Coordinator-General's Report

Wyaralong Dam

Released: 8 October 2008

Queensland the Smart State

Queensland Government
Department of Infrastructure and Planning

Wyaralong Dam

Contents

Coordinator-General's Report: Synopsis

This report has been prepared pursuant to section 35 of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and provides an evaluation of the Environmental Impact Statement (EIS) for the Wyaralong Dam Project ("the Project").

The proponent for the Project is Queensland Water Infrastructure Pty Ltd (QWI). QWI is proposing the development of new water infrastructure to meet expected additional water demands of the South East Queensland (SEQ) region. This Project includes the construction, operation and maintenance of the Wyaralong Dam and the construction and/or relocation of associated road, power, telecommunications and construction water pipeline infrastructure.

The dam site is located on Teviot Brook, at 14.8 kilometres (km) Adopted Middle Thread Distance, upstream of the confluence with the Logan River and 14.2 km northwest of Beaudesert. The dam will have a full supply level (FSL) of 63.6 metres (m) Australian Height Datum. At this FSL, the dam will provide a storage capacity of approximately 103 000 megalitres (ML). The dam embankment wall length will be approximately 500 m with a height of 47 m or 48 m, depending on which dam type option is chosen. Three dam types are under consideration, being Earth and Rockfill Dam, Concrete-Faced Rockfill Dam and Roller Compacted Concrete Dam.

The dam will operate in conjunction with the Cedar Grove Weir on the Logan River to provide a supply capacity of up to 21 000 ML per annum.

Development of the Project is in line with key government strategic commitments as described in *Water for South East Queensland: A long term solution* (2006) and the *South East Queensland Regional Water Supply Strategy: Stage 2 Interim Report* (2005).

As an 'emergency measure' under the *Water Regulation 2002*, made under the *Water Act 2000 (Qld)*, the Project's completion date and yield are mandated, which acknowledges the Project's significance in contributing to the adequacy of water supply for the SEQ region. The Regulation also designated QWI as service provider for the Wyaralong Dam.

On 19 September 2006, QWI lodged an Initial Advice Statement for the Project. On 20 October 2006, the Project was declared a 'significant project for which an EIS is required', pursuant to section 26(1)(a) of the SDPWO Act.

On 13 December 2006, the delegate of the then Commonwealth Minister for the Environment and Heritage determined that the Project was a 'controlled action' under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions of part 3 division 1 of the EPBC Act that apply to the Project are:

- sections 16 and 17B (Ramsar wetlands);
- sections 18 and 18A (listed threatened species and ecological communities); and
- sections 20 and 20A (listed migratory species).

The EIS process to be conducted under the SDPWO Act is accredited under the Bilateral Agreement between the Australian and Queensland Governments. The EIS therefore requires assessment by both levels of government and the Project will require approval from the Commonwealth Minister for the Environment, Heritage and the Arts under part 9 of the EPBC Act before it can proceed.

The public notification period for the EIS for the Project was from 7 November 2007 to 12 December 2007. On 21 December 2007 I provided QWI all the submissions received and requested QWI to prepare a Supplementary Report to the EIS (SREIS) to respond to the submissions. The SREIS was provided by QWI on 14 May 2008.

This evaluation report has been prepared pursuant to section 35 of the SDPWO Act to evaluate the environmental effects of the Project.

In evaluating the environmental effects, I have considered: the EIS, the SREIS, all properly made submissions and other submissions accepted about the EIS, advice provided by Commonwealth, State and local government authorities (advisory agencies), and other relevant information.

Having regard to the above, I consider that the EIS process has adequately addressed the environmental and other impacts of the Project and meets the requirements of the Queensland Government for impact assessment in accordance with the provisions of part 4 of the SDPWO Act and part 5 of the SDPWO Regulation.

I am satisfied that the EIS process has provided sufficient information to allow a thorough evaluation of the environmental impacts that may be caused by the Project and to enable me to recommend that the Project proceed, subject to the conditions in Appendix 1.

Therefore, I recommend that the Project, as described in the EIS and SREIS proceed in accordance with the conditions in Appendix 1, the proponent's commitments in Appendix 2 and my recommendations as made throughout this report and consolidated in section 5 of this report. The conditions that I have imposed address potential impacts from the Project including those relating to Ramsar wetlands, traffic, erosion and sediment, water quality and flow, aquatic and terrestrial flora and fauna, amenity (e.g. noise, dust, air, visual), cultural heritage, land use and safety. The conditions that I have imposed require ongoing reporting of compliance with the environmental management plans, conditions and the proponent's commitments. This reporting must be undertaken by an independent and appropriately qualified person, throughout the construction phase and for the first 5 years of the operation phase.

This report will now be provided to the Commonwealth Minister for the Environment, Heritage and the Arts, pursuant to section 17(2) of the SDPWO Regulation, to enable a decision on approval of the controlled action for this Project pursuant to section 133 of the EPBC Act.

A copy of this report will be provided to the proponent and advisory agencies and will be made publicly available on the Department of Infrastructure and Planning website, at www.dip.qld.gov.au/projects/water.

I would like to take this opportunity to thank all individuals, organisations and advisory agencies that have contributed to the EIS process by providing submissions on the Terms of Reference and the EIS. This input has contributed to the development of appropriate and reasonable conditions that are to apply to the Project to ensure best practice. I would particularly like to thank advisory agencies for their responses to my requests for advice and input, which has assisted the completion of this report.

Colin Jensen
Coordinator-General
Director-General

7 October 2008

1. Introduction

1.1. The proponent

The proponent for the Wyaralong Dam Project (the Project) is Queensland Water Infrastructure Pty Ltd (QWI). The Queensland Government established QWI in June 2006 as the entity responsible for developing specific new water infrastructure, including the Project, the Cedar Grove Weir, Bromelton Off-stream Storage and the proposed Traveston Crossing Dam on the Mary River.

I note that it is possible that the ownership of the Project will change in the future. Under the *State Development and Public Works Organisation Act 1971* (SDPWO Act), the term "proponent" includes a person who under an agreement or other arrangement becomes the proponent of the project, for example, during the operational phase of the project. In the case that the proponent changes, this Coordinator-General's Report (the report), including conditions, will continue to apply to the new proponent (i.e. the owner of the Project).

1.2. Project description

The Project is the design, construction, operation and maintenance of the Wyaralong Dam on Teviot Brook, a tributary of the Logan River, in South East Queensland (SEQ), and associated infrastructure. The Project is wholly within the Scenic Rim Regional Council (SRRC) local government area (LGA), and is located approximately 51 kilometres (km) south-west of Brisbane and 14.2 km north-west of Beaudesert. The dam wall is approximately 22 km east-north-east of Boonah, while the upstream limit of storage is approximately 7.5 km north-east of Boonah. The total area of the Teviot Brook catchment is 690 km^2. The Wyaralong Dam catchment area is 546 km^2.

The dam will have a full supply level (FSL) of 63.6 metres (m) Australian Height Datum (AHD) and a reservoir area of 1230 hectares (ha). At this FSL, the dam will have a storage capacity of approximately 103 000 megalitres (ML). The dam embankment wall length will be approximately 500m with a height of 47 m or 48 m, depending on which dam type option is constructed. Preliminary designs have been developed, with the three dam types that are under consideration being Earth and Rockfill Dam (E & R Dam), Concrete-Faced Rockfill Dam (CFR Dam) and Roller Compacted Concrete Dam (RCC Dam). The dam will operate in conjunction with the Cedar Grove Weir on the Logan River to provide a supply capacity of up to 21 000 ML per annum (ML/a). Water from Wyaralong Dam will be released down Teviot Brook to Cedar Grove Weir, where it will be extracted, treated, and transported into the SEQ Water Grid.

The Project is described in further detail in the Environmental Impact Statement (EIS) issued in October 2007. Subsequent stakeholder consultation and engineering studies refined the description of the Project components, resulting in the arrangements presented in the SREIS document, in particular the detail of a temporary water pipeline from the Bromelton Off-stream Storage to the Project site for supply of construction water.

The map presented as Figure 1 in Appendix 3 shows the location of the Project and its components.

The Project includes the following major components and all associated works:

- constructing, operating and maintaining a new dam with spillway and fish transfer system;
- realigning sections of the Beaudesert-Boonah Road;
- constructing a permanent access road to the dam site from the Beaudesert-Boonah Road;
- construction of a temporary construction water pipeline;

- relocation of local government roads;
- relocation of local power and telecommunications infrastructure;
- relocation of other impacted local infrastructure including private infrastructure; and
- impact mitigation measures and offsets (e.g. vegetation management offsets and revegetation activities).

In order to meet the requirements of the *Water Regulation 2002*, schedule 10B, the proponent intends to commence initial construction works as soon as practicable following all necessary approvals being acquired. The *Water Regulation 2002* requires construction to be completed by 31 December 2011.

