Wyaralong Dam
Initial Advice Statement

Prepared For:	Queensland Water Infrastructure Pty Ltd
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EXECUTIVE SUMMARY

The Wyaralong Dam project involves the construction of a new dam on Teviot Brook (14.8 km AMTD), a tributary of the Logan River in Southeast Queensland (SEQ). The dam will be located approximately 14.2 km north-west of Beaudesert and 50.6 km south south-west of Brisbane. The proposed dam encompasses approximately 26.2 km of Teviot Brook at the Full Supply Level (FSL) of 63.6 m Australian Height Datum (AHD), will hold up to 105,500 ML and cover 1300 ha. When operated in conjunction with Cedar Grove Weir the dam will ultimately supply up to 25,000 ML/annum of water to mainly urban and industrial users.

This project forms part of the proposed development of new water supply infrastructure to meet expected additional water demands of the SEQ region. A number of alternatives, including "do-nothing" and other locations in the Albert-Logan Catchment were assessed by the Queensland Government as possible options with the Wyaralong Dam location being the preferred location.

The proposed Wyaralong Dam will be designed and constructed in accordance with relevant Australian Standards. The construction methodology for the dam will be further assessed in the EIS. Design methodology will include capacity to cater for fish passage.

In addition to the construction of the dam, a permanent access road adjacent to the left bank of the dam site is proposed. It is also anticipated that some infrastructure in the area of inundation will be required to be relocated including telecommunication facilities, roads (including the Boonah-Beaudesert Road) and power distribution facilities.

In this IAS document, though preliminary. a number of potential impacts have been considered in both the construction and operational phases of the project.

The main issues (not in order of priority) identified for the Wyaralong Dam project are listed below:

- **Construction Phase**
  - water quality
  - flora and fauna impacts
  - traffic and relocation of road infrastructure
  - land ownership and impacts on current land uses
  - community consultation
- **Operational Phase**
  - soils and erosion
  - habitats in ponded area
  - flow regime
  - groundwater recharge
  - water quality
  - barrier effects

The preliminary assessment also determined that there are both social and economic benefits to the community and regional economy, with local benefits mainly during the construction phase and regional benefits associated with a more secure water supply.

The proponent, Queensland Water Infrastructure Pty Ltd, is seeking gazettal of the project by the Coordinator General (CoG) as a 'significant project' under the *State Development and Public Works Organisation Act 1971.* If successful, a Terms of Reference for an Environmental Impact Statement will be developed through a consultative approach.

The project will be referred to the Commonwealth Department of Environment and Heritage with respect to possible impacts on matters of national significance. It is expected that the departments' requirements will be satisfied through States' EIS process as it is accredited through an bilateral agreement.

Further assessment of the project will be completed as part of the EIS process to fully determine the likely impacts of the construction and operation of Wyaralong Dam. As part of the EIS an Environmental Management Plan will be developed to minimise risk of environmental harm, manage environmental impacts and nuisance caused by the construction and operation of the Wyaralong Dam project, and to meet statutory obligations.

When produced, the EIS will be a public document and all submissions will be reviewed. QWI will respond to those submissions in a Supplementary EIS. The Coordinator General will base the approval decision on the EIS and the Supplementary Report.

PURPOSE OF THIS DOCUMENT

The Queensland Government (through Queensland Water Infrastructure Pty Ltd (QWI)) is proposing the development of a new water storage on Teviot Brook in Southeast Queensland (SEQ). This project forms part of the proposed development of new water supply infrastructure to meet expected additional water demands of the SEQ region.

QWI are seeking gazettal of the project by the Coordinator General (CoG) as a 'significant project' under the *State Development and Public Works Organisation Act 1971.* Accordingly, this Initial Advice Statement (IAS) has been prepared for QWI to provide a description of the proposed project and the potential impacts proposed to be investigated as part of the preparation of an Environmental Impact Statement (EIS). The information in this IAS will assist in the scoping of issues for the preparation of draft Terms of Reference (ToR) for the EIS. The draft ToR will then be subject to review and, combined with the requirements of regulatory agencies and submissions received from relevant stakeholders, including members of the public, the final ToR will then be prepared by the CoG.

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1 INTRODUCTION

1.1 Background

The Wyaralong Dam project involves the construction of a new dam site on Teviot Brook, a tributary of the Logan River in Southeast Queensland (SEQ). The dam will ultimately supply up to 25,000 ML/annum of water to mainly urban and industrial users when operated in conjunction with Cedar Grove Weir (DNRMW, 2006a). The proponent of the Wyaralong Dam project is Queensland Water Infrastructure Pty Ltd (QWI), which has been established by the Queensland Government.

QWI will seek gazettal of the project by the Coordinator General as a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Accordingly, this Initial Advice Statement (IAS) has been prepared on behalf of QWI to provide a description of the proposed Wyaralong Dam project and enable scoping of the potential impacts proposed to be investigated as part of the preparation of an Environmental Impact Statement (EIS). The information in this IAS, combined with the requirements of regulatory agencies and submissions received from relevant stakeholders, including members of the public, will enable the subsequent preparation of final ToR by the Coordinator General (CoG) for the EIS.

1.2 Project Location

The Wyaralong Dam site (Latitude 152° 52' 50" E, Longitude 27° 54' 30" S) is located approximately 14.2 km north-west of Beaudesert and 50.6 km south south-west of Brisbane, within the upper Logan River catchment in SEQ (refer **Figure 1-1**). The Wyaralong Dam site is on Teviot Brook, 14.8 km (AMTD[1]) upstream from the junction of Teviot Brook and the Logan River. The Albert River flows into the Logan River at a confluence at Eagleby, and the Logan River then flows into southern Moreton Bay at Woongoolba. The proposed Wyaralong Dam wall site is located approximately 100 km upstream of the Logan River mouth and Moreton Bay Ramsar site (refer **Figure 1-2**).

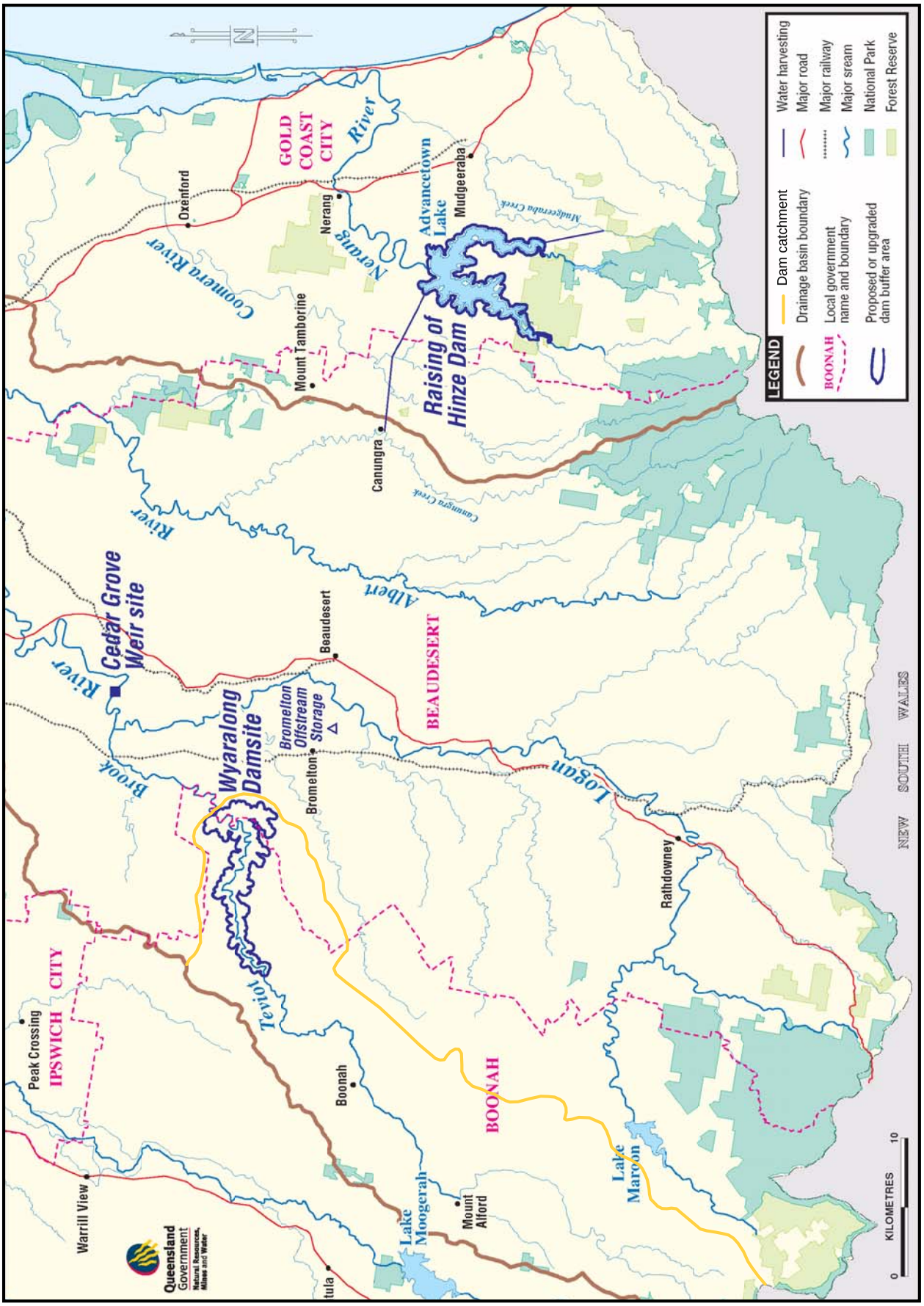
The proposed reservoir (refer **Figure 1-2**) encompasses approximately 26.2 km length of Teviot Brook at the Full Supply Level (FSL) of 63.6 m Australian Height Datum (AHD). Several ephemeral drainages flow directly into the reservoir area, the largest being Lower Sandy Creek.

1.3 Proponent

QWI is the proponent for the project. QWI was established as wholly state government owned company whose main purpose is to investigate the feasibility of developing a number of major water infrastructure projects in SEQ. Contact details of the proponent are as follows:

Queensland Water Infrastructure Pty Ltd
PO Box 15940, City East 4002
Telephone: (07) 3406 7100
Facsimile: (07)34067292
Web page: www.qldwi.com.au

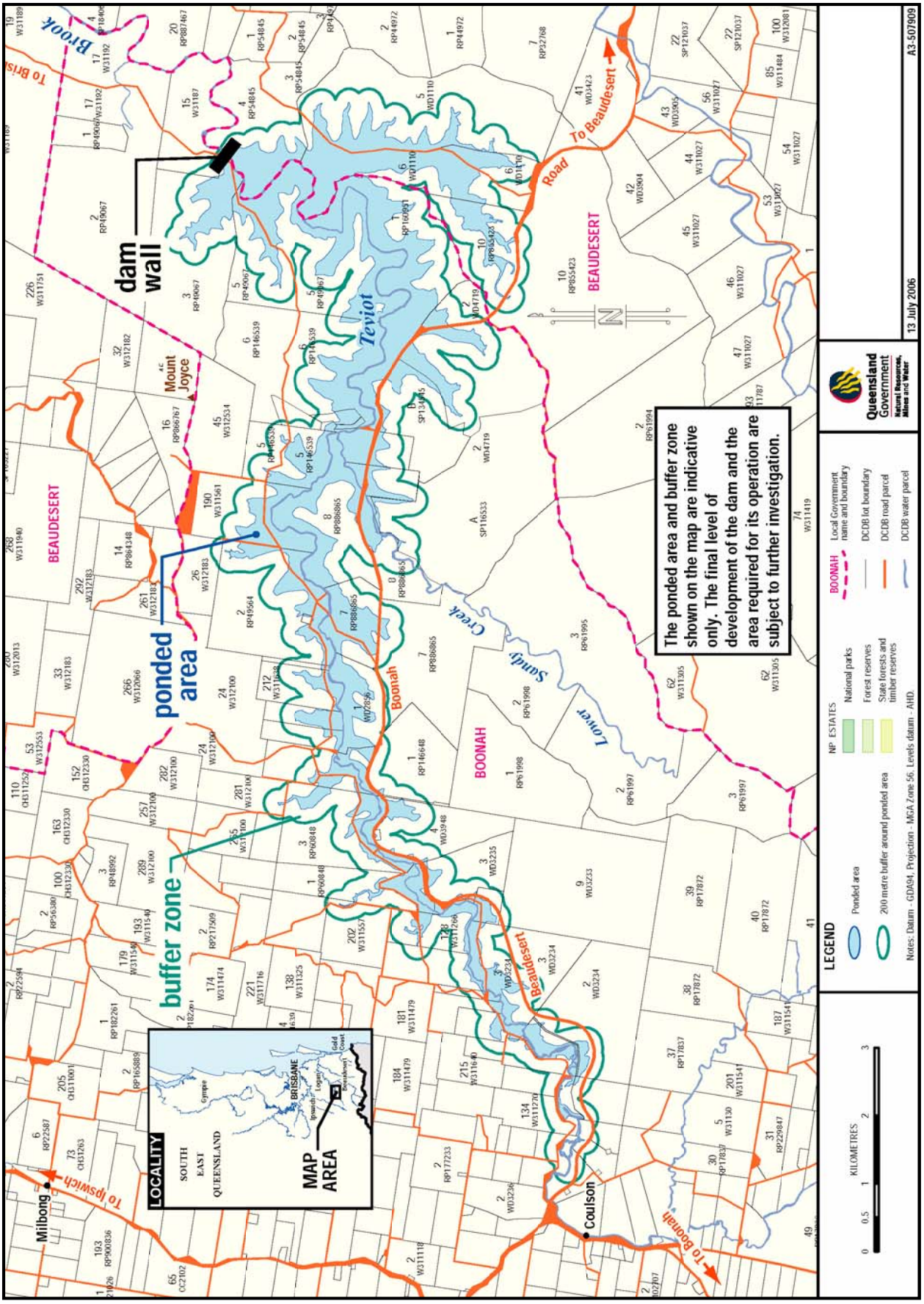
[1] Adopted Middle Thread Distance



I:\B16257_I_DWT Wyaralong DAH\DRG\ECO_002_060824_Location of proposed dam.WOR

Location of Proposed Wyaralong Dam in Relation to Other Water Infrastructure

Figure 1-1



I:\B16257_I_DWT Wyaralong DAH\DRG\ECO_003_060824_Dam site.WOR

Wyaralong Dam Site - Local Context **Figure 1-2**

1.4 Purpose of IAS document

This IAS has been prepared to provide information to government for the principal purposes:

- to assist the CoG to make a decision on 'significant project' declaration;
- to enable stakeholders, including members of the public, to determine the nature and level of interest in the proposed project; and
- to enable the preparation of draft ToR for an EIS for the proposed project.

