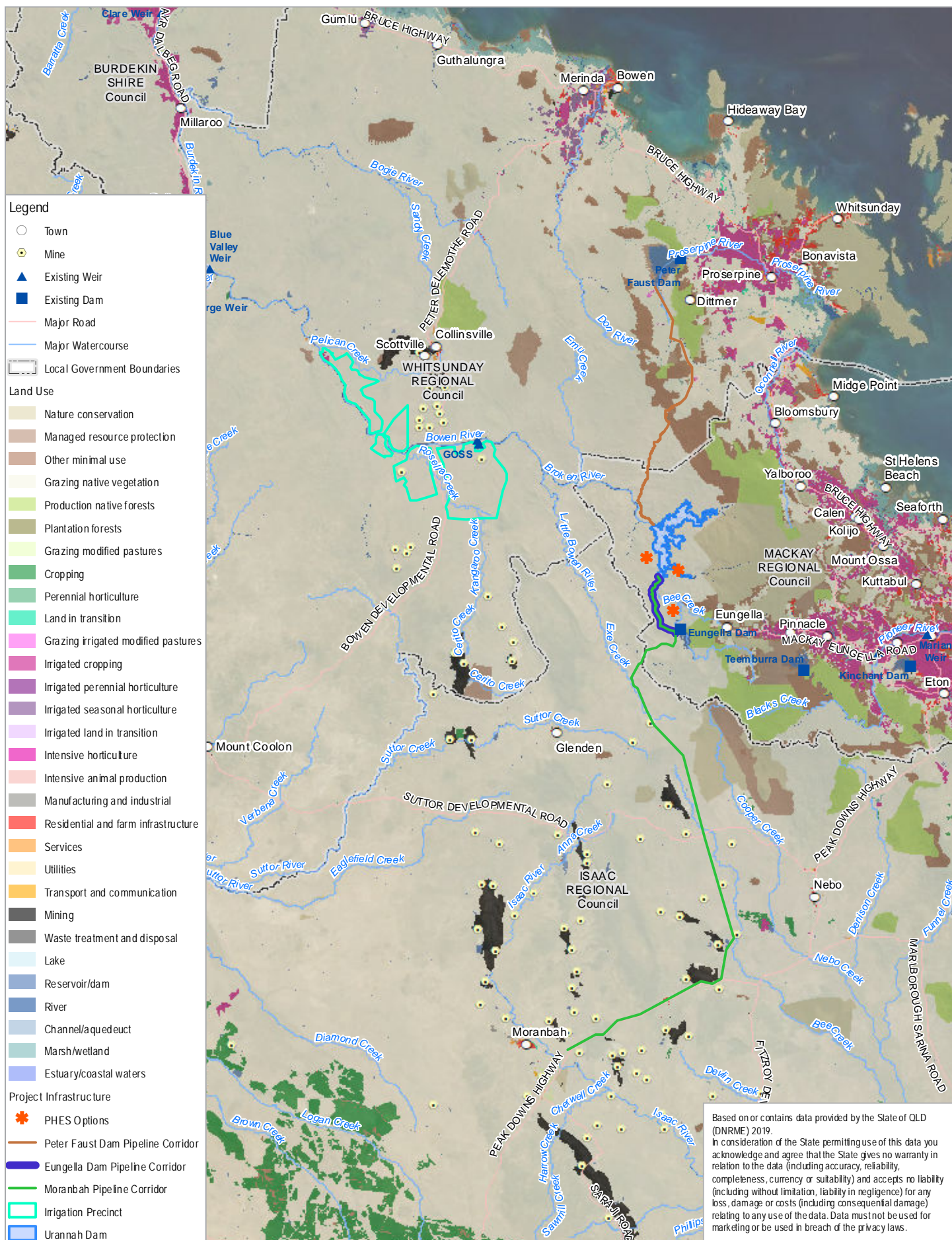
There are several small towns within the wider project area, which have largely been established to support resource activities that occur within these areas (Figure 5-6). Table 5-7 provides detail of these existing urban areas and their main industry of employment.

Regional goals for the area, as outlined by the IRC, WRC and MRC, include securing water for the environment, communities and industry, while ensuring the GBR, watercourses, wetlands and marine ecosystems are protected

Table 5-7 Urban areas

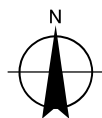
Town	Existing population	Major industry of employment
Scottville	259	<ul style="list-style-type: none"> Coal mining – 50.8% Beef cattle farming – 11.1%
Dittmer	79	Not available
Eungella	194	<ul style="list-style-type: none"> Primary education – 23.1 % Coal mining – 15.4%
Glenden	620	<ul style="list-style-type: none"> Coal mining – 54.1 % Primary education – 5.5%
Nebo	753	<ul style="list-style-type: none"> Coal mining – 25.7% Beef cattle farming – 11.1%
Moranbah	8,735	<ul style="list-style-type: none"> Coal mining – 39.3% Local government administration – 3.3%
Collinsville	1,114	<ul style="list-style-type: none"> Coal mining – 24.2% Supermarket and grocery stores – 6.8%

(Source, ABS 2016 census).



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Kilometres

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



Bowen River Utilities
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Land use

FIGURE 5-6

5.6.3 Infrastructure

The existing Bowen Weir, located approximately 35.6 km downstream of the dam site, will be utilised within the water distribution component of the project. Additional infrastructure surrounding the Bowen Weir will allow distribution and servicing of the irrigation precinct and customers on the left and right banks of the Bowen River.

There are several existing pipelines which run adjacent to or within close proximity to the proposed water distribution network of the project, including approximately eight pump stations along these pipelines. The existing pipelines include:

- Sunwater – BMP
- Sunwater – EWP/ eastern extension.

As shown in Figure 5-6, there is an extensive network of Ergon lower voltage pole mounted distribution substations scattered across the project area as well as fewer higher voltage ones. Powerlink's 275KV transmission line between Collinsville and Nebo runs north to south along the western edge of the project boundary.

There are four other water storages within proximity to the project area, including:

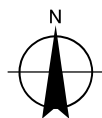
- Eungella Dam
- GOSS
- Bowen River Weir
- Peter Faust Dam.

Key infrastructure networks within the project area are shown Figure 5-7 and will be detailed further in the EIS with consideration of the utility providers and local government guidelines and policies.



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



Bowen River Utilities
Urannah Project

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Infrastructure and transport

FIGURE 5-7

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Data source: DNRME: Mine (2019), Town (2016), Road, Local Government Boundaries (2018), Existing Dam and Weir (2017), Ergon: Substation, Electrical Network (2019), SunWater: Existing Pipelines (2018), UWS: Proposed Water Distribution Network, Proposed Irrigation Area, Proposed Dam (2019), PHES Options (2020); Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: AC Jackson

5.7 Traffic and transport

The project area is serviced by a range of state controlled roads and local government roads. Key transport networks of relevance to the project area include:

- Peak Downs Highway (Central Queensland Region, reference number 33A)(state strategic road network)
- Suttor Developmental Road (regional road network)
- Eungella Dam Road (district road network and local road of regional significance)
- Turrawulla Road (local government network and local road of regional significance)
- Myuna Road (local government)
- Emu Plains Road (local government)
- Amberkolly Road (local government)
- Bee Creek Road (local government)
- Mount Barker Road (local government)
- Spring Creek Road (local government)
- Station Road (local government)
- Lizzie Creek Road (local government)
- Ramsay Street (local government)
- A number of unnamed roads (local government)
- Hail Creek Road (private or restricted).

Two rail corridors are located within the project area, identified as part of the Central Queensland Coal Network, including:

- Goonyella rail corridor
- Newlands rail corridor.

Two stock routes are located within the project area, identified as part of the National Stock Route Network, including:

- SR409WHIT
- SR320WHIT.

The primary airports servicing the area include:

- Collinsville airport (local airport)
- Mackay airport (major Australian regional airport).

Key transport networks within the project area are shown Figure 5-7 and will be detailed further in the EIS with consideration of the DTMR and local government guidelines and policies.

6. PLANNING INSTRUMENTS, GOVERNMENT POLICIES

There are a number of planning instruments and government policies applicable to the project, including:

- Queensland's State Planning Policy
- North Queensland Regional Plan
- Mackay, Isaac, Whitsunday Regional Plan
- Burdekin Region Water Quality Improvement Plan 2016
- Local government area planning schemes
- Relevant state codes under the State Development Assessment Provisions
- Australian and Queensland Reef 2050 Long-Term Sustainability Plan
- Northern Australia Infrastructure Facility
- Our North, Our Future: White Paper
- Australian Infrastructure Plan
- State Infrastructure Plan
- Queensland Bulk Water Opportunities Statement
- Queensland's Agricultural Strategy.

The project is generally consistent with the outcomes, strategies and policies of the above mentioned planning instruments and further assessment will be undertaken as part of the Environmental Impact Statement process.

6.1 State planning policy

The State Planning Policy (SPP) contains 17 state interests that must be considered in every planning scheme across Queensland.

The state interests are arranged under five themes:

- Liveable communities and housing
- Economic growth
- Environment and heritage
- Safety and resilience to hazards
- Infrastructure.

The state interests of most relevance to the project include:

- Agriculture
- Biodiversity
- Coastal environment
- Water quality
- Energy and water supply.

An assessment of how the project seeks to achieve the assessment benchmarks for each relevant state interest of the SPP will be undertaken as part of the EIS for the project.

6.2 North Queensland Regional Plan

The Queensland Government is developing a suite of new generation regional plans. The role of these regional plans is to identify and interpret the state's interests in land use planning and development (as identified in the SPP) for a particular region.

Regional plans define regional outcomes and identify regional policies to achieve these outcomes. The purpose of the outcomes and policies is to guide land use planning and development decisions in a region. Regional plans are prepared in collaboration with the wider community, local government, and key industry groups.

The North Queensland Regional Plan (NQRP) has been prepared by the Department of State Development, Manufacturing, Infrastructure and Planning. The regional plan sets the vision for North Queensland and develops a blueprint for the region's future. The project is consistent with the strategic intent of the NQRP, specifically:

- To position the North Queensland region as a leading regional economy over the next 25 years by capitalising on its diverse industry base and numerous competitive advantages
- To support the region's communities and economic resources by developing resilient and reliable infrastructure
- To protect and sustainably manage the region's natural assets

An assessment of how the project meets the outcomes and policies of the NQRP will be undertaken as part of the EIS for the project.

6.3 Mackay, Isaac, Whitsunday Regional Plan

The Mackay, Isaac and Whitsunday Regional Plan was prepared in partnership with the Mackay, Isaac and Whitsunday Regional Planning Committee and was launched on 8 February, 2012. The Plan establishes a vision and direction for the region to 2031 and provides a pre-eminent strategic framework which takes precedence over local level planning instruments. The project is consistent with the strategic intent of the Mackay, Isaac and Whitsunday Regional Plan, specifically:

- Land management and other planning decisions take account of projected climate change impacts including reduced water availability, as a result of variable rainfall, increased temperature and sea level rise
- Improved access to renewable energy options and low-emission technology is increased
- Regional landscape areas are managed to optimise economic, social, recreational and ecosystem services to the region
- Development is located, designed and managed to protect the environmental values and water quality of surface water and groundwater, wetlands and their associated buffers and coastal waters
- The quality of raw drinking water supplies is ensured by protecting existing and potential drinking water supply catchments from inappropriate land uses
- Adverse impacts on the region's natural resources are avoided or minimised through the location, design and management of development
- Fisheries resources and fish habitats are managed in consultation with all stakeholders, including commercial fishers, Traditional Owners, recreational fishers and conservation groups
- Land suitable for agricultural production is identified, protected and managed to provide for profitable and sustainable use of the resource

- Water supply and infrastructure sequencing and delivery respond to planned and actual demand
- Water supply infrastructure is planned, designed and constructed to take into account the anticipated effects of climate change
- Traditional Owners and Elders are actively consulted and engaged in planning decisions for their Country, ensuring their interests are considered and integrated
- Further develop and diversify existing and potential primary production and rural industries to enhance the contribution to the regional economy and regional landscape
- Alternative energy supplies, including low emission and renewable energy, are supported.

An assessment of the project against the relevant provisions of the Mackay, Isaac and Whitsunday Regional Plan will be undertaken as part of the EIS stage of the project.

6.4 Planning schemes

6.4.1 Mackay Regional Planning Scheme

The MRC adopted the Mackay Regional Planning Scheme (MRPS) in 2017. The project is consistent with the strategic intent of the MRPS, specifically:

- The rural areas are protected from the impacts of urban growth and managed to sustain their role in providing the natural resource base, maintaining the landscape function and ecosystem services, and supporting agricultural industries. Rural land is subject to sustainable agricultural practices and catchment management that controls soil erosion and stream bank stability, protects riparian vegetation and limits the movement of chemical residues and nutrients from farms into the aquatic environment.
- The network of dams and water catchments are protected and managed in urban and rural areas including the Eungella, Teemburra and Kinchant dams.

The project area within the MRPS is predominantly located within rural zoning. The development of water supply infrastructure is consistent with the purpose and overall outcomes of the rural zone code. An assessment of the project against the relevant provisions of the MRPS will be undertaken as part of the EIS stage of the project. Further details on development approvals triggered under the MRPS and *Planning Act 2016* (Planning Act) are detailed in Section 9.

6.4.2 Isaac Regional Planning Scheme

The IRC adopted the Nebo Shire Planning Scheme (NSPS), as one of three regional planning schemes, in 2008. The project is consistent with the strategic intent of the NSPS, specifically:

- The rural area provides for the continued and viable use of productive agricultural land, including use for both traditional, new and emerging primary production activities
- New uses and works are located, designed and managed to maximise the efficiency of infrastructure including water systems and compatibility with other uses, cultural heritage features and natural and cultural resources.

The project area within the NSPS is predominantly located within rural zoning. The development of water supply infrastructure is consistent with the purpose and overall outcomes of the rural zone code.

An assessment of the project against the relevant provisions of the NSPS will be undertaken as part of the EIS stage of the project. Further details on development approvals triggered under the NSPS and Planning Act are detailed in Section 9.

6.4.3 Whitsunday Regional Planning Scheme

The WRC adopted the Whitsunday Regional Planning Scheme (WRPS) in 2017. The project is consistent with the WPS strategic intent, specifically:

- Development of key economic sectors including agriculture, mining and tourism and associated development and construction activities.
- Communities are sustainable and are well supported through the provision of utility infrastructure.
- Agricultural land and existing rural activities are protected and diversified with rural activities being intensified in areas to the west of Collinsville, along the Bowen River, west and south-west of Proserpine and between Gumlu and Bowen. The long-term viability of this agricultural land is enhanced through sustainable land management practices, the use of new technology and the improvement and expansion of supporting infrastructure, such as water storage and irrigation infrastructure.
- The water resource catchments of the Bowen River Weir, BFD, Peter Faust Dam (Lake Proserpine) and the potential water resource catchments of the Andromache River and Urannah Creek are protected for future use. Water pipelines are established from Lake Dalrymple and the Burdekin River to Bowen and Abbot Point State Development Area, and from the Bowen River catchment to the Galilee Basin State Development Area.
- The project is located within the rural zone of the WRP. The development of water supply infrastructure is consistent with the purpose and overall outcomes of the rural zone code in that it will provide for a wide range of rural uses, including cropping, horticulture and other rural industries.
- The project is consistent with the local government priority infrastructure area, which includes both Collinsville and Scottsville, with prioritisation of trunk infrastructure to service existing and assumed future development.

An assessment of the project against the relevant provisions of the WRC will be undertaken as part of the EIS stage of the project. Further details on development approvals triggered under the WRP and Planning Act are detailed in Section 9.

6.5 State Development Assessment Provisions

The State Development Assessment Provisions (SDAP) provide assessment benchmarks for the assessment of development applications where the Chief Executive is the assessment manager of a referral agency. The SDAP is structured in a performance-based code format, whereby applicants address criteria to demonstrate that a development appropriately manages any impacts on a matter of state interest and/or protects a development from impacts of matters of state interest. In making a development application to the SARA, applicants should respond to each of the relevant provisions of the applicable state codes in the SDAP.

The SDAP outlines a purpose statement for each state code, as well as performance outcomes and acceptable outcomes. It includes locational and use-based state codes.

The relevant state codes for the project will likely include:

-
- State Code 9: GBR Wetland Protection Areas
 - State Code 10: Taking or Interfering with Water
 - State Code 15: Removal of Quarry Material from a Watercourse or Lake
 - State Code 16: Native Vegetation Clearing
 - State Code 18: Constructing or Raising Waterway Barrier Works in Fish Habitats
 - State Code 20: Referable Dams
 - State Code 22: Environmentally Relevant Activities.

Assessment of the project against the relevant state codes will be undertaken as part of the EIS stage of the project.

6.6 The Reef 2050 Plan

The joint Australian and Queensland Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan) provides an overarching strategy for managing the GBR.

The Reef 2050 Plan sets out an outcomes framework with seven overarching themes, including ecosystem health, biodiversity, heritage, water quality, community benefits, economic benefits and governance. These themes reflect the priority areas for action identified by governments and other stakeholders.

The Reef 2050 Plan considers risks from current and future threats to the reef's ecological and heritage values. These risks are grouped into the following four major influencing factors:

- Climate change
- Land-based run-off
- Coastal land use change
- Direct use.

These four themes represent the highest risks to the reef identified in the Outlook Report 2014.

As the project is located within the Burdekin Basin, identified as the largest contributor of fine sediment to the GBR according to the WQIP, and has potential to alter water quality and the hydrological regimes of the area an assessment of the project against the frameworks and strategies in the Reef 2050 Plan will be undertaken as part of the EIS stage of the project.

6.7 Burdekin Region Water Quality Improvement Plan 2016

The WQIP is a strategy developed in a partnership between NQ Dry Tropics, and the Australian and Queensland Governments. The WQIP aims to improve the water quality in the Burdekin region (and ultimately the GBR) by reducing the loss of sediment, nutrients and pesticides from the Burdekin catchments. It recognises that for agricultural lands, sediment run-off, nutrients, and pesticides affect productivity and contribute to environmental degradation.

Suspended sediments and associated particulate nutrients are a major contributor to water quality issues in regions dominated by grazing.

An assessments of how the project meets the outcomes and strategies outlined in the WQIP will be provided in the EIS for the project.

6.8 Key government policy

6.8.1 Northern Australia Infrastructure Facility

At a strategic level the project supports the vision of the Federal Government's Northern Australia Infrastructure Facility (NAIF) to accelerate development in northern Australia on the foundations of land, labour, water and infrastructure. The project aligns with the vision of the NAIF by delivering greater water security to Northern Australia.

6.8.2 Our North, Our Future: White Paper

The Australian Government has a strong preference to invest in water resources with the potential to diversify regional economies and increase exports. Development of the right water infrastructure in the right area is considered key to realising the vision set out in Our North, Our Future: White Paper on Developing Northern Australia (2015).

The project aligns with the priority area of water security.

6.8.3 Australian Infrastructure Plan

The Australian Infrastructure Plan (2016) states that infrastructure investment in Northern Australia should enhance the nation's regional productive capacity to take advantage of growing demand for Australian produce in places such as Southeast Asia and China. It also notes that successful irrigated agriculture depends on reliable and secure water resources. The Northern Australia Audit: Infrastructure for a Developing North (2015) highlighted the potential for new dams to support prospective agriculture.

The project aligns in that it will enhance regional productive capacity to take advantage of growing demand for Australian produce in South-East Asia and China.

6.8.4 State Infrastructure Plan

In the State Infrastructure Plan (2016), the Queensland Government indicates that water supply infrastructure should be in place where there is a sound business case and water resources are available. Solutions should be evaluated and determined after water needs are assessed.

The project supports the key outcome, such as:

- Water supply infrastructure where there is a sound business case and water resources are available
- Supporting the water needs of local governments
- Mitigating the effects of flooding
- Ensuring the dam is safe during extreme climate events
- Capturing a valuable finite resource (water) and increasing its availability to Queenslanders.

6.8.5 Queensland Bulk Water Opportunities Statement

The framework by which new proposals for water storage are considered is outlined in the Queensland Bulk Water Opportunities Statement (2018). For new water storage projects to proceed, the proponent currently needs to have commitment from foundation customers to take the water that will be made available. This allows long-term contracts to be put in place ensuring that construction

costs will be recouped and revenue will be ongoing. The objectives of the Queensland Bulk Water Opportunities Statement include:

- Safety & reliability of dams and urban water supplies
- Rise existing water resources more efficiently
- Support infrastructure development that provides a commercial return to bulk water providers
- Consider projects that will provide regional economic benefits.

The project aligns with these objectives and furthers water security and economic growth within the region.