The initial construction works will involve the establishment of site offices, medical facilities, ablution and amenities facilities, wastewater and sewerage treatment plant, machinery and personnel car parking areas, refuelling and maintenance areas, haul roads, concrete batching plant, materials storage facilities, security fencing, work site power and telecommunications infrastructure, as well as construction of temporary water storage dams and related clearing of vegetation.

I understand that this site establishment work is programmed to occur in the first quarter of 2009, subject to necessary approvals. In addition, initial construction works include construction of the dam access road and the construction of the Beaudesert-Boonah Road relocation. I understand that the proponent is seeking to substantially complete these initial construction works before the commencement of the balance of the Project Works, particularly dam wall construction within the banks of the Teviot Brook (programmed for 2009).

The proponent indicates that works will generally be based on one shift operation. However, there is a possibility that certain dam construction techniques will require continuous construction.

1.3. Rationale for the Project

The Rationale for the Project is described in section 2.1 and 2.2 of the EIS. The EIS describes the Wyaralong Dam as being needed as part of a portfolio of projects to overcome a shortfall in the supply of water to SEQ.

The development of the EIS considered relevant national, state, regional and local planning and policy frameworks, including the:

- *National Water Initiative*
- *Water Act 2000*
- *Water Regulation 2002*
- *Water Resource (Logan Basin) Plan 2007*
- *South East Queensland Regional Water Supply Strategy*
- *Water for South East Queensland: A long term solution*
- *South East Queensland Regional Plan*
- *South East Queensland Infrastructure Plan and Program.*

The Project within the context of these frameworks is described in section 2.1 of the EIS.

The development of the "Water for SEQ: A long term solution" report was a key milestone in identifying the need for the Project and providing baseline information to the EIS. This report documented the current demand for water in SEQ, the future demand for water in SEQ, the current and expected future supplies within the region, and provided an analysis of the demand-supply gap and a discussion as to how best to bridge this gap.

The outcome of the analysis within the "Water for SEQ: A long term solution" report was an integrated water demand and supply strategy including the Project. Under this and other strategies, the government is now implementing major initiatives, which collectively recognise the importance of:

- demand reduction approaches;

- recycling to industry and for indirect potable reuse;
- water use efficiency measures through implementation of the water grid and pressure and leakage reduction programs;
- non-climate dependent forms of supply through desalination; and
- enhanced groundwater and surface water supplies as part of the strategy.

A number of submissions on the EIS have questioned the rationale for the Project on the basis of:

- consistency with the National Water Initiative;
- consideration of the Water Resource (Logan Basin) Plan 2007 (WRP);
- consistency with the draft SEQ Water Strategy;
- consideration of the principles of Ecologically Sustainable Development (ESD);
- the possibility of using population limits to reduce resource requirements; and
- the appropriateness of the Queensland government response to the water supplyshortfall including the adequacy of the analysis of the do-nothing option.

In relation to these matters, I note that an analysis of the Project's compatibility with National Water Initiative (NWI) clauses 23, (iv), 69, 70 and 71 has been undertaken within the Supplementary Report to the Environmental Impact Statement (SREIS). The analysis confirms consistency with the principles enunciated in these clauses and I am satisfied the requirements of these components of the NWI have been appropriately considered. I also note that consistent with the NWI, any regulatory approvals for water use and works required for the Project must be in accordance with the WRP.

I further note that the Queensland Water Commission (QWC) strategy development process, involving various publications culminating in the 2008 publication of the draft South East Queensland Water Strategy, has confirmed the necessary supply contributions of existing and committed infrastructure, including the expected yield from Wyaralong dam.

In addition, the Terms of Reference (ToR) for the Environmental Impact Statement (EIS) required the consideration of principles of ESD and I am satisfied that the EIS and the SREIS adequately consider the principles of ESD including:

- integration with long and short term decision making strategies;
- issues of intergenerational equity;
- conservation of biodiversity and ecological integrity; and
- mechanisms to improve the valuation and pricing in the context of water use.

In summary, I consider the need for additional water supply sources for SEQ are justified on the basis of the following:

- the supply shortfall is real and significant even after a prudent allowance for the implementation of demand management strategies;
- the impact of not addressing the supply shortfall would be socially and economically unacceptable, eliminating the do-nothing option; and
- there is no available or generally acceptable policy mechanism to achieve the restriction of population growth in the region.

1.4. Alternatives

The EIS examined additional water supply options in two parts. First, the alternatives to additional surface water supply were considered; and second, the alternative locations of surface water supply options were examined.

I consider that the draft SEQ Water Strategy demonstrates the appropriateness of a mixed portfolio strategy to satisfy the SEQ region's water supply needs.

I accept that the strategy considered a range of alternative supply options and appropriate proportions of each supply option, while noting that the community has varied views of the preferred mix of measures. I consider the portfolio supply approach adopted under the

strategy satisfactorily reduces the risk of failure resulting from the current narrow supply basis, both from the geographic location of the source and the method of supply perspective, and as such additional surface water supplies are considered a necessary component of the portfolio approach to required new supplies.

In this context, one of the key criteria in achieving a balance between water supply and demand is availability of a reliable volume. The QWC's approach essentially assessed the contribution that could reasonably be achieved with each proposed option, then to select for further consideration the projects with the best potential to contribute a reliable volume of water to address the overall water supply shortfall.

Alternatives to the Project were examined in the EIS and were excluded on the basis of providing insufficient volume or providing an unacceptable change to the planned level of diversification of the water supply mix.

Identified shortcomings in the EIS with proposed alternatives to the Project in bridging the water supply gap included:

- **Recycling** – the current government strategy includes a new network of advanced recycled water plants to utilise the largest sources of available recyclable water to supplement supplies. Additional recycling from smaller sources is relatively more expensive and subject to high process losses of up to 20%. These losses are significant, especially in an extended drought period when the volume of effluent supply to recycling plants is reduced.
- **Groundwater** - the bulk of groundwater in SEQ is mostly contained in the sand mass areas, either on islands or in localised onshore areas. Most of these are in national parks and border marine parks and/or Ramsar wetlands or, in the case of the Cooloola sand mass, a World Heritage Area (Fraser Island). The environmental impacts are currently acknowledged as potentially significant and there is a great deal of uncertainty in the potential yield of these aquifers, particularly given the current extended period of drought.
- **Demand Management** - the target residential consumption of 230 L/person/d by 2020 (without water restrictions), if achieved, would put SEQ ahead of other major cities in Australia, including Sydney, Melbourne, Adelaide and Perth. The current forecasting of demand by the government is based on a high savings scenario and it is considered any further savings from this scenario may prove unrealistic in the longer term.
- **Rainwater Tanks** - a significant contribution from rainwater tanks has already been included in the government's strategy and the calculations of required supply. It is not practical to consider any more substantial contribution from rainwater tanks due to the relatively high cost per megalitre, limitations on use of the water and the inevitable need for a reticulated supply to provide the resource security that the small tanks in urban areas cannot provide.
- **Desalination** - the current government strategy includes a desalination plant at Tugun providing 45 000 ML/a compared to the 210 000 ML/a required in SEQ by 2026. This is a significant contribution and along with demand management and recycling initiatives provides a major, relatively climate independent component to the supply portfolio. The draft SEQ Water Strategy identifies further reliance on desalination as a key supply source for the future. This is an appropriate approach once other less expensive sources are exploited and provides an opportunity for the cost of desalination to reduce as the technology matures.

In summary, the Queensland Government strategy is to provide at least 210 000 ML/a of additional supply by 2026; in addition to the savings made by demand reduction and water use efficiency.

The strategy further aims to develop a supply buffer of up to 50 000 ML/a to provide security in case those latter water efficiency initiatives do not provide the savings necessary, or if the worst-case predictions of climate change and increased climatic variability eventuates in further significant drought events.

I note that the approximate contribution of the various components of the strategy in meeting demand in 2026 will consist of 51% by existing supplies, 18% through demand management, 16% by desalination and recycling together and 15% by new surface water supplies.

I agree with the findings of the EIS that the SEQ strategy for achieving a water supply balance does not represent an unwarranted reliance on surface water options.

In examining the alternative surface water supply options to service the SEQ region, the EIS considered:

- **Dam Sites in SEQ-** EIS investigations determined that the Logan and Mary River systems were likely to present opportunities for the construction of additional water storages that could make appreciable contributions to meeting the need for water within the region.

  Statutory water resource planning undertaken in these systems identified available reserves of 50 000 ML/a for the Logan catchment and 150 000 ML/a for the Mary catchment.

  Options for surface water supply in the Logan catchment considered in the EIS included:

  - Wyaralong Dam on Teviot Brook; and
  - Tilly's Bridge on the Logan River.

- **Water Harvesting to Moogerah Dam -** Each water harvesting option investigated as part of the EIS was shown to have fatal flaws in terms of hydraulic performance ruling them out from further consideration. These fatal flaws included:

  - location of water harvesting and diversion infrastructure in the vicinity of Boonah, which reduced the amount of available catchment by 33%. This 33% reduction includes the lower Wyaralong catchment, which makes an appreciable contribution to stream discharge therefore significantly reducing available yield;
  - diversion from Boonah to Moogerah Dam requires a lift of some 70 metres (m) resulting in high energy demand; and
  - high stream flows in Teviot Brook are of a short duration, requiring installation of prohibitively expensive flow/diversion infrastructure.