This IAS is intended to scope the potential impacts proposed to be investigated in detail as part of the EIS process. The draft ToR, and the requirements of relevant government agencies and feedback from stakeholders, including members of the public, will be used for the development of the draft EIS and draft Environmental Management Plan (EMP). The draft EIS and draft EMP will be made available for review by the public and relevant government agencies. If required, a supplementary report will be prepared and submitted to the CoG.

1.5 Environmental Impact Assessment and Approval Process

It is expected that the EIS for the project will proceed under the requirements of the SDPWO Act which requires the proposed Wyaralong Dam project to be designated by the CoG as a 'significant projec'. This process provides for public and government comment on both the draft ToR for the EIS and the draft EIS.

Under this arrangement, it is expected that the Department of State Development and Innovation (DSDI) will be the lead agency and State and Commonwealth bilateral arrangements for assessment processes will apply. Other key pieces of legislation likely to apply to the project are:

Commonwealth

- *Environment Protection and Biodiversity Conservation Act 1999*

State

- *Aboriginal Cultural Heritage Act 2003;*
- *Acquisition of Land Act 1967;*
- *Electricity Act 1994;*
- *Environmental Protection Act 1994;*
- *Fisheries Act 1994;*
- *Forestry Act 1959;*
- *Integrated Planning Act 1997;*
- *Land Act 1994;*
- *Nature Conservation Act 1992;*

- *Queensland Heritage Act 1992;*
- *Transport Infrastructure Act 1994;*
- *Vegetation Management Act 1999;* and
- *Water Act 2000.*

Key considerations in regard to approvals under the above legislation are as follows:

Commonwealth Approvals

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

In the situation where the project will have, or is likely to have, an impact on a Matter of National Environmental Significance (MNES), or is undertaken by the Commonwealth or on Commonwealth land, then the activity must be referred under the EPBC Act and a decision made as to whether the activity is a 'controlled action'. The EPBC Act identifies seven matters of national environmental significance; two of which could apply to this project, i.e. Ramsar wetlands of southern Moreton Bay and listed threatened species.

State Approvals

***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 Wyaralong Dam potentially affects land within two local government areas, 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. If the approval process was taken fully under the IPA, each Local Authority (Boonah and Beaudesert Shire Councils) would need to process a separate Development Approval application. A determination on whether the community infrastructure process for approvals will apply will be made once the Coordinator General's report on the final EIS has been prepared.

Environmental Protection Act 1994

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.

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. This licence will be issued subject to any terms and conditions in the Logan Basin Draft Water Resource Plan (WRP) and any Resource Operations Plan (ROP) that is in place.

Vegetation Management Act 1999

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.

Aboriginal Cultural Heritage Act 2003 (ACHA)

The ACHA states that a notified Cultural Heritage Management Plan (CHMP) is required if an EIS is undertaken. The ACHA also provides information on the nature and content of a CHMP. A CHMP is required to be registered by the Minister for Natural Resources, Mines and Water.

1.6 Public Consultation Process

The site at "the Yards" (i.e. "Wyaralong") on Teviot Brook was first investigated in detail in 1991 (Water Resources Commission, 1991). The State Government commenced purchasing properties within the proposed inundation area by standing in the market and currently owns 8 of the potentially effected 24 properties. There has been an extensive media campaign emphasising the need for further water infrastructure development in the SEQ region over recent months. In July 2006 the Premier of Queensland announced the Wyaralong Dam site as the Government's preferred site for a dam within the Logan catchment.

An ongoing communication program will be developed for both the public and key agencies to convey key issues identified throughout the EIS process.

2 PROJECT SUBSTANTIATION

This section describes the need for the proposed project within the context of the economic, social and environmental costs and benefits.

2.1 Need

The SEQ region is highly urbanised, and in 2004 the urban sector represented approximately 66% of total regional water usage, followed by irrigation (26%), power generation (6%) and the rural residential sector (2%) (Southeast Regional Organisation of Councils & DNRM, 2005).

Approximately 95% of the SEQ region's urban water supply is currently provided by the following sources (DNRMW, 2006a):

- Wivenhoe, Somerset and North Pine dams (SEQ Water);
- Hinze and Little Nerang dams (Gold Coast City Council);
- Baroon Pocket Dam (Aquagen);
- Cressbrook, Perserverance and Cooby Dams (Toowoomba City Council); and
- North Stradbroke Island groundwater system (Redland Shire Council).

The current drought has highlighted the vulnerability of existing water supplies to the vagaries of rainfall and climatic variability. The Queensland government has therefore embarked on a program to ensure that current and future water demands are met.

The demand for water is predicted to increase with increasing population growth. SEQ is currently experiencing high levels of economic growth, and associated with this, a population increase of 50,000 to 60,000 people per annum. It is predicted that the SEQ region's population will increase from the current 2.7 million people to 3.96 million in 2026, and to 5.08 million in 2051 (OESR, 2006).

The current annual water demand is 450,000 ML/annum. Based on current projections it is predicted that by 2050 demand will increase to 750,000 ML/annum (assuming water savings initiatives are implemented) or up to 930,000 ML/annum (assuming no changes in current water usage patterns) (refer **Figure 2-1**) (DNRMW, 2006a). While there is some scope for further reducing the urban sector's demand for water, the predicted levels of population growth cannot be supported without the provision of additional highly reliable water supplies (DNRMW 2006a).

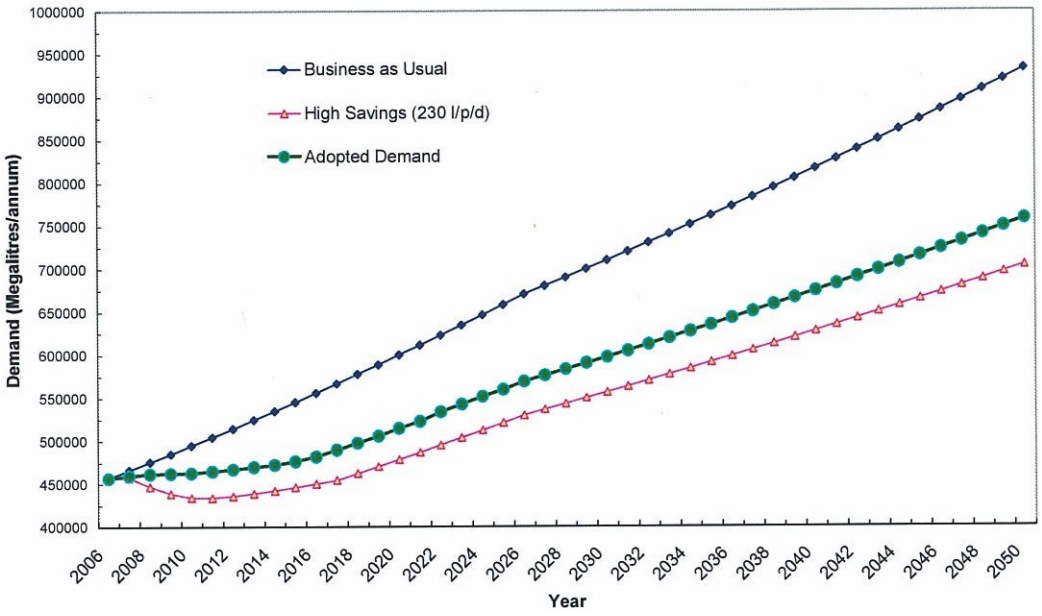


Figure 2-1 Projected Future Water Demands for the SEQ region (Source: DNRMW, 2006)

The SEQ Regional Water Supply Strategy (SEQRWSS) identified a range of measures to secure future water supplies, including the construction of several major water infrastructure projects in SEQ. The construction of a new dam in the Logan River catchment is a key measure to secure future water supplies. The proposed Wyaralong Dam on Teviot Brook would supplement regional water supplies, with most water to be used for urban and industrial purposes within the Beaudesert Shire, Logan City and Gold Coast City local government areas.

2.2 Cost and Benefit

Recent estimates suggest that dam construction would cost between $120 million and $134 million, depending on the dam wall height adopted[2]. This cost assumes an alliance delivery method, and does not include an allowance for land acquisition, road relocation, telecommunications relocation and electrical distribution relocation.

DNRMW (2006a) provided an approximate project cost of $500 million, which also considers costs associated with the relocation of roads and land acquisition.

The provision of a reliable water supply is essential for the economic growth and social stability of the SEQ region. The SEQ region is also of major state and national economic and social importance, with Gross Regional Product (GRP) of SEQ currently representing approximately 60% of the State's Gross State Product and 11% of Australia's Gross Domestic Product (DNRMW, 2006a). The SEQ region generates approximately 70% and 67% of the State's employment in the services and manufacturing sectors, respectively.

[2] Briefing note from SunWater to DNRMW dated 28/6/2006

ACIL Tasman[3] estimates that GRP could double by 2020 (~$200 billion) if sufficient water is available to meet expected demand (DNRMW, 2006a). Failure to supply the extra water has been estimated to result in a loss of between $55 and $110 billion to the regional economy. The 21,000 ML/annum to be supplied by Wyaralong Dam, together with existing and future water supply strategies, aims to meet this future demand for a reliable water supply.

The proposed Wyaralong Dam will hold up to 105,500 ML at FSL EL63.6 and will cover approximately 1300 ha at FSL EL63.6. It will boost regional supplies by up to 25,000 ML/annum when operated in conjunction with Cedar Grove Weir, with most being used for urban and industrial purposes in the Beaudesert Shire, Logan City and Gold Coast City.

The following social and economic benefits are expected:

- greater economic growth at regional, State and National scales due to the reliable supply of water;
- low unemployment rates associated with this economic growth;
- easing of water restrictions, and associated with this, the provision of water supplies for indoor use, parks, sporting facilities, residential gardens and other social activities essential to social well being and quality of life; and
- economic benefits flowing on from dam construction activities, including but not limited to generation of employment during construction phases, and skills development in the areas of plant and equipment operation, construction, contract administration and management, and project support.

The EIS process will develop information assessing regional employment, skill development prospects, and regional economic impacts resulting from the dam project.

2.3 Project Alternatives

A diversified supply strategy, with respect to both source type and the spatial configuration of supply options, is required to ensure a reliable regional water supply in the long-term. The Wyaralong Dam project proposal is one of several water infrastructure projects that together aim to meet future regional water demand. The Wyaralong Dam project is one of two major dam projects under consideration.

Other initiatives identified by the SEQRWSS and being progressed to secure additional supplies include the development of a regional water grid, a recycled water project for industry, and a desalination plant at Tugun. Water-saving programs for homes, businesses, industry and local councils are also being developed to maximise current water supplies.

[3] Economic Consultants

2.3.1 "Do-Nothing" Option

It is anticipated that all the proposed water sources combined would prudently deliver an additional (approximately) 320,000 ML/annum, exceeding the required additional demand estimate of 300,000 ML/annum by 2050 (DNRMW, 2006a). If infrastructure in the Logan River catchment were not developed, i.e. "do nothing" option, then the additional supply provided by other water infrastructure projects would be approximately equal to projected demand at around 2050. However, there are significant uncertainties with respect to future yields, which are dependent of rainfall patterns and climate change, and population growth rates. Consequently, there are some uncertainties whether supply is likley to meet long-term regional demand for the "do nothing" option.

It is likely that the region would experience adverse socio-economic effects should other water sources not be available to make up the short-fall in supply (DNRMW, 2006a).