6.8.6 Queensland's Agricultural Strategy

Queensland's Agricultural Strategy (2013) highlights the importance of agricultural industries to the state economy and the social fabric of rural and regional communities. Most jobs in agriculture and half of all jobs in food processing are regionally based. One of the four key pathways to grow Queensland's agricultural production – securing and increasing resource availability – focuses on enabling agricultural growth through optimal use of critical resources including land and water. The strategy outlines the government's intention to improve access to, and reliability of, water supplies for agricultural producers. Delivering secure and defined water entitlements for agriculture was identified as a key initiative to achieve this aim.

The project aligns with the strategy of improving access to reliable water for agriculture.

6.8.7 Queensland Climate Transition Strategy

The Queensland Climate Transition Strategy (2017) details the vision of Queensland to support a zero net emissions future which supports jobs, industries, communities and the environment. Emission reduction is a global priority, with this strategy directing Queensland towards overall emission reduction while maintaining economic security and industry growth.

The Queensland Government has made three key climate change commitments:

- Powering Queensland with 50% renewable energy by 2030
- Proactive global effort to arrest climate change by achieving zero net emissions by 2050
- Demonstrating our commitment to reducing carbon pollution by setting an interim emissions reductions target of at least 30% below 2005 levels by 2030.

The project aligns with the strategy to transition to renewable energy through the implementation of PHES.

6.8.8 Renewable Energy Target

The Renewable Energy Target (RET) is an Australian Federal Government policy designed to expand and secure renewable energy, specifically to ensure at least 33,000 GWhr of Australia's electricity comes from renewable sources by 2020. The RET consists of two main schemes:

- The Large-scale Renewable Energy Target (LRET) which requires high-energy users to acquire a fixed proportion of electricity from renewable sources
- The Small-scale Renewable Energy Scheme (SRES) provides financial incentive for individuals and businesses to install small-scale renewable energy systems.

The project aligns with the target, specifically the LRET as multiple renewable energy sources are proposed as part of the project.

6.8.9 Powering Queensland Plan

The Powering Queensland Plan sets out the Queensland Government's strategy to guide the state through the short-term and long-term challenges facing Australia's energy markets. A target has been set to achieve 50% renewable energy by 2030, to reduce emissions and act on climate change, create new jobs and diversify the state's economy.

The project aligns with the strategy to transition to renewable energy through the implementation of PHES.

7. POTENTIAL PROJECT IMPACTS

Key environmental, social, cultural and economic impacts and benefits have been identified through a desktop review of the existing environment and include the following:

Impacts:

- Permanent changes to land use within the inundation area and other key project components
- Acquisition of land
- Loss of grazing land
- Impacts to soils - loss of topsoil, compaction and erosion
- Interruption of water flow in waterways – impact on water quality and flow regimes
- Increased sediment, nutrient and pesticide loads to coastal ecosystems and Great Barrier Reef from expansion of agricultural areas
- Impacts to groundwater such as salinity, rising water tables, increased discharge to rivers
- Loss of biodiversity, habitat fragmentation, and restriction of fish movement in the catchment
- Impacts to landscapes and visual amenity
- Inundation, vegetation removal and irrigated agriculture resulting in changes to landscape
- Impact to Indigenous cultural heritage – the project covers both previously disturbed and non-disturbed areas so the potential for cultural heritage finds is high.

Benefits:

- Increased water security
- Expansion of the agricultural industry
- Support mining industry and project certainty
- Increase in employment opportunities, higher value land use, regional employment from agriculture and mining
- Increase water based recreation and tourism
- New opportunities for indigenous business development and employment
- Opportunity for renewable energy through 1.5 GW+ pumped hydro-electric power scheme.

At this stage of the project it is possible only to discuss potential impacts in general terms based on the desktop review of the existing environment of the study area. The Environmental Impact Statement (EIS) will include an assessment of the project's potential direct and indirect impacts on environmental values at a local, regional, state and national level. Further detailed assessment and modelling will be required during the EIS stage to qualify and quantify the impacts on the relevant environmental values and also propose avoidance, mitigation and management measures for each project component.

An environmental management plan will be developed in the EIS phase which will detail project mitigation and management measures across both construction and operational phases as applicable.

7.1 Natural environment

7.1.1 Topography, geology and soils

Soil profiles will likely be disrupted during the construction phase of the project. Topsoil will be removed as a result of earthworks associated with trenching and grading. Access routes and work areas will be compacted through use of areas by heavy machinery and earthmoving equipment. There

is the potential for erosion once vegetation has been cleared and soil is exposed to the effects of wind or rain. Sediment laden runoff has the potential to degrade water quality within the project area and at sites downstream. Targeted soil investigations will be undertaken within the EIS process to determine impacts and develop mitigation measures. In particular, a land suitability assessment will be undertaken in relation to the development of the irrigation precinct. Direct and indirect impacts will be managed through a Construction Environmental Management Plan (CEMP) for the project. During operations soil conservation measures will likely be required in relation agricultural development areas.

7.1.2 Surface water resources

7.1.2.1 Surface water

Impacts in relation to surface water in the project area will be investigated as part of the EIS, potential impacts are expected to include:

- A decline in water quality due to the on-going development and expansion of the development footprint in the region (such as changing grazing land to intensive agriculture, or industrial or urban development)
- Interruption of water flow in waterways has the potential to significantly impact on water quality
- Expansion of agricultural areas have the potential to impact on the values of the coastal ecosystems and the GBR, including areas of national and state significant environmental values. These impacts would arise predominantly from further changes to the hydrological regime, land clearing, and increased nutrient and pesticide discharge from agricultural activities.

7.1.2.2 Hydrology

The construction of Urannah Dam and subsequent supply of water for irrigation on the Bowen and Broken Rivers would have a direct impact on the regional hydrology of the area. The construction of a dam wall on the Broken River is likely to change the existing flow regime in the Broken River, Urannah Creek, and Massey Creek, and some associated tributaries. It will likely capture small to moderate floods in the storage and release regulated flows to supply downstream users. Further modelling and optimisation of dam operations will be undertaken in the EIS to determine the level of impacts on flow and possibility for mitigation and ability to meet the requirements of the Burdekin Water Plan.

7.1.3 Groundwater

Impacts in relation to groundwater in the project area will be investigated as part of the EIS. Potential impacts are expected to include:

- Salinity associated with irrigation practices can contribute to a rising water table, but may also be related to leaky water delivery systems and barriers to flow such as weirs
- Risk for increased groundwater discharge to rivers
- Ecological implications of altered groundwater and surface water flows on riparian ecology.

Further assessment of potential impacts to groundwater quality and quantity, will be required during the EIS stage of the project.

7.1.4 Water quality

The expansion of agricultural areas in the Bowen River sub-basin would have an impact on the environmental values of the Burdekin River, its coastal ecosystems and the GBR, including areas with national and state significant environmental value. These impacts would arise predominantly from further changes to the hydrological regime, land clearing, and increased nutrient and pesticide discharge from agricultural activities in to the Burdekin Basin. Though the expansion of the agricultural activities would be limited to areas outside of protected ecosystems, indirect impacts, including increased pressure on the wetlands to perform filtering ecosystem functions, could increase the risk of additional discharge; increasing the levels of agri-pollutants to the GBR. This may affect the progress of the Reef 2050 Plan, most notably the following targets (based on 2009 baseline data):

- Reducing dissolved nitrogen loads by at least 50% in priority areas, on the way to achieving up to an 80% reduction by 2025
- Reducing sediment loads by at least 20% in priority areas, on the way to achieving up to 50% reduction by 2025
- Reducing end-of-catchment particulate nutrient loads by at least 20% in priority areas
- Reducing end-of-catchment pesticide loads by at least 60% in priority areas.

The project is expected to comply with reef protection regulations without exemption and provides a clear opportunity for agricultural producers within the proposed irrigation area to improve land practices and efficiencies. This will not only allow for responsible resource use and potentially lowered operation costs but also improvement of water quality and overall GBR health.

In accordance with the *Environmental Protection Regulation 2019*, new or expanded commercial cropping and horticulture activities in the Burdekin region on more than five hectares that do not meet the cropping history test¹ will require an environmental authority. Minimum practice agricultural standards relating to fertiliser application, maintaining ground cover, measures to limit soil erosion and record keeping, will apply.

As the reef protection regulations are specifically related to compliance requirements of agricultural producers, the proposed irrigation precinct will be directly influenced by the updates. While the Reef protection regulations are currently in transitional enforcement, future agricultural producers within the irrigation precinct, as a new development, will have the opportunity to proactively comply with the requirements from initial production.

Together with a land suitability assessment, a cropping history assessment will be undertaken to ensure suitability and viability of crops. This will assist producers with regulatory compliance as the most suitable options can be selected. If any residual impacts remain after appropriate design and operating conditions are implemented, producers have the opportunity to purchase offsets to assist in mitigating impact outcomes.

Additionally, the Reef 2050 Plan has been established to drive the short, medium and long-term management of the GBR. The Reef Trust is one of the key mechanisms assisting in the delivery of the Reef 2050 Plan, focusing on known critical areas for investment, including improving water quality and coastal habitat along the GBR. The Reef Trust outlines four key phases of investment, with the Phase Three Investment Program focused on improving management practices for sugarcane farmers, reduce erosion in grazing lands and improve water quality in grains, dairy and horticulture industries.

¹ A cropping history is when cropping or horticulture activities have occurred during three out of the last 10 years (with at least one of the years being in the last five years). The cropping history test includes all types of crops including rotational, changing from one crop to another, sequencing or break crops and fodder crops.

The Program consists of a suite of integrated components that will seek to engage agricultural land managers operating within the GBR catchments to facilitate the increase the adoption of specific management practices to reduce pollutant loss:

- Supporting cane farmers to move beyond industry best practice
- Reducing erosion losses from rangelands grazing
- Maintaining water quality improvement momentum in grains, dairy and horticulture.

As such, the Reef Trust may provide opportunity for agricultural producers within the proposed irrigation area to improve land practices and efficiencies. This will not only allow for responsible resource use and potentially lowered operation costs but also improvement of water quality and overall GBR health.

Further assessment and modelling is required to be undertaken as part of the EIS to quantify each level of impact on the relevant environmental value and also propose adequate mitigation measures for each project component (i.e. dam, weir/s, pipeline, agricultural development and associated infrastructure).

7.1.5 Terrestrial and aquatic ecology

The project has the potential to directly and indirectly impact the following MNES and MSES:

MNES

- World Heritage properties and National Heritage places being GBRWHA (indirectly)
- Listed species and TECs
- Migratory species.

MSES

- High riverine conservation significance
- Regulated vegetation
- Connectivity areas where prescribed REs contain remnant vegetation
- Wetlands and watercourses
- Wetlands of high ecological significance
- Declared high ecological value waters
- Protected wildlife habitat (flora and fauna)
- Protected area (Eungella National Park)
- Waterways providing for fish passage.

Matters of MNES are discussed further in Section 7.8. Construction and operation impacts on MSES will be assessed as part of the EIS. Likely impacts include:

- Loss of biodiversity as a result of clearing REs, habitat destruction and fragmentation resulting in loss of connectivity
- Fragmentation of habitat due to construction of water distribution network and irrigation precinct
- Clearing vegetation causing soil erosion and degradation of water quality as a result of sediment laden and polluted runoff entering waterways
- Impoundment of waterways and changes of downstream flow regimes causing changes in aquatic habitat (for example, reduced water depth resulting in increased sunlight penetration) and interruption to fish movement
- Introduction of invasive species and disease
- Water quality and salinity impacts to waterways and ultimately the GBR

- Restrictions on fish movement in the catchment and reduced access to spawning habitat.

The construction of Urannah Dam and subsequent supply of water for irrigation on the Bowen and Broken Rivers would have a direct impact on terrestrial and aquatic ecology and assessment of these impacts will be conducted as part of the EIS for the project.

Mitigation and management measures will be determined based on the findings of the EIS. Large buffer areas will be assessed for key infrastructure/route selection to assist with avoiding sensitive environmental areas, such as regulated vegetation of important habitats where possible. Management measures will be developed in accordance with applicable state codes, standard approvals conditions, guidelines and policies.

Where residual impacts on MNES and MSES persist after avoidance, mitigation and management measures are applied, offsets may be provided in accordance with the EPBC Act and *Environmental Offsets Act 2014*, in relation to MNES and MSES, respectively.

7.1.6 Aquatic fauna passages

The inclusion of a fish passage will be integral to the design of the proposed Urannah Dam. The number of fish (biomass), size (juveniles and adults) and the type of fish to be transferred will be evaluated during the EIS. The outcomes of these assessments will better inform the requirements for fish passages within the design phase. Fish passage options and requirements will be developed in consultation with DAF. Fish passage infrastructure is discussed in Section 3.3.1.

Consideration of passage for other aquatic species may be required subject to the outcomes of field investigations and assessments.

7.2 Amenity

7.2.1 Noise and vibration

Given the remote and rural nature of the project area, existing noise levels are likely to be low, and dominated by typical rural activity, road usage and environmental contributors. The project involves the construction of a large scale dam and related water infrastructure. These activities have the potential to generate additional noise and vibration, with construction activities likely to contribute to noise emissions including:

- Earthworks
- Blasting
- Drilling
- Rock stabilisation
- Concrete batching
- Increased vehicle movements
- Other general construction activities.

Sensitive receptors will be identified and potential impacts assessed. Where impacts are predicted to occur, appropriate mitigation and management measures will be proposed. Where necessary a monitoring program will be developed.

Operational equipment that may contribute to noise and vibration include:

- Operation of pump and PHES equipment
- General operational activities

- Agriculture related activities such as harvesting and cropping
- Low level transport.

Assessment of the noise and vibration from the project on sensitive receptors will be undertaken as part of the EIS.

7.2.2 Air quality

The principal air quality pollutant for the project is particulate matter (dust) from construction activities. The project construction activities are likely to contribute to elevated levels of particulate matter as a result principally of clearing of land and undertaking earthworks associated with construction of the dam wall, water distribution network and PHES.

Sensitive receptors will be identified relative to potential emission sources. Where necessary and applicable air quality monitoring and modelling will be undertaken to inform the development of appropriate mitigation and management practices, including monitoring and rehabilitation programs.

Following construction, impacts to air quality are expected to be minimal, with increased soil exposure within the irrigation precinct potentially leading to additional dust generation. Further air quality investigations will be undertaken in the EIS.

7.3 Cultural heritage

7.3.1 Indigenous cultural heritage

Indigenous (Aboriginal) heritage places and objects have been identified within project areas, specifically the irrigation precinct (Section 5.4.1). The identified sites are dispersed across both previously disturbed and undisturbed areas and occur across a range of land forms. This broad distribution suggests a high likelihood of additional, unidentified Aboriginal cultural heritage objects and places occurring within the area. Landscape features including ephemeral streams and remnant vegetation are also located within many areas of the project, with these strongly correlated to indigenous activities. As such, the potential for Aboriginal cultural heritage remains high in all project areas.

The disturbance caused by the construction and operation of the project has the potential to directly and indirectly impact on Indigenous cultural heritage within the area.

In accordance with the ACH Act, all persons in Queensland have a Duty of Care to take all reasonable and practicable measures to ensure Aboriginal cultural heritage is not harmed with any activity. Under the Duty of Care Guidelines, the majority of the project area meets the definition of Category 5 activities meaning there is generally a high risk that activities could harm Aboriginal cultural heritage. In accordance with the ACH Act, the development of a Cultural Heritage Management Plan (CHMP) will be progressed with identified Aboriginal parties, namely the Birriah People of the Birri Gubba Nation and the Widi People of the Nebo Estate #1.

7.3.2 Non-Indigenous cultural heritage

There are no registered National heritage places within the project area. Four registered areas of state heritage interest are located proximal to the proposed irrigation precinct (Section 5.4.2).

Due to the nature and location of the heritage sites, it is not expected that the development of the agricultural precinct would impact on the character of the heritage place. Where it is identified that

heritage places cannot be avoided, historical (non-Indigenous) heritage surveys will be completed to determine applicable preservation and management measures.

7.4 Social environment

The construction of the project in the Bowen Basin region is expected to have a positive social impact on surrounding locations and communities through direct employment opportunities and increased regional water availability and security. The social benefits (positive impacts) and costs (negative impacts) identified for the project through the PBC are described in Table 7-1 and Table 7-2.

Table 7-1 Social benefits

Social benefit	Description
Increase in agricultural production, leading to higher value land use	Increased water accessibility will increase the extent to which producers can improve land activities to increase productivity.
Increase in mining expansion and project certainty	Increased reliability of high priority water allocations could lead the expansion of existing mines.
Increase in regional employment from enhanced agricultural productivity	Increased water resources will increase agricultural productivity, creating a number of additional agricultural employment opportunities. Additional regional opportunities will aid population growth and vitality.
Increase in regional employment from enhanced mining activity	Increased water resources will increase mining productivity, creating a number of additional mining employment opportunities. Additional regional opportunities will aid population growth and vitality.
Opportunities for Indigenous business development and employment	Construction of Urannah Dam the predicted local and regional growth has the potential to provide short and long term Indigenous employment opportunities. The opportunity for Traditional Owners, residents and locals from the region to gain employment during the construction and operational phases of Urannah Dam would create industry growth and upskill local employees.
Increased certainty of long-term water supply to at risk urban areas	Access to a reliable bulk water supply storage system will shift water demand away from the Peter Faust Dam at Proserpine. The connection supply to Peter Faust Dam catchment will provide additional allocations and security for residents and tourists, located in an 'at risk' urban area.
Enhanced confidence to invest in long term business operations and succession opportunities	Increased water security will increase the level of confidence within the agricultural and mining sectors to generate long term investment.

Social benefit	Description
Increase in value and flexibility of existing water allocations	Access to a bulk water supply provides additional water supply sources which could lead to additional water trading and an increase in the value of water traded. The increase in value and flexibility of water allocations could lead to a stronger and more resilient economy.
Increase in tourism to the region	Tourism is an important industry within the region; tourism attractions entice visitors to the area and provide employment opportunity for local residents. Urannah is located proximate to the Whitsunday region and Mackay, which are considered attractive tourism destinations. The region provides natural features and the coast is located to the East. An additional water body in the region could lead to increased tourism such as that seen at Lake Tinaroo in North Queensland.
Decrease in crime	The unemployment rate potentially correlates with social issues within the region, such as crime. Therefore, a decrease in unemployment resulting from the project could result in a decrease in crime.
Additional demand on existing services during construction and operational phases	Skilled trade and other professionals will be in high demand in the region throughout the construction and operational phases of Urannah Dam. Given the regional location of the proposed Dam site, an adequately skilled and qualified workforce is potentially limited, hence increasing demand for qualified services.

Table 7-2 Social costs

Social costs	Description
Potential loss of areas of cultural significance	<p>Urannah is the traditional land of The Widi People of the Nebo Estate #1 and Birriah people of the Birri Gubba Nation. Development of the project has the potential to impact on cultural heritage (Section 7.3).</p> <p>Engagement with the Traditional Owners and the Urannah Properties Association (UPA) is being undertaken to identify heritage values and develop appropriate strategies for avoidance and management of cultural assets.</p>
Displacement of existing land owners and industry	The construction of Urannah Dam and resultant land acquisition could lead to displacement of land owners and current businesses in the Bowen River catchment.
Demand for workers housing during construction phase may impact on regional housing affordability and supply	Given the likely influx of construction workers during the construction phase of the project, additional demand for housing may increase. As the supply of appropriate living situations declines, the price of housing may be driven up by the excess demand. Additionally, operational workers' demand for housing in the long term will increase, initially reducing housing availability.

The majority of the identified social benefits associated with the project are economic in nature. Creation of economic wealth influences a complex range of social outcomes and has a major bearing

on the quality of life able to be achieved. Economic prosperity facilitates investments in health, educational, recreational and social improvement.

Preliminary assessment of impacts identified through the PBC, indicate that these are of moderate to low significance and are likely able to be effectively mitigated and managed. Further investigations and assessment will be undertaken through a SIA as part of the EIS, inclusive of proactive engagement with relevant stakeholders and communities.

7.5 Economic effect

The initial construction of Urannah Dam and associated infrastructure will require substantial capital expenditure, which will provide economic benefits to businesses in the region through procurement of goods and services. Employment opportunities for residents of the region will also be created, particularly during the construction phase of the project but also on a long term basis in the agricultural and mining industries. Direct and indirect employment opportunities will generate both temporary and permanent population growth in the region thus having a flow on effect on the broader economy of the region.

The project delivers against three key elements in water, energy and food. The capital cost estimates (2018) for the individual components include the:

- Water and distribution project made up of \$673 million for the dam and \$416 million in pipelines
- Food precinct (irrigated agriculture) with a development cost of \$265 million
- Renewable hub totalling \$1.582 billion.

The project would create an estimated 1,200 FTE jobs in construction and 675 FTE jobs in operation.

