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REPORT ON

INITIAL ADVICE STATEMENT
PROPOSED
TRAVESTON CROSSING DAM
MARY RIVER, QUEENSLAND

Submitted to :

Queensland Water Infrastructure Pty Ltd
Level 8, 119 Charlotte Street, Brisbane QLD 4002

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1.0 EXECUTIVE SUMMARY

This Initial Advice Statement describes a proposed dam and associated infrastructure works near Traveston Crossing on the Mary River, South-east Queensland (SEQ). The Proponent, Queensland Water Infrastructure Pty Ltd (QWI), is seeking gazettal of the project as a "significant project" under the State Development and Public Works Organisation Act. If successful, the Coordinator General will develop a Terms of Reference for an Environmental Impact Statement (EIS) and QWI will respond by producing the EIS for public review in due course.

Traveston Crossing Dam is part of the State Government's diversified water supply strategy that aims to account for population growth, climate change and drought. Significant increases in water supply to the SEQ region, coupled with water conservation and demand management initiatives, comprise the strategy. Acil Tasman Economics estimated that the cost to Queensland of not providing additional water, for the period 2010 – 2020, would be of the order of $55 - $110 billion. Traveston Crossing Dam is a major component of the water supply strategy.

Current planning assumes two stages of construction with Stage 1 completed by late 2011 and Stage 2 potentially required by 2035. QWI is seeking approval for Stage 1 but acknowledging the planning for Stage 2. The cost of dam construction is approximately $1,700M. This expenditure will result is significant employment and economic flow-on benefits to the local and regional economies.

The scale of the dam can be appreciated from the following figures.

	Stage 1	**Stage 2**
Storage volume (ML)	161,700	660,000
Yield (ML/annum)	70,000	161,000
Depth at wall (m)	24.5	33.0
Length of Mary River inundated (km)	36.5	50.7
Area inundated (ha)	3160	7300
Properties affected (approx)	500	1000
Length of road affected (km)	35	79
Construction period (yrs)	2.5	1

Several rural towns would be directly or indirectly affected by the development. Kandanga would be affected by inundation at both levels of development but most significantly at Stage 2 when parts of the town, the cemetery and some buildings with local heritage status would require mitigation measures. The area to be inundated currently includes productive agricultural land on the valley floors, large sections of rural residential land and local towns. On announcing the dam the State Government established the Community Futures Taskforce to address the acknowledged significant social and planning issues linked to the need for land acquisition and the resultant population changes associated with the project.

Construction of the dam and associated works has the potential to impact on a range of terrestrial and aquatic flora and fauna that are listed under State or Commonwealth legislation as of conservation significance. These include several species listed as Endangered or Vulnerable and include the Mary River Cod, Mary River Turtle and the Lungfish. Two Regional Ecosystems listed as Endangered or Of Concern would also be impacted.

It is anticipated that significant further assessment will be completed as part of the EIS process to fully determine the likely impacts of the construction and operation of Traveston Crossing Dam. The EIS process can also be expected to interact with the development of dam design and routes for relocated roads and thereby optimise solutions. As part of the EIS, an Environmental Management Plan will be developed to minimise the risk of environmental harm, manage environmental impacts and nuisance caused by construction and operation and to meet statutory obligations.

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2.0 INTRODUCTION

2.1 Proponent

Queensland Water Infrastructure Pty Ltd (QWI) is the proponent for the proposed Traveston Crossing Dam, located on the Mary River. QWI was established by the Queensland State government in 2006 as the entity responsible for developing specified new water infrastructure, including the proposed Traveston Crossing and Wyaralong dams.

The name and address of the proponent is:

Queensland Water Infrastructure Pty Ltd (ABN: 18 119 634 427)
Level 8, 119 Charlotte St, Brisbane 4000

Or

PO Box 15940, City East, 4002

2.2 Environmental Impact Assessment Process and the Purpose of this IAS Document

Under Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act), the Environmental Impact Assessment (EIS) process works in the following way:

The Proponent submits an Initial Advice Statement (IAS) to the Coordinator General (CoG) with a request for the CoG to determine whether the project is "significant" under s26 of the SDPWO Act;

The CoG assesses the project proposal against standard criteria and may declare the project as "significant";

An EIS is then required and the CoG prepares a draft Terms of Reference (ToR) for this document;

Comments on the draft ToR are invited from Agencies and other stakeholders, including the public, after which, the CoG finalises the ToR;

The proponent then prepares an EIS in accordance with the ToR and submits the draft document to the CoG who places the document on public display, seeking comment from stakeholders and agencies. These comments are considered by the CoG;

The proponent prepares a supplementary report if necessary, addressing any issues that have been raised during the consultation process; and

Finally, the CoG evaluates the EIS (Draft and Supplementary) and any other submissions and provides a Report to the proponent which may or may not approve the project. If approved, the Report will state any conditions that must be attached to a development approval.

This IAS has been prepared by Golder Associates Pty Ltd (Golder) on behalf of QWI to provide sufficient information to:

support a request to the CoG to determine if the proposal can be declared a "significant" project;

enable stakeholders, including Government agencies and the public, to input into the ToR for the EIS; and

support a referral to the Commonwealth under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

This IAS provides an overview of the existing environment; delineates the potential area of influence of the proposal and identifies the potential impacts that will need to be fully addressed in an EIS. The ToR for the EIS will be developed based upon the outcomes of the IAS, along with consideration of any comments received from stakeholders and agencies on the draft ToR.

This IAS focuses primarily on the proposed Stage 1 works. However, to address issues such as the cumulative impact of the development, this IAS will also give consideration to the potential impacts associated with Stage 2 of the project, should that stage proceed.

2.3 Community and Stakeholder Consultation

The public, along with other stakeholders, will be invited to comment on the draft ToR for the EIS, which will prepared by the CoG. The period for comments on the ToR is not defined under the SDPWO Act; however, a period of 20 business days is typical.

An extensive consultation process will be required during the preparation of the EIS and will involve a range of activities including but not limited to:

- identification of relevant stakeholders;
- dissemination of project information through various forums;
- meetings with residents and landowners directly affected by the project;
- meetings with relevant local, State and Commonwealth government representatives; and
- consultation with local community, business and environmental groups.

Upon announcing Traveston Crossing as their preferred site for development of a dam, the Queensland Government established the Community Futures Taskforce to examine issues such as jobs, industry assistance, and how to help local communities capitalise on the construction of the dam in both the short and the long term. The Taskforce is headed by Major General Peter Arnison and also comprises the CoG Ross Rolfe as well as the Director-Generals of State Development, Trade and Innovation; Employment and Training; Natural Resources, Mines and Water; Main Roads, Public Works; Communities and Local Government and Planning.

Initiatives to be undertaken by the Community Futures Taskforce include:

- undertaking community needs assessment to identify social, economic and land use implications;
- providing shop front access to advice and support for individuals and community;
- generating a case management approach for affected individuals, businesses and communities;
- establishing community reference groups;
- identifying opportunities for regional employment and business continuity;
- developing industry adjustment initiatives;
- identifying longer term employment opportunities;
- implementing skills and training programs;
- identifying land use planning scheme options;
- identifying social infrastructure and lifestyle needs to rebuild communities;
- identifying access to rural water use; and

- rural futures planning.

Over time a range of State Government initiatives associated with the Community Futures Taskforce recommendations can be expected.

3.0 PROJECT SUBSTANTIATION

3.1 Need for the Project

South East Queensland (SEQ) is experiencing rapid population and economic growth. This, combined with drought and climate variability, has led to increasing difficulties in providing a reliable water supply for the region. Brisbane is currently on Level 3 water restrictions and without substantial rainfall will move to Level 4 on 1st November 2006.

A range of strategies have been introduced to reduce water consumption in SEQ, including rebates related to installation of rainwater tanks, pool covers and water efficient household devices, however, these are insufficient to cater for the expected increase in population. To reduce the region's susceptibility to drought and climate change, a diversified supply strategy has been developed which includes a range of initiatives such as:

- recycling;
- new pipelines forming a water grid between storages or distribution networks;
- desalination; and
- new water storages.

The State government has proposed the development of an integrated water supply grid that will connect new and existing water storages throughout the region to allow water to be moved and shared as required. The proposed dam on the Mary River at Traveston Crossing is a critical element of the overall strategy as it will be the second largest storage in the region.

3.2 Population Growth

The SEQ region has a current population of approximately 2.7 million people, which represents 80 percent of the State's total population. The region has experienced significant population growth over the past 20 years and this growth is predicted to continue. Population projections were recently revised upwards to reflect the continued population boom (**Table 1)**. These figures reflect an annual population increase of approximately 50,000 making SEQ the fastest growing region in Australia.

Table 1: Population Projections for SEQ

Year	2006 Projections
2001	2,470,000
2004	2,650,000
2006	2,780,000
2016	3,375,000
2026	3,906,000
2050	5,080,000

Source: Queensland Government (2006)

3.3 Cost and Benefit

Prolonged drought conditions combined with significant population growth in SEQ have demonstrated the vulnerability of the current water supply system. The primary objective of the proposed water grid and new infrastructure is to improve the security of water supply in a rapidly growing region.

Without additional water supplies in SEQ, economic growth is likely to be significantly affected. The cumulative impact of not providing additional water has been estimated to result in losses to the regional economy of between $55 and $110 billion for the period 2010 to 2020 (ACIL Tasman[1], in QLD Government 2006). This loss would also result in loss of employment which would affect new job seekers and families.

The construction cost of the dam is estimated to be in the order of $1,700 million. Whilst the project will result in loss of agricultural land and natural resources, it will also provide significant opportunities for employment.

3.4 Alternatives

Planning for management of SEQ's water resources is advanced, with four Water Resources Plan (WRP) areas. The Mary River WRP was finalised in July 2006 and the outcomes of that process included that the Mary River was considered able to provide a strategic reserve of 150,000 ML of surface water supply for SEQ (QLD Gov 2006).

Integrated urban water management solutions such as recycling and rainwater tanks are being introduced into new developments, and retro-fitted to an extent into existing areas, and may reduce the need for additional water supplies or extend the timeframe within which the supplies need to be sourced. However, these initiatives alone are insufficient to cater for the growing demand for water in SEQ within the planning horizon to 2050.

The main bulk water supply options considered include:

- new dams;
- groundwater;
- desalinisation; and
- recycling.

Each option has advantages and disadvantages, including energy and cost implications, social and environmental impacts. No single response is sufficient to cater for the predicted population increase, economic growth and inevitable variability of climate conditions. To cater for the long term, a combination of solutions is proposed ("Long-Term Solution"; Qld Government July 2006). These strategies are in addition to the introduction of new technologies.

[1] Economic Consultants

4.0 PROJECT DESCRIPTION

4.1 Background

The Queensland Government has proposed the development of water infrastructure in the Mary River catchment in three phases as listed below:

Construction of Stage 1 of Traveston Crossing Dam by the end of 2011. Stage 1 is expected to be a full supply level (FSL) of 71 m (AHD) providing an approximate annual yield of 70,000 ML from a total storage of 161,000 ML.

Raising the existing Borumba Dam by a maximum of 30m by 2025 to provide an extra 40,000 ML per year.

Stage 2 of the Traveston Crossing Dam, completed by about 2035 with a FSL of approximately 79.5m. Storage capacity at this level would be approximately 660,000 ML and would provide a yield of approximately 160,000 ML. This stage will only be completed if it is required to meet expected future SEQ demand.

The purpose of this document is to address the assessment requirements of the proposed Traveston Crossing Dam. It is proposed to seek full approval for Stage 1 and to notify the long term intention to develop Stage 2. At this stage it is not considered prudent to seek full approval for Stage 2 as the current planning horizon does not envisage construction for another 28 years. With rapid changes in technology, population projections, climate change and assessment requirements; a different course of action may be considered more appropriate at that time.

4.2 Location

The site is located on the Mary River in SEQ at approximately adopted middle thread distance (AMTD) 207 km which is approximately 27 km upstream of Gympie (**Figure 3-1**).

Currently there are 15 dams, weirs and barrages on the Mary River and its tributaries. These include Borumba Dam on Yabba Ck, Baroon Pocket Dam on Obi Obi Ck, the Mary River Barrage upstream of Maryborough and Tinana Creek Barrage. A number of small weirs exist to service rural towns and small irrigation schemes.

4.3 Associated Infrastructure

A pipeline and associated pumping infrastructure is planned to link the water storage to water treatment infrastructure serving Brisbane. Detailed planning for the pipeline has not yet been developed.

Noosa Shire currently draws water from the Mary River catchment near Coles Crossing. The Noosa Shire supply system will need to be reconfigured so that supply can be maintained as the current abstraction point will be inundated as a result of the proposal.

The proposal will require the relocation of various infrastructure, including roads, powerlines etc. The major infrastructure relocation task is the realignment of a section of the Bruce Highway.

Access roads to the dam will be constructed to facilitate construction and to be maintained as permanent dam access.

These actions are a direct result of the proposed dam therefore they are included in the impact assessment process.

4.4 Timeframe

Development of the design of the dam, minimisation of impacts and optimisation of management procedures is an iterative process that will occur over a number of years. Assuming that the project is designated as a significant project under the SDPWO Act, a preliminary timeframe is indicated below:

- concept design finalised August 2006;
- preliminary design completed December 2006;
- EIS/approvals completed March 2008;
- detailed design completed March 2009; and
- construction completed November 2011.

4.5 Concept Design

At present the concept design suggests that Traveston Crossing Dam is likely to consist of a roller compacted concrete (RCC) structure across the valley floor with earth embankment sections on both the left and right abutments.

In order to mitigate downstream flooding, a gated spillway has been included in the concept. General parameters for the site, based upon the concept design, are described in **Table 2**. It must be noted that the figures provided are based only on the current concept. As the design is developed for the dam and associated infrastructure, the concept outlined may change.

Table 2: General Concept Design Parameters

Feature	Description
Main Dam Embankment	
Wall Type:	Roller Compacted Concrete
Maximum Wall Height:	59 m
Nominal Crest Elevation:	EL 94 AHD
Wall Length:	475 m
Total Quantities:	573,000 m^3
Abutments:	
Wall Type:	Earth and Rockfill embankments
Maximum Wall Height:	66 m
Nominal Crest Elevation:	EL 94 AHD
Wall Length:	Left: 471 m; Right : 350 m
Total Quantities:	3,734,000 m^3
Saddle Dam Embankment	
Wall Type:	Homogeneous embankment
Maximum Wall Height:	4 m
Nominal Crest Elevation:	EL 94 AHD
Wall Length:	345 m
Total Quantities:	22,600 m^3
Description of Spillway	
Spillway Type:	Controlled crest
Spillway Description:	Mass concrete ogee, multiple radial gates
Spillway Crest Elevation:	Fixed crest EL 69.5 AHD
Stilling Basin Floor elevation:	EL 34 m AHD
Spillway Width:	61.5 m
Total Concrete Quantities:	90,900 m^3
Energy Dissipation Method:	Roller bucket
Description of Outlet Works	
Reservoir Inlet Description:	Incorporated in the left spillway training wall
Conduit Description:	1.35 m pipe in concrete conduit
Regulator Description:	Two 600mm diameter cone dispersion valves
Outlet/Offtake Description:	Screened intake with selective baulks

Feature	Description
Fishway	
Maximum barrier height	49 m
U/S fishway description	Fish lift located on the left embankment
Means of transfer:	Hoisting frame
D/S fishway description:	Fish collection slot on the intake structure
Means of Transfer	Open flume

AHD: Australian Height Datum

FSL at Stage 1 would inundate an area of approximately 3,155 ha and would affect approximately 500 private land holdings. The timing of Stage 2 is less certain, but approximately 1,000 properties would be affected and the area of inundation will increase to approximately 7,300ha. Additional land around the full storage level of both Stages would be acquired to act as a buffer zone and the requirement for infrastructure to be relocated would cause further property impacts.

To ensure that the proposed fishway provides a suitable means of passage for fish and other aquatic species, the detailed design will be developed in conjunction with Queensland Department of Primary Industries (DPI).

4.5.1 Raw Materials

It is expected that suitable construction materials will be available within close proximity to the site. Investigation of potential sources of clay and sand has focussed on the floodplain and streambed areas of the Mary River that will be subject to inundation.

Existing or potential quarries and pits could supply the required quantities of clay, filter sand, concrete aggregate and material for rip rap. Rockfill for the embankment will require the development of a new quarry. A potential site for this is being investigated near the site of the proposed dam wall.

Approximate quantities of the required construction material are shown in the **Table 3**.