2.3.2 Other Options in the Logan-Albert River Catchment

Three dam options within the Logan-Albert River catchment have been considered in recent feasibility studies (DNRMW, 2006b; DNRMW, 2006c; GHD, 2006):

- Wyaralong Dam on Teviot Brook (Prudent Yield Estimate 25,000 ML/annum, in conjunction with the recently approved Cedar Grove Weir);
- Tilleys Bridge Dam on the Logan River (Prudent Yield Estimate 35,000 ML/annum, with Cedar Grove Weir); and
- Glendower Dam (including a barrage) on the Albert River (Prudent Yield Estimate 18,000 ML/annum).

From an environmental perspective, the Glendower Dam option was not preferred as it would result in significant changes to the Albert River system which, with exception of some small structures, is largely unregulated at present (DNRMW, 2006b). By confining dam infrastructure to the Logan River system, ecological functions and processes operating in the freshwater and estuarine reaches of Albert River system would be largely unaffected. The Glendower Dam option would also have had a lower yield compared with the other two dam options.

The Logan Basin Draft WRP environmental assessment did not compare the relative effects of Tilleys Bridge Dam and Wyaralong Dam options in isolation. The Tilleys Bridge Dam option would provide a potentially higher yield than the Wyaralong Dam option. However, a larger number of landowners would be affected by the Tilleys Bridge Dam proposal, therefore resulting in higher social costs.

3 DESCRIPTION OF THE PROJECT

3.1 Location

The site is located on the Teviot Brook at AMTD 14.8 km, and approximately 14.2 km from Beaudesert (refer **Figure 1-1** and **Figure 1-2**). Teviot Brook rises in the McPherson and Great Dividing Ranges and flows in a roughly north-easterly direction for 99 km before joining the Logan River. The catchment area above the proposed dam is 546 km^2. The catchment is mainly rural, primarily used for beef cattle grazing.

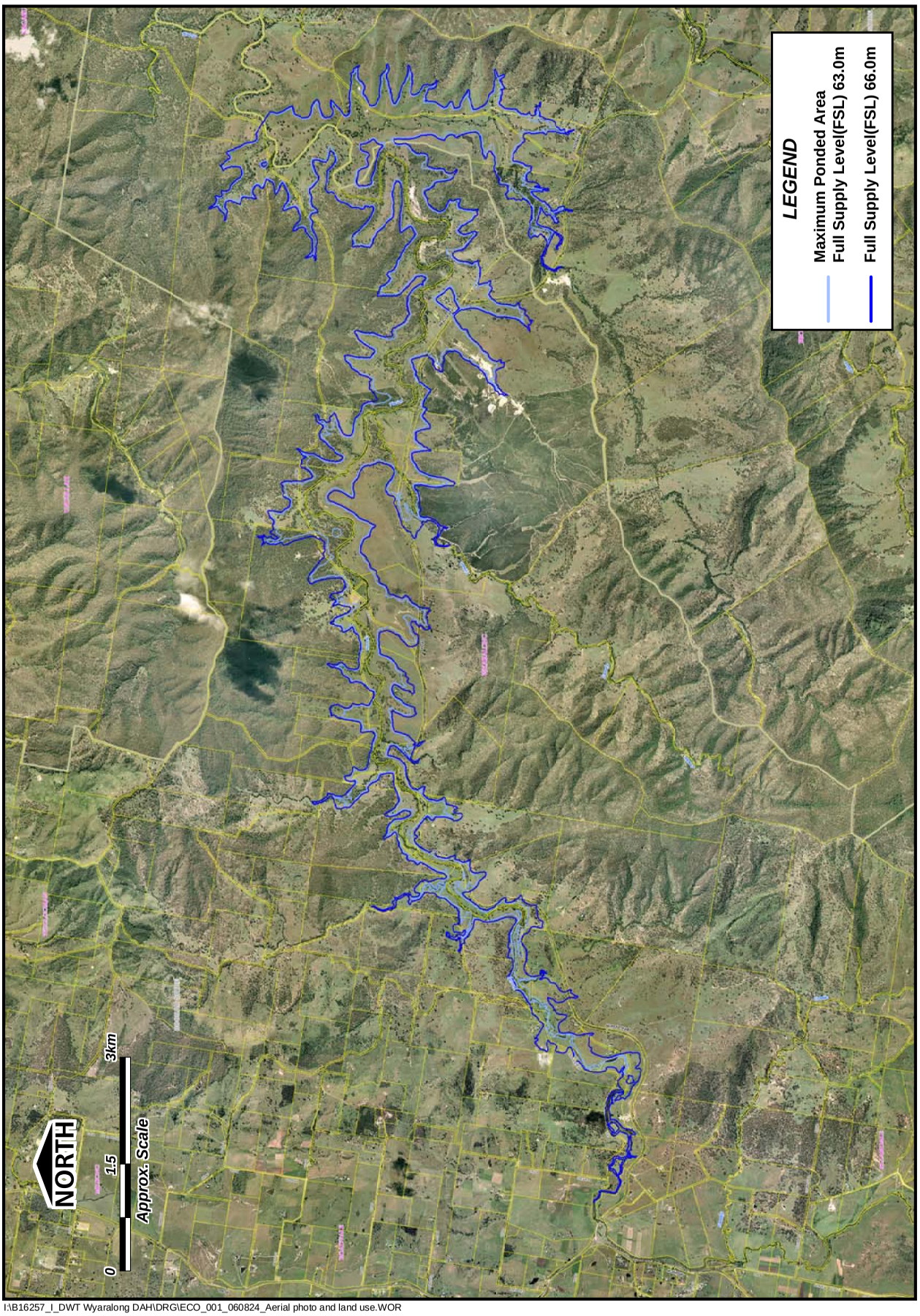
3.2 Size of the Storage

The Wyaralong Dam site was investigated in some detail in 1991 and chosen as the preferred site from a number of options at that stage. The proposed water management system at that stage consisted of the dam at Teviot Brook ("The Yards") feeding a weir at Cedar Grove on the Logan River from whence water would be extracted to a treatment works. The existing Maroon Dam on Burnett Creek can also release to Cedar Grove Weir. The approvals process for Cedar Grove Weir is progressing with the aim to construct this facility by 2008.

The Wyaralong Dam site is considered suitable for a Concrete Faced Rockfill Dam (CFRD) with an approximate height of 47 m or a Roller Compacted Concrete (RCC) Dam with a height of approximately 45 m. The cost of both options is similar and both options are being investigated further. The EIS will assess the impacts of both construction options.

For the CFRD option, a spillway is required on the right abutment and will discharge to the stream bed approximately 1 km downstream of the toe of the embankment. For the RCC option the spillway will be incorporated in the main embankment across the river and will discharge to the stream bed immediately downstream of the dam.

The proposed dam will hold up to 105,500 ML at FSL EL63.6 and will cover around 1300 ha at FSL EL63.6. **Figure 3-1** illustrates the extent of the area inundated at FSL in relation to existing land uses.



I:\B16257_I_DWT Wyaralong DAH\DRG\ECO_001_060824_Aerial photo and land use.WOR

Land Use in Ponded Area and Adjacent Land

Figure 3-1

Including buffer zones, up to 24 landowners would be affected by the proposed development. The State Government has been purchasing properties in the area over a number of years and currently owns eight of these land parcels. The buffer zone around the storage is proposed to be up to 200 m wide but will vary based on topography and potential risk to the water storage.

No State Forest or National Parks are known to exist within the inundation area.

3.3 Associated infrastructure works

A permanent access road adjacent to the left bank of the dam site is proposed. It is expected that this access road will meet Undullah Road, approximately 18 km from the Mount Lindsay Highway.

3.4 Construction Details

3.4.1 Development Timeframe

Development of the design of the dam, minimisation of impacts and optimisation of construction and operation processes is an iterative process that will occur over a number of years. A preliminary timeline for the project, assuming it will be designated as a 'significant project' under the SDPWO Act is shown below:

- Concept design final at August 2006
- Preliminary design completed December 2006
- EIS / approvals completed November 2007
- Detailed design completed September 2008
- Construction completed February 2011

3.4.2 Raw Materials

It is expected that suitable materials will be available within close proximity to the dam site although concrete aggregate may need to be sourced from the Bromelton basalt quarry approximately 10 km southeast of the site. Approximate quantities of required construction material for the CFRD and RCC Options are outlined in **Table 3-1** below.

Table 3-1 Construction Material Volumes

Material / Zone	Description	Approximate Volume (m^3)
CFRD Option		
2a	Fine filter	10,00
2b	Coarse filter	40,000
3a	Rockfill	760,000
3b	Miscellaneous Rockfill	
3c	Selected Rockfill	
Concrete	Upstream face, plinth, spillway (crest, apron, walls), intake and outlet structures	30,000
RCC Option		
Roller compacted concrete	Main embankment	200,000
Conventional concrete	Apron, training walls, intake and outlet works.	10,000

3.4.3 Construction Cost

The current estimated dam structure construction cost is $120 million to $134 million, with a total project cost, including land acquisition, relocation of infrastructure, etc. of an estimated $500 million.

No staging of works is anticipated.

Any of the above features may alter as the design is developed.

3.5 Relocation of other infrastructure

It is anticipated the following services will be affected by the inundated area:

- several kms of new road to replace those sections of Boonah-Beaudesert Road that will be inundated;
- local telecommunication facilities;
- local power distribution facilities;
- shire connection roads; and
- private structures on viable properties.

3.6 Operation of the Dam

3.6.1 Spillway

The spillway will be designed to pass the Probable Maximum Flood (PMF) in accordance with the Queensland Dam Safety Management Guidelines (February, 2002). For the CFRD Option, the spillway will be a channel excavated in rock with a fixed level concrete control structure located in the right abutment. For the RCC Option the spillway will be incorporated in the main embankment.

A flood mitigation study has yet to be carried out for the proposed Wyaralong Dam and no provision has been made for extra storage for flood control purposes. The proposed dam is planned to have an ungated spillway which means that the reservoir acts as a detention basin thus causing attenuation of the flood peak. Some flood benefit is therefore expected to be gained.

3.6.2 Outlet Works

The outlet is expected to consist of a vertical intake tower, a 2.4 m diameter conduit, a valve house and a dissipater. The intake tower will have provision for a selective withdrawal of best quality water at the appropriate level via a system of baulks placed one above the other in vertical slots. An open baulk will be used at the water extraction level.

It is anticipated that water will be released from storage and travel by run-of-river to Cedar Grove Weir on the Logan River from where it will be extracted to a water treatment plant and enter the potable supply system. Some irrigation supplies licences will also be served.

3.6.3 Fish Transfer

The need for fish passage will be determined through the EIS process. The detailed design of any necessary fishway will be developed in conjunction with the Queensland Department of Primary Industry and Fisheries.

3.7 Permit and approval requirements

Section 1.5 outlines the main permits and approvals that are likely to apply to development of the Wyaralong Dam.

3.8 Flood operations

The dam is planned to have an ungated spillway which means that the reservoir acts as a detention basin thus causing some attenuation of the flood peak. As the spillway is ungated, there is no capacity to provide any further flood control measures.

4 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Climate

Based on the Köppen classification[4], the climate of the Logan/Albert catchment is humid sub-tropical. Winds predominate from the south to southwest in winter-spring and southeast to northeast in summer-autumn. The study area is affected by northern monsoons and, to a lesser degree, by winter weather patterns from the south. Summer rains are generally high intensity and associated with thunderstorms, monsoonal troughs or tropical cyclones.

Teviot Brook is a naturally intermittent stream. Most high flow events occur during the wetter months of December through to March, resulting in summer-dominant flow regimes. Rainfall shows considerable inter-annual variation, resulting in a high degree of natural streamflow variability (DNRMW, 2006b).

4.2 Landform, Geology and Soils

4.2.1 Geology and Landform

The study area (incorporating the dam site, inundation area and immediate catchment area) is located mainly on Jurassic Period sandstone and siltstone sediments of the Marburg Formation. The smaller central section of the study area comprises Triassic-Jurassic sediments of the Woogaroo Subgroup. Sediments of the Marburg Formation form a major landform feature of the southern Moreton Region and are characterised by undulating hills and rises to steep hills. Teviot Brook and the associated valley essentially separates the steep hills and mountains of the Dugandan Range to the south from the isolated peaks and ranges of the Flinders Peak complex to the north. Sediments of the both the Marburg Formation and Woogaroo Subgroup are also characterised by shallow texture contrast soils (refer **Section 4.2.2**) with outcrops of sandstone and siltstone being common. These sediments are stable in the geophysical context and the area is not subject to earthquakes or other landform stability problems.

Teviot Brook forms a relatively narrow and incised channel through these landforms. There is only minor development of Quaternary alluvium adjacent to the main channel, reflecting the confined nature of the valley within the study area.

The catchment of the proposed dam and up to the western limit of the study area is comprised mainly of sediments of the Jurassic Walloon Formation. This formation is characterised by undulating hills and rises with a lower elevation than the Marburg and Woogaroo Subgroup formations.

[4] Köppen classification - the climate of each region based on temperature and rainfall, as indicated by the native vegetation.

4.2.2 Soils and Susceptibility to Degradation

The soils associated with the Marburg Formation and Woogaroo Subgroup comprise mainly shallow texture contrast soils (sandy and loamy solodics and soloths; Noble *et al* 1996) that are highly susceptible to sheet and gully erosion. Subsoils commonly have high levels of salinity and are strongly sodic. Significant erosion is evident in much of the grazing land within the immediate catchment of the Teviot Brook channel, reflecting the susceptibility of the soils to degradation and high stocking rates on mainly native or low quality improved pastures.