The project will also generate revenue from customers who acquire water allocations to extract water for industrial, agricultural, and urban demand.

The creation of an additional agricultural industry will facilitate diversification of the regional economy, which has traditionally been subject to fluctuations of the mining industry. The introduction of high intensity production through broad scale irrigation may cause an economic disadvantage to existing producers through increased competition or flooding of the market. Conversely, agricultural users may experience a positive economic impact as a result of increased productivity and value of agricultural output due to an increase in the availability and security of water supply.

The project will have direct economic benefits to property values for properties adjacent to the dam and in the irrigation areas due to the creation of a reliable water source. Indirectly the injection of economic wealth into the regional economy, along with associated employment and population growth may have a broader effect on property values.

The project will deliver water security to the region, which represents a critical catalyst to support economic development. It is expected that the project will support increased urban water supply to the Whitsunday region and Collinsville, as well as future industrial and mining developments, which will have a range of flow on economic benefits associated with the project itself and with the resultant economic growth that water security will deliver.

An assessment of the economic impacts and benefits of the project will be undertaken as part of the EIS.

7.6 Built environment

The project has the potential to impact some aspects of the existing built environment. While the region is primarily rural agriculture there is a potential for the supporting road infrastructure to be impacted by increased traffic. Following construction, the project will have a positive effect on access roadways due to population growth and the subsequent investment in infrastructure and services. The impacts of the project on the road network will be assessed as part of the EIS process with relevant mitigation measures defined and include consultation with local Councils and DTMR for local and state-controlled assets, respectively.

The areas proposed for Urannah Dam and the irrigation precinct are greenfield sites with no previous commercial development. Prior to the construction phase, acquisition of this land will be required. The infrastructure within these areas is typical of rural development including homesteads and associated small-scale infrastructure such as residential power supplies and storage sheds.

The water distribution network will predominantly follow existing pipeline infrastructure with relatively low impact related to this development element.

7.7 Land use

7.7.1 Land use, access and acquisition

Impacts in relation to land in the project area will be investigated as part of the EIS, potential impacts and benefits are expected to include:

- Permanent changes to land use within the inundation area of Urannah Dam and other key project components
- A loss of grazing land due to the project
- Increased water security in the area due to the reliability issues of Eungella Dam. The inclusion of 150,000 ML of water within the water system per year will assist with regional goals around water security and provision of water to industry
- Additional infrastructure to be placed on the land adjacent the Bowen River along the proposed irrigation precinct. Expansion of the agriculture industry in the Collinsville region is consistent with the goals of diversification of industry set by the MRC.

During construction and operation of the project potential impacts to land use will be primarily related to land acquisition. The inundation areas associated with the dam will result in a loss of land and therefore acquisition of those properties or part of them will be required.

The project has adopted a Corridor and Land Access Management Plan as part of its corporate compliance framework.

The Plan outlines the approach for initial land access and the second phase for acquisition for various infrastructure components.

Urannah Dam and fixed infrastructure landholdings have been identified and a series of option to purchase agreements have been executed. The large size of the individual land holdings reduces the time and complexity of negotiating final agreements. Compulsory acquisition powers of the State Government are not expected to be required. As the land is predominately leasehold, negotiation of an Indigenous Land Use Agreement (ILUA) has been commenced with the appropriate Native Title claimants.

For the pipeline infrastructure, easements will be created for the corridors noting minor freehold sections for balance tanks and ancillary infrastructure.

Other potential impacts associated amenity values are further described in Section 7.4.

7.7.2 Agricultural land and vegetation clearing

The proposed irrigation precinct is located within land nominated as suitable for agriculture. In general, the Mackay, Isaac and Whitsunday Region is one of Queensland's most productive regions. The local economy is primarily founded on agriculture and mining, with large areas also representing greenfield sites used for grazing in dense, native vegetation.

The Queensland Agricultural Land Audit (2013) (WALI 2.0) maps land within the project's proposed irrigation precinct as being suitable for: potential agriculture:

- Potential broadacre cropping
- Potential annual horticulture
- Potential perennial horticulture
- Potential sugarcane area
- Potential intensive livestock
- Potential native forestry.

Current land uses indicate the suitability of an irrigation precinct for agriculture, with this land use consistent with surrounding industry. Additionally, guidance material for PO 29 Clearing for agriculture (coordinated project) of State Code 16: Native Vegetation Clearing indicates a land suitability assessment is required to meet the land suitability and economic viability requirements for high value and irrigated high value agriculture applications.

A land suitability assessment is currently underway to identify the extent of suitable soils for irrigated agriculture and to consider crop types and mixes appropriate for the area. The land suitability assessment will include a preliminary field validation of vegetation.

Mapped vegetation within the approximate 40,000 ha irrigation precinct investigation areas comprises:

- Category B vegetation – 21,000 ha
- Category C and Category R vegetation – 828 ha
- Category X (non-remnant) (based on Property Map of Assessable Vegetation) - 18,960 ha.

In order to further avoid and minimise impacts on remnant vegetation associated with agricultural development the following are proposed:

- Areas mapped as non-remnant vegetation will be targeted as priority
- Category C and Category R vegetation will not be cleared for the purposes of irrigated agriculture.

Riparian protection zones (watercourse buffers) will comprise a minimum of:

- 100 m for wetlands
- 10 m for stream orders 1 or 2
- 25 m for stream orders 3 or 4
- 50 m for stream orders of 5 and above.

7.8 MNES under the EPBC Act

Under the provisions of the EPBC Act, actions that have, or are likely to have a significant impact on a matter of MNES require approval from the Australian Government Minister for the Environment. The following MNES that are protected under the EPBC Act are located within the project area or may be indirectly impacted by the project:

- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- World heritage and national heritage properties being the GBRWHA (indirect).

The construction and operation of a new dam in the Broken River sub-catchment has the potential to generate both direct and indirect impacts on MNES, including:

- Direct impacts associated with the construction of the project would result in land clearing and flooding of vegetation and drowning out of in-stream habitats.
- Construction of the dam is likely to change the current downstream flow regime. Creating negative effects on some aquatic species and favouring others (such as those who prefer more permanent water bodies).
- Secondary or consequential impacts such as changes to water quality may arise from increased areas of irrigated land within the catchment.

Expansion of agricultural areas have the potential to impact on the environmental values of the Burdekin River, its coastal ecosystems and the GBRWHA. These impacts would arise predominantly from further changes to the hydrological regime, land clearing, and increased sediment, nutrient and pesticide discharge from agricultural activities.

Field investigations and an assessment of the project against the significant impact guidelines under the EPBC Act will be undertaken as part of the EIS for the project.

8. ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

Management and mitigation measures will be determined during the Environmental Impact Statement and will be developed through consideration of the environmental management framework, environmental management plans and specific sub-plans for each of the following environmental aspects:

- Natural environment (flora, fauna, soils, water etc.)
- Built environment (e.g. Traffic Management Plan)
- Amenity
- Social/economic
- Indigenous cultural heritage
- Non-Indigenous cultural heritage
- Hazard, risk, health and safety
- Waste management.

The environmental management and mitigation measures required for the project will be determined during the EIS stage of the project and will be developed based on consultation with relevant authorities and in accordance with legislative, policy and industry guidelines.

A number of tools will be developed and implemented to ensure that management measures are considered at each stage of the project, including:

- Environmental management framework
- Environmental management plans (design and planning (pre-construction, construction and operation)
- Environmental, social and cultural values specific management plans (sub-plans).

Indicative sub-plans likely required to support environmental management of potential impacts are provided in Table 8-1.

Table 8-1 Identified sub-plans for EMPs

Aspect	Management Plans
Natural environment	Flora and Fauna Management Plan Weed and Pest Management Plan Erosion and Sediment Control Plan Water Quality Management Plan Vegetation Management Plan (including revegetation and rehabilitation) Soils Management Plan
Built environment	Traffic Management Plan

Aspect	Management Plans
Amenity	Air quality (dust) management plan Noise and vibration management plan
Social /economic environment	Social Impact Management Plan Local Content Strategy Workforce Management Plan Land Access Protocol
Indigenous Cultural Heritage	Indigenous CHMP
Non-Indigenous Cultural Heritage	Non-Indigenous CHMP
Hazard and risk, and health and safety	Emergency Spill Response Plan Fire Management Plan Bushfire Hazard Mitigation and Management Plan Hazard Reduction Plan Flood Management Plan Emergency Response Plan
Waste management	Waste Management Plan

9. APPROVALS REQUIRED FOR THE PROJECT

The potential approvals under commonwealth, state and local government legislation include:

- Referral under the *Environment Protection and Biodiversity Conservation Act 1999*
- Application for 'coordinated project' determination under the *State Development and Public Works Organisation Act 1971*
- Operational works for a referable dam
- Operational works for construction of a waterway barrier work
- Operational works for taking or interfering with water in a watercourse or a dam constructed on a watercourse
- Operational works for removing quarry material from a watercourse
- Operational works for clearing native vegetation
- Operation work that is high impact earthworks in a wetland protection area
- Material change of use for an environmentally relevant activity
- Material change of use of premises (change in land use) and Operational Work for reconfiguration of a lot (inundation area and irrigation area) assessable under a local government planning scheme.

A full list of potential approvals and their relevance to the project will be undertaken as part of the Environmental Impact Statement.

9.1 Legislative considerations

Clearing of native vegetation, unless exempted or accepted development, is assessable development that will require a development permit for Operational work that is the clearing of native vegetation. Vegetation management laws allow development applications to be made only for a relevant purpose as defined under s22A of the VM Act.

It is considered that clearing for the dam (and its associated inundation), pipelines and PHES facility components of the project would constitute development that is for a relevant purpose on the basis that the development is 'for relevant infrastructure activities and clearing for the development cannot reasonably be avoided or minimised', where relevant infrastructure activities are defined as:

- Establishing and maintaining a necessary fence, firebreak, road, or vehicular track
- Constructing and maintaining necessary built infrastructure.

Necessary built infrastructure is not explicitly defined. The Accepted development vegetation clearing code - clearing for infrastructure (7 February 2020) however references clearing for infrastructure that includes fences, roads and vehicular tracks, linear and non-linear infrastructure, amongst others. Linear infrastructure includes pipelines and power lines. Non-linear infrastructure includes commercial and industrial buildings and structures and dams. On this basis the dam, pipelines and PHES facility are taken to be necessary built infrastructure and are development that is for a relevant purpose (subject to determination by DNRME).

Clearing for agriculture per se is not development that is for a relevant purpose. However, a project declared to be a coordinated project under the SDPWO Act is development for a relevant purpose. The project has sought to be declared on the basis that the project:

- Involves complex approval requirements

- Is predicted to have significant environmental effects
- Is of strategic significance locally, regionally and to Queensland more broadly, in particular northern Queensland

9.2 Water requirements (resource operations licence)

The key legislative instruments relevant to an assessment of water requirements for the project are:

- The *Water Act 2007* (Commonwealth)
- *Water Act 2000* (Queensland)
- The *Water Regulation 2016* (Queensland)
- The Burdekin Water Plan
- *The Burdekin Basin Water Management Protocol 2016*
- *The Environment Protection (Water) Policy 2009*.

The water targeted for inclusion in the UWS is 150,000 ML of unallocated strategic reserve for water infrastructure held under the Burdekin Water Plan “for the Bowen and Broken sub catchment areas for industrial purposes”. Given that the UWS will require water for urban, agricultural and hydro-electric purposes, in addition to industrial uses, it is considered necessary to seek an amendment to the Burdekin Water Plan. The amendment will identify other purposes for the use of water under the Burdekin Water Plan.

Under an amended Burdekin Water Plan, the targeted water will have to be allocated by the State for use by the Proposed Scheme by way of:

- A resource operations licence (ROL) which authorises the construction and operation of infrastructure, and the distribution of water; and
- One or more water allocations.

Applying for the ROL will occur prior to, or concurrently with, applying for the water allocations for the targeted water.

The preparation of the application for the amendment to the Burdekin Water Plan, ROL and Water Allocations will occur in parallel with the EIS process, and in consultation with DNRME.

9.3 Anticipated approvals

Table 9-1 lists approvals identified for the project. Changes to the project or changes to legislation may mean that some of these approvals will no longer be required. Inversely, it may also mean that additional approvals will be required.

Table 9-1 Approval requirements

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
Commonwealth				
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Department of Environment and Energy (DEE)	Development that has the potential to significantly impact MNES.	<p>Applicable</p> <p>MNES have been identified in the project area including listed TEC, threatened species, and consequential impacts on the GBRWHA.</p> <p>A referral will be prepared under the EPBC Act. DEE will make a decision in regard to the referral and nominate an assessment approach. It is considered likely that assessment by EIS will be required.</p> <p>As such, it is proposed that the EIS will be undertaken under assessment bilateral agreement with Queensland Government.</p>	Whole project
<i>Native Title Act 1993</i>	N/A	Development on land where native title exists or has not been extinguished.	<p>Applicable</p> <p>Native title exists over parts of the project area.</p> <p>A detailed assessment of native title will be required for the project.</p>	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
State – State Development and Public Works Organisation Act 1975				
<i>State Development and Public Works Organisation Act 1971</i>	Coordinator-General	<p>Coordinated project determination.</p> <p>A proponent of a project with one or more of the following characteristics may apply to have it declared a 'coordinated project' under the SDPWO Act:</p> <ul style="list-style-type: none"> • Complex approval requirements involving local, state and federal governments • Strategic significance to the area in terms of economic and social benefits • Significant environmental effects • Significant infrastructure requirements. 	<p>Applicable</p> <p>The project is likely to meet characteristics of a 'coordinated project'.</p>	Whole project
State – Planning Act and Regulation Approvals				
<i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Environmental Protection Regulation 2008</i>	SARA/DES	<p>Operation work that is high impact earthworks in a wetland protection area.</p> <p>Planning Regulation, Schedule 10, Part 20 Division 2.</p>	<p>Possibly Applicable</p> <p>The proposed irrigation precinct contains one wetland protection area or MSES wetlands of high ecological significance under the <i>Environmental Protection Regulation 2008</i>.</p>	Irrigation precinct

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Environmental Protection Act 1994</i>	SARA/DES	Material change of use (MCU) for environmentally relevant activity Planning Regulation, Schedule 10, Part 5 Division 2.	Applicable The project is likely to trigger approval for Environmentally Relevant Activities for chemical storage, excavation and dredging, crushing and screening as well as electricity generation associated with the hydro facility. Other ERAs for water and waste management may be applicable for the accommodation camp.	Whole project
<i>Fisheries Act 1994</i> <i>Planning Act 2016</i> <i>Planning Regulation 2017</i>	SARA/DAF	Operational work for construction of a waterway barrier. Planning Regulation Schedule 10, Part 6, Division 4.	Applicable The proposed Urannah Dam is a waterway barrier and will require development approval. Other ancillary infrastructure (access, waterway crossings, etc.) may also be classified as waterway barrier works and will require assessment for determination. Minor works within fish habitats will require to be assessed against the <i>Accepted development requirements for operational work that is constructing or raising a waterway barrier</i> . Where works cannot comply with these requirements, an operational works application, assessable against State code 18: <i>Constructing or raising waterway barrier works in fish habitats</i> , will be required.	Urannah Dam Whole project – ancillary works
Planning Scheme <i>Planning Act 2016</i>	WRC/IRC/ MRC	Development assessable under a local government planning scheme.	Applicable The project is likely to trigger a MCU for change in land use and Operational Work for reconfiguration of a lot (inundation area and irrigation area) assessable under a local government planning scheme (refer to local approval section of this table).	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Vegetation Management Act 1999</i> <i>Planning Act 2016</i> <i>Planning Regulation 2017</i>	SARA/DES	Clearing of native vegetation may trigger the need for a development application for Operational Works for Clearing Native Vegetation (P Reg. Sch. 10 Part 3 Div. 2 section 5).	<p>Applicable</p> <p>The project will require the clearing of native vegetation.</p> <p>Clearing of native vegetation, unless exempted or accepted development, is assessable development that will require a development permit for Operational work that is the clearing of native vegetation. Vegetation management laws allow development applications to be made only for a relevant purpose as defined under s22A of the VM Act.</p> <p>It is considered that clearing for the dam (and its associated inundation), pipelines and PHES facility components of the project would constitute development that is for a relevant purpose on the basis that the development is 'for relevant infrastructure activities and clearing for the development cannot reasonably be avoided or minimised', where relevant infrastructure activities are defined as:</p> <ul style="list-style-type: none"> • Establishing and maintaining a necessary fence, firebreak, road, or vehicular track • Constructing and maintaining necessary built infrastructure. <p>Necessary built infrastructure is not explicitly defined. The Accepted development vegetation clearing code - clearing for infrastructure (7 February 2020) however references clearing for infrastructure that includes fences, roads and vehicular tracks, linear and non-linear infrastructure, amongst others. Linear infrastructure includes pipelines and power lines. Non-linear infrastructure includes commercial and industrial buildings and structures and dams. On this basis the dam, pipelines and PHES</p>	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
			<p>facility are taken to be necessary built infrastructure and are development that is for a relevant purpose (subject to determination by DNRME).</p> <p>Clearing for agriculture per se is not development that is for a relevant purpose. However, a project declared to be a coordinated project under the SDPWO Act is development for a relevant purpose. The project has sought to be declared a coordinated project as it:</p> <ul style="list-style-type: none"> • Involves complex approval requirements • Is predicted to have significant environmental effects • Is of strategic significance locally, regionally and to Queensland more broadly, in particular northern Queensland <p>Development will require assessment against the applicable requirements of State code 16: Native vegetation clearing.</p>	
<i>Water Act 2000</i> <i>Planning Act 2016</i> <i>Planning Regulation 2017</i>	SARA/ DNRME	<p>Operational works for taking or interfering with water in a watercourse or a dam constructed on a watercourse.</p> <p>Planning Regulation, Schedule 10, Part 19, Division 1.</p>	<p>Applicable</p> <p>The construction and operation of the proposed Urannah Dam and hydro or pump-hydro facility will involve taking or interfering with water from the Broken River and Bowen River.</p>	<p>Urannah Dam</p> <p>PHES</p>
<i>Water Act 2000</i> <i>Planning Act 2016</i> <i>Planning Regulation 2017</i>	SARA/ DNRME	<p>Operational works for removing quarry material from a watercourse.</p> <p>Planning Regulation, Schedule 10, Part 19, Division 2.</p>	<p>Possibly Applicable</p> <p>The project may involve the extraction of quarry material from a watercourse where material removed as result of construction is not classified as a waste and is utilised for a productive purpose.</p>	<p>Whole project</p>

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Water Supply (Safety and Reliability) Act 2009</i> <i>Planning Act 2016</i> <i>Planning Regulation 2017</i>	SARA/ DNRME	Operational works for a referable dam. Planning Regulation, Schedule 10, Part 19, Division 3.	Likely Applicable Once a Failure Impact Assessment (FIA) is accepted for a proposed dam (refer to State-non Planning Act and Regulatory Approvals section of this table), and the dam is referable, application must be made for operational works for a referable dam under the Planning Act for a development permit to construct the dam. Safety conditions would normally be attached to any development permit issued for a referable dam.	Urannah Dam PHES Storage ponds
<i>Water Supply (Safety and Reliability) Act 2009</i>	DNRME	Requirement to be a Bulk Water provider	Applicable The development of a large-scale, commercial dam is one of the project components. Application of service provider to be made to the regulator.	Urannah Dam
State - Non Planning Act and Regulation Approvals				
<i>Aboriginal Cultural Heritage Act 2003</i>	DATSIP	A person may not harm, take, relocate or excavate Aboriginal cultural heritage.	Applicable Cultural Heritage Duty of Care Guidelines must be followed. Undertake a cultural heritage assessment and consultation with relevant Aboriginal parties to develop a CHMP.	Whole project
<i>Biosecurity Act 2014</i>	DAF	General biosecurity obligation (GBO) for all people in Queensland to be responsible for managing biosecurity risks that are under their control.	Applicable GBO must be met during development and operation of the project. CEMP to include GBO requirements.	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Building Act 1975</i>	Building certifier	Development application for building works requiring assessment against the <i>Building Act 1975</i> .	Applicable Construction camp and other buildings, including pump stations and powerhouse complexes, etc. assessable under the <i>Building Act 1975</i> .	Whole project (components)
<i>Electricity Act 1994</i>	DNRME	Generation of electricity and connection to the transmission grid/supply network.	Applicable The development of PHES infrastructure is one of the project components. Application for the issue of a generation authority to be made to the regulator.	PHES
<i>Environmental Offsets Act 2014</i>	DES	An offset may be required if the activity will, or is likely to, have a significant residual impact (SRI) to MNES, MSES or MLES.	Applicable Given the nature, scale and extent of the project it is likely that residual impacts will persist and require offsets. An offsets strategy will be developed for the EIS.	Whole project
<i>Environmental Protection Act 1994</i>	DNRME DES	Entities carrying out environmentally relevant activities (ERAs) may need to apply for an environmental authority (EA).	Likely Applicable Environmental authorities may be required for the following ERAs: <ul style="list-style-type: none"> • Extractive and screening activities • Chemical storage. These may be held by the construction contractor or other contracted parties. An ERA will be required for electricity generation for the hydro facility. Other ERAs for water and waste management may be applicable for the accommodation camp.	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Environmental Protection Act 1994</i>	DES	Treatment, removal or disposal of material from a lot listed on the EMR and CLR. Or treatment, removal or disposal of material that is contaminated.	Possibly Applicable Will depend on results of field investigations to be undertaken during the EIS.	Whole project
<i>Forestry Act 1959</i>	DAF	Taking of quarry material owned by the state.	Possibly Applicable A permit to take quarry material may be required for construction of Urannah Dam.	Urannah Dam
<i>Land Act 1994</i>	DNRME	Approval may be required for any changes to lease arrangements, including dividing or amalgamating a lease, changing the purpose of a lease, obtaining an easement over state land, or purchasing state land.	Possibly Applicable The tenure of land in the inundation area and some of the pipeline corridors is "lands lease". If changes to lease arrangements are required application will need to be made to DNRME.	Whole project
<i>Nature Conservation Act 1992</i>	DES	A licence, permit or authority (issued under the NC Act), or an exemption is required to 'take' protected plants. This relates to almost all native plants within Queensland. A clearing permit would be required if a person becomes aware that endangered, vulnerable or near threatened (EVNT) plants are present and require clearing.	Applicable There are high-risk flora trigger areas mapped in the project area. A flora survey is required to be undertaken for the project during the EIS. Subject to field investigations, an exempt clearing notification or clearing permit will be required for the project.	Whole project