Table 3: Approximate Volume of Material Required for the Project

Description	Approximate Volume (m^3)
Clay	333,000
Fine sand and gravel	112,000
Coarse sand and gravel	55,000
Selected Rockfill	1,500,000
Miscellaneous Rockfill	1,430,000
Riprap, rock facing	84,000

4.6 Infrastructure

The project area is located within the Cooloola, Maroochy and Noosa Local Government areas. Infrastructure and services within the Stage 1 inundation area includes the following:

- an extensive network of powerlines that are managed by Energex. The powerlines include 1 kV, 11 kV and 33 kV. The 33 kV powerlines connect areas to the north, south, east and west of the study area;
- telecommunication infrastructure
- the Bruce Highway, major local roads, including strategic local roads and local access and property roads;
- local government infrastructure
- small parts of the town of Kandanga, including part of the cemetry; and
- private infrastructure such as houses, pumps and sheds.

The Stage 2 inundation area is expected to affect the following additional infrastructure:

- two towns, Kandanga and Imbil, are within the study area. These towns have a range of buildings and services contained within them typical of small country towns. Initial planning for Stage 2 indicated there may be considerable inundation of Kandanga, including the cemetery, but no inundation of Imbil;
- the Valley Rattler is a restored World War II steam train that runs between Gympie and Imbil stopping at Kandanga two days per week. A section of the railway line passes through the Stage 2 area of inundation;
- a significant length of the Bruce Highway would require relocation and greater lengths of local roads would be effected; and
- a more significant degree of impact on power infrastructure would also be expected.

Given the proposed staging of the project, the possible alternative routes for relocated roads will be assessed for both Stage 1 and Stage 2 and the preferred alternative selected as the most cost effective that minimises disruption. For example in some cases it may be best to relocate directly to the Stage 2 level of development while in others in may be more prudent to initially raise a road then relocate later.

4.7 Operation, Flood Management and Fish Transfer

4.7.1 Spillway

The spillway will be designed in accordance with the Queensland Dam Safety Management Guidelines (2002).

The dam would mitigate flooding downstream to an extent, including for the town of Gympie. A thorough analysis of the flood mitigation benefits to Gympie has not been undertaken to date however, this is currently being completed as part of the preliminary design. This analysis will include consideration of the operating regime for flood releases from the proposed dam and the requirements of the WRP.

4.7.2 Outlet Works

The spillway, gates and outlet works will be designed and operated so that flows will conform to the Mary River WRP.

4.7.3 Fishway

A fishway will be specifically designed, constructed and operated to ensure that the impact on faunal movement is minimised.

4.8 Permit and Approval Requirements

The construction of Traveston Crossing Dam (Stage 1 and 2) will require a range of approvals at the local, State and Commonwealth government levels.

There is a range of State legislation that may be applicable to the project and this is outlined below. A summary of the permits and approvals that may be required is provided in Appendix A.

4.8.1 State Legislation

a) State Development and Public Works Organisation Act 1971

The SDPWO Act provides the CoG with significant powers to manage major projects on a whole-of-government basis and to coordinate environmental approvals.

In considering whether the project should be declared a significant project, the CoG must have regard for one or more of the following (section 27):

- Detailed information about the project given by the proponent in an IAS;
- Relevant planning schemes or policy frameworks, including those of a relevant local government or of the State or the Commonwealth;
- The project's potential effect on relevant infrastructure;
- The employment opportunities that will be provided by the project;
- The potential environmental effects of the project;
- The complexity of local, State and Commonwealth requirements for the project;
- The level of investment necessary for the proponent to carry out the project; and
- The strategic significance of the project to the locality, region or the State.

The IAS is considered to be a scoping study and a public document that provides the CoG with sufficient information to make a decision on "significant project" declaration; to enable stakeholders to determine the nature and level of interest in the proposal and to enable the preparation of ToR for an EIS for the proposed project.

b) Integrated Planning Act 1997 (IPA)

IPA outlines the assessment and approval process (Integrated Development Assessment System (IDAS)) which is used for licences and permits required under, *inter alia*, the *Environmental Protection Act 1994* (EP Act), the *Water Act 2000*, the *Vegetation Management Act 1999* (VMA) and the *Fisheries Act 1994*. As noted earlier, the EIS is expected to be undertaken under the SDPWO Act and its integrated approach under IDAS.

A development permit under IPA will be required. However, as the Traveston Crossing Dam potentially affects land within three local government areas, Cooloola, Noosa and Maroochy, designation of the project as community infrastructure under Section 29K of the SDPWO Act is possible. Designation would simplify the approval process so that only one approval would be needed and would ensure that a consistent approach by both local governments was taken

A determination on whether the community infrastructure process for approvals will apply will be made once the CoG's report on the final EIS has been prepared.

c) Water Act 2000

There is potential for the requirement of a number of permits and licences under the *Water Act 2000* including the following:

- destruction of vegetation by removal or inundation: section 266 Permit required;
- sourcing controlled quarry material from a Watercourse: An allocation of quarry material may need to be applied for under section 280;
- taking water from a watercourse for a specified purpose where the activity has a foreseeable end date: A Water Permit may be required under section 237;
- taking water from a watercourse for a specified purpose where the activity has no foreseeable end date. A water allocation or resource operation licence (ROL) is required as well as a Development Permit; and
- interfering with the flow of water in a watercourse by construction of a weir or dam. A water licence is required under section 206.

d) Water Resource (Mary Basin) Plan 2006

The Mary Basin WRP 2006 is subordinate legislation under the *Water Act 2000*. Its purpose includes defining the availability of water in the plan area, providing a framework for the sustainable management of water and the taking of water, identifying priorities and mechanisms for dealing with future water requirements, and providing a framework for establishing water allocations of surface water. The plan covers the catchment area of the Mary River and some smaller rivers and streams that are not part of the catchment but are regionally important in meeting management objectives.

The plan has general outcomes which include the provision for future water requirements, including the opportunity for additional water to be taken, to ensure a reliable and secure supply of water from the plan area during the time the plan is in force, and to be consistent with the SEQ Regional Plan (Section 11(a) (i) (k)).

The WRP aims to support natural ecosystems by minimising changes to natural flow regimes and to maintain as far as possible, surface water and groundwater interactions (Section 11(g) (h)). Specifically, for the Mary River upstream of the Mary River Barrage, the WRP aims to minimise changes to the low flow regime of the river and to minimise changes to the hydraulic habitat requirements of species such as the Mary River Cod and Lungfish (Part 3, Section 13 (b)). The management and protection issues related to the small rivers and streams that are not part of the Mary River catchment, but are part of the WRP area, are also part of the mix to ensure support of natural ecosystems.

The next stage in planning under the *Water Act 2000* is the development of a Resource Operations Plan (ROP). The ROP will provide rules under which the water resources of the Mary River will be managed, including water allocations, trading, and the grant of Resource Operating Licenses. In this case, the Resource Operating Licence (ROL) for the future operator of the dam and associated infrastructure will incorporate monitoring and management practices in order to meet the management objectives of the WRP.

e) Land Act 1994

The *Land Act 1994* also has regard for allocating land for development in the context of the State's planning framework, and applying contemporary best practice in design and land management.

The Land Act provides a framework for the allocation of State Land as freehold, leasehold or other tenure. The dedication, opening of roads, closing of roads and the temporary closure of roads are managed under the Land Act (Section 93, 94, 98, 106). Roads may be built under this Act (Section 110).

f) Environmental Protection Act 1994 (EP Act)

A material change of use for an Environmentally Relevant Activity (ERA), as defined under the EP Act, is likely to apply to the proposed project. This may result from various activities applicable to the development of the infrastructure, e.g. ERA's may be required for construction site sewage treatment and extractive industry (for sourcing of construction material). EP Act application requirements have been integrated into the IPA process.

g) Aboriginal Cultural Heritage Act 2003 (ACHA)

The ACHA requires demonstrated compliance with the cultural heritage duty of care, as defined in the ACHA. The ACHA provides a series of mechanisms by which this can be done, including:

- preparation of a notified Cultural Heritage Management Plan (CHMP), developed in the manner specified in Part 7 of the ACHA, and approved by the Minister for Natural Resources, Mines and Water, or
- management of cultural heritage as a component of a native title agreement of a type specified in Schedule 2 of the ACHA.

h) Forestry Act 1959

The *Forestry Act 1959* regulates the use of forest products and quarry materials on Crown land.

A small portion of Crown Land may be affected in the buffer zone of the inundation area. Where removal of (or interference with) millable timber is required on any Crown Land, a permit is required under Section 53(1)(b) and Section 56 of the *Forestry Act 1959*. It will be necessary to consult with DNRMW regarding a permit for removing large trees for construction of the dam and associated infrastructure.

i) Vegetation Management Act 1999 (VMA)

For the clearing of vegetation on State or freehold land, the Department of Natural Resources, Mines and Water (DNRMW) *State Policy for Vegetation Management on Freehold Land* and the *Broadscale Tree Clearing Policy for State Lands* are likely to apply. An application to clear remnant vegetation, as defined under the VMA, would be required to be made.

j) Nature Conservation Act 1992 (NCA)

The *Nature Conservation Act 1992* (NCA) provides for the protection of protected areas, reserves and native wildlife in Queensland. The NCA is based on principles to conserve biological diversity, ecologically sustainable use of

wildlife, ecologically sustainable development and international criteria developed by the World Conservation Union (International Union for the Conservation of Nature and Natural Resources) for establishing and managing protected areas.

An intensive, targeted fauna and flora survey of the proposed construction area and inundation zone would be necessary to determine the actual occurrence of rare and threatened species within the project area and the need for action under the NCA. Where required, site-specific recommendations will ensure that the requirements of the NCA are met.

4.8.2 Commonwealth Legislation

a) Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act provides for Commonwealth involvement in decision-making where a project may have a significant impact on "matters of national environmental significance" (MNES). These include: federally listed ecological communities and species; migratory species protected under international agreements; World Heritage Areas and Commonwealth properties.

The EPBC Act defines processes for a referral. This process allows the Commonwealth Environment Minister to determine whether the project is likely to require assessment under the EPBC Act; or assess whether approval of actions is likely to impact on MNES.

The Commonwealth Department of Environment and Heritage (DEH) have produced guidelines that provide advice regarding making a determination of whether a development is likely to be considered to have a "significant impact" on a threatened ecological community or species.

The EPBC Act identifies seven matters of national environmental significance:

- World Heritage properties;
- National heritage places (from 1 January 2004);
- Ramsar wetlands of international significance;
- threatened species and ecological communities;
- migratory species;
- Commonwealth marine area; and
- Nuclear actions (including uranium mining).

QWI has determined that the project has potential to impact on MNES and will submit a referral to DEH stating same. If the DEH agrees that approval is required, the proposed action is called a "controlled action". The proposal will then undergo a formal assessment and approval process before it can proceed.

Queensland has signed a bilateral agreement with the Commonwealth regarding assessment of projects that trigger the EPBC Act. Under this agreement actions assessed under accredited processes would be deemed to have satisfied the Commonwealth EIS process. The Commonwealth Environment Minister would then make a decision regarding approval of projects after receiving a statement of potential impacts determined in the EIS. Accredited processes under the agreement include the EIS process in chapter 5 part 7A of IPA and the EIS

process in the SDPWO Act. An EIS developed under the SDPWO Act will, if it addresses referral issues, operate under the bilateral agreement to satisfy the EIS requirements of the EPBC Act.

The referral process will be placed out for public comment (on the DEH website) and to relevant Commonwealth and State Ministers.

b) Native Title Act 1993 (NTA)

The NTA establishes the rights and interests of native title holders, and the processes that must be followed for acts which may affect native title.. At present, there are two unregistered native title determination applications covering the project area; these are QC06/6 Kabi Kabi People #2 and QC06/7 Kabi Kabi People #3.. In order to validate the project under the NTA, an Indigenous Land Use Agreement (ILUA) must be negotiated with those persons who claim to hold native title for areas where native title has not been extinguished , If the intent is to extinguish native title, the State must be a party to the ILUA.

4.8.3 State Planning Policies

State Planning Policies (SPPs) are statutory planning documents that identify the State's interests in development related matters. The main purpose of SPPs is to ensure that the State's requirements are incorporated into local government planning schemes.

The most relevant SPP to the proposed dam is:

SPP1*/92 Development and the Conservation of Agricultural Land* – Sets out broad principles for the protection of good quality agricultural land (GQAL) from inappropriate developments.

4.8.4 Local Government

The proposed dam is located within the Cooloola, Noosa and Maroochy local government areas.

A number of Local laws may need to be considered in the development.

5.0 DESCRIPTION OF EXISTING ENVIRONMENT

5.1 Land Use and Tenure

The major land use in the inundation area, by area, is agriculture, primarily cattle grazing, dairy farming, and some small crops (including sugarcane and orchards). There are also some forestry operations, a number of small service towns and a growing amount of rural residential development. Beef production utilises native pastures, forested pasture and fodder/forage crops. The major dairies are located along the major tributaries of the river utilising the alluvial flats for crop production and irrigated pastures.

Forestry is an important local industry, particularly to the town of Imbil where a sawmill is located. Commercial timber operations started in 1853 (Pointon and Collins, 2004). Timber production at Imbil is centred on managed native Hoop Pine (*Araucaria cunninghamii*) plantations. Sand and gravel extraction has also been a major land use in the Mary River, particularly since the 1970s and 1980s (Stockwell *et al*., 2004).

Rural development and urbanisation has increased in the proposed dam area and the surrounding district. Rural residential development is the fourth largest landuse after cattle grazing, forestry and remnant vegetation (Pointon and Collins, 2000). Residential and rural residential land represents over 2/3 of the number of lots impacted at the Stage 2 level of development. The Mary Basin has a growing tourism industry focused around farm stays, the Valley Rattler train and other rural recreational activities.

Following the discovery of gold in the Mary Valley in 1867, gold mining became an important industry. Tailings from gold mining were released directly into the river until 1904 (Pointon and Collins, 2004). There was a war veterans settlement program in the area after World War I and major vegetation clearing in the valley occurred during this settlement phase. This resulted in higher than normal sediment loads in the river system (Pointon and Collins 2004).

There are several small towns in the area surrounding the proposed inundation area. Imbil is the major town and the focus of commercial development,. Other towns in the area that will be impacted on by the dam directly and indirectly include Kandanga, Brooloo, Amamoor, Federal and Kenilworth.

The proposed dam area is predominantly freehold title tenure (**Table 4, Table 5** and **Figure 4-1**). There are a small number of areas that are reserved for community or public purposes. There is one parcel of leasehold land near the proposed dam wall and leasehold land also exists along the railway line. State Forest land and State land is also located adjacent to the dam wall.

Table 4: Land Tenure in Stage 1

Tenure	Percentage (%)
Freehold	99.8
Leasehold	0.01
Reserve	0.05
State Land	0.07

For Stage 2, the land tenure is still predominantly freehold tenure with some state forest (**Table 5**).

Table 5: Land Tenure in Stage 2

Tenure	Percentage (%)

Freehold	99.7
Leasehold	0.11
Reserve	0.13
State Land	0.03
State Forest	0.0005

5.2 Historic and Cultural Heritage

5.2.1 European Cultural Heritage

No sites of National or State significance were found for the project area through searches of the Australian Heritage database and the EPA Cultural Heritage register. However, there are a range of buildings and infrastructure that have been recognised at the local government level. These are summarised below.

Within Cooloola Shire, the townscape of Imbil is recognised for its cultural significance and several buildings in the town are recognised in their own right. Kandanga Railway Station, Kandanga Cottage and Kandanga Memorial Hall are listed on the Cooloola Shire Council Heritage Places List and Kandanga State School is listed for cultural significance.

The Noosa Plan recognises two buildings as Heritage Sites on Schedule 3 of The Noosa Plan. They are Federal State School and Federal Memorial Hall, Bruce Highway, Federal.

5.2.2 Aboriginal Cultural Heritage

a) Native Title

A search of the Register of Native Title Claims, Register of Indigenous Land Use Agreements, the National Native Title Register and the Applications Summary found that there are no registered native title determination applications in Stage 1 of the project. However, there are two unregistered native title determination applications, namely QC06/6 Kabi Kabi People #2 and QC06/7 Kabi Kabi People #3. As the Mary River Valley was traditionally used by many people, it is possible that other groups may assert an interest over the project area.

b) Cultural Heritage

The preliminary search of the Queensland Cultural Heritage Register has found records of one indigenous cultural heritage site located within Stage 1 of the project area. There are also sites that are very close to the project area of Stage 1 and Stage 2. Many of the sites are associated with watercourses in the area. Given the history of occupation in the area and proximity to good water resources, there is a very strong likelihood that other sites will be found in the project area and downstream of the structure.