The soils associated with Quaternary alluvium on the terrace adjacent to the main stream channel are mainly fine-textured soils with medium clay subsoils. The alluvium and sediments within the main stream channel become sandier as the dam site is approached, reflecting the increasing dominance of the sandy Marburg Formation sediments within the catchment area.

Soils associated with the Jurassic Walloon Formation in the dam catchment upstream of the inundation area are comprised of grey and brown 'scrub' soils and loamy solodics. These soils also have high levels of salinity in the subsoil and are strongly sodic. Salinity outbreaks, albeit localised, are evident in some low lying areas near Teviot Brook, notably to the east/ north east of Boonah in the catchment area of the dam. High salinity levels in many of the subsoils are reflected in elevated conductivity levels in water quality monitoring (refer **Section 4.9.3**). The cause of this salinisation is discussed in Noble (1996). Salinity issues associated with agricultural activities in the Teviot Brook catchment have also been addressed in the study into the irrigation suitability of Teviot Brook (Christianos, *et al* 1986).

4.2.3 Good Quality Agricultural Land

A significant portion of the low sloping lands and alluvial terraces adjacent to Teviot Brook within the study area has been classified as Good Quality Agricultural Land (GQAL) (as per State Planning Policy 1/92: Development and Conservation of Agricultural Land) within the Boonah Shire Council Town Planning Scheme and Strategic Plan. All alluvial and colluvial lands of less than 5% slope have been classified as Class A Crop Land (i.e. GQAL). All remaining lands have been classified as Class C_2 Native Pastures and are not considered to be GQAL. No lands have been classified as GQAL within the Beaudesert Shire component of the study area. As noted in **Section 4.1**, there is only a small area of cropland within the study area.

4.3 Land Use and Tenure

4.3.1 Upstream Catchment Conditions

The catchment of Teviot Brook above the dam site has an area of 546 km^2. The upper parts of the catchment are bounded by the junction of the McPherson and Great Dividing Ranges. From here, the catchment and main watercourse head in a generally north-easterly direction for approximately 99 km to the dam site.

The upper parts of the long and narrow catchment are relatively steep and heavily timbered. The town of Boonah is the only major urban area in the catchment. The land use in the lower parts of the catchment is dominated by agricultural uses, primarily cattle grazing. However, there is more intensive usage including cropping and horticulture in the valley mainly upstream of Boonah.

4.3.2 Regional Land Use Patterns

The proportion of catchment area occupied by various types of land use in the Logan and Albert River catchments is summarised in **Table 4-1**.

Table 4-1 Major land uses (km^2) in the Logan/Albert catchment (Source: DNRMW, 2006b)

Land use	Logan	Albert	Total
Residential	114	19	1323
Commercial/Industrial	12	1.5	13.5
Rural	2325	572	2897
Forest	297	114	411
Other	252	43.5	295.5
Approximate total catchment area (km^2)	3000	750	3750

Rural

The dominant land use in the two catchments is rural. Grazing is the most widespread land use, although more intensive forms of agriculture such as including dairying, forage cropping, turf farming and horticulture, occur on river flats in the major valleys, including areas downstream of the proposed Wyaralong Dam, primarily on the alluvial flats of the Logan River. At local spatial scales, beef cattle pasture represents the dominant land use in the Teviot Brook sub-catchment, including the proposed dam impoundment area. The alluvial flats of Teviot Brook upstream of the inundation area and primarily to the south of Boonah are intensively used with irrigation water sourced from underground and surface supplies. Much of the uplands in the Coulson/Milbong/Boonah area were heavily utilised in past decades by intensive dairy farming, reflecting the presence of 'scrub' soils. However, the decline in the dairy industry has resulted in the establishment of permanent pasture over most of the cleared area. Most properties in the upland areas are too small to be commercially viable for full-time rural pursuits and 'hobby farming' or part time rural production has become prevalent.

Forests

Forests represent approximately 11% of the total Logan/Albert catchment area (refer **Table 4-1**). Most of this land is situated on steep slopes that are generally unsuitable for agriculture.

Residential

The most extensive urban development in the Logan/Albert catchment occurs at the northern end of the catchment around Logan, (i.e. the local catchment of the Logan/Albert estuary). Other major population centres include Beenleigh, Beaudesert, Boonah, Jimboomba, Rathdowney and Canungra. Rural–residential land use occurs around the major population centres, particularly in the northern part of the Logan catchment.

At a more local scale, the township of Beaudesert is located ~14.2 km southeast of the dam wall and ~12 km from the closest portion of the impoundment area. The township of Boonah is the closest major service town to the dam site, located approximately 8 km south west of the most upstream limit of the impoundment area. There are no other major service towns within a 10 km radius of the dam site. The village of Gleneagle is located ~8 km to the east of the proposed Wyaralong Dam site. Boonah and the small village of Mount Alford are the only population centres within the dam catchment. Rural residential type developments are found on the outskirts of Boonah. The Coulson area immediately upstream of the upper limits of the inundation area is a relatively concentrated area of small lot rural type settlement.

The Boonah sewage treatment plant (STP) is the only STP located upstream of the proposed impoundment area within the catchment. Effluent from the Boonah STP is re-used on land for irrigation purposes. The Beaudesert STP is situated downstream of the impoundment area on the Logan River.

4.3.3 Land Uses within Inundation area

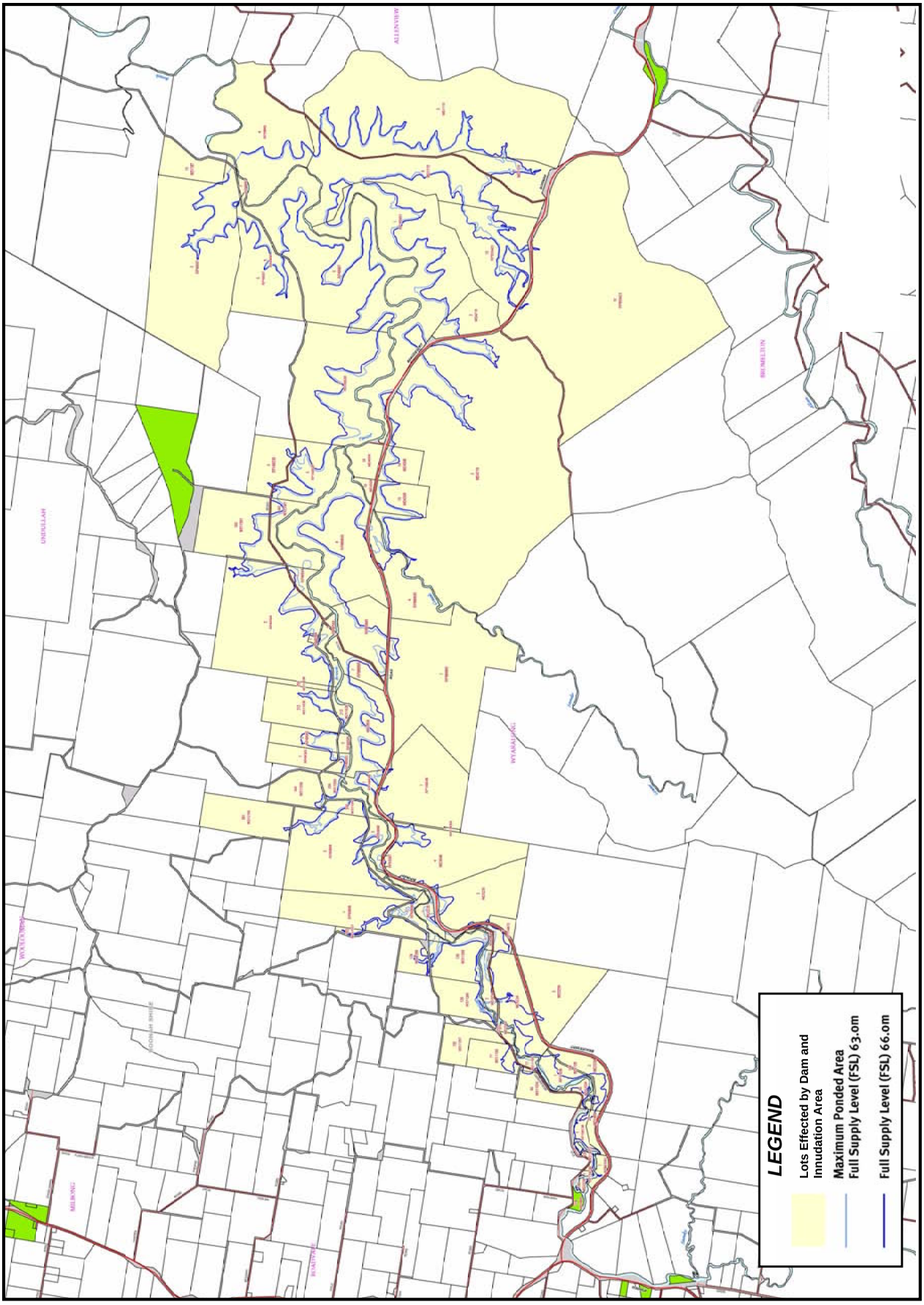
Figure 3-1 illustrates land uses within the proposed inundation area of the dam. Uses comprise predominantly broadscale grazing of beef cattle on native and low-quality improved pasture with only small areas of forage cropping. Some relic extractive industry operations have been undertaken on the sandy alluvium in the lower sections of Teviot Brook and feeder streams while turf farming has been undertaken in the past. An extensive area of plantation forestry has been established in the immediate southern catchment area of the proposed storage.

4.3.4 Land Ownership

The proposed dam impoundment area is situated within two local government areas: Boonah Shire and Beaudesert Shire. Most of the impoundment area is situated in Boonah Shire, except for the eastern-most extent, which includes part of the dam wall.

The lots situated within the impoundment area are shown on **Figure 4-1**. The proposed dam impoundment area covers an area of approximately 1560 ha of land, the majority of which is currently freehold land.

The nearest residence to the dam wall is located on Lot 5 WD1110. Some 10 residences occur within the impoundment area and the 200 m buffer zone. Details are not available at this stage to determine haul road routes and numbers of residences potentially affected by the proposed works.



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Land Holdings Effected by Wyaralong Dam **Figure 4-1**

4.3.5 Conservation Estates and Other Protected Areas

There are no National Parks or State Forests within a 10 km radius of the impoundment area. The headwaters of the Logan-Albert River catchment, located in the southern sections of the catchment, contain two National Parks. The Moogerah Peaks National Park contains the headwaters of several tributaries of Teviot Brook near Boonah. The Lamington National Park contains headwaters streams of the Albert and Logan Rivers. The Lamington Plateau is listed as a World Heritage area.

The estuarine and lower reaches of the Logan-Albert system, and the receiving environment of Moreton Bay, have high ecological, conservation and fisheries values. Areas of high conservation value that are specifically protected in conservation estates include Moreton Bay Marine Park, Moreton Bay Ramsar and Jumpinpin–Broadwater Fish Habitat Area (refer **Section 4.12**).

4.4 Historic and Cultural Heritage

The Mulanjali People and the Jagera People are the Aboriginal Traditional Owners of the Wyaralong Dam site (DNRMW 2006c). As a large proportion of this land is under private ownership, it has not been routinely accessed by Aboriginal Traditional Owners for some time, and there are no recorded cultural heritage sites in this area. The southern side of Teviot Brook was identified by DNRMW (2006c) as important to the Mulanjali people for many reasons, including the collection and use of cultural resources (such as food), and activities (social and spiritual ceremonies). As rivers and streams were traditionally well used by Aboriginal Traditional Owners, DNRMW (2006c) suggests that there is some potential for artefacts to be found both before and during construction. Further engagement with the Mulanjali and Jagera people will be required as part of the planning and impact assessment process.

No items were identified on the Register of the National Estate or the Queensland Heritage Register within or directly adjacent to the dam site.

4.5 Social, Economic and Planning Environment

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. As noted earlier, 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 centres of Ipswich and Brisbane as well as Beaudesert and Boonah. Beaudesert and Boonah serve as the primary service centres to the region and most community facilities, including hospitals, medical facilities and educational facilities are present in both towns. The water supply for Boonah is sourced from the Boonah-Kalbar Water Supply Scheme (on Reynolds Creek in the Bremer River catchment) while Beaudesert town water is derived from the Logan River.

The Boonah and Beaudesert Shires Town Planning Schemes and Strategic Plans zone the general area of the dam as Rural with a 200 ha minimum lot size for subdivision purposes.

The Boonah Town Planning Scheme (gazetted 1995) identifies the prospective presence of the Wyaralong dam site, inundation area and buffer zone. Lower sloping land within the inundation area is identified as GQAL (refer **Section 4.2.3**) while all forested land is identified in the scheme as having either Regional or State conservation values. No extractive industry Key Resource Areas (KRA's) have been identified in the inundation area although the Boonah Shire Strategic Plan has identified an extractive industry site near the central area of the potential impoundment. The Draft Beaudesert Scheme (2005) identifies the Wayarlong dam site and adjacent lands as a 'Rural Production, Conservation, Recreation Area'.