- **Dams in northern New South Wales (NSW) -** Storage and distribution schemes from the northern NSW rivers were investigated (EIS section 2.3.2.3). None of the northern NSW options evaluated provided prudent alternatives to the Project within an acceptable timeframe.

A number of submissions on the EIS raised questions regarding the assumptions and methods of the various studies used to justify the selection of the Wyaralong Dam over alternative supply options, including those relating to:

- yield estimates used to support the justification, inclusive of the ability of the Project to meet its stated yield;
- use of portfolio approach;
- lack of emphasis on costs per yield estimates ;
- Project construction cost estimates;
- appropriateness of the selected site versus Tilley's Bridge;
- off-stream storage as an alternative; and
- impacts resulting from the facilitation of growth in the region.

It is noted that a significant number of interrelated issues about the potential yield of the Project were raised in response to the EIS.

In response, the proponent highlighted that the WRP was finalised on 2 March 2007 and, as required under the *Water Act 2000*, sets out the environmental flow and water allocation security objectives, which must be considered when assessing new water resource developments.

I note that the Logan WRP, which was finalised in March 2007, was prepared by the Department of Natural Resources and Water (DNRW) through a rigorous process of public consultation, data collection and calibration over a number of years, in combination with the use of the Integrated Quantity Quality Model (IQQM). IQQM forms the basis for all statutory WRP modelling in Queensland.

The WRP provides a strategic framework for the management of water resources within a nominated area by specifying environmental flow objectives (EFOs) and water allocation and security objectives (WASOs) that are intended to achieve the outcomes in the plan.

The hydrology of the Logan River system is discussed in detail in chapter 6 of the EIS and chapter 5 of the SREIS. A focus of the discussion is the ability of the Project to deliver its stated yield.

The analysis presented shows the addition of the Project, and its operation in conjunction with other existing water storages, ensures that the supply at Cedar Grove Weir is reliably increased from 3000 ML/a to 21 000 ML/a. Further, the addition of Bromelton Off-stream Storage (BOS) increases the system yield to 26 000 ML/a. In terms of Wyaralong Dam's contribution to SEQ water supplies, the Project is most appropriately considered in conjunction with Cedar Grove Weir.

The SREIS notes that the proposed operation of the Wyaralong Dam as part of the Logan Basin system is consistent with the way the system will be operated by the SEQ Grid Manager.

I consider that the approach taken, based on satisfying the requirements of the WRP, and consistent with the SEQ Grid Manager's intent for whole-of-system water grid operation has been appropriate in demonstrating the ability of the Logan catchment to provide the Project's targeted yield. On this basis, I am satisfied appropriate consideration has been given to the Project's ability to achieve its stated yield.

A number of submissions about the EIS queried the methodology, including the portfolio approach, comparison of alternatives, and the apparent lack of a stand-alone cost analysis for the Project.

Section 2.3 of the EIS, compared the Project against other alternatives from a number of perspectives, including on a stand-alone basis, and as part of a portfolio with the proposed Traveston Crossing Dam outlined in the draft SEQ Water Strategy.

The portfolio modelling approach included whole-of-life costs for a series of supply augmentation options over a timeframe of 50 years and concluded that the Wyaralong Dam was a significantly lower cost option than the next best alternative involving Glendower Dam.

I note that the draft SEQ Water Strategy, the most contemporary water planning document in SEQ, uses a similar portfolio approach to assess potential water supply options to meet demand to 2056, over and above the government's committed infrastructure program. On this basis, I consider the use of the portfolio assessment approach to be valid and consistent with contemporary methodologies.

On a stand alone basis the Project compares favourably with most alternatives on a simple cost/ML basis, however it is not the best alternative on this one measure. I concur with the proponent that this measure is just one indicator, which has numerous limitations and needs to be considered in the context of non economic factors. Alternatives that have better ratings in relation to the cost/ML indicator are discounted by the proponent on other non-economic grounds (e.g. social, environmental management) which I consider reasonable.

Some submitters questioned the veracity of the cost estimate presented in the EIS. Section 5.2.4 of the SREIS presents a discussion responding to the development of the cost estimate for the Project, and I note that this discussion includes comments from an independent Expert Review Panel supportive of the process used to determine the costs of the Project.

Several submitters have queried the choice of the Wyaralong Dam over the Tilley's Bridge alternative. In a direct comparison of Tilley's Bridge to the Wyaralong Dam, it would appear the Tilley's Bridge site would have provided a greater yield, which supported its inclusion for further investigation during consideration of the project elements of the SEQ Water Grid.

The Tilley's Bridge option, as explained in the EIS and SREIS (e.g. section 5.2.3), was rejected in favour of the Project due to the greater disruption to the community involved and higher potential ecological impacts.

It is indicated that the construction of a dam at Tilley's Bridge would have required the purchase of approximately 95 private landholdings and the relocation of several sections of the Mount Lindesay Highway and sections of the Rathdowney to Boonah Road. Major impacts on business and industry in the towns of Rathdowney, Beaudesert and Palen Creek were also anticipated as a result of construction of a dam at Tilley's Bridge.

A submission raised the alternative supply option of building one or several off-stream storages instead of the Wyaralong Dam. In response, the proponent has provided additional analysis of the best potential off-stream storages at Appendix E of the SREIS.

In summary, investigation of off-stream storage options found they could not achieve the QWC's requirements for reliable yield for urban customers.

Investigation of an off-stream storage option at the proposed Glendower Dam site concluded an off-stream storage could achieve an additional volume of 4000 ML/a if operated in conjunction with Cedar Grove Weir and the Maroon Dam. However, this volume is insufficient to replace the volume available from the Project, as well as being identified as having adverse environmental impacts on the relatively undeveloped Albert River.

Further, the analysis revealed that the option of building several off-stream storages to delay the construction of the Wyaralong Dam would result in the EFOs outlined in the Logan WRP not being met.

A submission raised the issue that the provision of additional water supplies for urban communities in SEQ will lead to additional development and a higher population being sustained. Further, to the extent that growth is currently constrained by the water supply in the region, the additional capacity could be considered likely to result in further pollutant loads in the catchment of the Ramsar wetlands site.

While new water infrastructure is developed to meet the needs of economic and population growth in SEQ, in a period of drought and climate variability, the consequences of such growth is likely to result in increased nutrient loads to the sewerage systems and sewage treatment plants in SEQ.

It is the efficacy of sewage treatment plants that will determine impacts to downstream areas, not the water sources, including dams, used by the population that will create the impact.

I concur with the proponent that it is widely accepted practice that the most appropriate and effective place to mitigate the potential impacts of population growth on receiving waters is at the sewerage system and sewage treatment plant level. While it is a matter for government policy, it is likely that future sewerage system and sewage treatment plant capacity upgrade requirements will address the effects on receiving water. In this regard, it is perhaps notable that the nutrient load deposited within SEQ receiving waters will be substantially reduced by the draft SEQ Water Strategy, due to the inclusion of three advanced water treatment plants, plus waste water treatment plant improvements, such as Boonah as discussed in section 3.2.4 of this report.

I consider the analysis of project rationale and alternatives for the EIS has discussed and used appropriate levels of industry expertise and associated methodologies, underpinned by water supply planning processes, which have been progressed for over a decade. I also note that scientific rigour has been applied to determining the comparative merits of the various additional water supply options examined.

In summary, enhancement of surface water supply from new sources, including the Project, represents a prudent new component of a diversified water strategy for SEQ.

2. The impact assessment process

2.1. Commonwealth impact assessment

On 17 November 2006 the proponent referred the Project to the then Commonwealth Minister for the Environment and Heritage (reference 2006/3157) for a decision on whether the Project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 13 December 2006, the Minister for the Environment and Heritage determined that the Project is a 'controlled action' section 75 of the EPBC Act.

The controlling provisions of part 3, division 1 of the EPBC Act for the proposed action are:

- sections 16 and 17B (Ramsar wetlands);
- sections 18 and 18A (listed threatened species and ecological communities); and
- sections 20 and 20A (listed migratory species).

Under the Bilateral Agreement between the Australian Government and the State of Queensland made under section 45 of the EPBC Act, if a controlled action is a Significant Project for which an EIS is required under the SDPWO Act (see section 2.2 of this report), then the project does not require assessment under part 8 of the EPBC Act. Under part 4 of the SDPWO Act and the SDPWO Regulation, the Coordinator-General, in preparing his assessment report, must ensure the report assesses all relevant impacts that the action has, will have or is likely to have and provides enough information about the action and its relevant impacts to allow the Commonwealth Environment Minister to make an informed decision whether or not to approve the action under the EPBC Act.

2.2. State impact assessment

On 20 October 2006, the Coordinator-General declared the Project to be a 'significant project for which an EIS is required', pursuant to section 26(1) (a) of the SDPWO Act.