5.3 Social, Economic and Planning Environment

Three local government areas would be affected by the development, Cooloola, Noosa and Maroochy.

a) Cooloola Shire Council Planning Scheme

The majority of the area of the proposed dam is located within Cooloola Shire. Specifically, the project area is located within the Shire's rural zone. Cooloola Shire's intention is to retain rural lands for sustainable rural production and for environmental protection.

The Cooloola Shire Council Planning Scheme (2005) has a Heritage and Character Code which aims to retain places of heritage and character significance. Sites identified in the Schedule that would be affected by the inundation of Stage 2 are: Kandanga Railway Station, Kandanga Memorial Hall, Kandanga Cottage part of Kandanga State School and Imbil townscape Stage 1 and Stage 2 inundations will remain within the banks of the Mary River through Imbil so that the town buildings should not be impacted.

b) Noosa Planning Scheme

The eastern Section of the project area falls within the Mary River Catchment area of The Noosa Plan, Noosa Shire Strategic plan. The project is located within areas defined under the Noosa Planning Scheme Strategy Map as "Rural" and "Areas of Ecological Significance". The Natural Resources Overlay recognises the project area is in an area designated as an Agricultural Land Conservation Area.

The Noosa Plan recognises two buildings of cultural heritage; Federal State School and Federal Memorial Hall. and both are within the Stage 2 inundation area.

c) Maroochy Shire Plan

The proposed southeast section of the dam is located in the Maroochy Shire. The Maroochy Plan 2000 provides the planning process for the Maroochy Shire under the provisions of the IPA. The area of the proposed dam is zoned as Mary River Valley Pastoral (sustainable pastoral lands).

The area of inundation of the dam plus the associated buffer zone is essentially a rural environment with a low settlement density. Most landholders would be expected to gain at least part of their income from rural activities. The region in proximity to the dam including the catchment is also strongly dependant on rural activities although a growing proportion of the population commute to the major employment centre of Gympie. Gympie and Imbil serve as the primary service centres to the region and most community facilities are present in at least Gympie. Other significant rural towns near the proposed development include Kandanga, Amamoor and Brooloo.

5.4 Existing Infrastructure

5.4.1 Roads

There is an established road network administered by the Department of Main Roads (DMR) and local councils that provides access to land holdings in the area. The road network influenced by the proposed Traveston Crossing Dam is generally contained within an area extending from Traveston Crossing Road and the Bruce Highway to the north, Kandanga to Amamoor Road and Kandanga to Imbil Road to the west, Kenilworth to Skyring Creek Road to the east and Kenilworth to Eumundi Road to the south.

The Bruce Highway is a major rural arterial road with its main function being to serve inter-regional areas and it is designed as a high speed road with limited access. The Bruce Highway is a nationally listed highway of regional importance that carries significant volumes of traffic on a daily basis.

Gympie to Brooloo Road is a rural sub-arterial road that provides a high speed north-south connection, linking the small rural towns of Amamoor, Kandanga, Imbil and Brooloo in the study area.

Kenilworth to Skyring Creek Road is a rural local connector, which provides a north-south link to enable access to the Eumundi to Kenilworth Road to the south or the Bruce Highway to the north.

Tuchekoi Road is a rural local access road that provides an east-west connection between Gympie and Brooloo Road and Kenilworth to Skyring Creek Road.

The small rural townships of Amamoor, Kandanga, Imbil and Brooloo currently have local connectivity via the Kandanga to Amamoor Road, Kandanga to Imbil Road and Imbil to Brooloo Road. These roads run north-south and are generally parallel and to the west of the rural arterial Gympie to Brooloo Road.

It is estimated that over 30 roads pass through the proposed inundation area, including a section of the Bruce Highway. Approximately 8 km of the highway may require relocation.

Details of those roads that have been identified within the area of inundation are provided in **Figure 4-2**. It is likely that there may be other minor local roads within the area that have not been identified by this desktop study.

5.4.2 Rail

The Mary Valley Heritage Railway, known as the "Valley Rattler" is a restored World War II steam train that runs as a tourist attraction between Gympie and Imbil two days per week. Part of the railway line passes through the proposed area of inundation in Stage 2 (**Figure 4-2**).

The North Coast railway line between Gympie and Brisbane runs to the north of the inundation area and is not impacted by the proposal.

5.4.3 Power and Telecommunications

There is a Powerlink easement that traverses the project area from north to south. 32 kV, 11 kV and 1 kV powerlines owned and operated by Energex traverse the proposed inundation area. The 33 kV powerlines connect areas to the north, south, east and west of the proposed inundation area (**Figure 4-2**).

A fibre optic cable follows the North Coast Railway line route (out of the project area). There is a large network of Telstra telecommunications infrastructure in and around the proposed inundation area (**Figure 4-2**).

5.4.4 Shire Facilities

Kandanga, Imbil and Federal have a range of buildings and services typical of small country towns. Amamoor and Brooloo are also located in the Mary Valley and may be affected by the proposals (**Figure 4-2**).

Noosa Shire has a water pipeline that starts from the Mary River and traverses east across parts of the inundation area (**Figure 4-2**).

5.4.5 Private Infrastructure

A review of aerial photography was undertaken to assess the level of private infrastructure within the inundation area. The review found that:

- overall the area is largely utilised for agricultural purposes including cattle grazing (most likely dairy) and various crops;
- cropping is concentrated along the main floodplain of the major waterways with some grazing in these areas in addition to the valley slopes. Orchards have been largely planted on the slopes of the valley;
- there do not appear to have been any major point source industries located within the inundation area between 1968 and 2002 which may have resulted in contamination;
- there do not appear to have been any minor or major municipal and industrial waste disposal facilities (dumps) located within the area between 1968 and 2006; and
- it appears that a small quarry commenced operation between 1994 and 2002 near the location of the proposed dam.

A total of 57 dwellings and 184 other significant structures associated with farming activities have been identified as affected by Stage 1 of the development. In comparison, approximately 165 dwellings were identified within the Stage 2 inundation area.

A range of infrastructure and improvements on private properties, such as driveways, dams, service connections (e.g., power, water and telephone), gardens, pumps, tanks, water treatment equipment, and energy producing equipment are not included in the inventory. However, there will be many of these within the inundation area.

5.5 Contaminated Land

The area of the proposed Traveston Crossing Dam has been utilised largely for agricultural purposes including dairying, grazing and cropping over the last 100 years with some mining and quarrying activity.

Preliminary investigations have identified a number of potentially contaminated sites within the proposed inundation area. Preliminary searches of the Queensland Environmental Management Register (EMR) and Contaminated Land Register (CLR) for lots suspected of having had a notifiable activity (as defined in Schedule 2 of the EP Act) present were undertaken. No lots were identified in the CLR.

However, a number of lots are listed on the EMR for the following activities:

- livestock dips or spray;
- railway yards;
- service stations;
- hazardous contaminants – A number of the sites have been listed on the EMR for possible high levels of arsenic along the railway corridor, or
- wood treatment and preservation.

A number of unreported contaminating activities are also likely to be present within the area including operations resulting in mine wastes and/or mineral processing, aerial spraying operations, herbicide or pesticide manufacture, landfill facilities, pest control operations and scrap yards.

Other potentially contaminating activities that are not be listed on the EMR as notifiable activities may include illegal dumping of waste, septic tanks related to both households and industry, the accumulation of high levels of herbicides and pesticides within the soil through constant application, unknown or forgotten areas in which legal or illegal dumping of both municipal waste and waste associated with the local farming and timber industries may have been deposited and unreported spills of potentially contaminating substances such as pesticides, herbicides and petroleum products.

Potential contamination of land within the proposed dam area may cause adverse effects on water quality and the environment when flooded.

5.6 Air Quality

There is limited data available on air quality in the vicinity of the proposed dam. However, given the rural nature and relatively few industrial activities within the catchment, the existing air quality is considered to be relatively good. There are a small number of sawmills, abattoir, food factories and lime works located within 25 km of the dam site.

There are a number of human receptors located near the proposed inundation area. These include individual dwellings, rural residential development and several small villages on the edge of the proposed inundation area. Schools are located at Federal, Kandanga and Imbil, either within the inundation area or within 200 m thereof. No hospitals or nursing homes have been located within the area.

The Bruce Highway and several other major local roads pass through the inundation area. A number of roads within the inundation area make up part of tourist drive routes which attract additional vehicles passing through the area. Some roads have significant percentages of traffic resulting from heavy vehicles associated with the timber industry.

There are several environmental receptors within the catchment including the Mary River and its tributaries, in addition to several forest reserves and State forests.

5.7 Noise

There is limited data available for the existing acoustic environment of the proposed dam. Given the predominantly agricultural nature of the area and limited number of industrial activities, the existing acoustic environment is likely to be consistent with levels associated with a rural environment.

There is an operating quarry within 500 m of the dam site which would contribute to the existing noise environment.

5.8 Landscape and Visual Effects

The proposed dam site is located in a rural agricultural landscape setting characterised by large areas of cleared land which is dissected by a range of rural industries. Many of the hilltops and ridges are generally vegetated. The area is dissected by several hills and valleys that naturally form smaller visual catchments. There are several roads that traverse the site and the local area and they provide a range of views throughout the site. The Valley Rattler also offers views into the site from the railway line. The site is also visible from several highpoints and cleared areas.

5.9 Climate

The Mary River catchment is sub-tropical with temperatures varying slightly throughout the catchment. The average annual rainfall ranges from 2,000 mm in the upper reaches of the catchment to around 1,150 mm near the dam site. The headwaters of the river are located in high rainfall areas around Maleny and Mapleton. Gympie is

located to the north (downstream) of the proposed dam site and is a large regional centre with climate records dating from 1870. Due to the location and availability of data, Imbil and Gympie have been used as reference sites to describe climate conditions.

Figures 4-3 and **4-4** show the maximum, mean and minimum temperatures for Gympie and Imbil. The average daily maximum temperature varies between low 30s in the summer to low 20s in the winter. Maximum temperatures range from the low 40s, from October to January, and minimum temperatures during May to August can fall to just below zero.

The average annual rainfall for Gympie is 1,138 mm and this compares to the average yearly total evaporation of 1,436 mm. At Imbil the average annual rainfall is 1,180 mm and the average annual evaporation is 1,814 mm. A comparison of precipitation and evaporation is shown in **Figure 4-5** for Gympie and **Figure 4-6** for Imbil.

Historic records show that there is a large variability in annual rainfall at Gympie from 300 mm/yr up to a maximum of 2,250 mm/yr (**Figure 4-7**).

5.10 Landform

The majority of the inundation area consists of level to undulating river terraces with floodplains at elevations between 50 to 100 m AHD. Beyond the floodplain, the topography consists of rolling hills to steeply dissected topography largely controlled by lithology. Hills adjacent to the Mary River valley, such as Kenilworth Bluff, Mt Kandanga and Mt Cooroora, may rise to more than 550m AHD over distances of less than 3.5km, moderate slopes of 8 to 16 degrees are common near the dam.

The Mary River and major tributaries, including Bella Creek, Yabba Creek, Kandanga Creek, and Middle Creek have dendritic, meandering channels. The Mary River, although meandering, broadly follows the boundary between the North D'Aguiliar Block and the Gympie Block geological formations.

The investigation area includes five of Macnish's (1996) defined Land Resource Areas (LRA). These are listed in **Table 6** and their distribution is shown in **Figure 4-8**.

Table 6: Land resource areas and landforms

Land Resource Area	Description	Geology association in Study Area	Dominant Landform	Minor Landform
1	Stream alluvia	Alluvium	Level to undulating river terraces and floodplains	Levees, channel-fills, and narrow drainage depressions
5b	Consolidated sediments - plains and mountains	Keeftan Formation	Gently undulating to undulating plains with rolling hills and mountains	Includes narrow valley flats and some areas of uplifted flat plains
6	Volcanic/sedimentary complexes	Amamoor beds	Steep, dissected hills and mountains	Undulating to rolling plains and valley flats
8b	Granite	Granodiorite intrusive complexes	Undulating Plains, steep to rolling hills and mountains	
9	Metamorphic	Amamoor and Kin	Strongly dissected	Undulating plains and

	Kin beds	hills and mountains	valley flats; prominent strike ridges and faulted valleys

Most moderate to steep slopes in this area have potential to be unstable after heavy rainfall (Willmott, no date), particularly in valley heads and sides with deep soil profiles or deeply weathered rock. Groundwater seepage in valley head areas and cleared vegetation may increase the risk of instability.

5.11 Geology

The study area straddles geological regions called the North D'Aguilar Sub-province (or block) and Gympie Province (or block). The rocks in these provinces have formed during large-scale plate movement that occurred as the Australian landmass developed. They result from plate collision, extension, uplift, igneous activity and erosion that has occurred over a long time. Large scale block faults have been mapped in the Amamoor beds and the contact zone between the North D'Aguilar and Gympie blocks is defined by a major shear or fault zone known as the Electra Fault (HooTang, 2004). In the study area, the Mary River largely follows the contact zone suggesting that it may be a zone where the rocks are somewhat weaker, possibly due to faulting and shearing. Generally the Amamoor Rocks are relatively hard and resistant to erosion resulting in some incised zones along the river.

The area is now stable and the rocks have been weathered and eroded to the present topography. During this recent geographic activity soils have formed and recent alluvial sediments have been deposited in the river basins.

5.11.1 Economic Geology

More than twenty small gold, manganese, and occasionally other metal (e.g. silver, molybdenum or copper) mines and prospects occur in this area, however most have been abandoned. One Gold-Silver mine was still operating in 1999 (Cranfield *et al.*, 1999) and some manganese deposits were still supplying small amounts of manganese as pigment for brick making.

Licences to recover industrial minerals, such as sand, gravel and clay from the alluvium, have been issued for a number of sites along the river. These are a diminishing resource in SEQ.

Some sand recovery operations are upstream of the dam.

SunWater (2006) include a list and description of sand, gravel and rock workings in the area as being potential sites for resources for dam construction.

5.12 Soils

Soil descriptions have been provided by Reid (1988), Gunn (1988) and others in Pointon and Collins (2004). Soils and agricultural suitability of the project area has been mapped by Zund (2004) (**Table 7**). The mapping shows that the study area is predominantly Class 1 land which is valuable arable land (**Figure 4-9**) (Land Resources Branch Staff, 1990 in Pointon and Collins 2004).

Table 7: Land suitability classes

Class	Land suitability classes
1	Suitable land with negligible limitations
2	Suitable land with minor limitations
3	Suitable land with moderate limitations

4	Marginal land which is presently considered unsuitable due to severe limitations
5	Unsuitable land

Source: Soil and agricultural suitability study of the Gundiah-Curra area (Zund, 2004)

Soil issues that may influence the dam include:

- Some soils (e.g., Beedham and Neerdie) are listed as susceptible to salinity in low plains. Soils in this category, or other categories that may be susceptible to salinity, may contribute salts from shallow groundwater seepage or from shallow saline zones that may have accumulated in the soil.
- Many soils are described as sodic. These soils are susceptible to dispersion and erosion and may be source areas of high sediment or suspended material contribution to a dam.

5.13 Hydrogeology

Groundwater use is not regulated in the investigation area. This means that a licence is not required for groundwater use, however the *Water Act 2000* was amended in May 2003 to include a requirement that bore construction details be registered with DNRMW. As a result, there is little information about use or other bore data for aquifers in the study area.

5.13.1 Groundwater Potential

A broad classification of groundwater in the study area is presented in the Groundwater Resources of Queensland map (QWRC, 1987). The map classifies aquifers in the study area as a complex alternation of different lithologies with groundwater yield potential less than 5 L/s. According to this classification groundwater potential in these rock types is relatively low.

The discussion on groundwater in the Mary Basin draft WRP presents a map showing the main aquifers (DNRMW, 2005, Figure 4). Their classification does not regard the fractured rocks of North D'Aguilar or Gympie blocks as aquifers of any significance (they are, in fact, excluded from the figure), but shows alluvium in the Mary River as a significant aquifer.

Groundwater information from the DNRMW database was obtained and includes 17 bores that may be affected by the dam. These bores have similar average groundwater yields (0.4 L/s) to the regional average. The maximum bore flow-rate in the dam area is 50 L/s. The database records do not give sufficient detail to confidently assess the aquifer(s) in this area.

Generally, the rocks in this area do not constitute good aquifers, some high yields in the database must be verified, and some are expected to be errors. In general, potential for good groundwater resources in this area is low. A similar conclusion was reached by DNRMW (2005): "*It is apparent from the existing investigations that the prospects for significant yields of good quality groundwater in the Mary River area are poor*".

5.13.2 Groundwater Seepage

Groundwater investigation in the dam wall area shows that water levels are approximately at 50 m AHD. Typical permeabilities for sandy-clay to medium-sand would be expected in the alluvium. There is insufficient information to assess the permeability of the gravel or the sheared and fractured rock.