The Bromelton Industrial Area to the east is a significant agglomeration of existing (and potential) industrial activity in the region.

4.6 Existing Infrastructure

4.6.1 Road and Rail

The study area is traversed by one main road (the Boonah – Beaudesert Road) and a number of minor unsealed roads and tracks that mainly provide access to individual farm residences. The Boonah-Beaudesert Road is classified by the Main Roads Department as a Regional Road and provides an important southern linkage between the New England Highway and the Beaudesert/ Gold Coast regional transport network. This road passes close to the channel of Teviot Brook at a number of points and traverses two main tributary streams that flow into Teviot Brook i.e. Crows Creek and Lower Sandy Creek. The western end of the Boonah Beaudesert Road terminates at the Ipswich Boonah Road approximately 1 km to the west of the FSL of the dam.

There are four bridge crossings over Teviot Brook within the potential impoundment area. Such bridges are timber structures designed for local traffic only and would have a low flood immunity.

4.6.2 Power and Telecommunications

No significant transmission lines pass through the study area. Local residents are connected to the external grid by low voltage lines used for domestic purposes only. A Telstra optical fibre cable passes through the study area.

4.6.3 Shire Facilities

No significant shire facilities were identified within the study area.

4.6.4 Private Infrastructure

Most forms of private infrastructure are limited to facilities for on-farm operations. These include farm storages, windmills/bores and stockyards.

As noted above, the built environment comprises predominantly individual homesteads/ residences within a rural environment. It is estimated that there are some 10 residences within the potential impoundment area and associated buffer zone. All residences are located within 1 km of Teviot Brook or Crows Creek.

4.7 Air and Noise

Little information on the air quality and noise environment within the study area is available. The area surrounding the proposed Wyaralong dam site is largely rural grazing lands with the closest built-up residential area is Boonah, located 8 km to the west of the proposed dam. Isolated single residences occur along the length of the impoundment area. The nearest single residence to the dam wall is located approximately 4 km to the south of the wall.

The surrounding area contains several noise sources, including factories at Bromelton, quarry operations (including sand extraction activities on Teviot Brook approx 6 km to the north and other operations on Allan and Woollaman Creeks), light industry and agricultural activities (i.e. grazing, turf farming, cropping). The Boonah-Beaudesert Road (which is a sealed dual lane local access road carrying low levels of private and commercial traffic) passes to the south of the inundation area. Due to the proximity to a road and grazing paddocks, the site would experience low background noise levels. Noise sources would include cars, trucks, agricultural equipment, heavy plant equipment and barking dogs. The potential for noise related disturbance during the construction of the dam will require assessment in the EIS.

As with noise, the relative isolation of the site means that there would be limited existing adverse impacts on air quality within the impoundment area. With the possible exception of dust releases during construction, the proposed dam is unlikely to have any adverse impacts on air quality.

4.8 Landscape and Visual Character

The landscape character of the Teviot Brook area is typical of a rural area, with steep slope areas relatively well vegetated, and lowland areas predominantly pasture lands. Dams and associated infrastructure are typical features of rural landscapes, and tend to merge with the rural character.

4.9 Surface Water

4.9.1 Hydrology

The mean annual rainfall for the catchment is approximately 970 mm/annum. However, the southern, steeper upstream parts of the catchment experience higher mean annual rainfalls in the order of 1100 mm/annum.

The mean annual flow from the catchment is estimated to be 42,500 ML/annum at the proposed dam site which represents approximately 95% of the estimated pre-development mean annual flow. The median annual flow is estimated to be 23,000 ML/annum representing approximately 90% of the estimated pre-development median annual flow.

Peak 1% Annual Exceedance Probability (AEP) flood flows are estimated to be 1350 m^3/s occurring in a critical rainfall event of 18 hours duration. The total volume of flow from this event is estimated to be 107,000 ML (more than twice the mean annual flow).

4.9.2 Water Uses/Logan Basin Draft WRP

The Logan Basin Draft WRP (DNRMW, 2006b) describes the water usage in the catchment as follows:

> *"Water resource development in the catchment of Teviot Brook consists of unsupplemented extraction for stock, domestic and irrigation, which has led to reductions in depths and durations of low flows, and increased the duration of zero flows and incidence of dry spells."*

Water supplies for agricultural purposes within the dam catchment comprise in-stream and off-stream surface supplies and some groundwater usage. Potential for increased irrigation development in Teviot Brook is limited due to risks of salinisation and small yields in upper catchment areas (Christianos *et al*, 1986). There is some potential for expansion of irrigation on the alluvial flats of the Logan River to the west and north-west of Beaudesert and /or supplementation of existing supplies. These existing supplies comprise extraction from the Logan River (flows supplemented by regulated flows from Maroon Dam) and groundwater sources. Water from Wyaralong Dam will largely enter the potable supply system but some will be available as supply to allocation holders in conformance with the Logan Basin Draft WRP. No significant new irrigation development is envisaged for the area.

4.9.3 Water Quality

Land use in the surrounding Teviot Brook catchment area is predominantly rural, with livestock grazing (cattle) as the most widespread use (DNRMW, 2006b). Surrounding catchment land uses including livestock grazing, cropping, sand/gravel extraction and urban influences (including stormwater runoff and wastewater treatment plant discharges from Boonah) have largely contributed to the degradation of existing water quality. The Bromelton area has a number of industries that produce effluent, including an abattoir, rendering plant, gelatine plant, stock feed plant, pet food manufacturing plant, feedlots, saw mills, sugar mill, a dairy cooperative, a concrete plant and fertiliser plant (Horn and Wong, 1998).

Unsupplemented extraction of water from Teviot Brook is also identified to have affected water quality by reducing flows and hence effectively reducing flushing and concentrating pollutants (DNRMW 2006b). Existing water quality during low flows is characterised by high conductivity due to the influence of saline groundwater and elevated salinity levels in soils of the Walloon and Marburg sediments. Also of note is that unusually high levels of copper have been recorded in the catchment, however the source is unknown (DNRMW, 2006b).

The Logan Basin Draft WRP Environmental Investigations Report: Volume I – Summary Report (July 2006) identifies that existing water quality in Teviot Brook has undergone moderate change from reference conditions. This is generally consistent with Ecosystem Health Monitoring Program (EHMP) studies for the Logan River Catchment, which identified that freshwater streams in the catchment for the year 2005 were generally in very poor condition, with an overall report card rating of "D".

Under the Environmental Protection (Water) Amendment Policy (No. 1), 2006, environmental values (EVs) and water quality objectives (WQOs) have been established to protect Queensland's waterways. However, EVs and WQOs have not yet been scheduled under the *Environmental Protection (Water) Policy 1997* (EPP Water) for freshwater reaches or tributaries of the Logan River. Thus, under the EPP Water the WQOs for a waterway not defined in Schedule 1 are the set of WQOs that will protect all EVs for the water (s11[2]). The following lists EVs for Queensland waters that may be applied to the project site:

- Aquatic Ecosystem (slightly-moderately disturbed);
- Human Consumers of Aquatic Foods;
- Primary Recreation;
- Secondary Recreation;
- Visual Recreation;
- Cultural and Spiritual Values;
- Industrial Use;
- Aquaculture; and
- Drinking Water Supply.

Existing environmental values for the project site should be determined during the EIS to enable a more thorough assessment to be undertaken on the impacts of the proposed project.

4.10 Groundwater

The Logan Basin Draft WRP Environmental Investigations Report: Volume I – Summary Report describes the groundwater resources in the Logan Basin as follows:

> *"Most of the groundwater resources in the study area are found in the alluvial aquifers of the Logan and Albert Rivers. The groundwater baseflow component is likely to be chemically variable, depending on local aquifer material. Long and Lloyd (1996) established that the Logan/Albert system follows a relatively simple model of recharge in the southern sector, with regional groundwater flowing northward with an associated increase in total dissolved salts, which is partly the result of evaporative concentration. As reported by Please et al. (1996), to the north the water gets 'older', suggesting that direct recharge to the aquifer in this region is either a very slow process through the unsaturated zone or it is negligible. Horn and Wong (1998) reported almost all groundwater in the catchment is abstracted from depths of between 5m and 25m. The primary use for this groundwater is for irrigation and private supplies on farms (Please et al., 1996)."*

Groundwater conditions within the potential inundation area and immediate catchment area of the dam are understood to be mainly of low volume and/or with elevated conductivity levels. Some groundwater may be used for stock watering and limited irrigation.

4.11 Terrestrial Ecology

This assessment involved a review of ecological data to identify any known or likely flora and fauna species and/or areas and communities of conservation significance within or directly adjacent to the study area (i.e. the dam site, inundation area and immediate environs). The following datasets were used in this assessment:

- aerial photography;
- 2003 Remnant regional ecosystem (RE) mapping prepared by the Queensland Herbarium (QH) (V5.0);
- SEQ Biodiversity Planning Assessment Mapping prepared by the EPA (V3.4) (March, 2005);
- online RE maps produced by the Queensland Environmental Protection Agency (EPA); and
- threatened species records from the EPA's Wildlife Online database and the EPBC Act database.

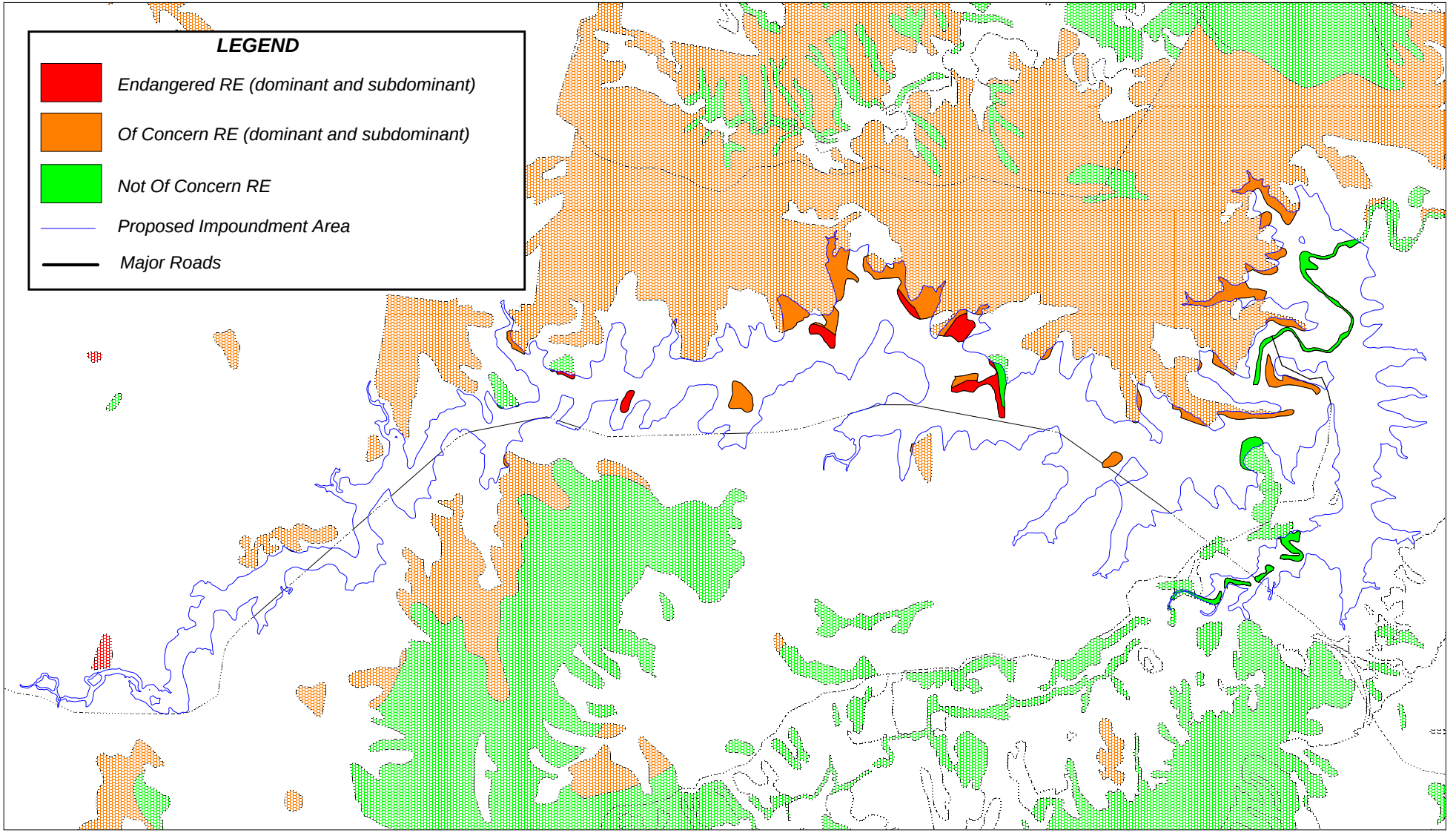
Appendix A presents the outputs of the data search.

4.11.1 Terrestrial Flora

Based on the certified 2003 remnant RE mapping produced by the QH (refer **Figure 4-2**), approximately 90% of the study area has been cleared and currently supports non-remnant vegetation dominated by grazing pasture.