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Nature Conservation Act 1992</i>	DES	Species management plan (SMP) (Removal and relocation of wildlife).	Applicable EVNT and SL species and/or species habitat are known in project areas. Subject to field survey and assessment, where impacts on breeding habitat are predicted, it will be necessary to develop and seek approval through high risk SMPs.	Whole project
<i>Queensland Heritage Act 1992</i>	DES	A person may not interfere with an artefact, or cultural heritage and may not destroy a protected area. Development on a Queensland or local heritage place.	Possibly Applicable Approval requirements will be determined following an investigation into the presence of potential non-indigenous heritage.	Whole project
<i>Regional Planning Interest Act 2014</i>	Queensland Department of State Development, Manufacturing, Infrastructure and Planning	Regional interests development approval (RIDA) is required when: <ul style="list-style-type: none"> • A 'resource activity' is proposed to be located in an area of regional interest, or • When a 'regulated activity' (Water Storage, Broadacre Cropping) is proposed to be located in an area of regional interest (strategic environmental area). Each of the following is an area of regional interest— (a) A priority agricultural area; (b) A priority living area;	Not applicable The project does not include a 'resource activity' as defined under the RPI Act. There are no 'strategic environmental areas' (regional interest) mapped in irrigation precinct or Urannah Dam construction impact area. The irrigation precinct includes a number of areas designated as Class A agricultural land under the State Planning Policy and some area designated as Class B agricultural land. However, these areas are not mapped as areas of regional interest under the RPI Act.	N/A

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
		(c) The strategic cropping area; (d) A strategic environmental area.		
<i>Stock Route Management Act 2002</i>	DNRME	Altering stock routes.	Possibly Applicable Stock routes may require realignment. Agreement with DNRME may be required for realignment of stock routes.	Urannah Dam
<i>Transport Infrastructure Act 1994</i>	Transport and Main Roads	Permanent and temporary road closures. Undertaking an activity or works within a state-controlled road.	Possibly Applicable Permanent and/or temporary road closures may be required. Requirements for road closures to be assessed as part of the EIS. Ongoing liaison with the relevant state, local or other road authority to continue.	Whole project
<i>Water Act 2000</i>	DNRME	Use of water by authorising persons to take or interfere with water.	Applicable The project will involve the taking of water from the Broken River and Bowen River in accordance with the provisions of the Burdekin Water Plan. Discussions with DNRME for licensing requirements for irrigation precinct will be required.	Whole project
<i>Water Act 2000</i>	DNRME	Destroying vegetation, excavating or placing fill in a watercourse requires a riverine protection permit	Applicable The project will involve works in a watercourse.	Whole project

<p><i>Water Supply (Safety and Reliability) Act 2009 (WSSR Act)</i></p>	<p>DNRME</p>	<p>The WSSR Act requires owners of certain dams, both proposed and existing, to undertake a FIA of their dam. The FIA is designed to identify any potential threat to people living downstream of the dam from unexpected flooding caused by dam failure.</p> <p>New dams require a FIA if they are either:</p> <p>More than 10 m high with a capacity of more than 1,500 ML</p> <p>More than 10 m high with a capacity of more than 750 ML and a catchment area more than three times its maximum surface area at FSL.</p> <p>A dam is classified as a 'referable dam' if the FIA demonstrates there would be people at risk if the dam were to fail.</p>	<p>Likely Applicable</p> <p>The proposed Urannah Dam will be greater than 10 m with a capacity of more than 1,500 ML.</p> <p>FIA must be completed and accepted by the Chief Executive before an application for approval to construct can be made. Subject to the outcomes of the FIA, a development approval for operational work for referable dams may be required.</p>	<p>Urannah Dam PHES Storage ponds</p>
<p>Local</p>				

Legislation	Authority	Approval trigger	Relevance to the project	Project aspects
<i>Local Government Act 2009</i>	WRC/IRC/ MRC	Local Road Permit Carrying out works on a road or interfering with the road or its operation.	Possibly Applicable Undertaking works within a road or interfering with its operation (e.g. road works, road closures). Details of proposed interference including plans, timeframes, location, materials and equipment, traffic management plan.	Whole project
Planning Scheme	WRC/IRC/ MRC	Development assessable under a local government planning scheme: <ul style="list-style-type: none"> • MCU • Operational works • Reconfiguration of a lot • Plumbing and drainage Building work.	Possibly Applicable Investigations during the EIS should satisfy the requirements of the development applications (Exemptions may apply). Developments are likely to require assessment against the relevant planning schemes.	Whole project

10. COMMUNITY AND STAKEHOLDER CONSULTATION

Community and stakeholder consultation, undertaken during the feasibility studies for the project, identified that there is broad acceptance of the identified drivers for regional economic growth and strong support for an additional bulk water source for the region. Benefits to existing urban, industrial and mining customers through increased reliability of supply were identified. Further consideration is needed in relation to distribution infrastructure for agricultural users, irrigation types and crop types, however the ability to grow the agricultural sector is viewed favourably.

Community and stakeholder consultation will be undertaken as part of the Environmental Impact Statement for the project in accordance with the requirements under State and Commonwealth legislation.

Community and stakeholder consultation has been targeted and conducted at a regional level as part of the feasibility studies for the project. The focus of stakeholder engagement, to date, has been on water infrastructure and potential customers of a large-scale water solution.

Consultation with the following stakeholders has been undertaken as part of the draft PBC:

- Coal miners, including:
 - Rio Tinto
 - Glencore
 - QCoal
 - New Hope
 - BMA
 - Peabody
 - Anglo American
 - Stanmore
 - Fitzroy Resources
- Native title leaseholders, UPA
- Agriculturists and irrigators
- Large scale contractors
- Financiers
- Sunwater
- Government departments in Brisbane and other regions.

Consultation was aligned with the Queensland Government's Project Assessment Framework (PAF) guidelines and focussed on water infrastructure and potential customers of a large-scale water solution. There was strong support for improving water security through long-term and large-scale solutions to support diversifying the economy.

Since the engagement during the PBC, additional consultation has occurred with:

- Coal miners
- Landholders, including with regard to access and acquisition
- Traditional owners, including Native Title claimants
- Sunwater and Powerlink

-
- Applicable local, state and federal government departments.

Targeted community and stakeholder consultation will be undertaken as part of the EIS for the project in accordance with the requirements under State and Commonwealth legislation.

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APPENDICES

APPENDIX A TENURE

Property	Tenure	Local Government Area	Area (Ha)	Percentage of Property covered (%)
Urannah Dam and water storage				
1522SP272352	Lands Lease	MRC	5089.460	81.836
1HLN252	Lands Lease	MRC	1129.640	18.164
Peter Faust Dam pipeline corridor				
1522SP272352	Lands Lease	MRC	764.995	22.509
17CP826170	Freehold	WRC	177.317	5.217
1SP225213	Lands Lease	WRC	176.556	5.195
1SP225214	State Land	WRC	60.375	1.776
20HR1508	Profit à Prendre	WRC	33.525	0.986
20SP277857	Freehold	WRC	33.525	0.986
237K124340	Freehold	WRC	10.533	0.310
2SP225072	Lands Lease	WRC	171.133	5.035
387FTY1326	State Forest	WRC	56.905	1.674
4611SP270181	Lands Lease	WRC	914.127	26.897
509H1245	Freehold	WRC	36.870	1.085
520SP223982	Freehold	WRC	85.002	2.501
5340SP223987	Lands Lease	WRC	578.363	17.018
544SP223983	Freehold	WRC	13.940	0.410
611SP225212	Freehold	WRC	31.123	0.916
683H12484	Freehold	WRC	26.707	0.786
72SP223986	Lands Lease	WRC	227.573	6.696
Eungella Dam Pipeline				
100SP239828	Freehold	MRC	42.940	5.246
109HLN198	Reserve	MRC	18.662	2.280
110HLN836087	Lands Lease	MRC	261.708	31.976
1HLN252	Lands Lease	MRC	487.804	59.601
9CP891281	Lands Lease	MRC	7.335	0.896
Moranbah Pipeline				
100SP239828	Freehold	MRC	309.322	4.490
100SP251730	Freehold	WRC	154.501	2.243
109HLN198	Reserve	MRC	25.464	0.370
10SP244495	Freehold	WRC	7.126	0.103
110HLN836087	Lands Lease	MRC	283.886	4.121
11SP124642	Freehold	WRC	8.252	0.120
12SP124642	Freehold	WRC	7.208	0.105
131SP266905	Freehold	WRC	32.997	0.479
13SP124642	Freehold	WRC	7.233	0.105
13WHS466	Lands Lease	WRC	309.809	4.498
14GV304	Reserve	WRC	309.809	4.498
14SP124642	Freehold	WRC	7.046	0.102
14SP236280	Freehold	WRC	34.618	0.503
15SP124642	Freehold	WRC	2.176	0.032
171RP866144	Freehold	WRC	40.452	0.587
17SP236270	Lands Lease	WRC	620.959	9.015
17SP261431	Freehold	WRC	32.508	0.472

Property	Tenure	Local Government Area	Area (Ha)	Percentage of Property covered (%)
18SP262679	Freehold	WRC	0.181	0.003
1HLN252	Lands Lease	MRC	487.804	7.081
1SP113033	Lands Lease	WRC	6.157	0.089
1SP144273	Lands Lease	WRC	0.019	0.000
1SP144274	Lands Lease	WRC	98.423	1.429
1SP158697	Freehold	WRC	0.546	0.008
1SP162593	Freehold	WRC	1.440	0.021
1SP187962	Freehold	WRC	54.494	0.791
1SP251730	Freehold	WRC	186.354	2.705
21GV264	Freehold	WRC	12.459	0.181
21SP130064	Lands Lease	WRC	3.079	0.045
22GV264	Freehold	WRC	6.943	0.101
22SP130065	Lands Lease	WRC	25.603	0.372
23GV264	Freehold	WRC	6.974	0.101
23SP130066	Lands Lease	WRC	16.070	0.233
24SP221564	Lands Lease	WRC	10.898	0.158
25SP130068	Lands Lease	WRC	10.898	0.158
27SP214499	Lands Lease	WRC	0.353	0.005
28GV304	Reserve	WRC	0.353	0.005
2SP104779	Lands Lease	MRC	633.056	9.190
2SP113033	Lands Lease	WRC	42.837	0.622
2SP144274	Lands Lease	WRC	19.219	0.279
2SP214498	Freehold	WRC	105.433	1.531
2SP221655	Freehold	WRC	1.447	0.021
2WHS373	Freehold	WRC	428.438	6.220
3HLN29	Freehold	WRC	273.115	3.965
3SP144274	State Land	WRC	2.036	0.030
3SP145152	Lands Lease	WRC	7.449	0.108
3SP221655	Freehold	WRC	68.591	0.996
3W4013	Freehold	WRC	163.688	2.376
47SP137004	Freehold	WRC	12.129	0.176
49RP616870	Freehold	WRC	0.040	0.001
4HLN225	Freehold	WRC	268.626	3.900
4SP144274	Lands Lease	WRC	23.141	0.336
4W4013	Freehold	WRC	160.449	2.329
5270SP144274	Lands Lease	WRC	145.139	2.107
5GV132	Freehold	WRC	284.542	4.131
5W4014	Freehold	WRC	165.158	2.398
6SP131761	Freehold	WRC	213.592	3.101
6SP155252	Lands Lease	WRC	16.652	0.242
7RP856274	Freehold	WRC	21.114	0.307
7SP155252	Freehold	WRC	296.790	4.309
8GV196	Reserve	WRC	5.710	0.083
8SP155252	Freehold	WRC	318.703	4.627
9CP891281	Lands Lease	MRC	11.286	0.164

Property	Tenure	Local Government Area	Area (Ha)	Percentage of Property covered (%)
9SP113033	Lands Lease	WRC	59.214	0.860
9SP244495	Freehold	WRC	7.095	0.103
AAP3682	Lands Lease	WRC	11.328	0.164
Irrigation Precinct				
018DK17	Lands Lease	WRC	137.704	85.02451
10DK17	Freehold	MRC	465.215	90.50895
11DK18	Freehold	WRC	455.458	88.02343
11SP171912	Lands Lease	WRC	1.57591	0.6165
12DK18	Freehold	WRC	112.077	21.86271
12SP171912	Lands Lease	WRC	7688.2	55.44762
13DK16	Freehold	MRC	238.924	84.55008
14DK18	Freehold	WRC	361.757	72.12536
15DK18	Lands Lease	MRC	269.687	54.05665
16DK18	Lands Lease	WRC	136.847	34.73979
17DK68	Freehold	WRC	189.172	16.49679
18DK17	Reserve	WRC	137.704	85.02451
1CP817140	Lands Lease	WRC	6745.01	42.81567
1DK4	Lands Lease	WRC	29.0766	0.341084
2DK232	Lands Lease	MRC	1945.81	4.783269
5DK17	Freehold	WRC	220.682	42.57427
618SP271121	Lands Lease	WRC	7290.74	25.7286
62SP248717	Lands Lease	WRC	12479.31	41.69872
6DK17	Freehold	WRC	334.768	64.40125
7DK17	Freehold	WRC	402.283	77.50495
8DK17	Freehold	MRC	484.769	96.50121
9DK17	Freehold	WRC	324.903	63.08478
AAP11663	Lands Lease	WRC	0.051	16.48768
AAP11664	Lands Lease	WRC	0.753	82.62878
BAP11664	Lands Lease	WRC	0.0186577	19.15842
PHES Option 1				
1522SP272352	Lands Lease	MRC	159.656	100
110HLN836087	Lands Lease	MRC	33.245	54.2
PHES Option 4				
1HLN252	Lands Lease	MRC	126.751	100
PHES Option 7				
110HLN836087	Lands Lease	MRC	77.8034	100

APPENDIX B EXISTING ENVIRONMENT

Existing environment – project components

Table 1 describes the existing natural environment of relevance for each key project component.

Table 1 Existing Environment

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Land							
Topography	The dam inundation area includes stream flow areas constrained by steep valley walls. The topography of the area ranges from approximately 280 AHD to 300 m AHD.	The land in these areas consists of river terraces constrained by steep valley walls. The elevation along these river terraces ranges from approximately 270 m AHD to around 620 m AHD at the highest point. The peaks in this area are above 640 m AHD.	The land in this area consists of river terraces constrained by steep valley walls. The elevation along these river terraces ranges from approximately 260 m AHD to around 400 m AHD at the highest point. The peaks in this area are above 700 m AHD.	The land in this area consists of river terraces constrained by steep valley walls. The topography in this area ranges from approximately 300 AHD to 650 AHD.	The topography in this area is variable, including mountainous regions in the northern sections of the project area near Eungella Dam, and low lying hills and flood plains in the southern region of the project area near Moranbah. The minimum elevation of the area is approximately 250 m AHD and 650 m AHD.	The land in this area consists of stream flows constrained by steep valley walls. As this project area is within a flow path, the elevation is low, approximately 240 m along the stream path, surrounded by higher mountainous regions with elevation up to approximately 550 m AHD.	The elevation of the irrigation precinct is variable, including both low-lying flood plains and surrounding mountainous regions. The elevation of the ranges from approximately 100 m AHD and 600 m AHD.
Soil	The dam inundation area is predominantly classified as having dermosol soil types, which are non-texture contrast soils that have structured subsoils.	The location of the pumped hydro-electric power scheme (PHES) options footprints are both classified as having dermosol soil types, which are non-texture contrast soils that have structured subsoils.	The project area of the Peter Faust pipeline predominantly includes soil types: <ul style="list-style-type: none">Vertosols (cracking, clay soils)Kandosols (non-structured soils)Dermosols (non-texture contrast soils that have structured subsoils).	Similarly to the Peter Faust pipeline, the predominant soil types within the Eungella pipeline include: <ul style="list-style-type: none">Vertosols (cracking clay soils) andKandosols (non-structured soils).	The Moranbah pipeline predominantly includes soil types: <ul style="list-style-type: none">Vertosols (cracking clay soils)Rudosols (soils with negligible pedological development)Tenosols (shallow with weak soil profile development)Kandosols (non-structured)Dermosols (non-texture contrast soils that have structured subsoils).	Similarly to the Peter Faust pipeline, the predominant soil types within the Eungella pipeline include: <ul style="list-style-type: none">Vertosols (cracking clay soils)Kandosols (non-structured soils).	The irrigation precinct includes soil types: <ul style="list-style-type: none">Tenosols (limited subsoil development and less than 15% clay content)Kandosols (non-structured soils)Rudosols (negligible pedological development, apart from minimal development of a surface (A) horizon).

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Geology	<p>The dam site is located on the Broken River, approximately 3.4 km downstream of the confluence of the Urannah Creek. The regional and site geology indicates:</p> <p>The Broken River is generally parallel to the eastern boundary of the Bowen Basin. The oldest rocks on the Eastern limb of this basin is the lower Bowen Volcanics of Lower Permian age, and these are exposed for approximately seven kilometres along the Broken River upstream of its confluence with the Bowen River.</p> <p>The rocks at the dam site belong to the Carboniferous to Mesozoic aged Urannah Complex, consisting of various igneous intrusions, including diorite, granodiorite, adamellite and granite, with some basic to ultra-basic components, all of which have been intruded by several generations of acid to basic dykes.</p>	<p>The proposed PHES option 1 intersects with two surface geologies, including:</p> <ul style="list-style-type: none"> • Salitros granite • Turnback granite. <p>The proposed PHES option 4 intersects with surface geology dominated by:</p> <ul style="list-style-type: none"> • Massey granite. <p>The proposed PHES option 7 intersects with surface geology dominated by:</p> <ul style="list-style-type: none"> • Urannah Batholith-CPgu • Eungella Granodiorite. 	<p>The proposed Peter Faust pipeline intersects with many different surface geologies, including:</p> <ul style="list-style-type: none"> • Mount Cauley Granite • Adaluma Tonalite • Turn Back Granite • Starvation Creek Complex • Pgd-NCON • Mount Crompton Granodiorite • Grass Humpy Gabbro • Amelia Creek Tonalite • Birds Nest Granodiorite • Qa-QLD • Mount Hector Granite • Hecate Granite/4 • Qr-QLD • Hecate Granite/3 • Qha-QLD. 	<p>The surface geology within the proposed Eungella pipeline corridor is varied, including:</p> <ul style="list-style-type: none"> • Salitros granite • Litros granite • Urannah Batholith-Cathedral Peak Granodiorite • Mount Benmore Volcanics • Mount Barker Granodiorite. 	<p>The surface geology within the proposed Moranbah pipeline corridor is varied, including:</p> <ul style="list-style-type: none"> • Mount Barker Granodiorite • Mount Benmore Volcanics • Qpa-QLD • Gebbie Formation • Blenheim Formation • Exevale Formation • Exmoor Formation • Moranbah Coal Measures • Ki-8555 • Qa-QLD • Fort Cooper Coal Measures • Tb-QLD • Rangal Coal Measures • Rewan Group • TQa-QLD • Suttor Formation • Qr-QLD. 	<p>The surface geology within the proposed Eungella pipeline corridor is varied, including:</p> <ul style="list-style-type: none"> • Adaluma Tonalite • Turn Back Granite • Beckford Granodiorite • Connors Volcanic Group • Lizzie Creek Volcanic Group • Qa-QLD 	<p>As the proposed irrigation precinct is located over a large area, the surface geology is highly variable including late tertiary, quaternary and early and late Permian age rock types. This incorporates geology such as:</p> <ul style="list-style-type: none"> • Blenheim Formation • Exmoor Formation • Mount Toussaint Volcanics • Crush Creek Coal Measures • TQf-QLD • Leichhardt Range Granite • Red Hill Creek Granodiorite • Goldbeetle Creek • Granodiorite • Lizzie Creek Volcanic Group.