There is the potential for seepage through the structured clays, sands, and gravels in the embankment sections of the dam. In addition to permeability in the alluvium, the

bedrock includes fractures that may be connected over broad zones. The Mary River appears to follow such zones so that, below the alluvium in the dam wall, or elsewhere, seepage could occur. Standard dam design procedures will address any such issues.

5.13.3 Groundwater Quality

The Groundwater Resources of Queensland (QWRC, 1987) map broadly classifies groundwater on the basis of the dissolved salt content (Total Dissolved Solids, TDS). The classification suggests that groundwater TDS in the Gympie Block could range between 500 to 1500 mg/L (this is relatively good quality water), while TDS from the North D'Aguilar block is expected to be between 1,500 and 5,000 mg/L (lower quality water).

The database only includes detailed analyses for four sites. One is a bore that will be affected by the dam, while the other three are relatively distant from the dam and may not be representative of groundwater in the vicinity of the dam. Water quality of these detailed analyses is fresh with TDS ±1,000 mg/L or less.

Generally the groundwater quality appears to be good; however, the presence of shallow, possibly saline groundwater, depending on the area affected, could influence water quality in the dam.

5.14 Surface Water

5.14.1 Existing Conditions

The Mary River is located in SEQ, stretching from the Cannondale and Jimna Ranges in the southwest then flowing north-easterly to the coast for discharge to the Great Sandy Straits region. The river transitions from mountain stream to meander through open farmland and coastal flood plains.

The proposed dam site is located at approximately 207 km AMTD with an up gradient catchment of 2,090 km^2. Three major tributaries feed the Mary River above the proposed dam site:

- Obi Obi Creek to the Southeast - has Baroon Pocket dam with storage of 60,000 ML and catchment area of 67 km^2 plus Maleny Weir (66.4 ML) and Upper Kings Weir (57 ML).
- Yabba Creek to the West - has Borumba Dam with a storage 46,000 ML and catchment area of 498 km^2, Imbil Weir, storage of 46 ML and Jimna Weir (8 ML).
- Kandanga Creek to the North of Yabba Creek – has Kandanga Weir (25 ML).
- The Mary Barrage is located downstream of the proposed dam site at AMTD 59.3 km. It has a storage capacity of 12,000 ML. There are also numerous small dams and weirs located though the catchment from small farm dams to water supply weirs.

The Environmental Conditions Report prepared as part of the Mary Basin WRP, Appendix C, (2003) used the Integrated Quantity Quality Model (IQQM) to model flows in the Mary River system. This model estimates the annual mean flow at the Mary estuary to be:

- 2,513,121 ML/year for pre-development systems (no development, extractions, storages or diversions);
- 2,360,167 ML/year for existing conditions (current extractions based on records, along with current infrastructure); and
- 2,304,393 ML/year for the fully developed system (the full use of all current licences and including works yet to be constructed).

The extraction for stock and domestic uses was not reported. The model can be used for scenario analysis and allows investigation of various development and environmental flow options.

5.14.2 Water Use/ Mary Basin WRP

The Mary Basin WRP was made under the *Water Act 2000*. The purposes of the WRP are:

(a) for both surface and sub-artesian water, the following—

(i) to define the availability of water in the plan area;

(ii) to provide a framework for sustainably managing water and the taking of water;

(iii) to identify priorities and mechanisms for dealing with future water requirements;

(iv) to provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems; and

(b) for surface water only—to provide a framework for establishing water allocations.

The WRP seeks to achieve a balance between water use and ecological outcomes. To achieve this, Schedule 6 of the plan specifies environmental flow objectives (EFO) under different flow conditions which the proposal would need to satisfy.

In accordance with the *Water Act 2000*, a Resource Operations Plan would need to be prepared to ensure that the EFO's are met.

The Final WRP identified a strategic reserve of 150,000 ML to be sourced from the Mary River in order to meet the growing demands of SEQ.

5.14.3 Hydrology

Detailed flood records for the region date from the early 1900s with documented records as far back as 1860. **Figure 4-10** shows the previous flood recordings for the Mary River recorded at Gympie from 1917 when regular records were initiated.

The DNRMW have a number of stream gauging stations on the Mary River and its tributaries. Information from these gauging stations has been used to construct the IQQM model for the catchment and allows modelling of the reliability and yield of the dam.

Preliminary investigations into flooding and hydrological site conditions include:

- SunWater Report - Traveston Dam site Concept Report (draft) G-81301-04-15, June 2006-08-10 – Flood event modelling and flow duration modelling using URBS.
- GHD report - South East Queensland Regional Water Supply Strategy, June 2006- Desktop review of identified dam and weir sites – yield analysis (excluding environmental flow).
- The GHD report noted the possible yields from the proposed dam would be 161,000 ML/year (excluding allocations for environmental flows) assuming full storage level at 79.5 m AHD. EFOs have since been determined in the WRP for the Mary River.

5.15 Water Quality

The DEH report (1994) indicated at the time that the water quality in the Mary River was good compared to other catchments in Queensland, though, like many river

systems, the water quality varied between reaches and sub-catchments. This is confirmed by a more recent study undertaken as part of the Environmental Conditions Report, Appendix D of the WRP (Feb, 2005) which shows the environmental conditions of the Mary River to be very good with no major areas of concern. The report summarised previous reports and data.

The report noted the following:

- conductivity increases with distance downstream, though high flows decrease salinity;
- pH and dissolved oxygen are of good levels, though pH downstream of the waste water treatment plant near Gympie has increased pH levels;
- sediment and turbidity levels are low, though high flows mobilised sediment and high levels of transport occur;
- Total Nitrogen and total Phosphorus levels are higher than for an undisturbed catchment; and
- heavy metal values are low or undetectable.

Some reaches and tributaries lacked data, and local influences, such as waste water treatment plants and storages, do affect water quality in their vicinity.

The EPA released a set of environmental values (EVs) and Water Quality Objectives (WQO's) for the Mary River (EPA, 2006). The environmental values are defined by the EPA as "those qualities of the waterway that make it suitable to support particular aquatic ecosystems and human uses…… " (EPA, Establishing Draft Environmental Values and WQOs, 2005).

The EPA also identifies specific WQOs for the Mary River which are designed to help protect and improve the environmental values. The WQOs and EVs for the Mary River are attached as Appendix F.

5.16 Terrestrial Ecology

5.16.1 Flora

There is evidence that major changes have occurred in the nature and functioning of the vegetation in the project area as well as upstream of the site and downstream of the proposed dam wall. This has been caused by extensive clearing of the catchment and the loss of the near stream communities; direct and indirect impacts of agricultural fertilisers, pesticides, grazing stock and direct and indirect impacts of exotic plant introductions (Werren, 2003).

The majority of the project area has been cleared of native vegetation (**Figure 4-11**). The remnant vegetation that is present occurs predominantly along the riparian zones and in the bed and banks of the watercourses. Of this remnant vegetation, 90% is composed of threatened Regional Ecosystems (RE) as recognised in the EPA's *Survey and Mapping of 2003 Remnant Vegetation Communities and Regional Ecosystems of Queensland, Version 5.0, 2005*. **Table 8** summarises the REs mapped as occurring in the areas of Stage 1 and 2 of the project.

The Endangered Regional Ecosystem 12.3.1 (Gallery rainforest on alluvial plains) occurs in the inundation area. As defined under the VMA, an Endangered Regional Ecosystem is one where less than 10% of original pre-clearing extent of that regional ecosystem remains in Queensland. The Regional Ecosystem 12.3.2 (*Eucalyptus grandis* tall open forest on alluvial plains) is also listed as Endangered under the VMA and occurs in the inundation zone (**Table 8**).

The "Of Concern" REs present in the area are Regional Ecosystem 12.3.11 (*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains usually near coast) and Regional Ecosystem 12.11.14 (*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics) (**Table 8**). The "Of Concern" status means that less than 30% of the regional ecosystem currently remains in Queensland under the *VMA*.

Table 8: REs mapped as potentially occurring in the Stage 1 and Stage 2 areas

Regional Ecosystem	Description	VMA Status
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	Endangered
12.3.2	*Eucalyptus grandis* tall open forest on alluvial plains	Endangered
12.3.11	*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains usually near coast	Of Concern
12.11.14	*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics	Of Concern
12.3.7	*Eucalyptus tereticornis, Callistemon viminalis, Casuarina cunninghamiana* fringing forest	Not of Concern
12.11.2	*Eucalyptus saligna* or *E. grandis, E. microcorys, E. acnemoides, Lophostemon confertus* tall open forest on metamorphics ± interbedded volcanics	Not of Concern
12.11.3	Open forest generally with *Eucalyptus siderophloia, E. propinqua* on metamorphics ± interbedded volcanics	Not of Concern
12.11.5	Open forest complex with *Corymbia citriodora, Eucalyptus siderophloia, E. major* on metamorphics ± interbedded volcanics	Not of Concern
12.11.10	Notophyll vine forest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics	Not of Concern
12.11.11	*Eucalyptus portuensis or E. acnemoides, Corymbia trachyphloia* open forest on Mesozoic to Proterozoic igneous rocks	Not of Concern

Source: Regional Ecosystem Mapping (EPA) Version 5.0

Several threatened plants listed under the EPBC Act may be present in the project area. A search of the databases over the area encompassing Stage 1 and Stage 2 identified 16 vulnerable species listed as potentially occurring in the area (Appendix C). Three species listed as vulnerable under the EPBC Act, (*viz., Xanthostemon oppositifolius, Fontainea rostrata* and *Macadamia ternifolia*) occur as part of the endangered Regional Ecosystem 12.3.1 and this is the predominant regional ecosystem present in both Stage 1 and Stage 2 areas. Therefore, there is a high likelihood that these species may occur within the inundation area.

Twenty two plant species listed as vulnerable or rare under the NCA (Appendix C) may be potentially present in the area and the following have been recorded; *Fontainea rostrata, Marsdenia coronata, Fontainea venosa, Ricinocarpos speciosus, Arthraxon hispidus, Floydia praealta, Macadamia integrifolia, Zieria verrucosa* and *Thesium australe*. *Fontainea rostrata* occurs in the endangered RE 12.3.1, *Marsdenia coronata* occurs in the RE 12.11.3 and *Macadamia integrifolia* occurs as part of the endangered RE 12.3.1 and the RE 12.11.10. As the REs 12.3.1, 12.11.3 and 12.11.10 are mapped and recorded as occurring within the project area there is a high likelihood that these species may occur within the project area. Ten species are listed as rare.

Ten threatened plant species (vulnerable and rare) have been recorded as occurring by the Queensland Herbarium in areas covered by Stage 1 and 2.

The main channel of the Mary River and Yabba, Amamoor, Kandanga Creeks are recognised as significant riparian corridors (Cooloola Shire Council, 1995).

Although still significant, many of the existing riparian areas are poor representatives of what were once diverse and extensive communities and thus, their value as corridors and refuges for wildlife is likely to have been reduced (Werren 2003). Degraded riparian habitats where exotic grasses are present are prime habitat for species such as the Cane Rat (*Rattus* sp.) and the Grassland Melomys *(Melomys burtoni)*.

5.16.2 Fauna

Threatened fauna species recognised under State and Commonwealth legislation that may potentially be present in Stage 1 and 2 of the proposed area of inundation are listed in Appendix D. Under the EPBC Act, nine vulnerable fauna species and nine endangered fauna species are listed as potentially occurring within the project area. Seventeen threatened species (viz,. 2 amphibians, 10 birds, 2 mammals and 3 reptiles) are listed under the NCA within Stage 1 and Stage 2 of the project area. These include two endangered species (viz., Giant Barred Frog and Mary River Cod), seven vulnerable species and eight rare species.

Many fauna species use the riparian communities as habitat. Fauna such as the Black breasted Button Quail (*Turnix melanogaster)* require closed vegetation communities that provide cover and food sources, such as those provided by RE 12.3.1. The critically endangered Red Goshawk (*Erythrotriorchis radiatus)* and the endangered Richmond Birdwing butterfly (*Cyclopsitta diophthalma)* use riparian corridors particularly during winter (Stockwell *et al*., 2004).

All native terrestrial fauna is protected under the NCA. It is likely that there are rare and threatened species occurring within the project area (Stage 1 and Stage 2) and the inundation area (Stage 1 and Stage 2).

5.17 Aquatic Ecology

5.17.1 Flora

Most of the reaches in the catchment were rated by Mackay (2003) as having undergone moderate or major change from the natural condition with respect to the aquatic plants (macrophytes). In the Mary River from Moy Pocket to Yabba Creek, Mackay found that there was a relatively low diversity of macrophytes. Exotic species represented 40% of the species present. Yabba Creek had moderate aquatic macrophyte growth with exotic species representing a small proportion of the species present. The Imbil Weir pondage was dominated by emergent and floating species with a low proportion of exotic species present.

There are two macrophyte species occurring in the Mary River catchments that are protected. *Vallisneria nana* is listed as rare under the NC Act. It is widely distributed throughout SEQ. *Aponogeton elongatus* may also be present in the proposed inundation area, and it is also listed as rare under the NCA (Mackay, 2003).

An aquatic plant survey was conducted by the Queensland Herbarium in 2001 (Stockwell *et al*, 2004). *Myriophyllum verrucosum* and *Vallisneria nana* were the most common submerged macrophytes. Three weeds were present viz., Water Hyacinth, *Elodea* spp. and *Salvinia* spp. Water Hyacinth and *Salvinia* are recognised as priority weeds by the SEQ Environmental Weeds Management Group.

5.17.2 Aquatic Fauna

There are at least three threatened aquatic fauna species under Commonwealth and State legislation that may potentially occur in Stage 1 and Stage 2 of the project area. These are the Mary River Cod (*Maccullochella peelii mariensis*), the Lungfish (*Neoceratodus forsteri*) and the Mary River Turtle (*Elusor macrurus*). A total of 39 species of fish have been recorded by the Queensland Museum as occurring within the Mary River in proximity of the proposed dam site and inundation area and are listed in Appendix E. One yet to be identified turtle species is also thought to be present only in the Mary River Catchment. The Mary River catchment is identified as having one of the highest levels of endemic turtle species in Australia (Stockwell *et al.*, 2004). The Mary River Cod and the Mary River Turtle's distribution are limited to the Mary River. A negative impact on the habitat of the species in the Mary River Catchment may negatively affect the population of the species.

The Mary River Turtle is listed as endangered under the EPBC Act. The Mary River Cod is listed as endangered under the EPBC Act, by the Australian Society for Fish Biology and in The Action Plan for Australian Freshwater Fishes (Simpson and Jackson, 1996). The Mary River Cod is listed as Indeterminate by the International Union for Conservation of Nature and Natural Resources (IUCN). Indeterminate is a class for taxa known to be Endangered, Vulnerable or Rare but there is not enough information to say which of the three categories is appropriate. Australian Lungfish is listed under the NC Act as a species of scientific interest and as vulnerable under the EPBC Act. The Australian lungfish is restricted in its distribution, occurring naturally in the Burnett and Mary River systems. The species is protected from fishing under the *Fisheries Act 1994*. The Australian Lungfish is also listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The Mary River Cod occurs only in the Mary River system, having only recently been recognised as unique to the Mary River system. The Mary River Cod Recovery Plan highlights Yabba Creek (below Borumba Dam) and Obi Obi Creek as two of the three areas of concern for managing impacts on cod populations. It states that "changes to instream temperature and flow regime downstream of impoundments can also adversely affect fish stocks and stream communities in general". The population in Tinana Creek are restricted from interbreeding with cod from the rest of the Mary system by several reservoirs and the tidal barrage on the lower Mary River. Fishways on some of the impoundments are considered to be ineffective in passing fish (Hajkowicz and Kerby 1992 in Simpson and Jackson).

Mary River Cod have been stocked in impoundments throughout SEQ. However, it is not known if Mary River Cod will breed in an impoundment.

The Mary River Turtle is found only in the Mary River in Queensland and it was only formally described in 1994. It has been recorded from Kenilworth south of the proposed project area through to the tidal reaches upstream from the saltwater barrage at Tiaro. Populations are known to occur in major tributaries and the main stream of the Mary River including Yabba creek (Cann 1998, Cogger et al. 1993, Flakus 2002).

There is an undescribed turtle *Elseya* sp .aff. *dentata* found in the Fitzroy, Burnett and Mary catchments. There are also at least five other freshwater turtle species present in the Mary River.

Other fauna of interest that would be expected in the project area include the Platypus (*Ornithorynchus anatinus).* Cooloola Shire has collated sightings of the Platypus upstream and downstream of the project area. Platypus may be found in a wide variety of habitats ranging from large riverine pools to fast flowing riffles (Werren and Arthington, 2003). The water rat is likely to occur in many streams in the project area.