The remainder of the study area supports remnant vegetation comprised of:

- mixed eucalypt woodland to open-forest on undulating hills (approx. 100 ha);
- fringing riparian communities (approx. 23 ha);
- *Eucalyptus tereticornis* open forest/woodland on alluvial plains (approx. 22 ha); and
- freshwater swamps on floodplains (approx. 6 ha).



2003 Remnant Regional Ecosystems (Qld Herbarium, 2006) **Figure 4-2**

Remnant vegetation in the study area occurs mainly on the edges of large, contiguous remnant patches and remnant riparian vegetation is mainly confined to the eastern section of Teviot Brook. Details are as follows:

- five RE's have been mapped in the study area. The majority, i.e. 96 ha, is classified as *Not Of Concern* under the VMA*;*
- 32 ha of *Of Concern* remnant vegetation has been mapped in the study area;
- 22 ha of Endangered RE has also been mapped in the study area. RE 12.3.3 is comprised of *Eucalyptus tereticornis* open-forest to woodland on alluvium. This community provides potential habitat for rare and threatened flora species and *E. tereticornis* grow into very large hollow-forming trees, which have high habitat value for fauna. (Refer **Table A, Appendix A**)

A search of the EPBC Act database indicates that the study area potentially supports three Commonwealth listed endangered ecological communities including Brigalow (*Acacia harpophylla* dominant and co-dominant), Swamp Tea-tree (*Melaleuca irbyana*) Forest of Southeast Queensland (Critically Endangered) and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered). However, none of these communities have been mapped within or directly adjacent to the study area on RE maps, and they are not expected to occur.

A search of the EPBC Act database and EPA's online database, WildNet, indicate that the study area potentially supports 37 rare or threatened plant species (refer **Table B**, **Appendix A**). Potential habitats for such species will the subject of future survey and investigations for the EIS.

4.11.2 Terrestrial Fauna

A search of the EPBC Act database and EPA database, WildNet, indicates that the study area potentially supports 48 fauna species of conservation significance, including 10 bird species; 1 frog species; 1 insect species; 7 mammal species; 3 reptile species; 8 migratory terrestrial species; 3 migratory wetland species; and 15 marine species (species which may utilise the study area periodically as fly-over and/or breeding) (refer **Table C**, **Appendix A**).

No essential habitat for threatened fauna species have been mapped in the study area on the EPA's online RE mapping (accessed June 2006). However, based on the vegetation types mapped in the study area the following species may occur within the following habitats within the impoundment area. Such habitats will be the subject of future survey and investigations.

Birds

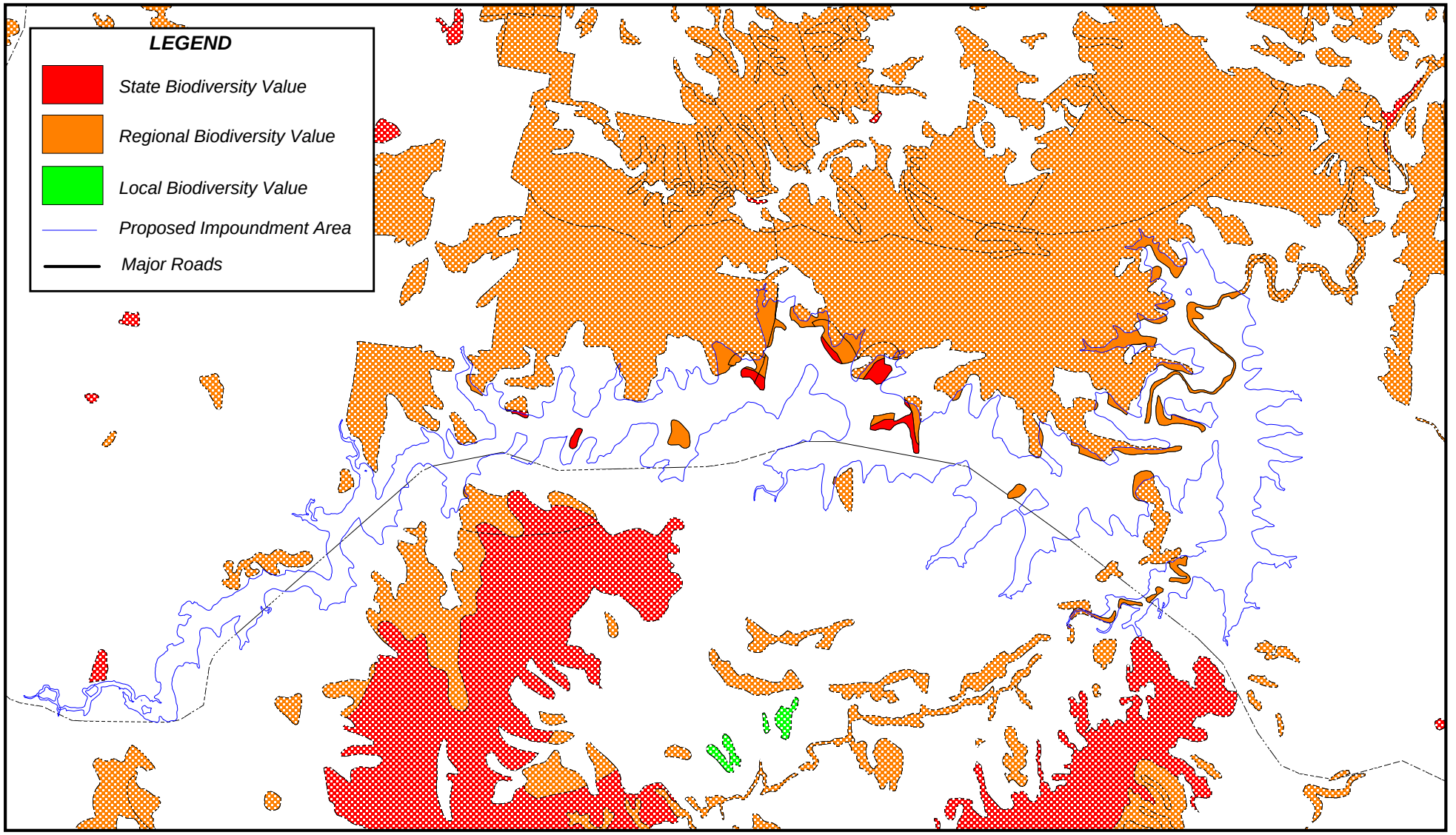
- Black-necked Stork (*Ephippiorhynchus asiaticus*). Permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands.
- Red Goshawk *(Erythrotriorchis radiatus)*. Mainly found along or near watercourses, in swamp forest and woodlands on the coastal plain. Favours patches of dense forest interspersed with open woodland or cleared land.
- Squatter Pigeon *(Geophaps scripta scripta)*. Grassy woodlands and plains, prefers sandy areas usually close to water.
- Swift Parrot *(Lathamus discolour)*. Eucalypt communities.

- Black-throated Finch *(Poephila cincta cincta)*. Eucalypt woodland and riverside vegetation, including paperbark and acacia shrubland.
- Australian Painted Snipe (*Rostratula australis*). Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, low scrub or open woodland.
- Regent Honeyeater (*Xanthomyza phrygia*). Inhabits dry open forest and woodland and riparian forests of River She Oak. Habitats generally have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.

Mammals

- Large-eared Pied Bat (*Chalinolobus dwyeri*). Roosts in caves, crevices in cliffs, frequenting low to mid-elevation dry open forest and woodland.
- Spotted tail Quoll, SE mainland population *(Dasyurus maculatus maculatus*). A range of habitat types, including rainforest, open forest, woodland and inland riparian forest. Use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces.
- Koala, SEQ bioregion (*Phascolarctos cinereus*). Inhabit eucalypt woodlands and forests.
- Grey-headed flying fox (*Pteropus poliocephalus*). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands and swamps.

No areas of essential habitat for threatened species or State Wildlife Corridors have been mapped in the study area. However, the majority of habitats in the study area are considered to have regional biodiversity value because they contribute to north-west bioregional corridors along Teviot Brook (refer **Figure 4-3**).



Biodiversity Planning Assessment Mapping (Qld EPA, 2005) **Figure 4-3**

4.12 Aquatic Ecology

4.12.1 Flora

Riverine habitats occur within and/or adjacent to the impoundment area. DNRMW (2006b) recorded 47 freshwater aquatic macrophyte taxa from stream reaches potentially affected by the proposed Wyaralong, Tilleys Bridge and Glendower Dam sites. Exotic or naturalised taxa comprised >20% known to occur within the assessment reaches, including two declared weeds, water hyacinth (*Eichhornia crassipes*) and salvinia (*Salvinia molesta*). Significant infestations of these two species were not observed during site inspections of the impoundment area in August 2006.

Ribbon weed (*Vallisneria nana*) is the only listed aquatic macrophyte species known to occur in the study area examined by DNRMW (2006b). This species is listed as Rare under the Queensland *Nature Conservation (Wildlife) Regulation 1994* (NCWR), but is reportedly widely distributed and abundant in Southeast Queensland (DNRMW, 2006b).

Approximately 6 ha of floodplain wetlands (RE 12.3.8) have been mapped in the study area (refer **Figure 4-2**). Characteristic species include *Cyperus* spp., *Schoenoplectus* spp., *Philydrum lanuginosum, Eleocharis* spp., *Leersia hexandra, Triglochin procerum, Nymphaea* spp., *Nymphoides indica, Persicaria* spp., *Typha* spp., and *Pennisetum alopecuroides*.

4.12.2 Fauna

Few aquatic invertebrate species are listed under Australian nature conservation legislation (Dunn, 2003), and of those none occur in the Logan River catchment. The iconic Lamington spiny crayfish (*Euastacus sulcatus*) is present in the upper reaches of the Logan/Albert River system, although this species is not considered threatened under Commonwealth or State legislation.

The Australian Lungfish (*Neoceratodus forsteri*) has been stocked in the Albert River catchment, but has not been recorded in catchment waterways despite extensive sampling (reviewed by Pusey *et al.* 2004). The Australian Lungfish is listed as a vulnerable species under the EPBC Act, and is specifically protected under the Queensland *Fisheries Act 1994*. Two other non-indigenous native fish of conservation significance have been stocked in Logan/Albert catchment: Southern Saratoga (*Scleropages leichardti*) and the Silver perch (*Bidyanus bidyanus*). The Australian Society of Fish Biology lists Southern Saratoga as Lower Risk–Near Threatened, and Silver perch as Vulnerable.

Native populations of a cod (*Maccullochella* sp.), possibly Mary River Cod (*Maccullochella peelii mariensis*), were recorded in the Logan and Albert River catchments prior to the 1940's. This species is thought to be extinct in the catchment, and its identity remains unknown (Pusey *et al.,* 2004). Inland and southern Australian populations of Purple-spotted gudgeon (*Mogurnda adspersa*) and Agasizzi's glassfish (*Ambassis agassizii*) have suffered large declines, and in these areas they are considered threatened. The population status in southern Queensland coastal streams remains secure (Pusey *et al.,* 2004), and both are likely to occur in the Teviot Brook system.

Four species of freshwater turtles belonging to the family Chelidae, all of which are indigenous, have been recorded from the Logan/Albert catchment *(Elseya latisternum*, *Chelodina expansa*, *Chelodina longicollis*, *Emydura krefftii*). None of these species are listed as threatened under the NCWR. These species have varying tolerances to habitat modifications associated with water infrastructure.

Platypus (*Ornithorhynchus anatinus)* may utilise pool habitats that occur in the upper sections of the study area. A range of other riverine dependent frog, bird and other reptile species are known or likely to occur in the study area, as discussed in **Section 4.11.2**.

4.13 Coastal and Near-shore Environments

Teviot Brook flows into the Logan River which ultimately discharges into southern Moreton Bay approximately 100 km downstream of the proposed Wyaralong Dam wall. The estuarine reaches of the Logan-Albert River system supports habitats of high ecological, conservation and fisheries values. Particularly notable areas of high environmental value include:

- Moreton Bay wetland, which is listed as an internationally significant wetland under the Ramsar convention. This wetland contains important habitats for local and migratory waterbirds, many of which are listed under the NCWR and/or JAMBA and/or CAMBA international agreements. Furthermore, the wetland contains important habitats for marine and estuarine fisheries species, and megafauna of conservation significance (e.g. dugongs, turtles, dolphins etc.);
- Jumpinpin–Broadwater Fish Habitat Area, which extends from the mouth of the Logan River into southern Moreton Bay and the Broadwater;
- Carbrook Wetland Aggregation in the lower Logan River, which is listed as a wetland of national significance in the Directory of Important Wetlands in Australia (Environment Australia[5], 2001); and
- Queensland EPA has assessed the northern section of the study area (including the estuarine reaches only of the Logan/Albert Rivers) as part of its Environmental Values Projects and identified parts of southern Moreton Bay as being High Ecological Value waters (EPA, 2006).

The EIS should consider the effects of the proposed water infrastructure development on hydraulic, geomorphic, water quality and ecological processes operating in these downstream environments, and impacts to environmental values. Consideration of the effects of reduced freshwater flows and sediment loads, as well as barrier effects, need to be considered. Such an assessment will need to take into account the effects of other proposed water infrastructure, most notably the recently approved Cedar Grove Weir on the Logan River, approximately 12 km downstream of the Wyaralong Dam. An EIS for that project was undertaken in 1998.