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Land use	All land in the proposed dam inundation area is currently used for grazing in native vegetation and is mapped as category 4 high-value agriculture land suitability.	Extensive grazing of native pastures is the dominant land use (90 per cent) of the Burdekin Basin area, with dryland cropping and mining in the upper catchments.	Extensive grazing of native pastures is the dominant land use (90 per cent) of the Burdekin Basin area, with dryland cropping and mining in the upper catchments.	Extensive grazing of native pastures is the dominant land use (90 per cent) of the Burdekin Basin area, with dryland cropping and mining in the upper catchments.	Extensive grazing of native pastures is the dominant land use (90 per cent) of the Burdekin Basin area, with dryland cropping and mining in the upper catchments.	Extensive grazing of native pastures is the dominant land use (90 per cent) of the Burdekin Basin area, with dryland cropping and mining in the upper catchments.	Land within the downstream area is almost exclusively used for grazing on natural pastures, with some irrigated horticulture and cropping, and small conservation, minimal use, urban and semi urban areas. The downstream area includes a number of areas designated as Class A agricultural land under the <i>Regional Planning Interests Act 2014</i> and some area designated as Class B agricultural land.
Water							
Surface water	Urannah Dam and its proposed inundation area are in the Broken River sub-catchment of the Bowen sub-basin. The Broken River, which is the main river that will run through the proposed Urannah Dam, joins the Bowen River at Bowen Weir, approximately 35.6 km downstream of the dam site. The Bowen River joins the Burdekin River at Blue Valley Weir and the Burdekin River then flows north and east into the GBR. The Broken River and its tributaries are major contributors to the flow of water and water quality into the Bowen and lower Burdekin rivers.	All PHES options are located within 2 km of the proposed inundation area of Urannah Dam. As such, these elements are within the Broken River sub-catchment of the Bowen sub-basin. PHES option 1 intersects the Broken River and five minor, unnamed watercourse (defined under the <i>Water Act 2000</i>). PHES option 4 intersects Massey Creek and approximately 16 minor, unnamed watercourses (defined under the <i>Water Act 2000</i>). PHES option 7 intersects the Broken River and four minor, unnamed watercourses. PHES option 7 is also within close proximity (approximately 2 km) to Eungella Dam.	The proposed Peter Faust pipeline is located within the Proserpine Catchment in the north, O'Connell Catchment in the middle and Burdekin Catchment to the South. The pipeline crosses the Proserpine River to the north and Broken River in the South, and crosses a number of minor waterways, including: Spring Creek, Charley's Creek, Jones Creek, Breakneck Creek, Andronmache River, Gap Creek, Oakey Creek, Birds Nest Creek, Sandy Creek, Grant Creek and a number on unnamed waterways.	The proposed Eungella pipeline corridor is in the Burdekin River Catchment and the Broken River sub-catchment. The pipeline crosses the Broken River, Furious Creek and a number of minor waterways.	The proposed Moranbah pipeline corridor is in the Burdekin Catchment and the Fitzroy Catchment. The proposed pipeline corridor follows Exe Creek (major waterway) to the north and crosses it at one point. The pipeline corridor meets Hail/Bee Creek (Major Waterway) where it crosses Suttor Development Road in the South, and crosses a number of minor waterways, including Walker Creek, Thirty Mile Creek, North Creek and a number of unnamed waterways.	The instream flow is proposed within the Burdekin River Catchment and follows the natural flow of the Broken River upstream until it meets the Bowen River at the Bowen River Weir and Gattonvale Offstream Storage.	The downstream area lies primarily within the lower reaches of the Broken River sub-catchment, as described in the hydrology of the inundation area, and the Bowen River sub-catchment of the Bowen River sub-basin. Small sections of the proposed irrigation area are in the Pelican Creek, Rosella Creek and Glenmore sub-catchments.

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Groundwater	<p>There are no registered groundwater monitoring bores in the vicinity of the proposed Urannah Dam inundation area. The area is not within a groundwater management area.</p> <p>Accessible information on groundwater in the vicinity of the Project, and the Broken River sub catchment, is limited.</p>	There are no registered groundwater monitoring bores in the vicinity of the proposed PHES options. The area is not within a groundwater management area.	A number of bores are located within close proximity to the proposed Peter Faust pipeline corridor, particularly within the northern extent of the pipeline corridor. These bores hold both active and abandoned statuses and further investigation of these may be required before development.	There are four registered groundwater bores in the vicinity of the Eungella Dam pipeline corridor. Of these, three are abandoned and destroyed and one holds an existing status (RN 105464).	A large number of bores are located within close proximity to the Moranbah pipeline corridor, both active and abandoned. Further investigation of these may be required before development.	A large number of bores are located within close proximity to the instream area, both active and abandoned. Further investigation of these may be required before development.	A large number of bores are located within the proposed irrigation precinct, both active and abandoned. Further investigation of these may be required before development.
Hydrology/ flooding	<p>The Queensland Floodplain Assessment Overlay (QFAO) represents a floodplain area within drainage sub-basins in Queensland. It has been developed for use by local governments as a potential flood hazard area. It represents an estimate of areas potentially at threat of inundation by flooding. The proposed Urannah Dam is not located within the QFAO.</p>	The proposed PHES options are not within the QFAO.	The majority of the proposed Peter Faust pipeline corridor is not located within the QFAO, with the exception of the northern extent of the pipeline corridor which intersects the O-Connell River and Proserpine River floodplains.	The proposed Eungella pipeline corridor is not located within the QFAO.	The Moranbah pipeline corridor intersects the QFAO within the Bowen River and Isaac River floodplains.	The instream area intersects the Bowen River QFAO (project element utilises existing stream).	The irrigation precinct intersects the QFAO within the Bowen River floodplain (irrigation precinct is located on left and right banks of the Bowen River).
Water quality	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>The surrounding land is predominantly designated for agricultural use with an estimated 67-70% of the regional particulate nutrient load derived from grazing lands. Three key mechanisms have been identified which increase nutrient load, including: erosion, additional fertiliser or sewerage and loss of natural trapping.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities. Additional water quality impacts, e.g. fuel particulates, may be associated with mining sites and related roads and urban development located towards the southern extent of the Project area.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities. Some additional water quality impacts may be associated with the mining sites located within the Project area.</p>	<p>To date, there are no locally developed Water Quality Objectives for the Broken River under the Schedule 1 (EPP) Water Guidelines.</p> <p>Similarly to the inundation area, the primary water quality issues are identified as sediment loads and particulate nutrients derived from agricultural activities. Some additional water quality impacts may be associated with the mining sites located within the Project area.</p>

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Waterway barrier works	Under the DAF waterway barrier works spatial layer, the waterways in the inundation area are primarily classified as major or high risk waterways, and as such a waterway barrier works approval will likely be required for the construction of the dam.	Under the DAF waterway barrier works spatial layer, PHES option 1 intersects one major (purple) (Broken River) and one moderate (orange) risk waterway. PHES option 4 intersects one major (purple) (Massey Creek) and one low (green) risk waterway. PHES option 7 intersects one major (purple) (Broken River) risk waterway. As such a waterway barrier works approval will likely be required.	Under the DAF waterway barrier works spatial layer, the waterways in the proposed Peter Faust pipeline corridor vary from low to major risk waterways, and as such a waterway barrier works approval will likely be required.	Under the DAF waterway barrier works spatial layer, the waterways in the proposed Eungella pipeline corridor are primarily classified as high risk waterways, and as such a waterway barrier works approval will likely be required.	Under the DAF waterway barrier works spatial layer, the waterways in the proposed Moranbah pipeline corridor vary from low to major risk waterways, and as such a waterway barrier works approval will likely be required.	Under the DAF waterway barrier works spatial layer, the waterways in the instream area are primarily classified as major risk waterways, and as such a waterway barrier works approval will likely be required for the construction of the dam.	Under the DAF waterway barrier works spatial layer, the waterways in the proposed irrigation precinct area vary from low to major risk waterways, and as such a waterway barrier works approval will likely be required.
Amenity							
Climate	Urannah Dam project area, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed PHES options, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed Peter Faust pipeline corridor, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed Eungella pipeline corridor, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed Moranbah pipeline corridor, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed instream area, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.	The proposed irrigation precinct, as part of the Burdekin River Basin, has a tropical sub-humid climate with high temperatures and distinct wet (December to April) and dry (May to November) seasons. The area is affected by variable inter-annual rainfall, averaging between 500 mm to 1500 mm, with droughts and tropical cyclones (and associated flooding) approximately once every four years.

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Air	As the dominant land use within the area is grazing and agriculture, the air quality within the Urannah Dam footprint would be largely uninfluenced by external factors.	As the dominant land use within the area is grazing and agriculture, the air quality within the PHES options footprints would be largely uninfluenced by external factors.	As the dominant land use within the area is grazing and agriculture, the air quality within the Peter Faust pipeline corridor would be largely uninfluenced by external factors.	As the dominant land use within the area is grazing and agriculture, the air quality within the Eungella pipeline corridor would be largely uninfluenced by external factors.	As a dominant land use within the area is grazing and agriculture, the air quality within the Moranbah pipeline corridor would be largely uninfluenced by external factors. Some air quality factors, such as dust particulate matter, may be present from the associated mining activities.	As the dominant land use within the area is grazing and agriculture, the air quality within the instream area would be largely uninfluenced by external factors. A number of sites associated with mining activities have been listed as being within close proximity to the instream area, with these potentially creating additional air quality impacts.	As the dominant land use within the area is grazing and agriculture, the air quality within the irrigation precinct would be largely uninfluenced by external factors, although some air quality impacts may be associated with the local mining sites.
Noise and vibration	As the dominant land use within the area is grazing and agriculture, noise and vibration would not be largely impacted.	As the dominant land use within the area is grazing and agriculture, noise and vibration would not be largely impacted.	As the dominant land use within the area is grazing and agriculture, noise and vibration would not be largely impacted.	As the dominant land use within the area is grazing and agriculture, noise and vibration would not be largely impacted.	While the land dedicated to grazing and agriculture would have relatively low impact on noise and vibration, the Moranbah pipeline corridor may be affected by the mining activities located towards the southern extent of the Project area.	While the land dedicated to grazing and agriculture would have relatively low impact on noise and vibration, the instream area may be affected by the mining activities located within the Project area.	As the dominant land use within the area is grazing and agriculture, noise and vibration would not be largely impacted. Some noise and vibration may be associated with the mining activity sites located within the area.
Visual amenity	The area surrounding the Urannah Dam inundation area is largely being used for grazing and agriculture and subsequently, visual amenity is predominantly unchanged from the natural landscape.	The area surrounding the PHES options footprints is largely used for grazing and agriculture and subsequently, visual amenity is predominantly unchanged from the natural landscape.	The area surrounding the proposed Peter Faust pipeline corridor is largely being used for grazing and agriculture and subsequently, visual amenity is predominantly unchanged from the natural landscape.	The area surrounding the proposed Eungella pipeline corridor is largely being used for grazing and agriculture and subsequently, visual amenity is predominantly unchanged from the natural landscape.	The area surrounding the proposed Moranbah pipeline corridor is largely used for grazing, agriculture and mining activities, particularly within the southern extent of the Project area.	The area surrounding the proposed instream area is largely used for grazing and agriculture and visual amenity is predominantly unchanged from the natural landscape. A number of sites used for coal mining activities are also located within the area.	The immediate vicinity is currently being used for grazing and agriculture. A number of sites used for coal mining activities are also located within the area.
Ecosystems							
Protected areas	The Eungella National Park protected area is within close proximity to the proposed Dam inundation area, approximately 1 km in some locations.	The Eungella National Park protected area is within close proximity to all PHES options, approximately 5 km from PHES option 4.	No protected areas intersect with the proposed Peter Faust pipeline corridor.	No protected areas intersect with the proposed Eungella pipeline corridor, although Crediton Forest Reserve is located within close proximity to the project area.	No protected areas intersect with the proposed Moranbah pipeline corridor, although Homevale National Park is located within close proximity to the project area.	No protected areas intersect with the proposed instream area.	No protected areas intersect with the proposed irrigation precinct, although Hells Gate Nature Refuge is located within close proximity to the project area.

Wetlands	<p>There are no wetlands of international importance (Ramsar) identified in the inundation area.</p> <p>The inundation area along Urannah Creek, Dicks Creek, Ernest Creek and Massey Creek is mapped under the NC Act as being of very high riverine conservation significance, and the inundation area along the Broken River is mapped as being of high riverine conservation significance. This is because these creeks and rivers form part of the Broken River, Urannah Creek and Massey Creek Aggregation, which is currently listed in the Directory of Nationally Important Wetlands and includes some of the least disturbed examples of riverine wetland in Central Queensland.</p> <p>There are no wetland protection areas or MSES wetlands of High Ecological Significance (HES) under the <i>Regional Planning Interests Act 2014</i> mapped within the proposed Urannah Dam inundation area.</p>	<p>There are no wetlands of international importance (Ramsar) identified in the PHES options footprints.</p> <p>Similarly to the inundation area of Urannah Dam, the PHES options footprints are proximal to the Broken River which is mapped as being of high riverine conservation significance. This because this river form part of the Broken River, Urannah Creek and Massey Creek Aggregation, which is currently listed in the Directory of Nationally Important Wetlands and includes some of the least disturbed examples of riverine wetland in Central Queensland.</p> <p>There are no wetland protection areas or MSES wetlands of High Ecological Significance (HES) under the <i>Regional Planning Interests Act 2014</i> mapped within the proposed PHES options footprints.</p>	<p>There are no wetlands of international importance (Ramsar) identified within the Peter Faust pipeline corridor.</p> <p>One nationally important wetland occurs within the area:</p> <ul style="list-style-type: none"> Broken River, Urannah Creek and Massey Creek Aggregation <p>There are no wetland protection areas or MSES wetlands of HES under the <i>Regional Planning Interests Act 2014</i> mapped within the proposed Peter Faust pipeline corridor.</p>	<p>There are no wetlands of international importance (Ramsar) identified within the Eungella pipeline.</p> <p>Two nationally important wetland occur within the area:</p> <ul style="list-style-type: none"> Broken River, Urannah Creek and Massey Creek Aggregation Eungella Dam <p>There are no wetland protection areas or MSES wetlands of HES under the <i>Regional Planning Interests Act 2014</i> mapped within the proposed Eungella pipeline corridor.</p>	<p>There are no wetlands of international importance (Ramsar) identified in the Moranbah pipeline corridor.</p> <p>One nationally important wetland occur within the area:</p> <ul style="list-style-type: none"> Eungella Dam <p>There are no wetland protection areas or MSES wetlands of HES under the <i>Regional Planning Interests Act 2014</i> mapped within the Moranbah pipeline corridor.</p>	<p>There are no wetlands of international importance (Ramsar) identified in the instream area.</p> <p>Two nationally important wetlands occur within the area:</p> <ul style="list-style-type: none"> Bowen River: Birralelee - Pelican Creek Broken River, Urannah Creek and Massey Creek Aggregation <p>There are no wetland protection areas or MSES wetlands of HES under the <i>Regional Planning Interests Act 2014</i> mapped within the instream area.</p>	<p>There are no wetlands of international importance (Ramsar) mapped in the irrigation precinct.</p> <p>Three nationally important wetlands occur within the area:</p> <ul style="list-style-type: none"> Bowen River: Birralelee - Pelican Creek Aggregation – 15 kilometre section of the Bowen River upstream of the confluence with Pelican Creek, approximately 27 km west of Collinsville. Broken River, Urannah Creek and Massey Creek Aggregation – extends along the Broken River, downstream of the dam site, to approximately 6.5 km upstream of the confluence with the Bowen River. Burdekin-Bowen Junction and Blue Valley Weir Aggregation – incorporates the junction of the Burdekin and Bowen Rivers and segments of those rivers, including the impoundment behind Blue Valley Weir on the Burdekin River. <p>The proposed irrigation precinct contains one wetland protection area or MSES wetlands of HES under the <i>Regional Planning Interests Act 2014</i>.</p>
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Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Ecological communities	According to the <i>EPBC Act</i> MNES there are no threatened ecological communities identified in the inundation area.	According to the <i>EPBC Act</i> MNES there are no threatened ecological communities identified in the PHES options footprints.	According to the <i>EPBC Act</i> MNES there is one threatened ecological community identified in the Peter Faust pipeline corridor, listed as: <ul style="list-style-type: none"> Broad leaf tea-tree (<i>Melaleuca viridiflora</i>) woodlands in high rainfall coastal north Queensland. 	According to the <i>EPBC Act</i> MNES there are no threatened ecological communities identified in the Eungella pipeline corridor.	According to the <i>EPBC Act</i> MNES there are three threatened ecological communities identified in the Moranbah pipeline corridor, including: <ul style="list-style-type: none"> Brigalow (<i>Acacia harpophylla</i> dominant and codominant) Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions. 	According to the <i>EPBC Act</i> MNES there are three threatened ecological communities identified in the project area, including: <ul style="list-style-type: none"> Brigalow (<i>Acacia harpophylla</i> dominant and codominant) Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin. Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions. 	According to the EPBC Protected Matter Search (undertake in August 2018), three threatened ecological communities were identified as potentially occurring in the downstream area, including: <ul style="list-style-type: none"> Brigalow (<i>Acacia harpophylla</i> dominant and codominant) Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions.
Flora & Fauna							
Listed species EPBC Act	<p>The EPBC Protected Matters Search (undertaken in July 2018) identified the following matters of national environmental significance (MNES) as occurring within the inundation area (2 km radius):</p> <ul style="list-style-type: none"> 8 bird species 1 frog species 5 mammal species 2 reptile species 7 plant species 15 migratory species <p>Of the above, 12 fauna and 4 flora species are 'likely to occur', with 5 fauna species 'known to occur' within 2 km of the dam area, including:</p>	<p>The EPBC Protected Matters Search (undertaken in July 2018) identified the following matters of national environmental significance (MNES) as occurring within the PHES options footprints (2 km radius):</p> <ul style="list-style-type: none"> 8 bird species 1 frog species 5 mammal species 2 reptile species 7 plant species 15 migratory species <p>Of the above, 12 fauna and 4 flora species are 'likely to occur', with 5 fauna species 'known to occur' within 2 km of the PHES options footprints, including:</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following matters of national environmental significance (MNES) as occurring within the Peter Faust pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 7 bird species 1 frog species 6 mammal species 2 reptile species 17 migratory species 6 plant species <p>Of the above, 13 fauna and 4 flora species are 'likely to occur', with 3 fauna species 'known to occur' within 2 km of the Peter</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following matters of national environmental significance (MNES) as occurring within the Eungella pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 8 bird species 1 frog species 5 mammal species 2 reptile species 15 migratory species 5 plant species <p>Of the above, 10 fauna and 4 flora species are 'likely to occur', with 5 fauna species 'known to occur' within 2 km of the Eungella pipeline corridor, including:</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following matters of national environmental significance (MNES) as occurring within the Moranbah pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 8 bird species 1 fish species 1 frog species 6 mammal species 6 reptile species 15 migratory species 6 plant species <p>Of the above, 8 fauna and 5 flora species are 'likely to occur', with 8 fauna species 'known' to occur within 2 km of the</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following matters of national environmental significance (MNES) as occurring within the instream area (2 km radius):</p> <ul style="list-style-type: none"> 8 bird species 5 mammal species 3 reptile species 1 shark species 16 migratory species 5 plant species <p>Of the above, 16 fauna and 4 flora species are 'likely to occur', with no fauna or flora species 'known to occur' within 2 km of the instream area.</p>	<p>The EPBC Protected Matters Search (undertake in August 2018) identified the following matters of national environmental significance (MNES) as occurring within the irrigation precinct (2 km buffer):</p> <ul style="list-style-type: none"> 8 bird species 1 frog species 7 mammal species 3 reptile species 1 shark species 10 plant species 18 migratory species <p>Of the above, 13 fauna and 6 flora species are 'likely to occur', with 11 fauna and 1 flora species 'known to occur' within 2 km of the irrigation precinct, including:</p>