There are several dams, large weirs and tidal barrages in the Mary River catchment and the ecological effects of these impoundments is likely to vary according to physical characteristics of these structures, length of stream impounded and the position in the catchment.

Many species and age classes of fish present in the Mary River are known to undertake some form of movement or migration at some point in their life cycle. Barriers to fish movement may impact on the abundance, size structure and composition of fish species in the freshwater and estuarine parts of the river (Kennard, 2003). Water flows also provide cues for life history processes of aquatic biota including plants, macro-invertebrates and fish.

Sand and gravel extraction has been a major landuse in the Mary River, particularly in the 1970s and 1980s (Stockwell et al., 2004). It has impacted on river beds and the floodplain, increased suspended solids downstream of the landuse and destroyed instream habitats of fish, Platypus and other aquatic fauna, such as benthic communities. This has resulted in declines in populations and fish spawning and feeding areas.

5.18 Coastal and Near Shore Environments

The Mary River catchment is the largest catchment that drains into the Great Sandy Strait. The average annual discharge of the Mary River into the system is 2,300 GL (under the full development scenario of the WRP) and large inputs of fresh water and sediment occur during flooding on a more or less annual basis (DEH, 1999). The Mary River supplies significant quantities of sediment to the northern section of the Great Sandy Strait and some of this sediment is then transported to Hervey Bay by tides (Brizga *et al.*, 2003).

The Mary River Draft WRP Environmental Conditions Report (Brizga *et al*., 2003) found that alterations to the upper and lower estuary have impacted on the production of the estuary processes and fishery, but it has not resulted in significant changes in the physical waters or their habitats. It is estimated that the current total freshwater outflow from the Mary and Burrum rivers has been reduced by 5%.

The Great Sandy Strait is listed as a Ramsar site (**Figure 3.1**) and part of a State Marine Park (Great Sandy Marine Park). The Ramsar site extends the length of Great Sandy Strait to the eastern end of Inskip Point and the southern extent includes Tin Can Inlet and Tin Can Bay. The western boundary extends along the Mary River and includes the Susan River mangrove system (DEH, 1999). The eastern side of the strait is occupied by World Heritage listed Fraser Island. The Great Sandy Strait is the largest area of tidal swamps within the SEQ bioregion and is an important feeding ground for migratory shorebirds. It is also important for a wide range of other shorebirds, waterfowl and seabirds, marine fish, crustaceans, oysters, dugong, sea turtles and dolphins. The Great Sandy Strait is a particularly good representative example of a natural or near natural wetland in a relatively undisturbed state (DEH, 1999).

The Mary River Estuary is a modified estuary system. The Mary River and Tinana Barrages act as partial sediment traps altering the catchment sediment supply to the estuary. The barrages have altered the hydrodynamic processes occurring in the estuary. Although estuary banks are predisposed to natural erosion processes, tidal amplification from the Mary River Barrage increases the erosion in the estuary. Water quality, particularly salinity and turbidity are greatly altered from what would have been the natural system (Brizga *et al.*, 2003).

Flow driven changes influence many ecological processes in the estuary and near shore. The distribution and abundance of fish and crustaceans are influenced by flow driven changes in salinity and turbidity (Brizga *et al.*, 2003). In the upper and lower

sections of the estuary, current commercial banana prawn and mud crab fisheries operate as well as commercial salmon, barramundi and mullet fisheries (Kinhill 1998 in Brizga *et al.*, 2003).

6.0 POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 Land Use and Tenure

6.1.1 Construction

Stage 1 of the proposed dam will result in changes to the current land use and ownership within and around the proposed inundation area and associated with relocation of infrastructure. Landholdings that are directly affected will be purchased. This aspect will be in accordance with QWI's land acquisition policy which follows standard Government procedures. The social impact of resulting changes will be addressed during the EIS process.

6.1.2 Operation

An area of good quality agricultural land and rural residential will be inundated or impacted through relocation of infrastructure. The remaining land around the dam is expected to remain rural and suit land uses similar to those in the area at present. It is a specific component of the charter of the Community Futures Taskforce to address the potential change in land use.

The catchment area provides for a wide range of recreational activities, including fishing, swimming and boating. Some of these activities may be directly impacted, positively and negatively, by the impoundment.

No decisions have been made regarding the potential use of the reservoir for recreation. There is potential to use the reservoir for primary contact recreation, such as swimming or water skiing, or limited secondary contact activities such as fishing and sailing.

If recreational uses are permitted there could be positive impacts for the community including additional services and drawing tourists to the area. However, use of the reservoir for recreational activities may also result in negative impacts, such as reduced water quality, disturbance of flora and fauna, and possible noise impacts.

6.2 European and Aboriginal Cultural Heritage

6.2.1 Construction

Whilst it appears that no items are listed on the registers that are of National or State significance in Stage 1, field verification will be required. There are a number of structures in Stage 2 that may be impacted and their significance would need to be assessed at the time.

Stage 1 and Stage 2 of the development are expected to remain within the banks of the Mary River through Imbil and therefore buildings within the town should not be directly impacted.

At Kandanga, Stage 1 will affect low lying areas surrounding the town. Stage 2 of the inundation area will impact on more of the town, a number of buildings, recreation areas and the cemetry. It is expected that the Kandanga Railway Station, Kandanga Cottage and Kandanga Memorial Hall would be affected.

The environmental impact on Aboriginal cultural heritage values in the vicinity of the project will be managed under a Cultural Heritage Investigation and Management Strategy (CHIMS) which will address the duty of care requirement under the ACHA. This may take the form of a cultural heritage management plan (CHMP) developed specifically for the project or a cultural heritage strategy forming part of an Indigenous Land Use Agreement (ILUA) The CHIMS will provide a process for the management of

cultural heritage places both identified and sub-surface at the project sites. The CHIMS will address and include the following:

- a process for including relevant indigenous people associated with the project site/s in protection and management of indigenous cultural heritage;
- a process for undertaking a comprehensive and systematic CH assessment of the project development area including the inundation zone (Stage 1), the construction area at the wall and all the work areas associated with building the dam structure such as work camps, material dump areas and access roads.
- processes for mitigation, management and protection of identified cultural heritage places and material in the project areas, including associated infrastructure developments, both during the construction and operational phases of the project;
- provisions for the management of the accidental discovery of cultural material, including burials;
- the monitoring of foundation excavations and other associated earthwork activities for possible sub-surface cultural material;
- cultural awareness training or programs for project staff; and
- a conflict resolution process.

6.2.2 Operation

It is not anticipated that further impacts will result during the operational phase of the dam.

6.3 Social, Economic and Planning Environment

6.3.1 Construction

Acquisition of property prior to construction will lead to relocation of families and associated businesses. The impact on individuals, families and the social fabric of the area, particularly in the small rural towns, will require careful and considerate assessment and management. The Community Futures Taskforce has been established by Government in response to recognition of this important issue.

The construction of the dam and relocated infrastructure will provide temporary/short term employment opportunities for skilled and unskilled workers. Employees will be required for plant and equipment operation, construction, contract administration and management. The construction phase of Stage 1 is estimated to last approximately 2.5 years. It is envisaged that some local Shire Council staff will undertake areas of work within their normal bounds, such as local road construction, with assistance from contractors where necessary. Workers from outside the region will require accommodation and services.

Local government planning schemes will require amendment and the impacts of the proposal on the planning environment is a key component of the charter of the Community Futures Taskforce.

6.3.2 Operation

At the local community level, there is opposition to the development of the proposed dam. Some residents will be directly affected by the acquisition of property and others directly or indirectly through the relocation of infrastructure. There will also be considerable loss of productive agricultural land and the resulting impact on the local and regional economies will be assessed during the EIS.

SEQ is currently the fastest growing region in Australia and it has been identified that without additional water, economic growth in the region is likely to be significantly affected.

Consideration will be given to the social and economic impacts resulting from the provision of a new water supply to the region and the consequent potential economic growth at regional and national levels.

6.4 Existing Infrastructure

6.4.1 Construction

a) Roads

The proposed project would require major changes to the existing road network. Sections of the Bruce Highway, Gympie-Brooloo Road, Kenilworth-Skyring Creek Road and many roads joining these in the project area will be inundated in Stage 1. There will be further inundation in Stage 2. The length of the Bruce Highway impacted by Stage 1 is approximately 4.5km. The length of new road required to replace it will be approximately 10km The roads which will be impacted by Stages 1, 2 or both are listed in **Table 9**. The total length of local roads impacted by Stage 1 is approximately 40km. At Stage 2 this rises to approximately 75km. It is also possible that additional local roads may be impacted that have not yet been identified. Re-establishment of the local road network and re-routing of the Bruce Highway, may require land acquisition in addition to that required for the dam alone. Initial planning aims to minimise this requirement.

Proposed road closures and planning for a new road network to service the area, including the realignment of the Bruce Highway will be considered during the EIS.

Table 9: Roads impacted by the proposed dam

Road	Stage 1	Stage 2
Bruce Highway	Between just south of Skyring Creek Road and northern entry of Carlson Road	Middle Creek road to Carlson Road
Carlson Road	In the Coles Creek area	Yes
Gympie-Brooloo Road	Between Traveston Crossing Road and Kandanga Road	Riverdale Road south to Park Lane
	The crossing at Yabba Creek	
Dobson Road	Near proposed dam wall	
Sanders Road	Eastern end	Yes
Knobby Glen Road	Section at northern end	Yes
Hasthorpe Road	Western and middle section	Yes
Kandanga Imbil Road	Main Street of Kandanga	Yes
Goomong Road and network roads from it	Sections of road	Yes
Kandanga Creek Road	Mapping indicates it should not be affected	Yes
Lowe Road	Yabba Creek end	Yes

Road	Stage 1	Stage 2
Skyring Creek Road	north of Bruce Highway	Yes
Christies Road	Creek crossing	Yes
Peacons Pocket Road	Sections	Yes
Chinamans Creek Road	Sections	Yes
Kenilworth Skyring Creek Road	Sections	Yes
Spiller Road	Mary River end	Yes
Aspennell Road	Sections	Yes
Whelan Road	Mary River end	Yes
Walker Road		Yes
Frayne Road		Southern end of Road
Kandanga Amamoor Road	Should not be affected	North of Kandanga
Melawondi Road		Small section
Hyne Estate Road		Yes
Bergins Pocket Road		Yes, all
Reeves Road	Yes	Yes
Park Lane		Yes
Tuchekoi Road	Creek crossings	Yes
Chippindall Road and cross road to the south		Yes
Middle Creek Road, Federal		Yes
Hillary Road		Yes
Happy Jack Creek Road		Yes
Brooloo Road, Imbil		Yes
Poulsen Road		Yes
Olearia Road	Creek crossing	Yes
Newspaper Hill Road		Yes

Source: Proposed Mary River Dam Project, South East Queensland Water Supply Investigations, DNR, Plan DLM001.

b) Rail

The North Coast railway line between Gympie and Brisbane will not be affected by the project as it runs to the north of the inundation area.

The Valley Rattler will not be affected in Stage 1 but sections of track around the town of Kandanga would be impacted by Stage 2.

c) Power and Telecommunications

There is an extensive network of power and telecommunication services that will be impacted by both stages of the proposal.

All services will need to be identified and relocated during the construction phase to ensure that these services are maintained and disruptions are kept to a minimum.

d) Shire Facilities

The town of Kandanga would be affected to some extent by Stage 1 but more directly affected by Stage 2 with parts of the town being inundated. At the scale of mapping available at this time, the cemetery at Kandanga appears to be on the edge of the Stage 1 but with greater impact within Stage 2 inundation areas.

The town of Imbil should not be impacted by the inundation as it will be within the banks of Yabba Creek as it flows through the town. At the town of Federal, the Memorial Hall will be inundated by Stage 2 and other buildings will possibly be in the flood zone.

Both Amamoor and Brooloo will be affected by changes to the road network, utilities, land use and population.

The current intake for the Noosa Shire water pipeline will need to be relocated and this will be fully assessed during the EIS.

e) Private Infrastructure

There will be impacts to private infrastructure including private roads, driveways, building, fences etc. during both Stages of development. The EIS will consider these impacts in more detail to assess the significance. Infrastructure will need to be relocated, if viable, and/or appropriate compensation paid.

6.4.2 Operation

It is anticipated that there will be no further impacts on infrastructure as a result of the operation of the dam.

6.5 Contaminated Land

6.5.1 Construction

A preliminary investigation has confirmed that a number of sites within the Traveston Crossing Dam area may have been contaminated from past use. It has also been recognised that there is the potential for further unknown contamination to be present within the area. Sites will be identified and mitigation strategies developed prior to construction. Those strategies will likely include a mix of removal of the contaminants and remediation where possible or sealing of the site.

It should be noted that these sources of contamination already exist and have for some time but the relevance to the EIS is that inundation may alter the risk profile of such contamination.

6.5.2 Operation

Contaminated sites within the inundation area may cause adverse effects on water quality and the environment when these areas are flooded. Identification and treatment of the areas prior to inundation would aim to avoid any such issues.

6.6 Air Quality

6.6.1 Construction

Construction activities can generate dust which needs to be managed. Dust is likely to result during clearing of vegetation, excavation, blasting and also from vehicle movements around the site. Some of the soils in the area are prone to erosion, so care will be required to minimise the potential for dust generation. Emissions from machinery on site can also lead to potential problems if not managed sufficiently.

Baseline data on air quality will be gathered in and around the inundation area. Consideration will be given to the impacts on local and regional air quality, with reference to regional and national air quality goals where appropriate.

6.6.2 Operation

Consideration will be given to the long term emissions resulting from the flooding of soils and vegetation.

6.7 Noise

6.7.1 Construction

Due to the type of equipment required for construction and the removal of resources prior to construction, it is anticipated that high noise levels will occur at times during the construction phase.

There are a number of sensitive noise receptors in the area surrounding the proposed dam site. A number of dwellings will be acquired as they are located within the inundation zone. However, those dwellings near the dam site that are not acquired could be affected by noise during the construction phase.

A full assessment of the impact of construction noise will be undertaken during the EIS, which will include consultation with the affected stakeholders.

Consideration will be given to dwellings located on access roads and near quarry sites and those roads required to access the construction site, which may also be affected by noise generated from vehicle movement.

There is the potential for vibration impacts from construction activities, particularly where blasting is required.

Depending on the location of receptors, acoustic assessments may be required to determine the impact of new roads that are proposed to replace those closed by the inundation.

Consideration will also be given to the noise impacts associated with works required for the Bruce Highway.

6.7.2 Operation

Consideration will also be given to the operation of pumps, and noise during discharge from the dam. This will be assessed to determine if there will be a significant impact upon any sensitive receptors.

6.8 Landscape and Visual Effects

6.8.1 Construction

During construction, much of the vegetation will be stripped and selected quarrying and removal of resources from within and alongside the river will also be undertaken.

Construction works will be undertaken simultaneously at a number of sites including the dam wall, associated quarries, various road or bridge sites and power or telecommunications sites. The visual impact of these works will be assessed.

6.8.2 Operation

The dam will form a substantial visual element in the landscape. Its visual impact will need to be assessed within its rural context. The inundation area of Stage 1 will be viewed as large expanses of water, dependant on water levels. The visual intrusion of Stage 2 would be similar to Stage 1 but will involve larger areas. The dam wall structure will be a dominant visual element in the landscape.

6.9 Climate

6.9.1 Construction

Some greenhouse gases will be emitted during the construction phase of the dam.

6.9.2 Operation

It is anticipated that there will be no additional impacts during the operation of the dam. However, there may be cumulative impacts resulting from some minor continued emissions of greenhouse gases from rotting vegetation.

6.10 Landform

6.10.1 Construction

Excavation and construction works will alter the existing landform within the construction and inundation footprint.

6.10.2 Operation

Landform in and around the inundation area could be impacted as a result of inherent instability and erosion potential, possibly exacerbated by saturation.

6.11 Geology

6.11.1 Construction

Suitable foundations have been found at the site. There are no limiting factors that will prevent the dam being designed and constructed in accordance with ANCOLD Guidelines, Queensland Dam Safety Management Guidelines and sound engineering practice.

6.11.2 Operation

The long term inundation of the river valley will trigger changes in the geological conditions, particularly with respect to aquifers and groundwater conditions.

6.12 Hydrogeology

6.12.1 Construction

Currently hydrogeological investigations are being undertaken which will assess the permeability of the alluvium. The results of these investigations will be assessed during the preliminary design phase and proven dam engineering construction techniques will be adopted to ensure that the seepage is reduced to acceptable levels.

6.12.2 Operation

The flooding of the valley will result in changes to the aquifers within and adjacent to the inundation zone.