Section 35(3) of the SDPWO Act requires the Coordinator-General to prepare a report evaluating the EIS, for a Significant Project for which an EIS is required. Under section 35(1) of the SDPWO Act, after the end of the EIS submission period, the Coordinator-General must consider the EIS, all properly made and other submissions accepted by the Coordinator-General about the EIS, and any other material the Coordinator-General considers is relevant to the Project.

The objective of this report is to evaluate the environmental effects of the Project and any other related matters. It summarises the key issues associated with the potential impacts of the Project on the physical, social and economic environments at the local, regional, state and national levels. It is not intended to record all the matters, which were identified and subsequently settled. Instead, it concentrates on the substantive issues identified during the EIS process.

This Coordinator-General's Report may state conditions under section 39, 45, 47C, 49 or 49B of the SDPWO Act, may make recommendations under section 43 or 52 of the Act and impose conditions under Part 4, Division 8 of the Act, for the undertaking of the Project.

On completion of the Coordinator-General's report, a copy is provided to the proponent and publicly notified on the Coordinator-General's website. The notification of this report and its provision to the Commonwealth Minister for the Environment, Heritage and the Arts completes the assessment process under the SDPWO Act.

2.3. Terms of reference for the EIS

An Initial Advice Statement was released for public information and the Draft ToR were advertised for public and agency review and comment on 13 January 2007 by the Coordinator-General. Comments were accepted until close of business on 26 February 2007. A total of 31 submissions were received and considered with comments incorporated into the final ToR which was released on 5 June 2007. Comments on the ToR were received from two organisations and community groups, nine members of the public and the following agencies[1]:

- Department of Communities
- Department of Primary Industries and Fisheries
- Department of Natural Resource and Water
- Department of Mines and Energy
- Department of Tourism, Fair Trading and Wine Industry Development
- Department of Emergency Services
- Department of Main Roads
- Department of Local Government, Planning, Sports and Recreation
- Department of Housing
- Queensland Health
- Department of Public Works
- Department of Education, Training and the Arts
- Department of State Development
- Department of Employment and Industrial Relations
- Queensland Transport
- Queensland Treasury
- Environmental Protection Agency
- Queensland Police Service
- Boonah Shire Council
- Commonwealth Department of the Environment, Water, Heritage and the Arts.

The final ToR was issued to the proponent on 5 June 2007.

2.4. Public notification and submissions

An EIS was prepared by the proponent and was advertised on Saturday 10 November 2007 in newspapers circulating in the local area, the State and nationally. The EIS was also provided to advisory agencies. The Coordinator-General invited the public and advisory agencies to provide submissions on the EIS from 7 November 2007 until close of business on 12 December 2007.

Printed copies of the EIS were available for purchase from the proponent at a cost of $100 for Volume 1 and 2 of the EIS and Volume 3 and 4 of the Appendices and $200 for Volume 5 and 6 containing supplementary technical reports. Alternatively a CD-Rom copy of the EIS and technical reports was available free of charge from the proponent. The EIS, appendices and supplementary technical reports and other information on the Project was uploaded onto the QWI and Coordinator-General's websites on 7 November 2007 for download by the public.

The hard copy of the six-volume EIS was displayed at 13 community locations. General consultation was undertaken using methods such as agency briefings, distribution of community newsletters and public information days. In summary, this consultation included:

- an Information Day on 17 November 2007 at Boonah to publicise the EIS to the community and invite submissions. Some 27 people attended;
- a freecall 1800 number provided by QWI.

[1] Note that due to Machinery of Government changes and council amalgamations, subsequent to events described in this report, some agencies' names now differ.

- a Project Update distributed to approximately 14 000 stakeholders in November 2008;
- 518 electronic copies of the EIS distributed on CD Rom;
- 1010 copies of a summary of the EIS were distributed by the proponent;
- fourteen advertisements by QWI in publications across the region, including the Courier Mail, between 7 and 16 November 2007, stating how to obtain a copy of the EIS, submission contact details and timings for Information Days;
- seven advertisements in State, national and local newspapers by the Coordinator-General, between 3 and 21 November 2007 stating the submission timeframe, contact details and where EIS copies were available;
- a freecall 1800 number provided by the Coordinator-General;and
- hard copies of the EIS were delivered to and displayed at the following locations on 7 November 2007:

    - Beaudesert Shire Council, 82 Brisbane St, Beaudesert
    - Beaudesert Shire Council, 18-22 Honora St, Jimboomba
    - Beaudesert Shire Council, Cnr Yuulong Rd & Main St, Tamborine
    - Beaudesert Library, 58 Brisbane St, Beaudesert
    - Beenleigh State Development Centre, 96 George St, Beenleigh
    - Boonah Shire Council, 70 High St, Boonah
    - Canungra Library, 12 Kidston St, Canungra
    - Fassifern Community Centre, 4 Little High St, Boonah
    - Ipswich City Council, 45 Roderick St, Ipswich
    - Ipswich State Development Centre, 26 East St, Ipswich
    - Jimboomba Library, 18-22 Honora St, Jimboomba
    - Logan City Council, 150 Wembley Rd, Logan Central
    - State Library of Queensland, Stanley Place, South Bank

The following Advisory Agencies were given copies of the EIS for review:

- Department of Education, Training and the Arts
- Department of Communities
- Department of Mines and Energy
- Department of Primary Industries and Fisheries
- Department of Natural Resources and Water
- Department of Emergency Services
- Department of Main Roads
- Department of Tourism, Regional Development and Industry
- Department of Local Government, Sport and Recreation
- Department of Housing
- Queensland Health
- Queensland Transport
- Environmental Protection Agency
- Queensland Police Service
- Department of Employment and Industrial Relations
- Queensland Treasury
- Department of Public Works
- Community Futures Taskforce
- Beaudesert Shire Council[2]
- Boonah Shire Council[3]
- Department of the Environment, Water, Heritage and the Arts

[2] Beaudesert and Boonah Shire Councils were amalgamated to form the Scenic Rim Regional Council in March 2008.
[3] Beaudesert and Boonah Shire Councils were amalgamated to form the Scenic Rim Regional Council in March 2008.

2.5. Submissions received

A total of 31 submissions to the EIS were received by the Coordinator-General during the public review period. Private submitters have not been named to protect their privacy. Submissions were received from the following:

Submitter	**Submissions**
Government (state and local) advisory agencies: • Department of Education, Training and the Arts • Department of Communities • Department of Mines and Energy • Department of Primary Industries and Fisheries • Department of Natural Resources and Water • Department of Emergency Services • Department of Main Roads • Department of Tourism, Regional Development and Industry • Department of Local Government, Sport and Recreation • Department of Housing • Queensland Health • Queensland Transport • Environmental Protection Agency • Queensland Police Service • Beaudesert Shire Council [4] • Boonah Shire Council [5]	16
Community, environmental, political organisations including the Community Futures Taskforce, Logan Albert Catchment Association and the Boonah Shire River Improvement Trust	6
Other local government: • Logan City Council	1
Private individuals or companies	8
Total	**31**

Advice was also received from the Department of the Environment, Water, Heritage and the Arts.

Issues raised in all the submissions were considered by the Coordinator-General. I consider that the key issues in submissions included:

- project rationale and definition including impacts of climate change, worst case scenario, more urban development, the prudent take of the dam, the cost of the Project, the cost/benefit analysis of the Project;
- analysis of alternatives including the no-dam scenario and comparison of the Project to other potential water supply options;
- loss of Good Quality Agricultural Land (GQAL);

[4] Beaudesert and Boonah Shire Councils were amalgamated to form the Scenic Rim Regional Council in March 2008.
[5] Beaudesert and Boonah Shire Councils were amalgamated to form the Scenic Rim Regional Council in March 2008.

- interactions with the Bromelton State Development Area (SDA);
- contaminated land management;
- conservation land use and land use conflicts;
- soil related issues;
- changes to visual amenity;
- validity of the IQQM, rainfall and evaporation, downstream water flows, seasonal flows, flows during drought and effects of climate change on yield;
- effects of potential pollution sources in the catchment, water quality in the storage and effects on water quality downstream of Wyaralong Dam;
- aquatic ecology including fish habitat, fisheries production, fish transfer, turtles and changes to wetlands and Ramsar Wetlands;
- social and economic impacts including consultation process, effects on landowners and the local community and economic analyses; and
- recreational and tourism opportunities.

These issues are addressed either individually or collectively in Sections 3 and 4 of this report, and in conditions placed on the Project in Appendix 1.

2.6. Review of the supplementary report to the EIS

All submissions received by the Coordinator-General on the EIS were forwarded by the Coordinator-General to QWI. I asked the proponent to prepare a SREIS to respond to the submissions.