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
	<ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (koala) <i>Hirundapus caudacutus</i> (white-throated needletail) – migratory and terrestrial <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Monarcha trivirgatus</i> (spectacled monarch) – migratory and terrestrial <i>Myiagra cyanoleuca</i> (satin flycatcher) – migratory and terrestrial 	<ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (koala) <i>Hirundapus caudacutus</i> (white-throated needletail) – migratory and terrestrial <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Monarcha trivirgatus</i> (spectacled monarch) – migratory and terrestrial <i>Myiagra cyanoleuca</i> (satin flycatcher) – migratory and terrestrial 	Faust pipeline corridor, including: <ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (koala) <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Myiagra cyanoleuca</i> (satin flycatcher) – migratory and terrestrial 	<ul style="list-style-type: none"> <i>Erythrotriorchis radiatus</i> (red goshawk) <i>Phascolarctos cinereus</i> (koala) <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Monarcha trivirgatus</i> (spectacled monarch) – migratory and terrestrial <ul style="list-style-type: none"> <i>Myiagra cyanoleuca</i> (satin flycatcher) – migratory and terrestrial 	Moranbah pipeline corridor, including: <ul style="list-style-type: none"> <i>Geophaps scripta scripta</i> (squatter pigeon southern subspecies) <i>Petauroides Volans</i> (greater glider) <i>Phascolarctos cinereus</i> (koala) <i>Denisonia maculate</i> (ornamental snake) <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Monarcha trivirgatus</i> (spectacled monarch) – migratory and terrestrial <i>Myiagra cyanoleuca</i> (satin flycatcher) – Migratory and terrestrial <i>Rhipidura rufifrons</i> (rufous fantail) – migratory and terrestrial <i>Pandion haliaetus</i> (osprey) – migratory and wetland <i>Eucalyptus raveretiana</i> (black ironbox) 		<ul style="list-style-type: none"> <i>Erythrotriorchis radiatus</i> (red goshawk) <i>Geophaps scripta scripta</i> (squatter pigeon southern subspecies) <i>Dasyurus hallucatus</i> (northern quoll) <i>Petauroides Volans</i> (greater glider) <i>Phascolarctos cinereus</i> (koala) <i>Denisonia maculate</i> (ornamental snake) <i>Cuculus optatus</i> (oriental cuckoo, horsfield's cuckoo) – Migratory and terrestrial <i>Hirundapus caudacutus</i> (white-throated needletail) – migratory and terrestrial <i>Monarcha melanopsis</i> (black-faced monarch) – migratory and terrestrial <i>Monarcha trivirgatus</i> (spectacled monarch) – migratory and terrestrial <i>Myiagra cyanoleuca</i> (satin flycatcher) – migratory and terrestrial <i>eucalyptus raveretiana</i> (black ironbox)

NC Act listed species	<p>The following vulnerable species were listed on wildlife online as being recorded within 1 km of the dam inundation area, including:</p> <ul style="list-style-type: none"> <i>Calyptorhynchus lathamii erebus</i> (glossy black-cockatoo (northern)) <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) <i>Bolemoreus Hindwoodi</i> (Eungella honeyeater) <i>Ninox strenua</i> (powerful owl) <i>Phascolarctos Cinereus</i> (koala) <i>Petauroides volans minor</i> (northern greater glider) <i>Plectranthus graniticola</i> (Unknown) <p>Also listed were species of 'Least Concern', including:</p> <ul style="list-style-type: none"> 4 frogs 114 birds 14 mammals 3 reptiles 146 plants <p>The two turtle species that have been recorded in the Bowen River sub-basin are the saw-shelled turtle (<i>Wollumbinia latisternum</i>) and the Irwin's turtle (<i>Elseya irwini</i>). Neither species is a listed threatened species under Commonwealth or state legislation. However, due</p>	<p>The following vulnerable species were listed on wildlife online as being recorded within 1 km of the PHES options footprints, including:</p> <ul style="list-style-type: none"> <i>Calyptorhynchus lathamii erebus</i> (glossy black-cockatoo (northern)) <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) <i>Bolemoreus Hindwoodi</i> (Eungella honeyeater) <i>Ninox strenua</i> (powerful owl) <i>Phascolarctos Cinereus</i> (koala) <i>Petauroides volans minor</i> (northern greater glider) <i>Plectranthus graniticola</i> (Unknown) <p>Also listed were species of 'Least Concern', including:</p> <ul style="list-style-type: none"> 4 frogs 114 birds 14 mammals 3 reptiles 146 plants <p>The two turtle species that have been recorded in the Bowen River sub-basin are the saw-shelled turtle (<i>Wollumbinia latisternum</i>) and the Irwin's turtle (<i>Elseya irwini</i>). Neither species is a listed threatened species under Commonwealth or state legislation. However, due</p>	<p>According to the Wildlife online MSES report no vulnerable species were listed and two species were listed as 'Least Concern' within the area, including:</p> <ul style="list-style-type: none"> 2 plant species 	<p>According to the Wildlife online MSES report no vulnerable species were listed and three species were listed as 'Least Concern' within the area, including:</p> <ul style="list-style-type: none"> 1 bird species 2 plant species 	<p>The following vulnerable species were listed on the wildlife online MSES report as being recorded within the Moranbah pipeline corridor, including:</p> <ul style="list-style-type: none"> <i>Geophaps scripta scripta</i> (squatter pigeon southern subspecies) <i>Bolemoreus hindwoodi</i> (Eungella honeyeater) <i>Phascolarctos Cinereus</i> (koala) <i>Petauroides volans minor</i> (northern greater glider) <p>Also listed were species of 'Least Concern', including:</p> <ul style="list-style-type: none"> 12 frog species 198 bird species 36 mammal species 47 reptile species 365 plant species 	<p>The following vulnerable species were listed on the wildlife online MSES report as being recorded within the instream area, including:</p> <ul style="list-style-type: none"> <i>Geophaps scripta scripta</i> (squatter pigeon southern subspecies) <p>Also listed were species of 'Least Concern', including:</p> <ul style="list-style-type: none"> 5 frog species 99 bird species 8 mammal species 18 reptile species 85 plant species 	<p>The following vulnerable species were listed on the wildlife online MSES report as being recorded within 1 km of the irrigation precinct, including:</p> <ul style="list-style-type: none"> <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) <i>Phascolarctos Cinereus</i> (koala) <i>Petauroides volans minor</i> (northern greater glider) <i>Acanthophis antarcticus</i> (common death adder) <p>Also listed were species of 'Least Concern', including:</p> <ul style="list-style-type: none"> 10 frogs 135 birds 26 mammals 47 reptiles 129 plants
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Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
	to its limited distribution, the Irwin's turtle is currently listed as a high priority on the Queensland government's Back on Track species priority framework. Due to the limited information on the distribution of the Irwin's turtle, its known occurrence in the Broken River, and the presence of suitable habitat in the inundation area, field surveys will be required for the environmental impact assessment process as the Project progresses.	to its limited distribution, the Irwin's turtle is currently listed as a high priority on the Queensland government's Back on Track species priority framework. Due to the limited information on the distribution of the Irwin's turtle, its known occurrence in the Broken River, and the presence of suitable habitat in the inundation area, field surveys will be required for the environmental impact assessment process as the Project progresses.					
Essential habitat	<p>Mapping indicates no essential habitats are located within the proposed dam inundation area, however, the Eungella National Park is located within close proximity and essential habitat for multiple species area located within this region.</p> <p>Essential habitat for <i>Phascolarctos cinereus</i> (koala) is directly downstream of the inundation area, and intersection could occur, particularly in times of flood.</p>	<p>Mapping indicates no essential habitats are located within the proposed PHES options footprints, however, the Eungella National Park is located within close proximity and essential habitat for multiple species area located within this region.</p>	<p>Mapping indicates the proposed Peter Faust pipeline intersects with essential habitat in the northern extent of the project, toward Lake Proserpine. The area is listed essential habitat for:</p> <ul style="list-style-type: none"> <i>Petrogale Persephone</i> (Proserpine rock-wallaby) <i>Phascolarctos cinereus</i> (koala) 	<p>Mapping indicates the proposed Eungella pipeline intersects with essential habitat in the southern extent of the project area, surrounding Eungella Dam. This area is listed essential habitat for:</p> <ul style="list-style-type: none"> <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) 	<p>Mapping indicates the proposed Moranbah pipeline intersects with a number of essential habitat areas. This area is listed essential habitat for:</p> <ul style="list-style-type: none"> <i>Denisonia maculate</i> (ornamental snake) <i>Petauroides Volans</i> (greater glider) <i>Phascolarctos cinereus</i> (koala) <i>Macroderma gigas</i> (ghost bat) <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) 	<p>Mapping indicates the proposed instream area intersects with a number of essential habitats, including:</p> <ul style="list-style-type: none"> <i>Crocodylus porosus</i> (estuarine crocodile) <i>Petauroides Volans</i> (greater glider) <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies) 	<p>Mapping indicates the proposed irrigation precinct intersects with a number of essential habitat areas, including:</p> <ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (koala) <i>Pteropus conspicillatus</i> (spectacled flying-fox) <i>Calyptorhynchus lathamii</i> (glossy black cockatoo) <i>Bolemoreus hindwoodi</i> (Eungella honeyeater) <i>Geophaps scripta Scripta</i> (squatter pigeon southern subspecies)

Remnant vegetation/regional ecosystem (REs)	<p>Mapping indicates that much of the inundation area, an estimated 6,099 ha, includes MSES regulated vegetation that comprises Category B Least Concern and Of Concern REs as well as C Of Concern REs. There is also a section of Category R vegetation mapped within the inundation area. These include:</p> <ul style="list-style-type: none"> 11.12.1/11.12.9/11.3.4 - Least Concern/ Least Concern/ Of Concern – 2763.1 ha. 11.3.25b - Least Concern - 1531.3 ha 11.3.29 - Least Concern - 740.7 ha 11.12.1 – Least Concern - 479.8 ha 11.12.1/11.12.1b – Least Concern/ Least Concern - 432.9 ha 11.12.1/11.3.25 – Least Concern/ Least Concern - 148.4 ha 11.3.25 – Least Concern - 1.92 ha 11.12.3 – Least Concern – 0.66 ha 11.3.29a – Least Concern – 0.21 ha 	<p>Mapping indicates that PHES option 1 includes MSES regulated vegetation that comprises Category B Least Concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.1 – Least Concern 11.3.29 – Least Concern 11.12.1/11.3.25 – Least Concern <p>PHES option 4 includes MSES regulated vegetation that comprises Category B Least Concern and Category B Of Concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.1/11.12.1b – Least Concern 11.12.19 – Of Concern <p>PHES option 7 includes MSES regulated vegetation that comprises Category B Least concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.6a – Least Concern 11.12.6b/11.12.6a – Least Concern 	<p>Mapping indicated that the Peter Faust pipeline corridor is predominantly located within MSES regulated vegetation including Category A or B Endangered, Of Concern and Least Concern REs as well as Category C Of Concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.1 – Least Concern 11.12.1/11.3.10/11.3.4 – Least Concern/ Least Concern/ Of Concern 11.12.16a – Of Concern 11.3.25b – Least Concern 11.12.1/11.3.10 – Least Concern/ Least Concern 8.12.7c/8.12.7a – Least Concern/ Least Concern 8.12.12a – Least Concern 8.3.5/8.3.3a – Of Concern/ Least Concern 8.3.3a – Least Concern 8.12.6a/8.12.12a – Least concern/ Least Concern 8.12.20a – Least Concern 8.12.6a – Least Concern 8.5.2c/8.5.3b – Endangered/ Of Concern 	<p>Mapping indicated that the Eungella pipeline corridor is located within MSES regulated vegetation including Category A or B Endangered, Of Concern and Least Concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.1 – Least Concern 11.12.1/11.3.25 – Least Concern/ Least Concern 11.12.6a – Least Concern 	<p>Mapping indicated that the Moranbah pipeline corridor is predominantly located within MSES regulated vegetation, including Category A or B Endangered, Of Concern and Least Concern REs as well as Category C Of Concern REs. These include:</p> <ul style="list-style-type: none"> 11.12.1 – Least Concern 11.9.10 – Of Concern 11.3.2 – Of Concern 11.3.25b – Least Concern 11.9.9/11.9.2 – Least Concern/ Least Concern 11.12.1c – Least Concern 11.3.2/11.3.25 – Of Concern/ Least Concern 11.9.13 – Of Concern 11.5.3 – Least Concern 11.8.5 – Least Concern 11.9.1/11.8.5/11.3.25 – Endangered/ Least Concern/ Least Concern 11.9.2/11.9.9 – Least Concern/ Least Concern 11.8.5/11.8.4 – Least Concern/ Least Concern 11.11.1/11.12.1 – Least Concern/ Least Concern 	<p>Mapping indicated that the instream area includes MSES regulated vegetation including Category A or B Least Concern REs. This includes:</p> <ul style="list-style-type: none"> 11.3.25b – Least Concern 	<p>Mapping indicates that the irrigation precinct includes MSES Category A or B Endangered, Of Concern and Least Concern REs and Category C Of Concern and Least Concern REs.</p> <p>Of these, 10 are classified as “Endangered”.</p>
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Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
			<ul style="list-style-type: none"> 8.5.3a – Of Concern 8.3.5/8.12.20a/8.3.1a/8.3.3a – Of Concern/ Least Concern/ Of Concern/ Least Concern 8.3.1a/8.3.3a/8.3.5 – Of Concern/ Least Concern/ Of Concern 8.5.1b/8.12.20a – Endangered/ Least Concern 8.12.6a/8.12.20a – Least Concern/ Least Concern 		<ul style="list-style-type: none"> 11.9.9 – Least Concern 11.3.25 – Least Concern 11.9.7a – Of Concern 11.3.4 – Of Concern 11.3.21 – Endangered 11.9.7a/11.9.9/11.9.2 – Of Concern/ Least Concern/ Least Concern 11.9.2/11.3.4 – Least Concern/ Of Concern 11.4.13/11.4.2 – Least Concern/ Of Concern 11.4.2/11.4.2/11.4.13 – Of Concern/ Of Concern/ Least Concern 11.3.4/11.3.2 – Of Concern/ Of Concern 11.5.3/11.3.4 – Least Concern/ Of Concern 11.5.3/11.4.9 – Least Concern/ Endangered 11.4.9 – Endangered 11.3.2/11.3.1/11.3.25 – Of Concern/ Endangered/ Least Concern 11.5.9b/11.5.18 – Least Concern/ Of Concern 11.4.2 – Of Concern 		

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
Flora trigger area	There are no high-risk areas on the flora survey trigger map for threatened plant species in the proposed inundation area.	There are no high-risk areas on the flora survey trigger map for threatened plant species in the proposed PHES options footprints.	There are no high-risk areas on the flora survey trigger map for threatened plant species in the Peter Faust pipeline corridor.	There are high-risk areas on the flora survey trigger map for threatened plant species in the Eungella pipeline corridor. More specifically, the region surrounding the Eungella Dam is listed as high-risk.	There are six high-risk areas on the flora survey trigger map for threatened plant species in the Moranbah pipeline corridor. More specifically, the region surrounding the Eungella Dam and the southern-most pipeline extent are listed as high-risk.	There are no high-risk areas on the flora survey trigger map for threatened plant species in the instream area.	There are no high-risk areas on the flora survey trigger map for threatened plant species in the irrigation precinct.
Biosecurity	<p>Ten introduced terrestrial and aquatic plant species (or groups of plant species) listed as Weeds of National Significance (WoNS) are either known to occur or may occur in the inundation area, including:</p> <ul style="list-style-type: none"> <i>Parthenium hysterophorus</i> (parthenium weed) <i>Eichhornia crassipes</i> (water hyacinth) <i>Salvinia molesta</i> (salvinia) <p>These plants, along with an additional 15 introduced plant species that may occur in the inundation area, are categorised as Category 3 restricted matter under the Queensland Biosecurity Act 2014.</p> <p>18 invasive terrestrial fauna species are either 'known to occur' or 'may occur' within the dam inundation area:</p> <ul style="list-style-type: none"> 5 bird species 1 frog species 1 reptile species 11 mammal species 	<p>Ten introduced terrestrial and aquatic plant species (or groups of plant species) listed as Weeds of National Significance (WoNS) are either known to occur or may occur in the PHES options footprints, including:</p> <ul style="list-style-type: none"> <i>Parthenium hysterophorus</i> (parthenium weed) <i>Eichhornia crassipes</i> (water hyacinth) <i>Salvinia molesta</i> (salvinia) <p>These plants, along with an additional 15 introduced plant species that may occur in the PHES options footprints, are categorised as Category 3 restricted matter under the Queensland Biosecurity Act 2014.</p> <p>18 invasive terrestrial fauna species are either 'known to occur' or 'may occur' within the PHES options footprints:</p> <ul style="list-style-type: none"> 5 bird species 1 frog species 1 reptile species 	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following invasive species as occurring within the Peter Faust pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 6 bird species 1 frog species 10 mammal species 1 reptile species <p>Of these, the <i>Rhinella marina</i> (cane toad) is listed as the only species 'known to occur'.</p> <p>11 species (or groups of plant species) that are classified as WoNS are also listed as potentially occurring within the Peter Faust pipeline corridor.</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following invasive species as occurring within the Eungella pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 3 bird species 1 frog species 8 mammal species <p>Of these, the <i>Rhinella marina</i> (cane toad) is listed as the only species 'known to occur'.</p> <p>Eight species (or groups of plant species) that are classified as WoNS are also listed as 'Likely to Occur' within the Eungella pipeline corridor.</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following invasive species as occurring within the Moranbah pipeline corridor (2 km radius):</p> <ul style="list-style-type: none"> 4 bird species 1 frog species 9 mammal species <p>Of these, the <i>Rhinella marina</i> (cane toad) is listed as the only species 'known to occur'.</p> <p>Nine species (or groups of plant species) that are classified as WoNS are also listed as potentially occurring within the Moranbah pipeline corridor.</p>	<p>The EPBC Protected Matters Search (undertaken in March 2019) identified the following invasive species as occurring within the instream area (2 km radius):</p> <ul style="list-style-type: none"> 2 bird species 1 frog species 9 mammal species <p>Of these, the <i>Rhinella marina</i> (cane toad) is listed as the only species 'known to occur'.</p> <p>Seven species (or groups of plant species) that are classified as WoNS are also listed as potentially occurring within the instream area.</p>	<p>Up to 225 introduced plant species may occur in the Bowen River sub-basin, of these 11 species (or groups of plant species) that are classified as WoNS are either known to occur or may occur in the irrigation precinct. These plants are also categorised as Category 3 restricted matter under the Queensland <i>Biosecurity Act 2014</i>.</p> <p>18 invasive fauna species are listed as potentially occurring within the irrigation precinct, including:</p> <ul style="list-style-type: none"> 5 bird species 1 frog species 12 mammal species 1 reptile species <p>Of these, the <i>Rhinella marina</i> (Cane toad) is listed as the only species 'known to occur'.</p>

Aspect	Urannah Dam and inundation area	PHES (Options 1, 4 and 7)	Peter Faust Dam Pipeline corridor	Eungella Dam Pipeline corridor	Moranbah Pipeline corridor	Instream Distribution	Irrigation Precinct
	Guppies, an introduced fish species, and mosquitofish (<i>Gambusia spp.</i>), a noxious fish species under the Biosecurity Act, are present in the Bowen Broken Bogie river basin. Mozambique tilapia (<i>Oreochromis mossambicus</i>) have been found in the Burdekin catchment since at least 2004.	<ul style="list-style-type: none"> 11 mammal species 					
Groundwater Dependent Ecosystems (GDE)	While accessible groundwater information in the vicinity of the proposed inundation area is limited, the Bureau of Meteorology's GDE Atlas identifies the Broken River and Urannah Creek as having "high potential" for terrestrial and aquatic GDEs in the inundation area.	While accessible groundwater information in the vicinity of the proposed PHES options footprints is limited, the Bureau of Meteorology's GDE Atlas identifies the Broken River and Urannah Creek as having "high potential" for terrestrial and aquatic GDEs in the inundation area.	The Bureau of Meteorology's GDE Atlas identifies the proposed Peter Faust pipeline project area as intersecting with a number of GDEs ranging from "high potential" to "moderate potential".	The Bureau of Meteorology's GDE Atlas identifies the proposed Eungella pipeline project area, located within the Broken River, as having "high potential" for aquatic GDEs.	The Bureau of Meteorology's GDE Atlas identifies the proposed Moranbah pipeline project area, located within the Broken River, as having "high potential" for aquatic GDEs.	The Bureau of Meteorology's GDE Atlas identifies the proposed instream area, intersecting with the Broken River and potential other waterways, as having between "low potential" and "high potential" for aquatic GDEs.	The Bureau of Meteorology's GDE Atlas identifies the proposed irrigation precinct, located within the Bowen River and Pelican Creek area, as having either "high potential" or "moderate potential" for aquatic GDEs.