6.13 Soils

6.13.1 Construction

The issue of construction erosion management has the potential to be significant as the works will be carried out over an extended period. A detailed erosion and sediment control plan will be developed to mitigate potential downstream impacts during construction. The plan will be developed in accordance with the Institute of Engineers Guidelines for Soil Erosion and Sediment Control for Queensland Construction Sites. This will address factors such as:

- staging of clearing;
- sediment controls measures;
- topsoil stripping and stockpiling;
- soil and spoil storage;
- access and construction roads; and
- rehabilitation.

Possible issues could arise with the management of materials during construction.

6.13.2 Operation

Once the construction of the dam is finalised, it is not anticipated that there will be any long term impacts associated with soils. However, soils within the catchment area and inundation area could have an impact on water quality.

An evaluation will be undertaken of the areas susceptible to salinity which will be affected by the proposals, as well as an assessment of possible salt load and resulting impact upon water quality.

The management of the dam environs, including the fluctuating supply level and associated buffer zone, regarding the need to reduce erosion levels and sediment input will also need to be addressed in the EIS.

6.14 Surface Water

6.14.1 Construction – Hydrology

Surface water flow will be disrupted during construction. Temporary diversion measures will be employed to manage water at the site of the dam. Diversion works may need to be in place for an extended period of time, including the wet season. The specific site requirements will be assessed once more advanced design for the dam is completed. Consideration will be given to:

- management of flood events and cyclones;
- risk and management of failure;
- restrictions to water allocations.
- movement of aquatic fauna;
- changes to surrounding hydrology; and

- impact of bunds or other diversions on local hydrology and adjoining land.

6.14.2 Construction – Water Quality

During construction of the dam, consideration should be given to sediment and erosion control, as well as spill management on site. Potential impacts on water treatment processes downstream will also be assessed.

6.14.3 Operation – Hydrology

The inundation area of the dam will represent lake habitat, much of it much deeper than was present in the river. This will replace the original riverine riffle/pool sequences. Depending on the fill level at the time, the dam will capture inflows and attenuate downstream flows. The hydrological behaviour of the Mary River downstream will change significantly once the dam is operational.

EFOs are mandated in the WRP and will need to be incorporated into the operation of the dam. The optimum balance of maintenance of the EFO's and WASO's with dam yield is an iterative process, particularly when the storage does not act in isolation. Water allocations both upstream and downstream need to be considered in accordance with the WRP for the Mary River. Possible issues to be investigated include;

- environmental flow requirements;
- access to pumping stations;
- changes in flood hydrology;
- releases from the dam for downstream users;
- inter-basin transfers out of the catchment; and
- changes to upstream storages operational requirements.

6.14.4 Operation – Water Quality

Once the dam has become operational, possible impacts to water quality will occur with respect to the stored water, to water in the river downstream, and in the estuary. The quality of stored water will be effected by the quality of inflows from the upstream catchment, releases from flooded sediments and vegetation, and the hydrodynamics of the storage itself (depth, shape, wind driven circulation, stratification etc). Downstream water quality will be dictated by tributary inputs, flood flows and releases from the dam but also by sediment capture by the dam. Estuarine water quality will be the result of the sum of the above effects superimposed on marine water quality issues. The EIS will address the achievement of environmental values and WQOs with respect to EPA guidelines. It will also address impacts on current licence holders downstream, both high and medium priority, with respect to the quality of water required to meet their needs.

The interaction of sediment dynamics and flows will require evaluation.

6.15 Terrestrial Ecology

6.15.1 Construction

a) Flora

Approximately 335 ha of remnant vegetation will be affected by the project (**Table 10**). Of this, 90% is listed as either "Endangered" or "Of Concern". A total of 242 ha of the endangered RE will be affected by Stage 1 of the project. This represents 2.67% of the

total area of this RE remaining in Queensland. The remaining threatened vegetation comprises REs that are listed as "Of Concern".

Table 10: Vegetation in the proposed area of inundation

Vegetation Type	Ha (Stage 1)	Ha (Stage 1 and Stage 2)	% of project area (Stage 1)
Cleared	2767	6437	88%
Remnant	335	734	10%
Regrowth	40	155	1.2%

Source: Regional Ecosystem Mapping (EPA) Version 5.0

The remnant native vegetation present within Stage 1 and Stage 2 is recognised for its ecological and botanical significance and therefore protected by State and Commonwealth legislation. More detailed vegetation survey of the inundation area of Stage 1 and 2 will be required to refine the areas of the respective RE's and to determine whether rare and threatened plants are present.

Under the *Forestry Act 1959*, any trees in the affected area need to be assessed for their timber utilisation properties prior to inundation.

Relocation of infrastructure, particularly roads, will lead to additional loss though conceptual planning suggests most of the area potentially impacted will consist of cleared farming land.

b) Fauna

A desk top assessment has highlighted the potential for numerous rare and threatened species as listed under the EPBC Act and the NCA, to be present in the area. In addition, all native terrestrial fauna is offered protection under the NCA.

Detailed surveys of all the habitats occurring in the inundation area and areas effected by relocation of infrastructure will be required to enable a thorough assessment of the impact of the project. Expected impacts include the removal of habitat and riparian corridors for fauna movement and a change in composition of species utilising the site.

6.15.2 Operation

Floristic and structural changes within the riparian zone may occur downstream of the dam wall and will vary with location and the particular component of the flow regime effected. Increases or decreases in components may have very different effects.

The provision of water storages may advantage some water birds, but the loss of riparian trees may adversely affect nectar, blossom and insect resources for other birds and bats.

6.16 Aquatic Ecology

6.16.1 Construction

a) Aquatic Flora

It is anticipated that the impact upon aquatic flora will be confined to the area surrounding the dam wall, spillway and other associated infrastructure plus that related to extraction of materials within the inundation area. Any low quality water leaving the site may impact on downstream aquatic flora.

Although the condition of the aquatic vegetation is considered to be generally poor throughout the area of inundation, there are some aquatic habitats which are of better quality. An aquatic plant survey undertaken in 2001 should be updated to record the condition of vegetation and habitats throughout the inundation area as well as provide a baseline for future monitoring. This survey should also record the presence and location of aquatic weeds.

b) Aquatic Fauna

It is anticipated that the impact upon aquatic fauna during the construction phase will be confined to the area immediately impacted by the various construction activities, extraction of resources and any areas downstream affected by poor quality water.

6.16.2 Operation

a) Aquatic Flora

The impact of the proposed Traveston Crossing Dam on aquatic plants will be in relation to the changes associated with habitat alteration (river changing to lake) and changes to the flow regime and possibly the water quality environment downstream of the dam. The dam is expected to suit some free floating native and exotic species at the expense of rooted species that prefer flowing or permanent shallow water habitat.

Micro-algae are likely to develop within the storage and the EIS should predict the likelihood of occurrence of blue-green algal blooms.

b) Aquatic Fauna

In the operations phase the impacts on aquatic fauna are expected to relate to:

- Habitat change, including loss of riffle habitat and replacement with lake habitat within the inundation area and as a result of flow regime changes downstream;
- Physical barrier effect, that is, the physical structure of the dam limiting or preventing movement of fauna and sediment;
- Flow regime changes downstream of the dam, and
- Water quality changes downstream as a result of the release of stored water.

The EFO's contained in the Mary River WRP are specifically aimed at minimising many of the possible changes to the flow regime and specifically target Mary River Cod, Lungfish and the Mary River Turtle.

It is proposed that a fishway be incorporated as part of the development to allow for upstream and downstream movement of fish and other aquatic species. The impact of the proposal on threatened species and other aquatic species, both upstream and downstream, will be assessed during the EIS.

c) Inter-basin Transfer

Interbasin transfers (IBTs) of water may occur as part of the proposed Traveston Crossing Dam operations. A key risk of IBTs is the transfer and dispersal of non native organisms into the receiving catchment (Kennard, 2003), particularly alien species, or native species from discrete genetic stock which may be of importance for maintaining the genetic populations of threatened species such as the Mary River Cod and the lungfish. Though preliminary, the initial thoughts on transferring water from the dam to the Brisbane system is that it would go directly to the treatment works and into the distribution system rather than to another watercourse.

6.17 Coastal and Near Shore Environments

6.17.1 Construction

Temporary diversions will be required to manage stream flow during the construction phase. Construction activities within the stream channel and clearing of land within the inundation zone is unlikely to result in increases in the volume of sediment received by the Great Sandy Straits given the distance downstream but flood flows during construction will require consideration.

6.17.2 Operation

Consideration should be given to the impact of the proposed dam on the Great Sandy Strait and the upper and lower estuaries of the Mary River. The Mary River Basin WRP sets EFOs which must be met and these objectives were established with development of the dam in mind. The WRP-based flow regime represents an alteration from natural and at the river mouth the medium flow targets are between 83% and 89% of pre-development levels while the 20 yr daily flow volume percentage is set at 69%. Changes to the low flow regime will also occur but are less pronounced at the river mouth because of tributary inflow below the dam. Potential impacts include reduced freshwater, nutrient and sediment input.

Current impoundments and barrages disrupt sediment transport continuity during low flow and minor events. However, significant quantities of sediment can be transported past barrages in large floods. Land use activities such as clearing, agriculture, urbanisation, roads and gravel extraction have generally increased the mobility of sediment in the landscape, particularly the finer fractions (Brizga *et al*. 2003 in Brizga *et al*., 2003). It is generally thought that sediment and nutrient inputs have increased with land developed so reductions are not necessarily an entirely negative impact but it will need careful consideration.

The downstream affects on the long-term health of the Great Sandy Straits should be investigated. Such issues could include, but are not limited to:

- sediment capture by the dam;
- changes in sediment movement below the dam;
- changes in erosion / bed and bank stability downstream, and
- flow regime changes.

6.18 Traffic

6.18.1 Construction

During the construction stage of the proposed development, there will be an increase in the amount of traffic on local roads. This will comprise construction vehicles working on the site and vehicles associated with transporting materials to and from the inundation area or other sources of material. The impact of this upon local residents and other road users will be considered in the EIS.

The impact of road rerouting, noise and air quality associated with this increase in traffic is considered in Sections 5.4, 5.6 and 5.7. The proposed construction timeline indicates that while some sequencing is possible, most of the impacts related to road re-routing and dam construction/resource extraction will occur simultaneously. This is likely to represent a significant disruption to local traffic conditions over an extended period.

6.18.2 Operation

It is anticipated that the volume of traffic on the roads surrounding the inundation area will be similar to pre-construction levels once the dam is in operation. It is expected that the new roads will be of at least the same standard, and in some cases of higher standard, than the existing roads.

6.19 Waste

6.19.1 Construction

Waste will be generated during the construction of the proposed dam. Waste sources can be broken down in to three main categories:

- waste from the construction of the dam wall and associated infrastructure;
- waste from the preparation of the inundation area for eventual flooding; and
- waste from relocation and reconstruction of infrastructure.

Wastes from the construction of the dam wall may include, but not be limited to: soil, sand and gravel arising from the excavation of the foundations, concrete cylinders used in construction, bulk rock, vegetation, oil, hydraulic fluids, oily rags and oily waste, tyres, packaging materials (timber, plastic, cardboard), domestic wastewater, waste acids from concrete cleaning and concrete mixing washdown water.

Wastes from the clearing of the inundation area may also include various farm chemicals, existing waste such as discarded vehicles and municipal waste and waste associated with site decontamination.

An environmental management plan for waste will be developed that takes into account both the dam wall construction and land clearing phases. The plan for waste should cover the requirements of the EP Act and the *Environmental Protection Waste Management Policy and Regulation 2000*.

Resources within the inundation area such as timber, soils and aggregate that have commercial value should be extracted and utilised where practical prior to inundation.

6.19.2 Operation

The operation of the dam will not result in significant volumes of waste. Any waste generated at ancillary facilities will be collected by a licensed operator.

7.0 ENVIRONMENTAL MONITORING AND REPORTING

7.1 Overview

In order to achieve a high level of environmental management, an EMP will be developed for the design, construction and operation of the dam. The EMP will specify, but not be limited to, the following:

- statement of commitment to Environmental Management;
- EMP objectives;
- strategies and actions to avoid, minimise, repair and compensate for identified impacts;
- environmental performance criteria (including those set by regulatory authorities and licence or permit conditions);
- documentation and record keeping;
- monitoring programs (see below);
- corrective actions to mitigate identified impacts; and
- reporting requirements (see below).

The EMP will be developed using the relevant EPA guidelines.

A draft EMP will be included in the draft EIS. Relevant stakeholders will therefore have an opportunity to review and comment on the EMP as part of the EIS process.

Environmental monitoring is critical to the control of environmental impacts during construction and operation. A comprehensive monitoring program will need to be developed as part of the EMP. The results of the monitoring programs will be compared with the agreed performance criteria and where monitoring indicates that unacceptable environmental impacts are occurring (i.e. performance criteria are not being met); the proponent will be required to take corrective action.

It is anticipated that the ROP will contain environmental and flow monitoring requirements (*Water Act 2000*, 98(1)(f)) and these will be reflected in the proponent's environmental monitoring program.

The proponent will report results of monitoring to government agencies and the community as required in any licences and permits or as specified in the ROP.

Environmental monitoring strategies should be outlined for the pre-construction, construction and operational phases of the project.

7.2 Construction

Environmental Management procedures to be developed for the construction program will include the following:

- Sediment and Erosion Control Plan;
- Waste Management Plan;
- Vegetation Clearing Plan;
- Flora and Fauna Management;
- Pest and Weed Management;
- Air, Noise and Vibration Management;

- Land Management (including potentially contaminated lands);
- Emergencies/Incidents and Non-Conformance Management;
- Community Relations Management Plan;
- Cultural heritage management (as part of the CHMP); and
- Traffic Management Plan.

7.3 Operation

Monitoring in the operations phase will be in accordance with the ROP and with the ROL issued to the operator of the dam. The type of monitoring is dictated by the WRP. The EIS may determine that monitoring in excess of such requirements is necessary and any such recommendations will be cognisant of monitoring being conducted or proposed by management agencies or catchment groups.

Operation plans will need to be developed for the management of water releases to minimise the effects on downstream areas and other issues.

For the operation phase of the proposed dam the following ongoing monitoring commitments may need to be considered:

- groundwater levels and salinity concentrations;
- water quality;
- targeted species;
- aquatic ecosystems;
- vegetation; and
- fish transfer.