The SREIS was submitted to the Coordinator-General in May 2008 and in June 2008 was forwarded to advisory agencies. Advisory agencies were invited to comment on the SREIS and to provide advice to me for consideration for inclusion as conditions or recommendations in this report, if the Coordinator-General were to recommend that the Project proceed. I have incorporated matters raised in my conditions and analysis detailed elsewhere in this report. The following agencies advised that they were satisfied that all issues relevant to their jurisdiction had been addressed in the SREIS:

- Department of Education, Training and the Arts
- Department of Mines and Energy
- Department of Emergency Services
- Department of Tourism, Regional Development and Industry
- Department of Local Government, Sport and Recreation
- Department of Housing
- Department of Employment and Industrial Relations
- Queensland Treasury
- Department of Public Works
- Queensland Transport

The following agencies either provided advice or recommended conditions if the Coordinator-General were to recommend that the Project proceed:

- Department of Communities
- Department of Primary Industries and Fisheries
- Department of Natural Resources and Water
- Department of Main Roads
- Queensland Health
- Environmental Protection Agency
- Community Futures Taskforce

- Queensland Police Service
- Tourism Queensland
- Scenic Rim Regional Council
- Department of the Environment, Water, Heritage and the Arts

Substantive issues raised in submissions are discussed individually in section 3.

2.7. Relevant documentation

This report is prepared in accordance with section 35 of the SDPWO Act to evaluate the environmental effects of the Project and any other related matters.

In preparing this report, I have considered the EIS and the SREIS, all properly made submissions on the EIS and other submissions accepted by me about the EIS, advice from local, State and Commonwealth Government agencies and other material relevant to the Project.

2.8. Approvals, permits and licences

The proponent has been directed under Schedule 10B of the Water Regulation 2002 and section 12A of the SDPWO Regulation to take all necessary steps to prepare for, and construct, Wyaralong Dam by 31 December 2011. Under Schedule 9 of the *Integrated Planning Act 1997* (IP Act) all "aspects of a development a person is directed to carry out under a notice, order or direction made under State Law" are exempt from assessment against a local government planning scheme, and therefore planning scheme approvals will not be required for the Project.

Apart from approval under section 133 of the EPBC Act to undertake a controlled action, other key statutory approvals necessary for development of the Project are:

Legislation	**Approval**
Integrated Planning Act 1997 and *Water Act 2000*	Operational Works for constructing or raising a waterway barrier works
Integrated Planning Act 1997 and *Water Act 2000*	Operational Works for taking or interfering with water
Integrated Planning Act 1997 and *Water Supply (Safety and Reliability) Act 2008*	Operational Works for referrable dam
Integrated Planning Act 1997 and *Vegetation Management Act 1999*	Operational Works for clearing native vegetation
Integrated Planning Act 1997 and *Water Act 2000*	Operational Works for removing quarry material in a watercourse or lake

Legislation	Approval
Integrated Planning Act 1997 and Environmental Protection Act 1994 Environmental Protection Regulation 1998	Material Change of Use for Environmentally Relevant Activities (ERAs) including: ▪ ERA 7 - Chemical storage ▪ ERA 11 - Crude oil or petroleum product storing ▪ ERA 15(b)- Sewerage treatment - operating ▪ ERA 19 - Dredging material ▪ ERA 20 - Extracting rock or other material ▪ ERA 22 - Screening etc. materials ▪ ERA 28 - Motor vehicle workshop ▪ ERA 62 - Concrete batching ▪ ERA 76(a) - Incinerating waste ▪ ERA 83 - Regulated waste transport ▪ ERA 84 - Regulated waste storage.
Nature Conservation Act 1992	Permit for taking, using or interfering with protected plants or animals
Transport Infrastructure Act 1994	Interference with a State-controlled road or its operation
Water Act 2000	Permit to destroy vegetation, excavate or place fill in a watercourse, lake or spring
Water Act 2000	Interim resource operations licence
Environmental Protection Act 1994	Permit to dispose of contaminated soil
Integrated Planning Act 1997 and Building Act	Building works
Dangerous Goods Safety Management Act 2001 and *Dangerous Goods Safety Management Regulation 2001*	Storage of flammable and combustible liquids on premises
Explosives Act 1999	Authorities to possess, store, transport and use explosives.
Fire and Rescue Service Act 1990	Permit to light a fire
Aboriginal Cultural Heritage Act 2003	Cultural Heritage Management Plan/s or Indigenous Land Use Agreement (ILUA) that does not exclude Aboriginal cultural life.

The proponent has expressed a preference for the use of a community infrastructure designation under the IP Act, which would enable the use of the land required for the Project. The proponent proposes that the aspects of the Project for which the land could be designated would comprehensively cover all aspects of the Project.

The proponent contends that the use of community infrastructure designations for major water infrastructure is well established, citing examples of its use for both the Paradise Dam and Eidsvold Weir.

A community infrastructure designation has the effect that development under the designation is exempt development under the IP Act (i.e. no development approval is required) to the extent the development is:

- assessable under a planning scheme; and/or
- the reconfiguration of a lot.

The effect of both the emergency direction under the Water Regulation 2002 and the regulation made under s.100 of the SDPWO Act is that the Project is, under Schedule 9 of the IP Act, exempt from assessment against the relevant local government planning schemes. I further note that the IP Act provides an existing exemption for a reconfiguration of a lot for acquisition of land for a "water infrastructure facility" which is a measure, outcome, works or anything else that QWI is directed to carry out or achieve under the SDPWO Act or the *Water Act 2000*.

At this stage therefore, I am not recommending that a community infrastructure designation be made for the Project, as the designation will not provide any additional benefit to the undertaking of the Project.

If in the future a community infrastructure designation is made for the Project, then I recommend that the conditions set out in Appendix 1, Schedule C should be included in that designation in accordance with section 43 of the SDPWO Act.

3. Evaluation of environmental impacts

3.1. Land

3.1.1. Land use and tenure

The area required for the Project comprises 2304 ha which includes all or part of 19 properties, eight of which are currently owned by the State Government. This will result in the permanent change in use of the land in the operational area of the dam including the inundation area (1230 ha), a buffer area (932 ha) adjacent to the area of inundation, the relocated Beaudesert-Boonah Road (106 ha), and the dam access road (36 ha). The existing watercourse is not included in these totals and the area for road relocation will be partially offset by the rehabilitation of redundant sections of the existing Beaudesert-Boonah Road.

The area required also includes a potential conservation area to the north of the Project area (1279 ha) and an area devoted to wildlife corridors (1545 ha).

An area of land previously purchased for dam development on the site prior to the currently proposed Project, is now not required and is surplus to needs. The existing land use on this area of 3121 ha, to the south west of the Project area is expected to continue although I understand that that surplus land will be first offered for sale to the original owners and then, if necessary, to the open market.

In the greater proposed dam catchment, the majority of land is zoned for rural purposes with some horticultural and grain cropping and areas of improved pasture. It is estimated that there is at least 2500 ha of cultivated land within the proposed dam catchment. The township of Boonah and the village of Mt Alford lie within the catchment. There is a range of civil and urban infrastructure in the catchment area, including the Boonah Waste Water Treatment Plant (WWTP) located upstream of the dam near the township of Boonah on Teviot Brook. The predominant land use for approximately the first 7 km downstream of the dam site is grazing, and that rural land use with grazing and small areas of cropping continues downstream to the township of Jimboomba below the confluence of Teviot Brook and Logan River. Further downstream land use adjacent to the Logan River is predominantly agricultural but with an increasing proportion of rural residential and residential development.

At the time the EIS was prepared, the Project was located within the local government area (LGA) boundaries of Beaudesert and Boonah, but following local government amalgamations in 2008 the Project area is now entirely within the new SRRC LGA. The Beaudesert and Boonah planning schemes will be maintained in the interim until a new scheme is developed by the SRRC.[6] The Boonah Shire Town Planning Scheme identifies the future development of the Wyaralong Dam site and buffer zone, and the Beaudesert Shire Planning Scheme identifies the site as Rural-Future Dam. The Project complies with the strategic intent of both planning schemes. The Boonah Shire Structure Plan and the Beaudesert Shire Strategic Framework both recognise the Project as the preferred land use for the area and also provide a buffer for future protection of the resource.

Land that will be directly affected by the Project includes the dam wall site, land within the resulting area of inundation, the dam access road, the relocated parts of the Beaudesert-Boonah Road and the temporary construction water pipeline. Land use within these areas is predominantly rural, consistent with the "Rural" zoning, mostly grazing on unimproved pasture with some small-scale irrigated forage production. Other land uses include a sandstone quarry and sales office, small scale sand extraction, silviculture and a machinery sales and mechanical repair business. There are no other commercial or industrial activities in the Project area or directly affected by the Project.

Existing infrastructure that will be affected by the Project includes the Beaudesert-Boonah Road, a number of Council controlled and private access roads, private infrastructure associated with rural and extractive industries, and telecommunications and power supply infrastructure. The dam site will require connection to power and telecommunications infrastructure. As discussed in section 3.8 of this report, part of the Beaudesert–Boonah Road will need to be realigned. The proposed realignment also traverses a corner of the sandstone quarry mining lease and access will require an agreement with the landowner and lease holder.