APPENDIX C PRELIMINARY LIKELIHOOD OF OCCURRENCE ASSESSMENT

1. Likelihood of occurrence assessment

1.1 Methodology

A likelihood of occurrence assessment was undertaken for the proposed project footprint to identify the likelihood of listed threatened ecological communities (TECs), flora and fauna species occurring. This assessment included:

- Listed TECs, flora and fauna species that are predicted to occur based on the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) database (categorised as known to occur, likely to occur or may occur); and
- Listed flora and fauna species that have also been recorded within 1 km of the proposed project footprint on the Wildlife Online Database.

Determination of a species' likelihood of occurrence considered information relating to:

- Habitat preference
- Distribution and relative abundance
- Previous records from the region
- The occurrence of corresponding regional ecosystems (REs) or TECs that matched their preferred habitat.

A likelihood of occurrence ranking was attributed to each listed community or species based on the frameworks outlined in Table 1-1 and Table 1-2. The likelihood of occurrence assessment for EPBC Act listed species is in Table 1-3 with NC Act listed species in **Error! Reference source not found..**

Table 1-1 Likelihood of occurrence criteria for flora and fauna species

Likelihood	Definition of supporting information
Unlikely to occur	No confirmed records in desktop search extent (within 10 km) (from PMST or wildlife online) and preferred habitat is not mapped as occurring within project area.
May occur	Confirmed record within 10 km in the desktop search extent (from PMST) or on wildlife online or preferred habitat is mapped as occurring within project area.
Likely to occur	Confirmed recorded within 10 km in the desktop search extent or on wildlife online and preferred habitat is mapped as occurring within project area.

Table 1-2 Likelihood of occurrence criteria for TECs

Likelihood	Definition of supporting information
Unlikely to occur	No corresponding REs mapped in the desktop search extent as occurring within the project area.
Likely to occur	Corresponding REs mapped in the desktop search extent occur within the project area.

Table 1-3 EPBC Act Likelihood of occurrence assessment

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
Threatened Ecologically Communities											
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	E		PMST	In Queensland, the brigalow ecological community that has been listed under the EPBC Act is defined by reference to 16 regional ecosystems, these being: REs 6.4.2, 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14, 11.12.21, 12.8.23, 12.9-10.6, 12.12.26 (DEH, 2003).	Two corresponding REs (11.3.1 and 11.4.9) are mapped as occurring within the proposed project pipeline boundary.	Likely	Unlikely	Unlikely	Unlikely	Unlikely	Likely
Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin	E		PMST	In Queensland, the ecological community includes the following seven regional ecosystems, REs 11.3.21, 11.4.4, 11.4.11, 11.8.11, 11.9.3, 11.9.12, 11.11.19 (DoEWHA, 2008).	One corresponding RE (11.3.21) is mapped as occurring within the proposed project pipeline boundary.	Likely	Unlikely	Unlikely	Unlikely	Unlikely	Likely
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E		PMST	In Queensland, the ecological community includes the following 10 regional ecosystems within the Brigalow Belt bioregion: REs 11.2.3, 11.3.11, 11.4.1, 11.5.15, 11.8.3, 11.8.6, 11.8.13, 11.9.4, 11.9.8, 11.11.18 (DEE, 2019).	No corresponding REs were recorded as occurring within the proposed project boundary.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
Broad leaf tea-tree (<i>Melaleuca viridiflora</i>) woodlands in high rainfall coastal north Queensland	E		PMST	This ecological community is limited to the wet tropics and central Mackay coast bioregions. In Queensland, the ecological community includes the following nine regional ecosystems, these are: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2, 8.5.2a, 8.5.2c and 8.5.6 (DEE, 2019).	No corresponding REs were recorded as occurring within the proposed project boundary, however the Peter Faust Dam Pipeline contains potentially suitable habitat.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
Birds											
<i>Calidris ferruginea</i> Curlew sandpiper	CE, Mig, Ma.	E	PMST	The curlew sandpiper inhabits intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and around non-tidal swamps, lakes, lagoons near the coast, and ponds in salt works and sewage farms. Breeding occurs during June and July in Siberia. Species depart breeding grounds in early August, and arrive in Australia in late August and early September (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary. The closest recorded sighting is 19 km southwest of the northernmost section of the proposed Moranbah pipeline.	May	May	May	May	May	May

¹ PFDP = Peter Faust Dam Pipeline, EDP = Eungella Dam Pipeline, MP = Moranbah Pipeline

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
<i>Erythrotriorchis radiatus</i> Red goshawk	V	E	PMST	The red goshawk occurs in a range of habitats, often at ecotones, including coastal and sub-coastal tall open forests, tropical savannahs crossed by wooded or forested watercourses, woodlands, the edges of rainforests and gallery forests along watercourses, and wetlands that include <i>Melaleuca</i> and <i>Casuarina</i> species. The species typically nests in tall trees within 1°km of permanent water, and occurs in habitats that support a high abundance of bird species (DEE 2019).	Preferred habitat in the form of Eucalypt woodlands and open forest are likely to be present within the proposed project boundary and surrounding environments. This species was reported within the Wildlife Online desktop search near the proposed Moranbah pipeline. Two old Birdlife records (1990 and 1998) are located 4.6 and 15 km from Moranbah Pipeline. Five outdated Atlas of Living Australia records are located within the project area.	May	May	Unlikely	Likely	Likely	Likely
<i>Neochmia ruficauda</i> Star finch (eastern)	E	E	PMST	Species occurs in grasslands and grassy woodlands that are located close to fresh water bodies, it also occurs in cleared or suburban areas such as alongside roadsides and in towns. Studies found that habitat consisted mainly of woodland, dominated by trees that are typically associated with permanent water or areas that are regularly inundated. Common species include <i>Eucalyptus coolabah</i> , <i>E. tereticornis</i> , <i>E. tessellaris</i> , <i>Melaleuca leucadendra</i> , <i>E. camaldulensis</i> and <i>Casuarina cunninghamii</i> (DEE, 2019).	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed project pipeline boundary. The closest recorded sighting is approximately 68 km south east of the proposed Moranbah pipeline.	May	May	Unlikely	May	May	May
<i>Numenius madagascariensis</i> Eastern curlew	CE	E	PMST	Species prefers sheltered coasts, especially bays, harbours, estuaries, inlets and coastal lagoons with large intertidal sand flats and mudflats with beds of seagrass. Species forages on soft sheltered intertidal sand flats and on beaches and in rock pools (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint. The closest recorded sighting is approximately 34 km east of the proposed Peter Faust pipeline.	May	Unlikely	Unlikely	May	May	May
<i>Geophaps scripta scripta</i> Squatter pigeon (southern)	V	V	PMST WO	Species generally inhabits open forests to sparse, open woodlands and scrub that are mostly dominated by an over storey of Eucalyptus, Corymbia, Acacia or Callitris species that is within 3 km of a waterbody (DEE, 2019).	Scatter records of this species are reported throughout the project area. The closest recorded sightings are several records within 1 km west of the proposed Moranbah pipeline. The species was recorded within the Wildlife Online desktop searches for the proposed Moranbah pipeline, irrigation precinct and Peter Faust Dam Pipeline. This species is likely to occur throughout the entire project area.	Likely	Likely	Likely	Likely	Likely	Likely
<i>Poephila cincta cincta</i> Black-throated finch (southern).	E	E	PMST	Species generally inhabits grassy, open woodlands and forests, typically dominated by Eucalyptus, Corymbia and Melaleuca, and occasionally in tussock grasslands and other habitats, often along watercourses. Some species of trees often frequented by the species include narrow-leaved	Two corresponding REs (11.3.25 and 11.3.4) are mapped as occurring within the proposed project pipeline boundary and inundation area. There is a 2015 record of the species within the irrigation precinct (Birdata, 2019).	May	May	Likely	May	Maya	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
				ironbark (<i>E. crebra</i>), river red gum (<i>E. camaldulensis</i>), silver leaved ironbark (<i>E. melanophloia</i>), and Reid River box (<i>E. brownii</i>), yellowjacket (<i>E. similis</i>) and forest red gum (<i>E. tereticornis</i>) (DEE, 2019).							
<i>Rostratula australis</i> Australian painted snipe	E	E	PMST	Species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Habitat usually consists of tussocks of grass, sedges, rushes or reeds, often with scattered clumps of lignum or cane grass, and sometimes tea-tree (Melaleuca). The species breeding habitat requirements include shallow wetlands that contain areas of bare, wet mud, and both upper and canopy nearby (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 25 km east of the Peter Faust Dam Pipeline.	May	May	May	Likely	May	May
<i>Tyto novaehollandiae kimberli</i> Masked owl (northern)	V	V	PMST	Species occurs in north Queensland, in riparian forests, rainforests, open forests, Melaleuca swamps and the edge of mangroves and usually inhabits tree hollows (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint species and no known corresponding REs have been identified as occurring within the project boundary. The closest recorded sighting is 60 km northwest of proposed Peter Faust Dam Pipeline boundary.	May	May	Unlikely	May	May	May
<i>Bolemoreus hindwoodi</i> Eungella honeyeater	NL	V	PMST	Eungella honeyeater inhabits mainly higher-altitude rainforest areas, sometimes visiting lowland Eucalypt and Casuarina forests. This species is known to occur within Eungella National Park and Crediton Forest Reserve (DEE, 2019).	Essential habitat for the species is mapped within the proposed project boundary. Preferred habitat is available in the rainforest areas of Eungella National Park and Crediton Forest Reserve. The closest recorded sighting is located at the Eungella dam, within approximately 5 km of the project area.	Likely	May	Unlikely	May	Likely	Likely
<i>Calyptrorhynchus lathamii erebus</i> Glossy black-cockatoo (northern)	NL	V	PMST	Species inhabits woodlands that are dominated by Drooping sheoak (<i>Allocasuarina verticillata</i>) often interspersed with taller stands of Sugar gum (<i>Eucalyptus cladocalyx</i>). These woodlands occur in small gullies in coastal and sub-coastal areas, generally on shallow acidic soils on the steep and rocky slopes of gorges and valleys, along inland creek and river systems (DEE, 2019). This species distribution is heavily dependent on the distribution of Allocasuarinas (dependent feeding resource).	Essential habitat for the species is mapped within the proposed project boundary. Preferred habitat is generally lacking from the project area, however species may utilise eucalypt woodlands. The closest recorded sighting is approximately 20 km east of the inundation areas, within the Crediton Forest Reserve	May	May	Unlikely	May	Likely	Likely
<i>Ninox strenua</i> Powerful owl	NL	V	PMST	Species inhabits open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses (DEE, 2019).	Suitable habitat for this species is located within the project area and the species has been previously recorded within the Eungella National Park.	May	May	Unlikely	Likely	Likely	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
<i>Numenius phaeopus</i> Whimbrel	M	SL	PMST	Species is common across northern Australia and found mainly in coastal areas, near tidal and estuarine mudflats, especially near mangroves. They are sometimes found on beaches and rocky shores (Birdlife, 2019).	Preferred habitat is generally lacking from the project area. The closest recorded sighting of the species is approximately 20 km from Moranbah.	Unlikely	Unlikely	Unlikely	May	Unlikely	May
<i>Hydroprogne caspia</i> Caspian tern	NL	SL	PMST WO	Species are common throughout Australia and usually found in coastal areas, extensive wetlands, coastal and interior beaches and sheltered estuaries (Birdsinbackyards, 2019a).	There are 15 sightings of the species within Eungella dam. Multiple sightings have also been recorded within Lake Proserpine and the Peter Faust Dam Pipeline.	May	May	Unlikely	Likely	Likely	Likely
<i>Plegadis falcinellus</i> Glossy ibis	NL	SL	PMST WO	Species are common in swamps and lakes throughout much of the Australian mainland but is most numerous in the north. The species requires shallow water and mudflats, as well as well-vegetated wetlands, floodplains, mangroves and rice fields (Birdsinbackyards, 2019b).	Preferred habitat for the species is generally lacking from the proposed project footprint, however, the closest recorded sighting (2018) is located 2 km east of the proposed Moranbah pipeline.	Unlikely	May	Unlikely	May	May	Likely
Amphibians											
<i>Taudactylus eungellensis</i> Eungella dayfrog	E	E	PMST	Species inhabits small creeks in rainforests, as well as wet sclerophyll forests. The immediate streamside habitat requires dense rainforest with ferns, vines, palms with epiphytes in the understorey. Species inhabits exposed steep, rocky sections of stream within splash zones of waterfalls and cascades. The species is known to occur within the Eungella National Park. Cathu State Forest and Eungella State Forest (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary. The species is listed as a confidential species and therefore does not contain any recorded sightings.	Unlikely	May	Unlikely	May	May	May
Reptiles											
<i>Denisonia maculata</i> Ornamental snake	V	V	PMST	This species is distributed from Townsville to Gladstone in QLD, extending inland within the Brigalow Belt bioregion. The preferred habitat is within, or adjacent to, habitat that is favoured by frogs, particularly gilgai (melon-hole) mounds and depressions that are found where deep-cracking alluvial soils with high clay contents occur. The species is known to prefer brigalow (<i>Acacia harpophylla</i>), gidgee (<i>Acacia cambagei</i>), blackwood (<i>Acacia argyrodendron</i>) woodlands and open forests associated with moist areas, particularly gilgai mounds and depressions in REs on landzone 4, but also lake margins and wetlands (DEE, 2019).	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed project pipeline boundary, and the closest recorded sighting are three records approximately 1 km west of the proposed Moranbah pipeline.	May	May	May	Unlikely	May	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
<i>Egernia rugose</i> Yakka skink	V	V	PMST	The yakka skink occurs in open dry sclerophyll forest, woodland and shrubs from the coast of QLD to the eastern hinterland, from Cape York to the QLD/NSW border (DoEE 2019). Basalt-derived soils are suitable for burrowing. This species inhabits cavities under and between partly buried rocks, root cavities, trees or log stumps and abandoned animal burrows. Species often takes refuge in large hollow logs and is known to excavate deep burrow systems under dense ground vegetation (DEE, 2019).	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed project pipeline boundary, however, the closest recorded sighting is approximately 100 km west of the proposed irrigation precinct.	May	May	Unlikely	May	May	May
<i>Lerista vittata</i> Mount Cooper striped skink	V	V	PMST	This species inhabits low, closed forests and woodlands with vine thickets, soft sandy soils and leaf litter. Species occurs in areas of ironbark (<i>Eucalyptus crebra</i> and <i>E. melanophloia</i>), bloodwood (<i>Corymbia clarksonia</i> and <i>C. intermedia</i>), cotton tree (<i>Cochlospermum gregorii</i>), and kapok bush (<i>C. gillivaraei</i>) dominated low woodland to low open woodland amongst other ironbark species (DoE, 2019). Known from the Mount Cooper area and the Einasleigh Uplands bioregion.	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 70 km west of the proposed inundation area.	May	May	May	May	May	May
<i>Elseya albagula</i> Southern snapping turtle	CE	E	PMST	Species prefers clear, flowing, well-oxygenated waters that suits their physiological adaptation of extracting oxygen via cloacal respiration. Species occupies riverine habitat within Fitzroy catchment, Burnett catchment and Mary catchment (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 92 km east of the proposed Moranbah pipeline.	Unlikely	Unlikely	Unlikely	Unlikely	May	May
<i>Furina dunmalli</i> Dunmall’s snake	V	V	PMST	Species is found in a broad range of open forest and woodland habitats dominated by blue spotted gum (<i>Corymbia citriodora</i>), ironbark (<i>Eucalyptus crebra</i> and <i>E. melanophloia</i>), white cypress pine (<i>Callitris glaucophylla</i>) and bull-oak associations on sandstone derived soils or black alluvial cracking clay and clay loam. Species has been found sheltering underground litter and fallen timber, and favours altitudes of 200 to 500 m about sea level (DEE, 2019).	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed project pipeline boundary, however, the closest recorded sighting is approximately 100 km south west of the proposed Moranbah pipeline. Potentially suitable habitat is located within the dam inundation and pipeline options project areas.	May	Unlikely	Unlikely	May	May	May
<i>Lerista allanae</i> Allan’s Lerista	E	E	PMST	Species is only known from black soil downs in the Brigalow Belt North bioregion, specifically, undulating plains of shale, basalt, sandstone and unconsolidated sediments. Species has been found several centimetres below the surface of black-red soil under tussocks of farmland grasses in association with mountain coolabah (<i>Eucalyptus</i>	The species preferred habitat of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC is identified as likely to occur within the proposed project pipeline boundary. The closest recorded sighting is approximately 50 km south west of the proposed Moranbah pipeline.	Unlikely	May	May	Unlikely	Unlikely	May