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Figures

Figure 3-1 : Locality plan

Figure 4-1: Land tenure

Figure 4-2: Built infrastructure

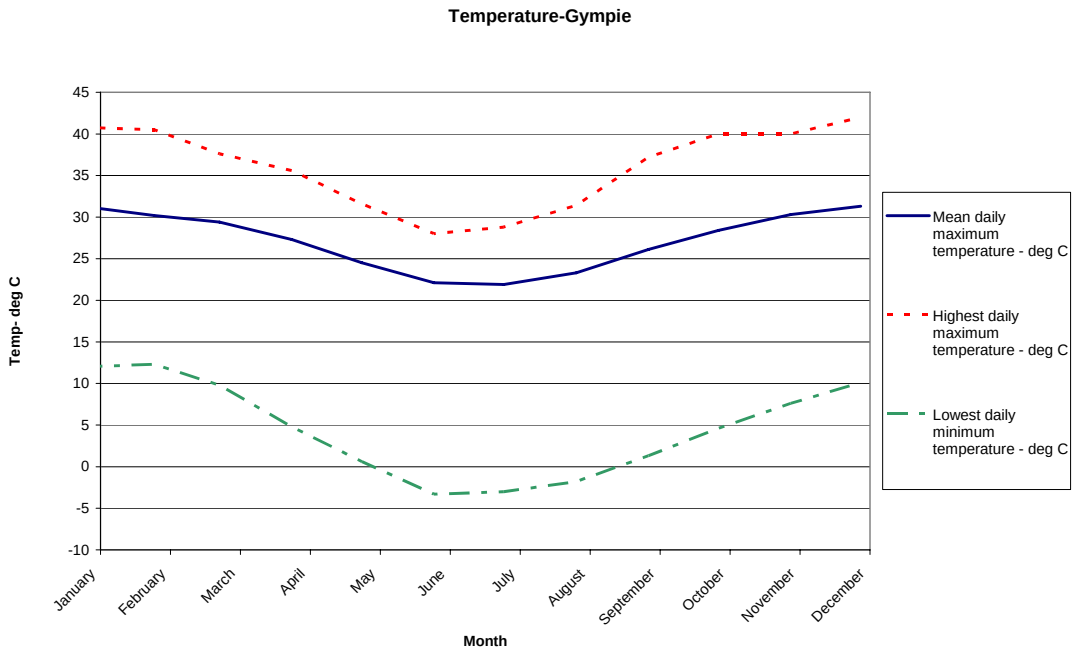


Figure 4-3 : Maximum, mean and minimum temperature for Gympie

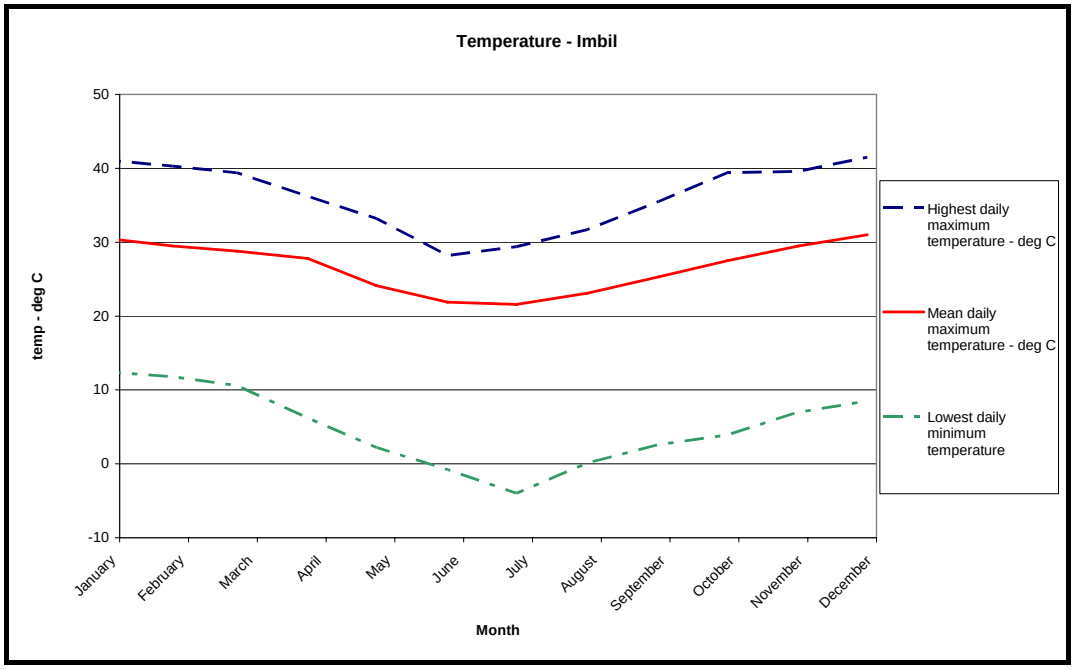


Figure 4-4 : Maximum, mean and minimum temperature for Imbil

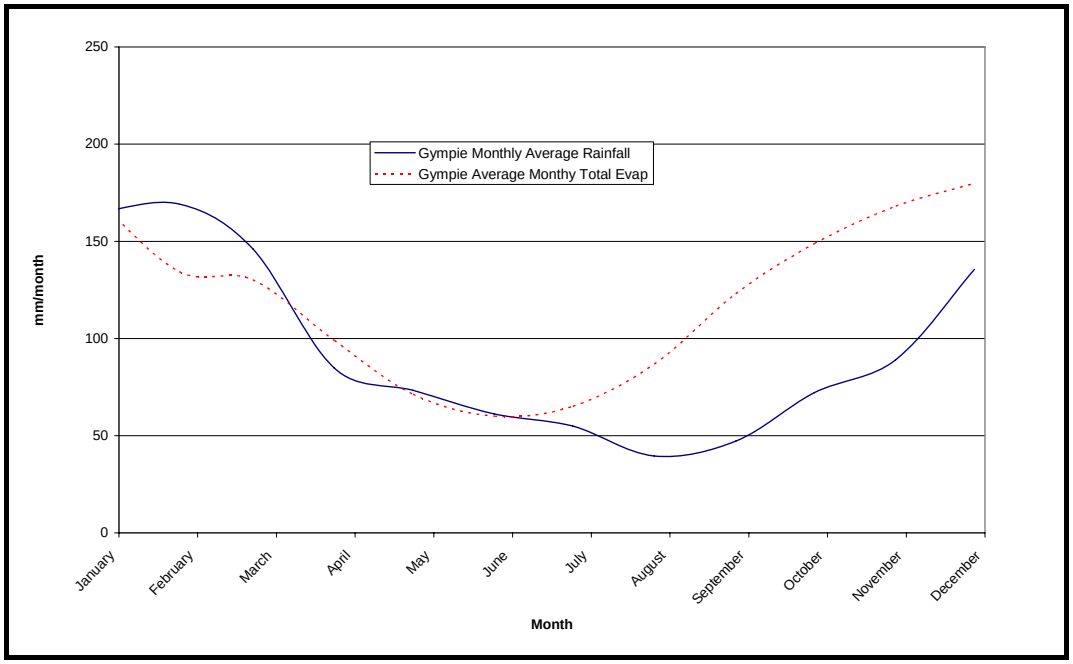


Figure 4-5 : Average monthly precipitation and evaporation for Gympie

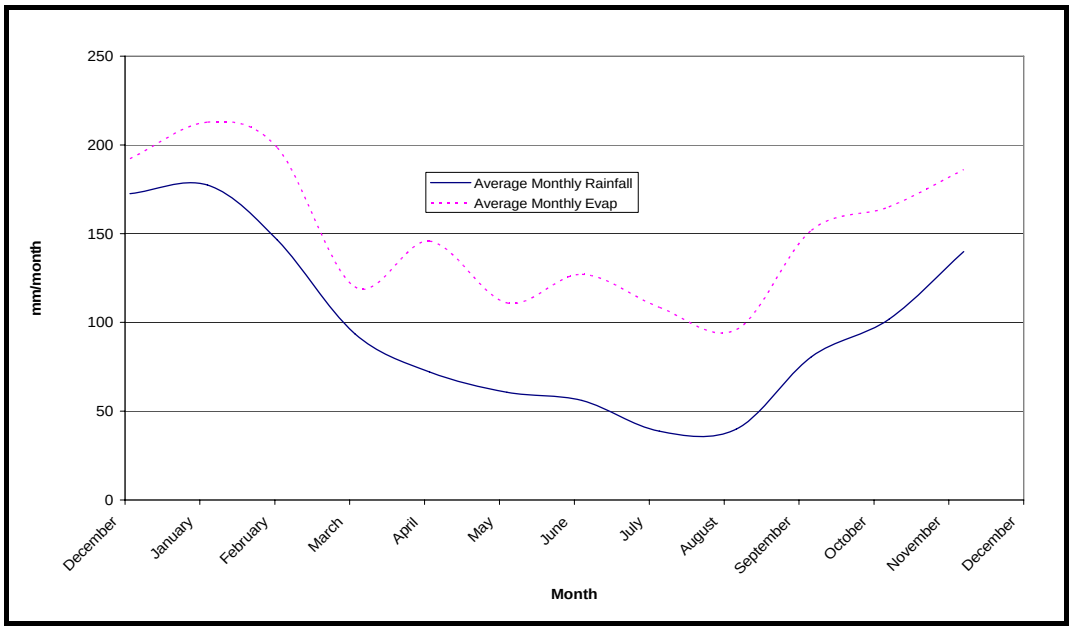


Figure 4-6 : Average monthly precipitation and evaporation for Imbil

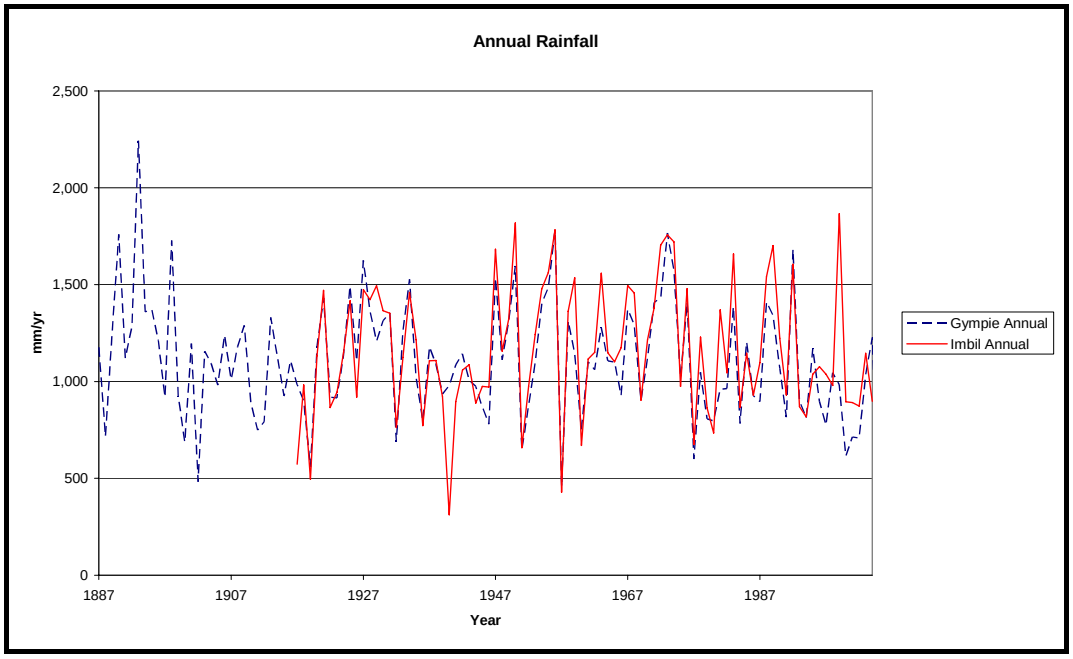
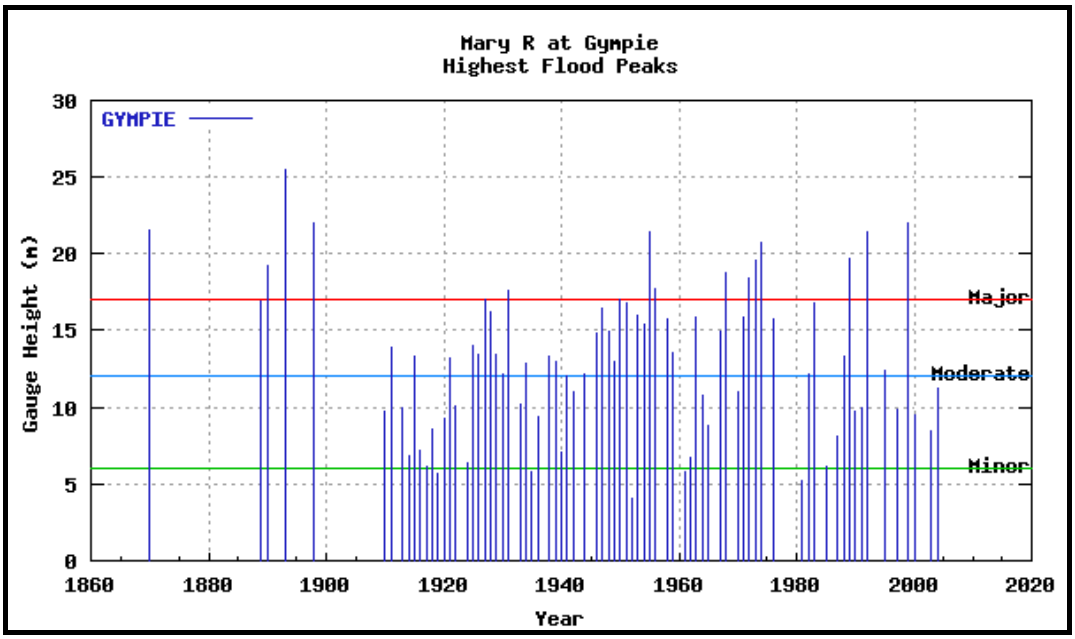


Figure 4-7 : Annual rainfall for Gympie and Imbil

Figure 4-8 ： Landform of the proposed Traveston Crossing Dam

Figure 4-9 : Soil suitability classes



Source http://www.bom.gov.au/hydro/flood/qld/brochures/mary/mary.shtml -

Figure 4-10 : Flood peaks for the Mary River at Gympie

Figure 4-11 : Vegetation

Appendix A
List of Possible Statutory Approvals

Statutory Approvals that may be Required

Legislation	Department	Trigger	Necessary Approvals / Permits
Commonwealth			
EPBC Act	DEH	Projects assessed against whether the project may have a significant impact on matters of national environmental significance (matters of NES) Proposed project may affect: • Great Sandy Strait Ramsar Wetland • Nationally listed threatened species • Listed migratory species	A referral would need to be prepared and the accredited bilateral process of assessment followed
Native Title Act 1993	National Native Title Tribunal	Establishes the rights and interests of native title holders, and the processes that must be followed for acts which may affect native title.	ILUA
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	DEH	The purposes of this Act are the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition.	Cultural Heritage Management Plan or Agreement
Telecommunications Act 1997	Australian Telecommunications Commission	Moving, installing, planning infrastructure	
State			
Aboriginal Cultural Heritage Act 2003	DNRMW	If an EIS is required for the project, a CHMP will be mandatory.	Cultural Heritage Management Plan (CHMP)
Electricity Act 1994 *Electricity Regulation 1994*		Design, building and maintenance of electric lines and works	
EP Act	Environmental Protection Agency (EPA)	Conducting any environmentally relevant activity	Development approval
Environmental Protection Regulation 1998	EPA	Environmentally Relevant Activities ERA 7: Chemical Storage ERA 11: Storage of petroleum ERA 17: Fuel Burning ERA 20: Extracting rock or other material, sand, clay, gravel ERA 22: Screening materials, washing, crushing, grinding, milling, sizing or separating	Licences

Legislation	Department	Trigger	Necessary Approvals / Permits
		material extracted from the earth	
		ERA 62: Concrete batching	
		ERA 83: Regulated waste transport	
Explosives Act 1999	DNRMW	Possession, storage and use of explosives	
Explosives Regulation 2003	DNRMW	Licence to use blasting explosives in QLD for purpose of blasting activities-quarrying, mining, construction	Licence
Fisheries Act 1994	DPI	Fish movement exemption notice	Permit Application
		Application for waterway barrier works	
Forestry Act 1959	DNRMW	Clearing riparian vegetation, removing quarry materials from project area prior to flooding.	Permit to remove or interfere with millable timber and quarry materials on State land
Integrated Planning Act 1999	DNRMW	Operational works	IDAS,
			Riverine Protection Permit, vegetation clearing permit, removal of quarry materials
Land Act 1984	DNRMW	Opening and closing of roads and land acquisition, management of cemeteries	
Land Protection (Pest and Stock Route Management) Act 2002	DNRMW	Duty of care	
NCA	EPA	All wildlife is protected including threatened and rare species	Permit to remove rare or threatened species may be necessary.
		Taking, using, keeping or interfering with a protected animal	Permit
		Taking, using, keeping or interfering with a protected plant	Permit
		Taking, using, keeping or interfering with wildlife not protected under the Act, but found in an area identified as critical habitat, or major interest by a conservation plan	Permit
Nature Conservation Regulation 1994	EPA	Clearing of protected plants	Permit (s107)
Queensland Heritage Act 1992	EPA	Carrying out a development impacting heritage registered places. No Heritage places	

Legislation	Department	Trigger	Necessary Approvals / Permits
		identified on register	
Soil Conservation Act 1986	DNRMW	A project plan may be developed by DNRMW for the project area	
SDPWO Act	CoG appointed	If the project is declared to be a "significant project"	Approval by CoG
Transport Infrastructure Act 1994 and Transport Planning and Coordination Act 1994	DMR	Management and planning of State roads, opening and closing roads, closure of railway line	Written agreement from rail and road authority to undertake works
Transport Operations (Road Use Management-Dangerous Goods) Regulation 1998	Queensland Transport	Transportation of dangerous goods in water supply catchment	
Transport Operations (Road Use Management) Regulation 1998	Queensland Transport	Development of road infrastructure	
VMA	DNRMW	Clearing remnant vegetation	Permit
Water Act 2000	DNRMW	Referable dam construction, interference with bed and banks of watercourse, gravel extraction from watercourse, place fill in watercourse	Licence, Permits, ROP

Appendix B
Water Quality Objectives for the Mary River

	Environmental Values [1, 2, 3, 4]													
Water	Aquatic ecosystems	Human consumer	Primary recreation	Secondary recreation	Visual recreation	Cultural heritage	Industrial use	Aquaculture	Drinking water	Irrigation	Stock water	Farm supply	Oystering	Seagrass
Kandanga Creek –freshwater	✓		✓	✓	✓	✓	✓		✓		✓			
Yabba Creek –freshwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Little Yabba Creek – freshwater	✓	✓	✓	✓	✓	✓								
Obi Obi Creek – freshwater	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Six Mile Creek –freshwater	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			
Coondoo Creek-freshwater														
Tinana Creek – freshwater and estuarine water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
tidal canals, constructed estuaries, marinas and boat harbours	✓	✓	✓	✓	✓	✓								
Other estuarine tributaries	✓	✓	✓	✓	✓	✓								
Other freshwater tributaries	✓	✓	✓	✓	✓	✓				✓	✓	✓		
wetlands, lakes and reservoirs	✓	✓	✓	✓	✓	✓								
Ground waters	✓								✓	✓	✓	✓		