Several local controlled roads that would be directly affected during floods will require new access arrangements to be provided for relevant properties, as addressed in section 3.8.2 of this report. Access to an existing mechanical repair business will be affected by the FSL and the proponent has advised that the business is not expected to remain in its current location. I note that this matter has been addressed by the conditions I have imposed (discussed within this section).

Within the Project area, there are no designated Key Resource Areas (KRAs) under the State Planning Policy (SPP) 2/07 for the Protection of Extractive Resources. While there are no anticipated impacts on any known mineral resources, gas or oil reserves, the affected area includes a sand extraction operation which will be inundated. I note that the owner will be compensated for the loss of access to this resource.

By 2011, all existing land uses within the 1230 ha inundation area at FSL will cease, and the land will be used for water storage. Land-use in the buffer area (including the flood margin area) will partially change through land use constraints allowing only low impact activities (such as grazing), imposed to protect water quality and the dam, limit property damage in the event of a flood, and to ensure public health and safety.

The proponent intends to purchase directly affected properties by commercial negotiation in the first instance and if agreement cannot be reached, the proponent intends to request compulsory acquisition under the SDPWO Act for the required land. The partial purchase of properties and severance of properties, particularly for the road components of the Project, may affect the ongoing viability of existing land uses. Additionally around the extremities of the dam, a number of lots will only be partially inundated at FSL.

As part of the Project, the proponent may consider consolidating smaller lots and leaseback arrangements to achieve lot sizes that are considered viable for rural uses. Changes to access associated with the severance of existing properties are discussed in section 3.8.2. The realignment or reinstatement of affected private infrastructure will also need to be incorporated within the Project. I require that consultation must be undertaken with the

[6] s42 *Local Government Reform Implementation (Transferring Areas) Regulation 2007*

owners and users, as per Condition 3(g)(v)(C) within Appendix 1, Schedule C, to facilitate the continuation of current land use around the storage area and in the vicinity of the road realignment, and to finalise changes to infrastructure (i.e. realignment, replacement and/or retirement).

I require a complaints and response process for impacts on privately held land must be addressed in accordance with Appendix 1, Schedule C, Conditions 2 and 3.

Power supply requirements will depend to some extent on the partial or complete purchase of properties and the corresponding need for continuation of supply, and the realignment, replacement or retirement of existing infrastructure must be undertaken in consultation with power infrastructure owners. Telecommunications infrastructure owned by Telstra will be impacted including approximately 11 km of fibre-optic cable and 11.5 km of copper cable. Telecommunications services will need to be maintained by realignment or replacement of infrastructure, through consultation with Telstra.

The Bromelton SDA is located approximately 5 km to the east of the Project area and was declared and notified in the Government Gazette on 29 August 2008.[7] The need for the Project is not linked to the potential future development of the SDA, nor is the SDA linked to the objectives of the Project. The Bromelton SDA lies outside of the catchment of the Wyaralong Dam. Prior to the approval of any specific assessable development within the SDA, appropriate protection measures would be required to protect environmental values and adjacent land uses, including water supply facilities such as the dam and the downstream environment generally. Approximately 723 ha of GQAL lies within the dam area at FSL and a further 18 ha of GQAL will be required for the Beaudesert-Boonah Road realignment and dam access road. In total approximately 741 ha of GQAL will be impacted by the proposed dam. The Project area (2304 ha) covers 1% of GQAL in the previous Boonah LGA and 0.5% in the Logan catchment. No GQAL is impacted in the previous Beaudesert LGA. The loss of approximately 1% of grazing land in Boonah LGA (now part of SRRC) is not considered to have a significant impact on the balance of rural activities in the catchment.

Approximately 21 separate land use and tenure issues were raised in eight submissions in response to the invitation for submissions about the EIS.

These are summarised in sections 5.5.1 and 5.5.5 of the SREIS. The submitters raised concerns in relation to matters including:

- whether Bromelton SDA impacts should be considered as part of the Project;
- the loss of GQAL and grazing land;
- impacts on extractive industries;
- impacts and land use arrangements for the Conservation area, wildlife corridors and Project buffer zones;
- impacts of land use fragmentation;
- land required for Greenhouse gas offsets; and
- land use mitigation measures.

These matters have been responded to by the proponent in the SREIS and I have taken account of the submissions when considering the impacts of the Project and I have imposed conditions as per my Condition 3(g)(v)(C) within Appendix 1, Schedule C.

The reservoir area and road routes cut across a number of land holdings so fragmentation of GQAL and grazing land of lower utility will occur. Impacts of fragmentation will be reduced by:

- providing under-road access to join holdings bisected by new roads;
- providing alternative water sources where the Project isolates land from existing water points;
- reconfiguring holdings to remove existing roads where they bisect holdings and are redundant;

[7] s12 *State Development and Public Works Organisation (State Development Areas) Regulation 1998.*

- reconfiguring holdings where the reservoir prevents access for day-to-day management operations; and
- offering impacted landowners some of the land previously purchased by Government, which is now surplus to needs, as offsets for their existing impacted property.

Land in the buffer and flood margin area on the majority of the northern side of the reservoir is currently used for grazing at very low stock densities. QWI purchase of this land includes leaseback arrangements that will apply until the dam becomes operational. After that time, the land will be vacated and managed by the dam operator for environmental purposes and limited or no grazing will be allowed in this area, consistent with my Condition 8 at Appendix 1, Schedule C. Purchase agreements on the southern side of the reservoir include a legal right of access for cattle watering. Some allotments will become isolated by inundation and realignment of the Beaudesert–Boonah Road. Consistent with the land purchase and consultation requirements discussed above, access conditions or the provision of off-stream watering and fencing will need to be negotiated with each landowner to keep surrounding land productive where possible while ensuring appropriate safeguards for water quality and protection of the banks and riparian vegetation. I have mandated the implementation of appropriate water quality and terrestrial safeguards at Conditions 5 and 8 at Appendix 1, Schedule C.

The proponent has committed to, and I have conditioned, the establishment of an Environmental Corridor to provide for the north-south movement of fauna to offset the loss of habitat by the barrier created by the reservoir. The Corridor is likely to include land within two properties currently in private ownership, and a negotiated outcome is being sought on a voluntary basis to preferably agree a suitable covenant that achieves the management outcomes sought while leaving the land in private ownership, or through the purchase of whole properties. If those negotiations result in the purchase of the whole property, the land will be managed by the proponent during the operations phase of the Project as part of the Operation Environmental Management Plan (EMP). In the event agreement cannot be reached with those landholders, alternative offsets that could include similar corridors in an alternative location and revegetation of areas to provide similar habitat to that which has been removed will be agreed with the Coordinator-General and the DNRW and the Environmental Protection Agency (EPA). These requirements are addressed in Condition 8 in Appendix 1, Schedule C.

Land tenure arrangements for recreational facilities adjacent to the reservoir, and management and maintenance of any facilities will need to be agreed as part of recreational management planning. The Recreation Master Plan must be developed in consultation with the SRRC and may provide for facilities to pass to the local government, as has been the case at other dams. The land tenure arrangements associated with the recreation facilities must be clarified and resolved by the proponent before commencement of operations of the Project. See section 3.10 for further discussion about recreational facilities.

3.1.2. Topography and geomorphology

Teviot Brook rises in the Great Divide between Wilsons Peak and Mount Roberts east of the headwaters of the Condamine River. Its major headwaters tributary, Carneys Creek, rises to the east of Mount Roberts on the Queensland-NSW border. Teviot Brook flows through an incised valley with well developed alluvial plains to Coulson, on to the proposed Wyaralong Dam site, past the junction with Woollaman Creek and then joins the Logan River upstream of Cedar Grove. The reservoir will occupy parts of the valleys of Teviot Brook itself, Crows Creek and Lower Sandy Creek to the south and Oaky Creek to the north as well as the valleys of a number of minor tributaries.

The storage will create five islands of appreciable area at FSL. Smaller islands will be created as well on minor rises in alluvial areas with only shallow water separating them from the mainland. Strategies that will be applied to manage the consequences of islands in the reservoir include: boat patrols to rescue stranded terrestrial fauna if food resources are becoming depleted; and (in some instances if detailed survey indicate this is feasible) the construction of an embankment to the mainland; or digging the saddle so the connection is

less frequent to keep out feral animals and provide a refuge for native animals. I have conditioned the development of an Operation EMP Sub-Plan to address the fauna issues associated with the islands created by the Project (see Appendix 1, Schedule C, Condition 17).

Field observations indicate that Oaky Creek, Lower Sandy Creek and some of the unnamed gullies entering Teviot Brook are the major sources of bedload sediment (almost exclusively sand) entering the Project inundation area. The inundation zone will act as a sediment trap effectively retaining all bedload sediment entering the reservoir and a proportion of the suspended sediment. Estimate of the quantities of sediment entering the dam are volume are insignificant in terms of the reservoir volume and the design life of the dam. Bedload sediments entering the dam will tend to be carried into the reservoir to or just above the water level at the time where they will be deposited as a series of 'slugs' in the channels and over time, existing stream channels below and just above FSL may become blocked and a series of deltas could form. Suspended sediments will settle out across the entire reservoir area.