[5] Now known as Commonwealth Department of Environment and Heritage

5 POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 Construction Phase Impacts

5.1.1 Workforce and Resources

The exact workforce numbers and their source will be determined once a construction methodology has been finalised and will be provided in the EIS. This is project of significant regional scale so it is expected that most workers will commute from local or regional areas, some on-site or nearby accommodation will be required at different times.

5.1.2 Traffic and Relocation of other Infrastructure

Large sections of the Boonah-Beaudesert Road, as well a number of minor unsealed roads and tracks are situated within the impoundment and/or buffer area of the proposed dam. Road infrastructure will therefore need to be relocated.

A permanent access road to the left bank of the dam site is proposed. It is expected that this access road will meet Undullah Road, approximately 18 km from the Mount Lindsay Highway. This will require the establishment of a road reserve and acquisition of properties, resulting in impact to landowners.

Construction traffic will include:

- hauling of rockfill and concrete aggregate from the quarry site;
- transport of machinery from regional centres or the Greater Brisbane area to the site, via Mount Lindsay Highway and regional road network;
- transport of construction materials to the site; and
- construction workers commuting from local towns such as Beaudesert and Boonah, and surrounding regional centres.

Management measures will be implemented to maintain safe road conditions and minimise disruption and inconvenience to users.

5.1.3 Air and Noise

The impact of noise during construction will be controlled to acceptable levels at noise sensitive places, as outlined in the *Environmental Protection (Noise) Policy 1997*. Noise levels during dam operation phases are not expected to result in disturbance to sensitive noise receptors.

Dust generated during dam construction will be managed following standard operational procedures, including the control of vehicle speeds on haul roads, and use of sprinklers on dirt surfaces. Air quality controls are unlikely to be required during the dam operation stage.

5.1.4 Waste

It is expected that there will be minimal waste generated during construction and operational phases. The waste management hierarchy (reduce, reuse, recycle, dispose) will be used to determine the most appropriate means for managing each waste type produced during construction and operational phases. The proponent and its contractors will hold appropriate waste management licenses.

5.1.5 Water Quality

The proposed works have the potential to impact upon water quality during the construction phase if appropriate management measures are not taken. The most significant potential for adverse impacts to water quality during the construction phase is associated with the possible release of sediments into Teviot Brook via in-stream works or overland flow paths. Other potential pollutants of concern include nutrients, gross pollutants, and the release of fuel, oil and other toxic substances into Teviot Brook.

Under the EP Act, the organisation and all individuals undertaking works must take all reasonable and practicable measures to prevent or minimise environmental harm. Furthermore, the EPP Water, the Queensland Water Quality Guidelines (EPA, 2006) and the Australian and New Zealand Guidelines for Fresh and Marine Waters (ANZECC, 2000) prescribe performance criteria for the management of water quality during construction.

The following measures are recommended to manage potential impacts to water quality during the construction phase:

- schedule works as much as possible to be undertaken during periods of dry weather;
- construct stabilised entry/exit points and access tracks;
- use in-stream sediment barriers to prevent the mobilisation of sediment downstream (e.g. coffer dams, floating silt curtains, staked sediment fences);
- remove sediment from waters prior to discharge downstream (e.g. settle in a sediment pond and/or filter);
- divert clean water upslope of disturbed areas and stockpiles and install sediment fences downstream of disturbed areas and stockpiles;
- develop and instate procedures for the storage and handling of fuel, oil and chemicals to prevent and capture spills (e.g. bunded areas located some distance from flow paths); and
- develop response procedures and corrective actions for spills and non conformances with WQOs.

An EMP will be developed for the construction phase of the project to ensure risks to water quality downstream are managed and statutory obligations are met.

5.1.6 Flora and Fauna

Direct disturbance to flora and fauna during construction will be largely limited to areas immediately adjacent to the dam wall and any access routes to the construction site. The selection of access roads will avoid areas of native vegetation wherever possible. Access routes not required during the operational phase will be reinstated, as will other areas disturbed by dam construction works. The construction works area will be cleared defined and marked, and all works will be confined to this area. Where appropriate, a spotter-catcher will be used to relocate displaced fauna.

Water quality control measures will be employed to reduce the risk of harm to downstream aquatic communities (refer **Section 5.1.5**).

In-stream works will disrupt aquatic fauna movements at the dam wall construction site during the construction phase. These works include controls on downstream flows, diversion works around the dam wall site, and sediment and erosion controls. An EMP will be developed and implemented to minimise risk of harm to aquatic communities (refer **Section 6.1** and **Section 6.3**).

5.1.7 Hazard and Risk

The proposed Wyaralong Dam will be designed and constructed in accordance with relevant Australian Standards.

Other hazards associated with fuels and oils will be managed by strict adherence to relevant legislation, standards and codes of practice.

5.2 Operations Phase Impacts

5.2.1 Soils and Erosion

Soils within the dam development and inundation area and immediate catchment have been identified as mainly shallow and highly erodible with evidence of significant sheet and gully erosion. 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 need to be addressed in the EIS.

Soils within the catchment have also been identified as being erodible with sodic and saline subsoils. The implications of these soils and the effects of associated land uses on the water quality of the stored water will also need to be addressed.

5.2.2 Habitats in Ponded Area

The operation of the dam will result in changes in habitat conditions within the ponded area. The dam will convert existing riverine, riparian, wetland, floodplain and upslope habitats into a lacustrine (lake) habitat within the impoundment. Changes in water quality, geomorphology and other habitat attributes, e.g. aquatic plant cover, riparian vegetation cover and species, permanency of water, loss of snags etc., will occur. Potential impacts associated with habitat changes in the ponded area include:

- loss of terrestrial fauna habitat;
- changes in aquatic macrophyte, plankton, benthic and nektonic invertebrate and fish community structure within the impoundment;
- changes in ecological processes and ecosystem functions within the impoundment area;
- increase in potential habitat for exotic fish species; and
- flow-on effects to upstream and downstream areas due to modified ecosystem functioning.

The magnitude and severity of these impacts will need to be assessed in the EIS.

5.2.3 Groundwater

Groundwater is an important source of water supply in some parts of the Logan River catchment. The proposal will result in changes to flow regimes and this in turn may directly affect the groundwater recharge in downstream areas. Weirs constructed within alluvial areas can cause mounding of the groundwater, which may or may not be desirable, depending on water table behaviour and usage patterns in the vicinity. The EIS will need to fully assess the changes to groundwater flow behaviour near the proposed storages and the impacts of the changes to flow regimes on groundwater recharge.

5.2.4 Flow Regime

The proposed Wyaralong Dam on Teviot Brook would significantly alter the flow regime. This is mainly due to the storage of flow events in Wyaralong Dam and the subsequent supplemented releases from the dam to Cedar Grove Weir. The volume and peak flow for small and medium floods would be considerably reduced with a lesser impact on larger floods (depending on the initial water level in the dam). However, low flows would be elevated, particularly in the drier months, due to the releases to Cedar Grove Weir.

Downstream of Cedar Grove Weir, the proposed water storages and extractions would result in reductions in low and medium flows. Flood flows in the Logan River downstream of Cedar Grove Weir would also reduce. However, there is some potential (albeit minor) for certain flood events to experience a change in the timing of flood peaks from the Logan River tributaries and this may result in increased flood levels in the Logan River.

The EIS will need to fully quantify the expected changes to the flow regime of all potentially affected reaches of the Logan River system. The effects of Wyarlong Dam, Cedar Grove Weir and their operations must conform to the WRP for the catchment. As well, the impact on flood behaviour will need to be fully analysed using hydrological and hydraulic models to quantify impacts to flood levels, timing and duration of inundation. Scenarios with flood events commencing with the proposed storages full and empty will need to be assessed.

Altered flow regimes have the potential to influence aquatic ecosystem functioning in downstream environments. Changes to inflows may result in modified geomorphological and water quality patterns and processes, resulting in changes to aquatic, estuarine and terrestrial communities and ecosystems. Altered flow regimes may also directly affect ecological processes in downstream environments, such as spawning, migration, movements and recruitment patterns of aquatic fauna. Impacts to fisheries and conservation values of downstream environments should therefore be considered.

5.2.5 Water Quality

The Logan Basin Draft WRP Environmental Investigations Report (DNRMW, 2006b) identifies that water quality in the reach between the proposed Wyaralong Dam site and the Logan River confluence would show a very major change from reference conditions (currently moderate) during the operational phase of the project. However, it should be noted that the DNRMW (2006b) study examines the combined effects of Glendower Dam (on Albert River), together with Cedar Grove Weir and Wyaralong Dam, but did not consider the effects of Wyaralong Dam and Cedar Grove Weir in isolation. The present government is not considering the development of the Glendower Dam.

During the operational phase of the project, water quality may be adversely affected both at the dam site and downstream. Potential water quality issues relating to the operation of the dam are outlined below.

- Stratification of the dam, causing large temperature, salinity and pH gradients, anaerobic conditions, increases in available nutrients and other soluble compounds and potentially phytoplankton and/or cyanobacteria blooms. Thermal stratification of the dam will be a key water quality issue to be addressed during the operational phase of the project. Anaerobic conditions adjacent to the bed under stratified conditions can facilitate the release of dissolved (bio-available) nutrients from sediments. Similarly, anaerobic, reducing conditions can facilitate the desorption of metals from sediment. It is noted that elevated levels of copper have been recorded in the area (DNRMW, 2006b), therefore potential also exists for elevated concentrations of copper to be released from sediment into the dam as a result of stratification[6], depending on the nature of the copper source in the catchment (i.e. soluble or particulate bound). To avoid water quality issues related to thermal stratification during the operational phase of the dam, mixing of surface and bottom waters may need to be undertaken during warmer months. This can be achieved through the use of surface aerators or bubble plume systems.

[6] possible issues with laboratory levels of detection for copper versus guideline levels for copper will need to be checked

- More homogenous water quality characteristics (e.g. less variable pH) from the dam site to Cedar Grove Weir, due to permanently ponding water and larger more constant low flows. Fluctuating conductivity currently experienced in Teviot Brook from saline groundwater and upstream surface influences would be drowned out once the dam is constructed, due to permanent pooling of water. Reductions in minor-moderate flood flows downstream of the proposed dam site and larger more constant low flows would also cause water quality downstream of the dam to become more homogenous over time, with loss of seasonal variability and changes in water quality associated with existing flow regimes. Salinity concentrations in water releases downstream of the proposed dam (from surface runoff) would be lower than existing concentrations, which are largely influenced by saline groundwater.
- Fluctuating water levels in the lower reach of Teviot Brook caused by the Cedar Grove Weir operation could also impact on water quality during the operational phase of the project. Large fluctuations in water levels would be detrimental to lower bank vegetation, and could therefore increase the potential for streambank erosion and slumping to occur. This would be further exacerbated by saturated conditions of the banks, occurring as a result of the ponding water storage. Bank erosion and slumping would be detrimental to water quality, increasing sediment inputs and possibly releasing associated pollutants (i.e. nutrients and metals) previously bound to sediment.
- Consideration of the inputs of contaminants from upstream sources needs to be fully considered from both human and ecosystem health perspectives. Unlike most existing dam catchments, the catchment upstream of Wyaralong Dam contains both urban (e.g. sewage and stormwater) and agricultural (e.g. horticulture and intensive agriculture and cattle pastures, dairying and piggeries, etc.) land uses that could represent potential sources of pathogens and contaminants. Future recreational use of the dam (if considered appropriate) and implications for water quality will also need to be considered.

Prior to Wyaralong Dam being constructed, modelling of both catchment and in-storage water quality should be undertaken to identify suitable offtake points or levels to minimise impacts on extracted and downstream water quality. During the operational phase of the project monitoring will need to be undertaken to ensure water quality objectives are met and environmental values are protected in accordance with the EPP Water, the Queensland Water Quality Guidelines (EPA, 2006) and the Australian and New Zealand Guidelines for Fresh and Marine Waters (ANZECC, 2000). Any potential land use controls in the catchment of the dam to maintain water quality will need to be documented in the EIS, including any implications for future land and rural development activity.

5.2.6 Barrier Effects

The construction of a dam on Teviot Brook will disrupt the natural sediment transport process effectively forming a sediment trap. The quiescent nature of waters in the impoundment will allow fine sediments to gradually settle out of suspension, resulting in the accumulation of muddy sediments on the bed of the impoundment area. Flow-on effects to aquatic ecosystem functions and community composition are expected to occur to some degree within the impoundment area as a result of changes in bed sediments and other habitat modifications.

Coarse sediments trapped in the dam will be unavailable to downstream areas, which is likely to result in bed armouring immediately downstream of the dam wall, resulting in changes to benthic flora and fauna communities. The effect of this reduced sediment supply on benthic habitats will diminish with distance from the wall, as sediments from the adjacent lands begin to contribute to sediment loads.

The dam will represent a significant fauna movement barrier. Impacts to aquatic fauna movements will partly be mitigated through the operation of a fish transfer device. However, no fish transfer device allows unimpeded aquatic fauna access at all times both upstream and downstream, therefore some impact is expected. Careful consideration will be given to the design and implementation of the fish transfer device. The likely effectiveness of such a device will need to be addressed in the EIS.