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
<i>Dasyurus hallucatus</i> Northern quoll	E	LC	PMST	This elusive species inhabits a diverse range of habitats, including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrub lands, grasslands and desert. Habitat generally encompasses some form of rocky area for denning purposes, with surrounding vegetated habitats used for foraging and dispersal. Dens are usually made within rock crevices, tree holes or termite mounds (DEE, 2019).	Preferred habitat in the forms of eucalypt forest and woodlands are likely to be present within the proposed project boundary. The closest recorded sighting of the species consists of scattered records approximately 6 km east of the proposed Peter Faust Pipeline at Lake Proserpine. The species has also been recorded within the Proserpine State Forest, adjacent to the Peter Faust Pipeline.	Likely	May	May	Likely	Likely	Likely
<i>Macroderma gigas</i> Ghost bat	E	LC	PMST	Species inhabit caves, rock devices and old mines in tropical north Queensland. Roost sites that are used permanently are usually located in deep natural caves or disused mines with a temperature between 23-28 degrees Celsius. There are a total of 14 known roosts (Australian Wildlife Conservancy, n.d.).	Essential habitat for the species is mapped with the proposed project boundary; however, the closest recording to the proposed project boundary is approximately 8 km east of the proposed Moranbah pipeline.	Likely	Likely	May	Likely	Likely	Likely
<i>Petauroides volans</i> Greater glider	V	V	PMST WO	Species inhabits eucalypt forests and woodlands as it primarily eats eucalypt leaves and flowers. It is typically found in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (DEE, 2016).	This species has been widely recorded within the Macartney State Forest, approximately 6.5 km southeast of the Peter Faust Pipeline. The species has also been recorded in woodlands 6.5 km east of the inundation area and 10 km west of the Moranbah Pipeline. Suitable habitat is located within the proposed pipeline network, PHES options and the inundation area.	Likely	Likely	May	Likely	Likely	Likely
<i>Petrogale persephone</i> Proserpine rock-wallaby	E	E	PMST	Species prefers rocky outcrops, rock piles and cliffs within a microphyll / notophyll semi-deciduous dry vine forest. Species occurs in Conway National Park / Conway State Forest and areas of Conway Range, Gloucester Island National Park, Dryander National Park / Dryander State Forest, Proserpine State Forest / Clarke Range, Mt Julian, Mt Lucas and around Airlie Beach (DERM, 2010).	Essential habitat for the species is mapped with the proposed project boundary, however, the closest recorded sighting is 4.8 km east of the proposed Peter Faust pipeline within the Proserpine State Forest and Andromache Conservation Park.	Unlikely	Unlikely	Unlikely	May	Unlikely	Unlikely
<i>Phascolarctos cinereus</i> Koala	V	V	PMST WO	Scattered populations occur throughout Queensland, occurring in moist forests along the coast, sub-humid woodlands in southern and central Queensland, and in some eucalypt woodlands along water courses in semi-arid environments of the western part of the State (DEE, 2019).	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting being 1 km east of the proposed Peter Faust pipeline. Species was also recorded in proximity to the PHES options, Moranbah Pipeline and Lake Proserpine.	Likely	May	May	Likely	Likely	Likely
<i>Pteropus poliocephalus</i> Grey-headed flying fox	V	LC	PMST	Species occurs in subtropical and temperate rainforests, tall sclerophyll forests, woodlands, heaths and swamps, as well as urban gardens and	The closest recorded camps are located at Eungella State School near the proposed Eungella pipeline and Kelsey Creek near the	Likely	Likely	Likely	Likely	Likely	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
				cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and commonly found in gullies, close to water, or in vegetation with a dense canopy. Species generally feeds on the nectar and pollen of native trees, particularly eucalyptus, melaleuca and banksia and the fruits of rainforest trees and vines (OEH, 2017).	proposed Peter Faust pipeline with recorded sightings near both of these camps. Whilst these camps are located 12 km and 11 km east of the proposed project footprint respectively, it is likely that the species will utilise habitat within the proposed project pipeline areas for foraging.						
<i>Nyctophilus corbeni</i> Corben's long-eared bat	V	NL	PMST	Species is found in a wide range of inland woodland vegetation types including cypress pine woodlands, ironbark, box, buloke woodlands, brigalow woodland, belah woodland, smooth-barked apple woodland, black box woodland, river red gum forest and various tree mallee types. Species is most abundant in extensive stands of vegetation, incorporating old growth and habitats with a distinct tree canopy and a dense, cluttered understorey layer (DEE, 2019).	Preferred habitat is likely to be absent from the proposed project footprint, with the closest recorded sighting occurring over 300 km south of the proposed Moranbah pipeline	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	May
<i>Ornithorhynchus anatinus</i> Platypus	NL	SLC	WO	Species occurs in freshwater systems from tropical rainforest lowlands and plateaus of far northern Queensland, to cold, high altitudes of Tasmania and the Australian Alps. Species feed in both slow-moving and rapid parts of the stream but show preference to coarser bottom substrates (Australian Museum, 2018).	Preferred habitat for the species is likely to be present within the proposed project footprint. The closest recorded sighting is located at the Eungella dam, near the proposed Eungella pipeline.	May	May	Unlikely	May	Likely	Likely
<i>Tachyglossus aculeatus</i> Short-beaked echidna	NL	SLC	WO	Species is found throughout Australia and inhabits a wide range of terrestrial habitats including dessert, rainforest, open forest, bushland, farmland and suburban backyards (Wildlife org, 2019).	There are five 2006 Wildlife Online records of this species within 1 km the irrigation precinct and the species has been recorded 0.4, 1.6 and 2.3 km from the proposed Moranbah Pipeline. Considering the array of habitat types utilised by this species, the short-beaked echidna is likely to occur in all areas of the project.	Likely	Likely	Likely	Likely	Likely	Likely
<i>Taphozous australis</i> Coastal sheathtail bat	NL	NT	WO	Species occurs along a narrow coastal zone in Queensland, from Shoalwater Bay, through Cape York Peninsula. Species depends on coastal roosts, preferring sea caves and rocky clefts however it is also known to roost in disused mines, boulder piles, rock fissures, concrete bunkers, and occasionally buildings. Species forages in areas of coastal dune scrubland, melaleuca swamps and open eucalypt forest, grasslands, coastal heathland, monsoon forests and mangroves on lowlands and foothills (Hourigan, 2011).	Preferred habitat is generally lacking from the proposed project footprint. The closest recorded sighting is located 77 km east of the proposed inundation area.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
Plants											
<i>Cycas ophiolitica</i> Marlborough blue	E	E	PMST	Species grows in sparse, grassy, open eucalypt woodlands at an altitude between 80 - 400 m above sea level. This species is most frequently found on shallow, stony, infertile soils developed on serpentinite and sandstone. Species grows in tropical climate with hot, humid summers and dry, mild winters and 1500 mm of rainfall per annum (DEE, 2019). Associated species include <i>C. xanthrope</i> and <i>Eucalyptus fibrosa</i> , as well as <i>Corymbia dallachiana</i> , <i>C. erythrophloia</i> and <i>Eucalyptus crebra</i> on mudstone, <i>Corymbia intermedia</i> , <i>E. tereticornis</i> and <i>Eucalyptus drepanophylla</i> on alluvial loams (DEE, 2019).	Preferred habitat may be present within the proposed project boundary in the form of eucalypt woodland, however, the closest recorded sighting is approximately 117 km south east of the proposed Moranbah pipeline boundary.	Unlikely	May	Unlikely	May	May	May
<i>Dichanthium setosum</i> Bluegrass	V	LC	PMST	Species is associated with heavy basaltic black soils with clay subsoil and is often found in moderately distributed areas such as grassy roadside remnants, cleared woodland and highly disturbed pasture that are water-enriched and nutrient-enriched. Associated species include <i>Eucalyptus albens</i> , <i>Eucalyptus melanophloia</i> , <i>Eucalyptus melliodora</i> , <i>Eucalyptus viminalis</i> , <i>Myoporum debile</i> , and <i>Aristida ramosa</i> amongst others (DEE, 2019).	The species preferred habitats of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC and semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions TEC are identified as likely to occur within the proposed project pipeline boundary. The closest recorded sighting of this species is also approximately 3 km east of the Moranbah pipeline boundary.	Likely	Likely	Likely	Likely	Likely	Likely
<i>Dichanthium queenslandicum</i> King blue-grass	E	V	PMST	Species’ distribution overlaps with: brigalow (<i>Acacia harpophylla</i> dominant and co-dominant); weeping myall woodlands; natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland; and natural grasslands of the Queensland central highlands and the northern Fitzroy Basin, all of which are listed as TECs under the EPBC Act. Species is endemic to central and southern Queensland (DEE, 2019).	This species is known to occur between Nebo to Monto and west to Clermont and Rolleston. The closest recorded sighting of this species is also approximately 8 km south east of the far southern end of the Moranbah pipeline boundary.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Likely
<i>Eucalyptus raveretiana</i> Black ironbox	V	V	PMST WO	Species occurs on banks of creeks, rivers and other watercourses, on clayey or loamy soil and in areas of remnant vegetation. Species’ distribution overlaps with the following EPBC Act- listed TECs: brigalow (<i>Acacia harpophylla</i> dominant and co-dominant), bluegrass (<i>Dichanthium spp.</i>) dominant grasslands of the Brigalow Belt Bioregions (north and south), and semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions (DEE, 2019). Regional Ecosystems in which the	Two corresponding REs (11.3.25 and 8.3.3) are mapped as occurring within the proposed project pipeline boundary and inundation area. The closest recorded sighting is from 2017 and is located along the proposed Moranbah Pipeline at - 21.3013°S, 148.3142°E. This species was also recorded along an ephemeral watercourse approximately 0.5 km west of the proposed Moranbah pipeline. Several <i>E. raveretiana</i> were recorded in the surrounding landscape.	Likely	Likely	Likely	Likely	Likely	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
				species has been recorded in include: 9.3.1, 11.3.11, 11.3.25(a) and 8.3.3 (DEE, 2019).	Additional Wildlife Online records are located of the irrigation area and PHES project areas.						
<i>Ozothamnus eriocephalus</i>	V	V	PMST	This species is known from a range of habitat types, including the margins of disturbed notophyll vine forest, margins of gallery forest, microphyll vine forest, tall open New England Blackbutt (<i>Eucalyptus andrewsii</i>) - <i>E. resinifera</i> forest with an understorey of black she-oak (<i>Allocasuarina littoralis</i>), in open eucalypt forest and on rocky ridges with Eucalyptus and Acacia scrubs (DEE, 2019).	Preferred habitat may be present within the proposed project boundary in the form of eucalypt woodland, however, the closest recorded sighting is approximately 12 km east of the inundation area.	May	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Omphalea celata</i>	V	V	PMST	Species grows in fragmented semi-evergreen vine thicket along a watercourse on weathered metamorphics in a steep-sided gorge, creek bed or rocky granite gully. Distribution is not known to overlap any EPBC Act-listed TECs (DEE, 2019).	Preferred habitat is generally lacking in the project area and no known corresponding REs have been identified as occurring within the proposed project boundary. The closest recorded sighting is approximately 9 km east of central section of the Moranbah pipeline.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	May
<i>Phaius australis</i> Lesser swamp orchid	E	E	PMST	Species occurs in eastern Queensland, with 14 known populations. Species is associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where broad-leaved paperbark (<i>Melaleuca leucadendra</i>) or swamp mahogany (<i>Eucalyptus robusta</i>) are found.	Preferred habitat is likely to be absent from the proposed project footprint, with the closest recorded sighting occurring over 70 km south of the proposed inundation area.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Samadera bidwillii</i> Quassia	V	V	PMST	Species commonly occurs in lowland rainforest or on rainforest margins as well as open forest and woodland. This species is commonly found near temporary and permanent watercourses in areas up to 510 m altitude. The species occurs on silts and sands with clay subsoil, lithosols, sands, loam soils and skeletal soils. Commonly associated w spotted gum (<i>Corymbia citriodora</i>) and grey gum (<i>Eucalyptus propinqua</i>) amongst others. (DEE, 2019).	The species preferred habitats of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) TEC and semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions TEC are identified as likely to occur within the proposed project pipeline boundary. However, the closest recorded sighting of this species is approximately 137 km east of the proposed Peter Faust pipeline.	Unlikely	Unlikely	Unlikely	Unlikely	May	May
<i>Bertya pedicellata</i>	NL	NT	WO	Species occurs in rocky hillsides in eucalypt forests or woodland, Acacia woodland or shrub land and open heathland or vine thicket communities. Associated species include <i>Corymbia trachyphloia</i> , <i>Dodonaea filifolia</i> , <i>Acacia catenulata</i> , <i>A. curvinervia</i> , <i>A. Shirleyi</i> , <i>A. rhodoxylon</i> , <i>A. sparsiflora</i> , <i>E. crebra</i> , <i>Acacia harpophylla</i> and <i>E. decorticans</i> (DES, 2019).	This species has been previously recorded at several scattered locations near Moranbah and Coppabella, approximately 0.3, 1.2 and 1.3 km from the Moranbah Pipeline. Potential habitat occurs in the dam inundation area and along the proposed Peter Faust pipeline.	May	May	Unlikely	May	May	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
<i>Brachychiton guymeri</i> Bottletree	NL	E	WO	Species is associated with the ‘Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions’ TEC (McDonald, 2010).	There are five Wildlife Online records for the species within in 5 km of the PHES works area.	Unlikely	Likely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Cerbera dumicola</i>	NL	NT	WO	Species occurs across a range of habitats in central and southern Queensland. Associated vegetation and species include: sandstone hills in open <i>E.umbra</i> subsp. <i>Carnea</i> , on plateaus, in woodland on <i>Acacia shirleyi</i> with <i>Corymbia dolichocarpa</i> ; open woodland of <i>E. melanophloia</i> with occasional <i>Acacia shirleyi</i> , <i>E.populnea</i> and <i>E.brownii</i> and semi-evergreen vine thicket with <i>Corymbia citriodora</i> and <i>Corymbia aureola</i> (DES, 2019).	The species preferred habitat may be present within the proposed project footprint. The closest recorded sighting is located near Collinsville, 10 km east of the irrigation area. Additionally, this species has been recorded multiple times approximately 18 km north of the southernmost point of the proposed Moranbah pipeline.	Unlikely	Unlikely	May	Unlikely	Unlikely	May
<i>Croton magneticus</i>	NL	NT	WO	Species occurs in deciduous vine thickets (dry rainforest) on soils derived from sandstone, granite or acid agglomerate substrates, often in association with <i>Croton arnhemicus</i> and <i>C. phebaloides</i> (DES, 2019).	The species preferred habitat is generally lacking within the proposed project footprint. However, the closest recorded sighting is located within the irrigation precinct.	Unlikely	Unlikely	May	Unlikely	Unlikely	Unlikely
<i>Macropteranthes leiocaulis</i>	NL	NT		Species occurs in and on the margins of coastal notophyll vine forest, microphyll vine forest and littoral rainforest on shallow rocky or alluvial soils at altitudes from sea level to 200 m AHD. Associated species include; <i>Argyrodendron trifoliatum</i> , <i>A. polyandrum</i> , <i>Araucaria cunninghamii</i> , <i>Graptophyllum ilicifolium</i> (DES, 2019).	The species preferred habitat is generally lacking from the proposed project footprint. However, the closest recorded sighting is located 12 km west of the proposed Moranbah pipeline.	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	May
Migratory species											
<i>Actitis hypoleucos</i> Common sandpiper	M	SL		The common sandpiper inhabits coastal wetlands, lakes, dams and inland wetlands. Mostly found around muddy margins or rocky shores. The species generally forages in shallow water and on bare soft mud at the edges of wetlands (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 44 km east of the proposed Peter Faust pipeline.	Unlikely	Unlikely	Unlikely	May	Unlikely	Unlikely
<i>Apus pacificus</i> Fork-tailed swift	M	SL		Species is almost exclusively aerial, occurring over inland plains and sometimes foothills or coastal areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, health land or saltmarsh (DEE, 2019).	Preferred aerial habitat for the species is likely to be present within the proposed project boundary, with the closest recorded sighting being approximately 23 km east of the proposed Peter Faust pipeline	Likely	Likely	May	Likely	Likely	Likely
<i>Calidris acuminata</i> Sharp-tailed sandpiper	M	SL		Species inhabits muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Preferred species habitat, such as dams, is present within the proposed project boundary near Eungella Dam. The closest recorded	May	May	Unlikely	Likely	May	May

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
				Their habitat includes lagoons, swamps, lakes and pools near the coast, as well as dams, waterholes and saltpans (DEE, 2019).	sighting is approximately 24 km east of the proposed Peter Faust pipeline.						
<i>Calidris melanotos</i> Pectoral sandpiper	M	SL		Species inhabits shallow fresh to saline wetlands. The species is found within coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, creeks, floodplains and artificial wetlands (DEE, 2019).	There is limited preferred habitat for the species and no known corresponding REs or TECs have been identified as occurring within the proposed project boundary with the closest recorded sighting being 60 km east of the proposed Eungella pipeline	Unlikely	Unlikely	Unlikely	May	Unlikely	Unlikely
<i>Calidris ferruginea</i> Curlew sandpiper	CE, M	E	PMST	Species inhabits both intertidal mudflats in sheltered coastal areas, such as inlets, bays, and estuaries and non-tidal wetlands up to 60 mm deep where they can forage at the edge of shallow ponds. (DEE, 2019). Species occurs in fresh and brackish waters and roost on bare dry shingle, shell or sand beaches, islets and sand spits in or around lagoons and other wetlands.	Some preferred species habitat, such as dams, is present within the proposed project boundary near Eungella dam. The closest recorded sighting is approximately 35 km east of the proposed Peter Faust pipeline.	May	May	Unlikely	May	May	May
<i>Cuculus optatus</i> Oriental cuckoo	M	SL	PMST WO Birdata	Species inhabits coastal regions across northern and eastern Australia, as well as offshore islands. Species utilises a range of vegetated habitats, including monsoon rainforests, wet sclerophyll forest, and open woodlands and along the edges of forests (DEE, 2019).	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed Project boundary and surrounding environments, with the closest recorded sighting being 5 km east of the Eungella Dam. This species was reported within the Wildlife Online results for the irrigation area.	May	May	May	May	Likely	Likely
<i>Crocodylus porosus</i> Saltwater crocodile	M	V	PMST	Species mostly occurs in tidal rivers, coastal floodplains and billabongs, channels and swamps up to 150 km inland from the coast. Species usually inhibits lower reaches of rivers, particularly restricted to coastal waterways. Preferred nesting habitat includes elevates, isolated freshwater swamps with no tidal movements and floating raft of vegetation exposed to midday sun (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint The closest recorded sighting is approximately 30 km east of the proposed Peter Faust pipeline	Unlikely	Unlikely	Unlikely	May	Unlikely	Unlikely
<i>Gallinago hardwickii</i> Latham’s snipe	M	SL	PMST WO	Species inhabits permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation. The species sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint The closest recorded sighting is approximately 24 km east of the proposed Peter Faust pipeline. However, the wildlife online search identified the species as occurring within the proposed Moranbah pipeline.	May	May	May	May	May	May
<i>Hirundapus caudacutus</i> White-throated needle tail	V, M	V	PMST WO	Species is almost exclusively aerial however they are most often seen above woodlands, open forests and rainforests. In Queensland, it is observed in all coastal regions (DEE, 2019).	Preferred species habitat, such as open woodlands and cleared areas, is present within the proposed project footprint. The closest	May	May	May	May	Likely	Likely

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
					recorded sighting is approximately 17 km east of the proposed Peter Faust pipeline. However, the wildlife online search for the proposed Moranbah pipeline identified the species as occurring						
<i>Monarcha melanopsis</i> Black-faced monarch	M	SL	PMST WO	Species inhabits rainforest ecosystems that include semi-deciduous vine thickets, complex notophyll vine-forests, tropical rainforests, subtropical rainforests, mesophyll thicket/shrub land, warm temperate rainforest, dry rainforest and cool temperate rainforest (DEE, 2019).	Preferred species habitat is generally lacking from the proposed project footprint, however, preferred habitat is likely to be present in the surrounding Eungella National Park, Macartney and Cathu State Forests. The closest recorded sighting is approximately 8 km east of the proposed Eungella Dam pipeline. The species was reported in wildlife online desktop search areas for all pipeline options.	Likely	May	May	Likely	Likely	Likely
<i>Monarcha trivirgatus</i> Spectacled monarch	M	SL	WO	Species is found in coastal north-eastern and eastern Australia and prefers broadleaf thicket/shrub land, subtropical rainforests, tropical rainforests and wet sclerophyll forests (DoE, 2015).	This species has been extensively recorded around the Eungella Dam. Potentially suitable habitat is also located within the Peter Faust Dam Pipeline and proposed inundation area.	May	May	Unlikely	Likely	Likely	Likely
<i>Motacilla flava</i> Yellow wagtail	M	SL	PMST WO Birdata	Species is found in highly variable habitats, but typically found in open grassy flats near water. Habitats include open areas of low vegetation such as grasslands, pastures, sports fields and damp open areas (DEE, 2019).	Preferred species habitat, such as open woodlands and cleared areas, is present within the proposed project footprint. A 2018 record of this species is located at the Eungella Dam, approximately 3 km from the proposed pipeline.	May	Unlikely	Unlikely	May	Likely	Likely
<i>Myiagra cyanoleuca</i> Satin flycatcher	M	SL	PMST WO Birdata	Summer breeding migrant in southern Australia; migrate north to spend winter in northern Queensland and beyond. Species inhabits eucalypt forest and woodland, particularly common in tall wet sclerophyll forest often in gullies or along watercourses (DEE, 2019).	Preferred habitat in the form of Eucalypt forest and woodlands are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting are 5 km from the proposed Eungella Dam and Peter Faust Dam Pipeline pipelines.	May	May	May	Likely	Likely	Likely
<i>Pandion haliaetus</i> Osprey	M	SL	PMST WO Birdata	Species inhabit littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers. They frequent a variety of wetland habitats, including inshore waters, reefs, bays, coastal cliffs, beaches, large lakes and waterholes (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint. The closest recorded sighting is approximately 25 km east of the proposed Peter Faust pipeline.	May	Unlikely	Unlikely	Likely	Likely	Likely
<i>Pteropus conspicillatus</i> Spectacled flying-fox	E	E	PMST	Species roosting sites generally occur within 6.5 km of rainforest habitat (DEE, 2019).	Essential habitat for the species is mapped within the proposed project boundary. Preferred habitat for the species is generally lacking within the project area. The Crediton Forest Reserve and	Unlikely	Unlikely	Unlikely	May	May	May

Species of community name	Conservation status		Source	Habitat preference	Assessment	Project component					
	EPBC Act	NC Act				Dam inundation	PHES	Irrigation precinct	Water distribution network ¹		
									PFDP	EDP	MP
					Eungella National Park may provide suitable habitat, however, the closest registered roosting sites is mapped at Elliot River, approximately over 100 km north of the project area.						
<i>Rhipidura rufifrons</i> Rufous fantail	M	SL	PMST WO Birdata	Species inhabit wet sclerophyll forests, often in gullies dominated by eucalypts such as tallow-wood, mountain grey gum, narrow-leaved peppermint and mountain ash and is usually within a dense shrubby understorey that often includes ferns (DEE, 2019).	Preferred habitat in the form of eucalypt forests are likely to be present within the proposed project boundary and surrounding environments, with the closest recorded sighting being at the existing Eungella Dam. The wildlife online search identified the species as occurring within the proposed Moranbah pipeline.	May	May	May	Likely	Likely	Likely
<i>Tringa nebularia</i> Common greenshank	M	SL		Species found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Typically occurs in sheltered coastal areas with large mudflats, saltmarsh, mangroves or seagrass. The species use both permanent and ephemeral wetlands including swamps, lakes and creeks (DEE, 2019).	Preferred habitat is generally lacking from the proposed project footprint The closest recorded sighting is approximately 25 km east of the proposed Peter Faust pipeline.	Unlikely	Unlikely	Unlikely	May	Unlikely	Unlikely

Key to table: CE = Critically endangered, E = Endangered, V = Vulnerable, NT = Near threatened, Mig = Migratory, Ma = Marine.

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APPENDIX D IAS APPLICATION CHECKLIST

Before submitting an application for project declaration, check you have:	x/✓
Provided a signed and dated covering letter, including proposed timing of a referral to the Commonwealth Minister for the Environment	✓
Provided a final IAS	✓
Provided a separate statement of proponent's capacity to complete an EIS or IAR for the project	✓
Provided a separate pre-feasibility assessment	✓
Paid the correct fee by direct bank deposit (cheques are not accepted). Refer to page 6 of this guideline or the Overview of coordinated project fees to confirm the amount payable	✓