The proponent has committed to, and I have mandated at Condition 5 and 17, Appendix 1, Schedule C, mitigations to prevent or minimise sediment movement into and within the reservoir, and to manage sand deposits that do develop.

The reservoir will interrupt the downstream movement of bedload sediments in Teviot Brook and the flow regime downstream, other than spillway discharges, will be regulated. Stream morphology and sediment transport rates will change as a result. There will be appreciable changes in mean annual flow and the frequency of daily flows in the 1 in 1.5 to 1 in 5 Annual Exceedance Probability (AEP) range in Teviot Brook, which are important for determining stream morphology. Flow changes and hence sediment transport will diminish with distance downstream. The greatest flow reduction will occur in Teviot Brook, where annual flows will reduce by 22% compared to the existing case. Reductions in flows in the remainder of the Logan River are smaller, ranging from 13% downstream of Cedar Grove to 8% at the mouth of the Logan River.

Without mitigation, the interruption of sediment inputs from upstream may result in scouring of the bed of Teviot Brook immediately downstream of the dam but the rate at which bedload sediments are depleted will depend on effects of the release strategy and on overflows. The lower Teviot has an existing surplus of sediment so it may take appreciable time for the effects of scouring to move downstream. Tributaries of Teviot Brook downstream of the dam contribute sand to Teviot Brook and scouring may not be a problem for more than a few kilometres downstream. Scouring downstream may deepen the streambed and undercut banks possibly leading to bank collapse.

Only one topography and geomorphology issue was raised by a single submitter in response to the invitation for submissions about the EIS. A number of further related issues in regards to in stream water quality were raised but I have addressed these under the heading of water quality in section 3.2.4 of this report. The submitter was concerned about the possibility of sediments from upstream silting up the reservoir. This matter has been addressed by the proponent in section 5.6.2 of the SREIS, and I have taken account of the submission when considering the impacts of the Project and my imposed conditions.

The proponent has committed to, and I have mandated at Condition 5 and 17, Appendix 1, Schedule C, the implementation of mitigations to minimise any downstream instability resulting from changes to sediment loads in Teviot Brook immediately downstream of the dam wall, with the length of waterway to be managed to be determined from monitoring.

Discharges of both coarse and fine sediment to the Logan River estuary will be reduced as a result of the reduction in flows and sediment trapping in the reservoir. However, sediment inputs to the Logan River system are greater now than under pre-European settlement conditions so this reduction in sediment inputs is expected to be an improvement on the current situation. The catchment above the dam represents 15% of the total catchment, so any improvement may be roughly proportional. The spillway outfall must be carefully designed to avoid terrace and stream bank erosion immediately downstream. Under current conditions downstream wetlands in cut off valleys or on seldom-active floodplains fill from

Teviot Brook less frequently than once in five years so that impacts on them resulting from bed level changes are expected to be small.

3.1.3. Geology and soils

Geological investigations at the site found suitable foundation rock for a RCC dam within 4 to 16 m of the natural surface, or shallower for the other dam options. The foundation sandstone is expected to be massive and to require minimal treatment beyond minor slope correction, seam treatment and grouting to ensure adequate watertightness.

Historical records show that there has been little seismic activity in the vicinity of the dam. Dam design will take full account of hazards associated with the South Moreton Anticline, a fault along Crows Creek and seismic activity.

Slopes surrounding the reservoir area are not extreme so that water level fluctuations are unlikely to result in landslips. Nevertheless, wave action, particularly that at FSL, may result in sorting of topsoil materials to form minor sandy 'beach' deposits or minor terracing in steeper areas.

Most potential borrow areas for construction materials are on land within the inundation area that is at or below 50 m AHD. The dam will be at approximately 11% of capacity when it is at this level and modelling undertaken shows that this will occur relatively infrequently. Thus, their habitat value for aquatic species will be limited. Where areas below FSL are excavated to little-weathered rock, they will be protected from runoff from upslope and left as bare rock with provision for runoff to drain to the reservoir. Other areas will be protected from runoff from upslope, shaped to conform to the surrounding landscape, top dressed with soil materials and have appropriate vegetation established.

There are no acid sulfate soils or materials with acid sulfate potential in the area likely to be affected by the Project. Elevations in this area preclude their potential for occurrence and this was borne out by field investigations.

The salinity hazard of the alluvium along Teviot Brook has been investigated and the only area in the vicinity of the Project that was identified as having high or moderate salinity hazard rating was a valley of 20 ha at the south-western end of the Project area. This is approximately 300 m from the reservoir at FSL on the right bank at 39 km Adopted Middle Thread Distance (AMTD). Lower parts are within the 1 in 100 year AEP flood zone with or without the dam. The salinity hazard for land on alluvium along Teviot Brook was rated based on salt sources in the profile, salt sources in the groundwater, depth to groundwater and water logging. The area with high salinity hazard in the vicinity of the reservoir was found to be low in comparison with that of areas upstream.

Three soil issues were raised in two submissions relating to the need to consider the properties of dispersive sodic soils when designing and constructing both the dam and relocated roads. These issues have been further addressed by the proponent in section 5.5.2 of the SREIS and I have taken account of the submissions when considering the impacts of the Project. I have imposed a range of conditions to address erosion issues both generally, and specifically, in regards to dispersive sodic soils.

The Project may lead to soil erosion at all work and borrow areas, along temporary roads during construction, along the temporary construction water pipeline, at the dam site, along reconstructed permanent roads, and throughout the reservoir area and downstream along Teviot Brook on completion of works. All disturbed areas will require temporary erosion protection to restrict sediment movement in the landscape and minimize sediment loads reaching Teviot Brook. The proponent has committed to, and I have mandated at Condition 5, Appendix 1, Schedule C, mitigations to prevent or minimise erosion, and to rehabilitate any areas where erosion does occur as a result of the Project. These conditions include monitoring and reporting requirements to ensure that all instances of erosion are detected and dealt with in an appropriate and timely manner.

Water levels in the reservoir will continually change, however there may be appreciable periods during wet times when the reservoir is at FSL. Given the shape of the dam and the direction of prevailing strong winds, from the south-east, erosive wave action induced by wind

fetch is unlikely but nonetheless, I require that controls must be implemented in accordance with the proponent's commitments and my Condition 5 within Appendix 1, Schedule C.

3.1.4. Visual amenity

The dam site is situated in a rural landscape with relatively few houses. Land use is predominantly improved rural pasture supporting beef cattle, and interspersed with groups of trees, farm dams and some denser bushland. Houses are generally situated on slight rises and surrounded by trees. Landform varies from undulating to quite hilly in places. The Beaudesert–Boonah Road winds its way through this hilly landscape, with views along the road ranging from quite dense bushland to more open views over grassed paddocks. The valley area and lower slopes alongside Teviot Brook have been significantly cleared for farming activities. Teviot Brook itself is a narrow watercourse, which winds through the narrow surrounding valley, with a generally narrow and patchy riparian zone.

Approximately 26 km of the main channel of Teviot Brook will be inundated at FSL, resulting in a water impoundment approximately 1.5 km wide at its widest point near the dam wall and much less than this at other upstream locations.

The location of the dam wall is common to all three dam design options. The outside appearance of two of the design options would be of rock boulder wall, while the third option would have a grey concrete face, be more upright and would seem to have a lesser impact as the spillway would be constructed as part of the wall. Apart from this, there is little to distinguish the dam options in visual terms due to the lack of public access and outside viewpoints.

The realignment of the Beaudesert–Boonah Road would reduce the curvy nature of the existing road and result in some extensive earthworks. The road corridor would require the removal of vegetation in a number of sections within its boundaries, including young plantation timber. The remainder of the route is cleared except for the western end. The paved width of the new road will be 11 m, including 2 m shoulders, which together with cleared verges and obstacle free areas will add to the perceived width.

I consider that the dam, the dam access road and realigned Beaudesert–Boonah Road will have a low and acceptable visual impact, as there are few publicly accessible viewpoints. The most widespread change would be that associated with the new water body. This new lake feature would replace the existing trees, paddocks and patches of bushland. However, the water body is a compatible and familiar feature of many rural landscapes and would not appear out of place in context with the existing landscape. The final form of the dam is one with quite a natural configuration, as it is relatively narrow and elongated.

There would be limited visual impact to permanent viewers due to the low number of houses from where views of one or more elements of the Project site would be possible. The necessary clearing of vegetation, and the vast change that this would have on the character of the landscape, would represent an initial impact to permanent viewers. Those highly impacted would be situated close to the waters edge and would have quite clear views of it. In most cases their access would also be altered. The dam access road would only be seen from within the single property in which it is to be located.

Travellers on the existing and realigned Beaudesert–Boonah Road may notice the loss of trees associated with the dam construction during the initial construction phases. Over time, and with the dam filling, it is anticipated the intermittent views of the dam water body would become a harmonious feature in this landscape. The widest of the dam views would be possible from the most western end of the realigned Beaudesert–Boonah Road.