5.3 General

5.3.1 Social and Economic Impacts

The development of Wyaralong Dam is expected to provide benefits to the community and regional economy, particularly during the construction program. It is anticipated that the workforce will primarily be derived from local and regional sources depending on the nature of the skills required. Landholders who suffer direct loss of land will be suitably compensated in accordance with current legislation.

Social benefits mainly have the potential to accrue from the provision of the dam as a critical component in the overall strategy of providing a reliable water supply to the SEQ region. Social issues will be addressed as part of the EIS process and including consultation with the community to identify issues and the development of appropriate means to address these.

Consideration will need to be given to the potential for Wyaralong Dam to become a water based recreational resource. The effects of such uses will be considered in the social context, including implications for other recreational dams in the region, e.g. Moogerah Dam. In addition, issues relating to water quality and on-going management of the impoundment and buffer zone will be considered.

5.3.2 Cultural Heritage

The general study area has been identified as being of cultural heritage significance to the Aboriginal Traditional Owners. Detailed cultural heritage investigations and consultation with indigenous and local/historical groups will be necessary. The duty of care requirements of the ACHA will need to be met as part of the EIS process.

6 ENVIRONMENTAL MANAGEMENT AND MONITORING

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 also below).

The EMP will be developed using EPA guidelines.

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

6.1 Monitoring

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 (refer **Section 4**). 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 2007 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.

6.2 During Design

Environmental flow strategies and conformance with the Logan Basin Draft WRP should be considered during the design phase. This strategy will need to consider the ecological requirements of environmental flow releases, while balancing the socio-economic needs of community.

6.3 During 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.

6.4 During Operation

Operation plans will need to be developed for the management of water releases to minimise the effects on downstream areas and other issues. This plan preparation is a normal procedure for dam operators and is the basis of their ROL which is issued under the WRP.

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.

It is likely that most of the ongoing monitoring commitments will be for a specified time only, with the exception of water quality.

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APPENDIX A: TERRESTRIAL ECOLOGY DATABASE SEARCHES

Table A 2003 Remnant REs of the Study Area

RE	VMA Status	Area (ha)	% of study area	Description	Features
12.3.3	E	21.9	1.4	*Eucalyptus tereticornis* open-forest to woodland. *Eucalyptus crebra* and *E. moluccana* are sometimes present and may be relatively abundant in places, especially on edges of plains and higher level alluvium. Other species that may be present as scattered individuals or clumps include *Angophora subvelutina* or *A. floribunda, Corymbia clarksoniana, C. intermedia, C. tessellaris* and *E. melanophloia*.	Habitat for rare and threatened flora species including occasional *Stemmacantha australis*. While *Eucalyptus tereticornis* remains common in the landscape, very few intact stands remain. *Eucalyptus tereticornis* grows into a very large hollow-forming tree and has a special significance for fauna species, especially in drier areas. The type is variable, ranging from woodland in drier parts to tall open forest in higher rainfall areas and mono-specific to intermixed with other canopy species. *Eucalyptus tereticornis* will regenerate readily but there is a lack of recruitment to replace old trees in stands that are logged, thinned or grazed and regularly burnt. The grasses and herbs associated with intact *Eucalyptus tereticornis* communities also persist in the landscape, so there is a potential for re-establishing the RE and increasing its remnant area.
12.3.7	NC	22.9	1.5	Narrow fringing community of *Eucalyptus tereticornis, Callistemon viminalis, Casuarina cunninghamiana* ± *Waterhousea floribunda*. Other species associated with this RE include *Melaleuca bracteata, M. trichostachya* and *M. fluviatilis* in north of bioregion. *Lomandra hystrix* often present in stream beds. Occurs on Quaternary alluvial plains along watercourses.	Prone to invasions by weeds such as Chinese elm (*Celtis sinensis*), broad leaved pepper tree (*Schinus terebinthifolius*) and cat's claw creeper (*Macfadyena unguis-ca*ti).
12.3.8	OC	6.3	0.4	Characteristic species include *Cyperus* spp., *Schoenoplectus* spp., *Philydrum lanuginosum, Eleocharis* spp., *Leersia hexandra, Triglochin procerum, Nymphaea* spp., *Nymphoides indica, Persicaria* spp., *Typha* spp., and *Pennisetum alopecuroides*. Occurs in freshwater swamps associated with floodplains.	Many shallower seasonal water bodies in the region have been drained or have become silted. Generally too small to map at 1:100 000 scale. Important for water birds and freshwater vertebrates and invertebrates such as tortoises.
12.9-10.2	NC	72.6	4.7	Open-forest or woodland of *Corymbia citriodora*, usually with *Eucalyptus crebra*. Other species such as *Eucalyptus tereticornis* and *Corymbia intermedia* may be present in scattered patches or in low densities. Understorey can be grassy or shrubby. Shrubby understorey of whipstick Lophostemon (supplejack) often present in northern parts of bioregion. Occurs on Cainozoic and Mesozoic sediments.	Habitat for rare and threatened flora species including *Notelaea lloydii*.
12.9-10.7	OC	25.5	1.7	*Eucalyptus crebra, E. tereticornis* ± *Corymbia tessellaris, Angophora* spp., *E. melanophloia* woodland. Occurs on Cainozoic and Mesozoic sediments.	
regrowth	-	0.01	0.0		
non-remnant (cleared)	-	1388.5	90.3		

Table B EPBC and EPA Threatened Flora Species Database Searches

SPECIES / COMMUNITY	COMMON NAME	NC ACT	EPBC ACT	DATA SOURCE
Threatened Ecological Communities				
Brigalow (*Acacia harpophylla* dominant and co-dominant)			E	EPBC
Swamp Tea-tree (*Melaleuca irbyana*) Forest of Southeast Queensland			CE	EPBC
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland			CE	EPBC
Plants				
Acacia acrionastes		R		EPA
Acacia saxicola	Mt. Maroon Wattle	E		EPA
Arthraxon hispidus	Hairy-joint Grass	V	V	EPBC
Arundinella grevillensis		R		EPA
Banksia conferta subsp. Conferta		V		EPA
Bosistoa selwynii	Heart-leaved Bosistoa		V	EPBC
Bosistoa transversa	Three-leaved Bosistoa		V	EPBC
Bulbophyllum globuliforme	Miniature Moss-orchid	R	V	EPBC
Clematis fawcettii		V	V	EPA, EPBC
Comesperma breviflorum		R		EPA
Coopernookia scabridiuscula	Coopernookia	V	V	EPA
Cryptostylis hunteriana	Leafless Tongue-orchid		V	EPBC
Cupaniopsis tomentella	Boonah Tuckeroo	V	V	EPA, EPBC
Eucalyptus michaeliana	Hillgrove Gum	R		EPA
Gahnia insignis		R		EPA
Haloragis exalata subsp. *velutina*		V	V	EPBC
Hibbertia hexandra		R		EPA
Hibbertia monticola	Mountain Guinea Flower	R		EPA
Huperzia varia	Long Club moss	R		EPA
Hydrocharis dubia	Frogbit	V	V	EPBC
Leionema elatius subsp. Beckleri		E		EPA
Marsdenia longiloba		V	V	EPA
Notelaea lloydii		V	V	EPBC
Ozothamnus whitei		R		EPA
Pandorea baileyana	Large-leaved Wonga Vine	R		EPA
Parsonsia tenuis	Slender Silkpod	R		EPA
Plectranthus alloplectus		R		EPA
Pouteria eerwah	Shiny-leaved Condoo	E	E	EPA, EPBC
Pultenaea pycnocephala		R		EPA
Pultenaea whiteana	Mt Barney Bush Pea	R		EPA
Ricinocarpos speciosus		V		EPA
Rulingia salviifolia	Sage-leaved Rulingia	R		EPA
Sophora fraseri		V	V	EPBC
Thelionema grande		R		EPA
Thesium australe	Austral Toadflax, Toadflax	V	V	EPBC
Westringia blakeana		R		EPA
Wahlenbergia scopulicola		R		EPA

Table C EPBC and EPA Threatened Fauna Species Database Searches

SPECIES / COMMUNITY	COMMON NAME	NCA	EPBC ACT	DATA SOURCE	PREFERRED HABITAT
Birds					
Accipiter novaehollandiae	Grey Goshawk	R		EPA	Coastal and subcoastal forest and wooded lands, particularly, rainforest, riparian forest and open forest.
Cyclopsitta diophthalma coxeni	Coxen's Fig Parrot	E	E	EPBC	Dry rainforests and adjacent wetter eucalypt forest. Shows a preference for fig trees, but also feeds on other fruiting rainforest species.
Ephippiorhynchus asiaticus	Black-necked Stork	R		EPA	Permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands.
Erythrotriorchis radiatus	Red Goshawk	E	V	EPBC	Mainly found along or near watercourses, in swamp forest and woodlands on the coastal plain. Favours patches of dense forest interspersed with open woodland or cleared land.
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	EPBC	Grassy woodlands and plains, prefers sandy areas usually close to water
Lathamus discolor	Swift Parrot	E	E	EPBC	Eucalypt communities.
Poephila cincta cincta	Black-throated Finch (southern)	V	E	EPBC	Eucalypt woodland and riverside vegetation, including paperbark and acacia shrubland.
Rostratula australis	Australian Painted Snipe		V	EPBC	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, low scrub or open woodland.
Turnix melanogaster	Black-breasted Button-quail	V	V	EPBC	Prefers drier rainforests and viney scrubs, often in association with Hoop Pine and a deep, moist leaf litter layer.
Xanthomyza phrygia	Regent Honeyeater	E	E	EPBC	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Habitats generally have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.
Frogs					
Mixophyes iteratus	Southern Barred Frog, Giant Barred Frog	E	E	EPBC	Rainforest, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m. Breed around shallow, flowing rocky streams from late spring to summer.
Insects					
Phyllodes imperialis (southern subsp. - ANIC 3333)	a moth			EPBC	Found in undisturbed subtropical rainforest below 600 m.
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	R	V	EPBC	Roosts in caves, crevices in cliffs, frequenting low to mid-elevation dry open forest and woodland.
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	V	E	EPBC	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest. Use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces.
Petrogale penicillata	Brush-tailed Rock-wallaby	V	V	EPA, EPBC	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.
Phascolarctos cinereus (southeast Queensland bioregion)	Koala	V		EPA	Inhabit eucalypt woodlands and forests.
Potorous tridactylus	Long-nosed Potoroo (SE mainland)	V	V	EPBC	Inhabits coastal heaths and dry and wet sclerophyll forests. Habitat characteristics include dense understorey with occasional open areas and sandy loam soil.
Pseudomys oralis	Hastings River Mouse	V	E	EPBC	Inhabits a variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as

SPECIES / COMMUNITY	COMMON NAME	NCA	EPBC ACT	DATA SOURCE	PREFERRED HABITAT
					rocky outcrops.
Pteropus poliocephalus	Grey-headed Flying-fox		V	EPBC	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.
Reptiles					
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	R	V	EPBC	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. Inhabits loose soil, leaf litter and rotting logs.
Delma torquata	Collared Delma	V	V	EPBC	Occurs on rocky hillsides on basalt and lateritic soils supporting open eucalypt and Acacia woodland with a sparse understorey of shrubs and tussocks or semi-evergreen vine thicket.
Furina dunmalli	Dunmall's Snake	V	V	EPBC	Preferred habitat is Brigalow forest and woodland with fallen timber and ground litter, growing on cracking clay soils and clay loam soils.
Migratory Terrestrial Species					
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot		m	EPBC	
Haliaeetus leucogaster	White-bellied Sea-Eagle		m	EPBC	
Hirundapus caudacutus	White-throated Needletail		m	EPBC	
Monarcha melanopsis	Black-faced Monarch		m	EPBC	
Monarcha trivirgatus	Spectacled Monarch		m	EPBC	
Myiagra cyanoleuca	Satin Flycatcher		m	EPBC	
Rhipidura rufifrons	Rufous Fantail		m	EPBC	
Xanthomyza phrygia	Regent Honeyeater		m	EPBC	
Migratory Wetland Species					
Gallinago hardwickii	Latham's Snipe		m	EPBC	
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose		m	EPBC	
Rostratula benghalensis s. lat.	Painted Snipe		m	EPBC	
Listed Marine Species					
Anseranas semipalmata	Magpie Goose		m	EPBC	
Apus pacificus	Fork-tailed Swift		m	EPBC	
Ardea alba	Great Egret, White Egret		m	EPBC	
Ardea ibis	Cattle Egret		m	EPBC	
Gallinago hardwickii	Latham's Snipe, Japanese Snipe		m	EPBC	
Haliaeetus leucogaster	White-bellied Sea-Eagle		m	EPBC	
Hirundapus caudacutus	White-throated Needletail		m	EPBC	
Lathamus discolor	Swift Parrot		m	EPBC	
Merops ornatus	Rainbow Bee-eater		m	EPBC	
Monarcha melanopsis	Black-faced Monarch		m	EPBC	
Monarcha trivirgatus	Spectacled Monarch		m	EPBC	
Myiagra cyanoleuca	Satin Flycatcher		m	EPBC	
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose		m	EPBC	
Rhipidura rufifrons	Rufous Fantail		m	EPBC	
Rostratula benghalensis s. lat.	Painted Snipe		m	EPBC	