Water	Environmental Values [1, 2, 3, 4]													
	Aquatic ecosystems	Human consumer	Primary recreation	Secondary recreation	Visual recreation	Cultural heritage	Industrial use	Aquaculture	Drinking water	Irrigation	Stock water	Farm supply	Oystering	Seagrass
Mary River – enclosed coastal	✓	✓	✓	✓	✓	✓		✓						✓
Mary River – mid estuary	✓	✓	✓	✓	✓	✓	✓	✓						
Mary River – upper estuary	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Mary River – lowland freshwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Mary River – upland freshwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Susan River – estuarine and freshwater	✓	✓		✓	✓	✓								
Munna Creek – freshwater	✓				✓	✓				✓	✓			
Wide Bay Creek – freshwater	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		
Widgee Creek – freshwater	✓		✓	✓	✓	✓		✓		✓	✓	✓		
Glastonbury Creek – freshwater	✓		✓	✓	✓	✓		✓		✓	✓	✓		
Eel Creek – freshwater	✓					✓				✓	✓			
Amamoor Creek – lowland freshwater	✓	✓	✓	✓	✓	✓			✓	✓	✓			

Water	Environmental Values [1, 2, 3, 4]													
	Aquatic ecosystems	Human consumer	Primary recreation	Secondary recreation	Visual recreation	Cultural heritage	Industrial use	Aquaculture	Drinking water	Irrigation	Stock water	Farm supply	Oystering	Seagrass
Kandanga Creek –freshwater	✓		✓	✓	✓	✓	✓		✓		✓			
Yabba Creek –freshwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Little Yabba Creek – freshwater	✓	✓	✓	✓	✓	✓								
Obi Obi Creek – freshwater	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Six Mile Creek –freshwater	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			
Coondoo Creek-freshwater														
Tinana Creek – freshwater and estuarine water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
tidal canals, constructed estuaries, marinas and boat harbours	✓	✓	✓	✓	✓	✓								
Other estuarine tributaries	✓	✓	✓	✓	✓	✓								
Other freshwater tributaries	✓	✓	✓	✓	✓	✓				✓	✓	✓		
wetlands, lakes and reservoirs	✓	✓	✓	✓	✓	✓								
Ground waters	✓								✓	✓	✓	✓		

Appendix C
Rare and Threatened Flora Species

Rare and Threatened Plant Species Potentially Occurring in the Stage 1 and 2 Areas

Species	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence	Recorded in area
Acomis acoma			R	-		Yes
Arthraxon hispidus	Hairy-joint Grass	Found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	V	V	Species or species habitat likely to occur within area	Obi Obi
Atalya rigida		creeks	R			Scrubby Creek
Baloghia marmorata	Marbled Balogia, Jointed Baloghia	Found in subtropical rainforest on soils derived from basalt.	V	V	Species or species habitat likely to occur within area	
Boronia rivularis			R			Series Ck, Gympie
Bosistoa selwynii	Heart-leaved Bosistoa	Rainforest up to 300m in altitude. Occurs on deep asaltic soils.	-	V	Species or species habitat likely to occur within area	
Bosistoa transversa	Three-leaved Bosistoa	Lowland subtropical rainforest up to 300m in altitude.	C	V	Species or species habitat likely to occur within area	
Bulbophyllum globuliforme	Miniature Moss-orchid	Grows on hoop pines in upland subtropical rainforest	R	V	Species or species habitat likely to occur within area	
Choricarpia subargentea	Giant Ironwood	Found in dry rainforest regrowth consisting of thickets growing in steeply sloping paddocks on basalt derived soil.	R	-	Species or species habitat likely to occur within area	Yes, Stage 1 and Stage 2
Corynocarpus rupestris subsp. arborescens	Southern Corynocarpus		R	-		Yes, Stage 1 and Stage 2
Floydia praealta	Ball Nut, Possum Nut	Riverine and subtropical rainforest, usually on soils derived from basalt.	V	V	Species or species habitat likely to occur within area	Yes, Stage 1 and Stage 2, Glastonbury, Amamoor SF, Lagoon Pocket, Imbil
Fontainea rostrata			-	V	Species or species habitat likely to occur within area	Yes, Stage 1 and Stage 2

Species	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence	Recorded in area
Fontainea venosa			V	V	Species or species habitat likely to occur within area	Yes
Macadamia integrifolia	Macadamia Nut, Queensland Nut	creeks	V	V	Species or species habitat likely to occur within area	Mitchell Creek Imbil
Macadamia ternifolia	Small-fruited Queensland Nut		V	V	Species or species habitat likely to occur within area	Glastonbury Reserve
Marsdenia coronata	Slender Milkvine		V	V		Yes
Nothoalsomitra suberosa			R	-		Yes
Papillilabium beckleri			R	-		Kenilworth
Picris conyzoides			R	-		Yes
Ricinocarpus speciosus			V		Species or species habitat likely to occur within area	Yes, Stage 1 and Stage 2
Sarcochilus weinthalii	Weinthal's Sarcanth	Rainforest and drier scrubs, often in isolated patches from 400m to 700m in altitude.	-	V	Species or species habitat likely to occur within area	
Sophora fraseri	Brush Sophora	Found in moist situations, often near rainforest.	-	V	Species or species habitat likely to occur within area	
Stemmacantha australis	Austral Cornflower	Found on fertile lowlands	V	V	Species or species habitat likely to occur within area	
Symplocos harroldii			R			Imbil Compartment 12

Species	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence	Recorded in area
Thesium australe	Toadflax	Occurs in grassland and grassy woodlands. Often found in damp sites in association with *Themeda australis*	V	V	Species or species habitat likely to occur within area	Bella Creek west of Imbil
Xanthostemon oppositifolius	Southern Penda		V	V	Species or species habitat likely to occur within area	
Zieria verrucosa		Grows in semi-evergreen vine thicket or eucalypt open forest or woodland communities with a shrubby vine thicket understory	V	-	Species or species habitat likely to occur within area	Amamoor

Appendix D
Rare and Threatened Fauna Species

Rare and Threatened Fauna Species Potentially Occurring in the Stage 1 and 2 Areas

Scientific Name	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence
Amphibians					
Mixophyes iteratus	Giant Barred Frog	Ground dwelling and lives in forests such as Antarctic Beech, wet sclerophyll and rainforest. Often hides in leaf litter near permanent fast-flowing streams.	E	E	
Adelotus brevis	Tusked Frog	Rainforest, wet sclerophyll forest or grassland which is sometimes flooded	V	-	
Avifauna					
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose	Completely aquatic, seldom leaving the water except to rest on logs. Spend the majority of their time floating among water lilies in deep water in pairs or small family groups. Come near to the shore only to feed. This species can move considerable distances.	-	M	Species or species habitat likely to occur within area
Rostratula australis	Australian Painted Snipe	Boggy swamps, active mostly at dawn and dusk.	-	V	Species or species habitat likely to occur within area
Turnix melanogaster	Black-Breasted Button-quail	Drier low closed forest, particularly semi- evergreen vine thicket, low microphyll vine forest, Araucaria notophyll vine forest with deep leaf litter and lantana thickets	V	V	Species or species habitat likely to occur within area
Melithreptus gularis	Black-chinned Honeyeater	Drier eucalypt forests, woodlands, timber on watercourses	R	-	
Monarcha melanopsis	Black-faced Monarch	Dwells in rainforest, wet broad-leafed forests and denser eucalypt forests, damp gullies, mangroves and sometimes in open woodland	-	M	Breeding may occur within area
Ephippiorhynchus asiaticus	Black-necked stork	Coastal wetlands, mangroves, tidal mudflats, flood plains, open woodlands, irrigated lands, bore drains	R	-	

Scientific Name	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	lowland subtropical rainforest, dry rainforest, littoral and developing littoral rainforest, sub-littoral mixed scrub, riparian corridors in woodland, open woodland and otherwise cleared land and urbanised and agricultural areas with fig trees.	-	E / M	Species or species habitat likely to occur within area
Calyptorhynchus lathami	Glossy Black-cockatoo	Coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas are common.	V	-	
Accipiter novaehollandiae	Grey Goshawk	Rainforests, forests, forest gullies and valleys, taller woodlands, timber on watercourses, open country in autumn dispersal	R	-	
Gallinago hardwickii	Latham's Snipe		-	M	Species or species habitat likely to occur within area
Rallus pectoralis	Lewin's Rail		R	-	
Rostratula benghalensis	Painted Snipe	Boggy swamps, active mostly at dawn and dusk.	V	V / M	
Podargus ocellatus plumiferus	Plumed Frogmouth	Rainforest	V	-	
Erythrotriorchis radiatus	Red Goshawk	Tree-lined watercourses, surrounding open country, lightly wooded foothills. Nests in trees taller than 20m within 1 km of permanent watercourse wetland.	-	E	Species or species habitat likely to occur within area
Climacteris erythrops	Red-browed Treecreeper	Lives mostly in heavy mountain forests, but can also be found in coastal rainforest.	R	-	
Xanthomyza phrygia	Regent Honeyeater	Inhabits dry open forest and woodland, particularly box-ironbark woodland and riparian forest of river sheoak.	-	E / M	Species or species habitat likely to occur within area
Rhipidura rufifrons	Rufous Fantail	Rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps, riverside vegetation, open country on migration.	-	M	Breeding may occur within area
Myiagra cyanoleuca	Satin Flycatcher	found in the wt forests of hillsides, valleys and gullies	-	M	Breeding may occur within area

Scientific Name	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence
Tyto tenebricosa	Sooty Owl	Found predominantly in dry, subtropical and warm temperate rainforest and wet sclerophyll forest from 200m to 1000m above sea level. They favour forests with a tall dense understory layer occurring in gullies on sheltered aspects.	R	-	
Monarcha trivirgatus	Spectacled Monarch	Inhabits rainforests, mangroves and wet sclerophyll forests.	-	M	Breeding may occur within area
Lathamus discolour	Swift Parrot	Found in nectar-rich box-ironbark forests and woodlands	-	E	Species or species habitat likely to occur within area
Haliaeetus leucogaster	White-bellied Sea-eagle	Often seen soaring in the skies near oceans, bays and water bodies or flying over the surface of the water. These sedentary birds form permanent breeding pairs and have a few favoured perch trees where they roost and rest. The nests of these birds are approximately 4m deep and often 30m or more above the ground.	-	M	Species or species habitat likely to occur within area
Hirundapus caudacutus	White-throated Needletail		-	M	Species or species habitat likely to occur within area
Bony Fish					
Neoceratodus forsteri	Australian Lungfish	Most common in deep pools in still or slow-flowing water with some aquatic vegetation on the stream banks. Found in clear or turbid water over mud sand or gravel substrates.	Scientific interest	V	Species or species habitat likely to occur within area
Maccullochella peelii mariensis	Mary River Cod		-	E	Species or species habitat likely to occur within area
Insects					
Phyllodes imperialis	Pink Underwing Moth	Found in undisturbed subtropical rainforest below 600m.	-	E	Species or species habitat likely to occur within area
Mammals					

Scientific Name	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence
Nyctophilus timoriensis (SE form)	Eastern Long-eared Bat	Inhabits a variety of vegetation types, including mallee, bulloke, and box eucalypt dominated communities, but it is distinctly more common in box/iron-bark/cypress pine vegetation that occurs in the north-south belt along the western slopes and plains of NSW and southern Queensland.	-	V	Species or species habitat likely to occur within area
Pteropus poliocephalus	Grey-headed Flying-fox	A variety of habitats including rainforest, mangrove, paperbark swamp, wet and dry sclerophyll forests and cultivated areas	C	V	Species or species habitat likely to occur within area
Phascolarctos cinereus	Koala (SEQ bioregion)	Inhabit eucalypt forest and woodland.	V	-	
Chalinolobus dwyeri	Large-eared Pied Bat	Roosts in caves and mines. Dry, tall open Eucalypt forest and woodland	-	V	Species or species habitat likely to occur within area
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Inhabits coastal heath and dry and wet sclerophyll forests.	-	V	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus	Spotted-tailed Quoll (southern subspecies)	spot-tailed quoll favour rainforest, closed canopy sclerophyll (Eucalypt) and riparian forests habitat but will venture out into adjoining woodlands and open pastureland in search of food	V	E	Species or species habitat likely to occur within area
Reptiles					
Delma torquata	Collared Delma		-	V	Species or species habitat likely to occur within area
Acanthophis antarcticus	Common Death Adder	Wide variety of habitats	R	-	
Elusor macrurus	Mary River Turtle		E	E	Species or species habitat likely to occur within area
Eroticoscincus graciloides			R	-	

Scientific Name	Common Name	Habitat	NC Act Status	EPBC Act Status	Type of Presence
Neoceratodus forsteri	Lungfish		Scientific interest	Threatened species	

The codes are; Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C), or Not Protected (-); NC Act - Indicates the conservation status of each taxon under the *NCA;* EPBC Act - Indicates the conservation status of each taxon under the EPBC Act.

Source: EPBC Online Search and Queensland EPA's online wildlife database, Freshwater Fishes of Australia, 2003.

Appendix E
Fish Species recorded from the Mary River Catchment

Fish species that may potentially occur in the Mary River (Stage 1 and 2)

Scientific Name	Common Name	Location	Status
Ambassis agassizi		Black Swamp Creek, SW of Hervey Bay	Widespread
Anguilla reinhardtii		Maryborough, Golf Links Lagoon	Common
Craterocephalus marjoriae		Yabba Ck, trib Mary River, above Borumba Dam	Abundant in Mary and Clarence Rivers, less common at other localities
Craterocephalus stercusmuscarum		Borumba dam, Mary River system	Relatively common in most localities
Cyprinus carpio	Carp	Mary River, upstream of Widgee crossing	introduced
Favonigobius sp	A Goby	Tinana Creek barrage, Mary R system	
Gambusia holbrooki	Mosquito fish	Susan River, SW of Hervey Bay	exotic
Gobiomorphus australis		Schultz Bridge, Tinana, Maryborough	
Harpadon translucens		Mary River, Maryborough	
Hypseleotris klunzingeri		Borumba dam, Mary River system	
Hypseleotris sp		Borumba dam, Mary River system	
Hypseleotris galii		Coondoo Ck, trib Tinana Ck, Mary River system	
Hypseleotris compressus		Mary River trib, Schultz Bridge, Tinana, Maryborough	
Johnius australis		Mary River, Maryborough	
Johnius borneensis		Mary River, Maryborough	
Kyphosus bigibbus		Duck Island, Hervey Bay	
Kyphosus cinerascens		Duck Island, Hervey Bay	
Leiopotherapon unicolor		Borumba dam, Mary River system	widespread
Leptobrama muelleri		Maryborough	
Maccullochella peelii mariensis	Mary River Cod	Tinana Ck, Bungawatta Stn, Mary River	Critically Endangered
Megalops cyprinoides		Mary River	
Melanotaenia duboulayi		Coondoo Ck, trib Tinana Ck, Mary River system	Relatively common over much of its range
Mogurnda adspersa		Yabba Ck, trib Mary River, Imbil	
Mugil cephalus		Maryborough, Golf Links Lagoon	worldwide in tropical and temperate seas

Scientific Name	Common Name	Location	Status
Neoceratodus forsteri	Lungfish	Mary River	Threatened species (EPBC)
Notesthes robusta		Mary River system, near Gympie	widespread and relatively common in Pacific coastal drainages
Ophiocara porocephala		Maryborough	
Ophisternon sp		Tinana Creek, trib Mary River	
Paristiopterus labiosus		Beaver Rocks, Mary River	
Philypnodon grandiceps		Borumba dam, Mary River system	
Philypnodon sp		Coondoo Ck, trib Tinana Ck, Mary River system	
Porochilus rendahli		Mary River trib, at east Gympie	Patchy distribution and never common
Pseudomugil signifer		Borumba dam, Mary River system	
Retropinna semoni		Borumba dam, Mary River system	
Rhinoptera neglecta		Mary River mouth	
Scleropages leichardti	Saratoga	Borumba dam, Mary River system	Restricted, stocked in Borumba Dam
Strongylura kreffti		Maryborough	Widespread but not especially abundant
Tandanus tandanus		Coondoo Ck, trib Tinana Ck, Mary River system	Widely distributed throughout eastern coastal drainages
Thryssa hamiltonii		Mary River, Maryborough	