The Landscape Design and Visual Amenity EMP Sub-Plan must include consideration of this roadway and include measures to ensure visual impacts are minimised and that the roadway is stabilised and visually enhanced with vegetation as soon as possible. Opportunities to allow for views over the lake by travellers on this road should be considered during the detailed design phase. In addition, the EMP Sub-Plan must enable the replaced section of the existing Beaudesert–Boonah Road to be de-commissioned and be rehabilitated to either a rural or other suitable landscape if no longer required for traffic.

Three visual amenity issues were raised in four submissions in response to the invitation for submissions about the EIS. These related to the visual impact of the new water body and the landscape value and usage of the Beaudesert-Boonah Road. These issues have been further addressed by the proponent in section 5.5.3 of the SREIS and I have taken account of the submissions when considering the impacts of the Project.

While I consider that the change to visual amenity is acceptable, I have set conditions to ensure that those changes are mitigated as far as practicable in Condition 4, Appendix 1, Schedule C.

3.1.5. Land contamination

The EIS documents the results of contaminated land investigations, which included searches of the Contaminated Land Register (CLR) and Environment Management Register (EMR), aerial photograph interpretation, consultation with landholders and property inspections of potential contaminated land sites within and surrounding the reservoir area. The investigations identified 15 livestock dip or spray race sites and three other potentially contaminated sites on 16 Lots where any contamination present could pose a threat to water quality in the reservoir if remediation is not undertaken. The livestock dip and spray race sites may contain a variety of contaminants including arsenic, organochlorins, organophosphates and synthetic pyrethroids within the facility as well as in the draining yards and immediately surrounding soils. The other potentially contaminated sites which contain an old oil drum, abandoned vehicles and the current operation of an engine repair business may be producing contaminants such as acids, solvents and hydrocarbons.

The preliminary assessment of the Boonah landfill in the EIS suggests that there is little runoff, and no groundwater contamination from the landfill. Nonetheless, as per advice from submitters on the EIS and the conditions that I have imposed in Appendix 1, Schedule C, Condition 5, I consider that further investigations must be carried out to assess the risk of water quality effects from the Boonah landfill as part of a broader investigation of potential contaminated land sources.

I note the proponent within the SREIS has committed to a schedule of investigations and remediation activities to meet the requirements of the EPA in relation to identified sites. This will include sampling and analysis, more detailed soil and groundwater investigations if contamination is found, assessment of human health and environmental impacts on the reservoir in consultation with the relevant authorities, and if necessary the development and implementation of a remediation plan in consultation with the EPA. The proponent has indicated that any necessary remediation and validation will be completed before dam construction has proceeded to a stage where the site is likely to be inundated.

Investigations and remediation activities will be undertaken to meet the requirements of the *Environmental Protection Act* (EP Act) with regard to contaminated land, and to protect the quality of the water in the reservoir. Investigation, remediation where necessary and validation of all potentially contaminated sites located below the 1 in 100 year AEP flood level will be undertaken to ensure that the risk of contamination entering the water supply during the nominal 100-year life of the dam remains low. I note that third party review certification will be undertaken at each stage of the site assessment and investigation process.

Any necessary remediation and validation must be completed before dam construction has proceeded to a stage where the site is likely to be inundated. All contaminated sites must be remediated as appropriate to ensure there are no risks to human health or water quality, either by burial and capping with an impermeable clay, removal and disposal at an approved waste disposal facility or in-situ treatment. Once treatment is completed a final site assessment must be undertaken to validate the treatment effectiveness.

The processes required by the EPA, and conditioned in Appendix 1, will be followed to remove all land in the Project area from the EMR, and will require more detailed site investigations, and potentially, remediation.

EPA and Department of Defence advice indicates that some areas within the broader catchment area have a potential for unexploded ordnance (UXO). Searches reveal that 22

lots have the potential for UXO to be present, and other parts of the Project area were identified as being used for training areas and bombing ranges during World War II.

Advice received indicates that all or parts of lots around the proposed dam wall, the area likely to be disturbed during construction, and downstream past Undullah Road have a 'slight' potential for UXO. The Department of Defence website shows all or parts of a number of lots south of Teviot Brook towards the centre of the reservoir as having 'other' UXO potential. There are reports of signs warning of unexploded bombs in the 1950s and the discovery of bombs during land cultivation probably in the 1970s apparently within the area having 'other' UXO potential. This area was further investigated by the proponent through email communications with the Department of Defence and through examination of the results of site surveys.

Information provided within the EIS included a Department of Defence advice recommendation 'that all land usage and development within areas of 'slight' residual UXO potential should continue without any need for further UXO investigation' indicates that all work on lots listed in the vicinity of the dam construction site could proceed without further UXO investigation or remediation.

I recommend that all personnel on Project related construction sites should be trained in recognition of UXO and procedures to follow if UXO is found as part of their site induction, and the approach reviewed if there is any change to the level of assessed risk.

I further recommend for the lots identified as having 'other' UXO potential in the EIS:

- no work involving ground disturbance be undertaken unless UXO investigation and remediation has been undertaken before work commences; and
- all areas within the listed lots purchased by QWI carry clear warning signs setting out the possible UXO hazard.

Nine contaminated land issues were raised in a detailed submission by the EPA. These issues related to the need for third party review, the process to be followed if unexpected contamination is encountered, and the need to observe the requirements of the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (DEH) 1998). These issues have been further addressed by the proponent in section 5.5.4 of the SREIS and I have taken account of the submissions when considering the impacts of the Project.

There are a range of contamination risks that may impact land during construction, operation and decommissioning of the Project. I am satisfied that the proponent, in section 5.5.4 of the SREIS, has suitably responded to the land contamination issues raised in submissions, and I have conditioned, consistent with EPA requirements and as explained above, suitable management and risk mitigation arrangements that must be implemented. This is detailed in Appendix 1, Schedules A and C.

3.2. Water resources and water quality

3.2.1. Hydrology

The Project is located on Teviot Brook, a tributary of the Logan River within the Logan Basin. The Logan Basin is drained by two major streams, the Logan and Albert Rivers. The Albert River parallels the Logan River in the east before joining it at about AMTD 12 km near Eagleby, far downstream of the Project. The combined Logan Basin catchment area of approximately 3750 km^2 includes approximately 750 km^2 in the Albert River subcatchment, 3000 km^2 in the Logan River subcatchment including 690 km^2 in the Teviot Brook subcatchment.

The Logan River is tidal for about 60 km upstream from its mouth (to just downstream of MacLean Bridge on the Mt. Lindsay Highway) and salt water penetrates about 36 km inland from the river mouth during dry periods. The Highest Astronomical Tide (HAT) level in the Logan River is located downstream of South MacLean Weir (AMTD 71.8 km).

Mean annual rainfall varies from less than 900 mm/year in the central part of the catchment to over 2000 mm/year in the catchment headwaters (i.e. within McPherson ranges). Most rain falls in summer although significant winter rainfalls can occur. Historical rainfall varies considerably from year to year.

Teviot Brook is the major left bank tributary and joins the Logan River at about AMTD 86 km, upstream of Cedar Grove Weir. The dam wall is located at AMTD 14.8 km on Teviot Brook, approximately 100 km upstream of the Logan River mouth. The catchment of Teviot Brook above the dam wall has an area of 546 km^2. At FSL of 63.6 m AHD, the Project will inundate 26.5 km of Teviot Brook. Several ephemeral creeks flow directly into the reservoir area, the largest being lower Sandy Creek.

The Logan River Sub-basin has supplemented water allocations of 23 378 ML/a, and unsupplemented allocations of 24 029 ML/a including allocations from Teviot Brook of 3734 ML/a. There are no existing water supply structures on Teviot Brook. Along Teviot Brook, the predominant water use is irrigation, with only 1% being used for stock and domestic supplies. Approximately 810 ML/a of the Teviot Brook allocation is drawn from downstream of the proposed Wyaralong Dam site, and is likely to become a supplemented supply after the dam is constructed.

Approximately 51 separate hydrology issues were raised in eleven submissions. These are summarised sections 5.6 and 5.2.2 of the SREIS. The submitters raised concerns in relation to matters including:

- yield of the Project;
- the Water Resource (Logan Basin) Plan 2007;
- inclusion of climate data recorded since 2003;
- environmental flows;
- maintenance of the natural flow regime;
- IQQM modelling and input data; and
- flood management issues in the Logan City LGA.

These matters have been responded to by the proponent in the SREIS and I have taken account of the submissions when considering the impacts of the Project and, where required, I have imposed conditions as discussed further below.

The setting of river system flow requirements, to be adhered to by infrastructure operators and other water users, that maintain the duration, magnitude, variability and seasonality of flow patterns to ensure environmental and public benefit outcomes, are achieved through the development and implementation of WRPs and Resource Operations Plans (ROP) prepared under the *Water Act 2000*.

A WRP includes water allocation security objectives (WASOs) specifying the probability of being able to obtain water under a water allocation, and environmental flows to protect the health of natural ecosystems. The Logan WRP, using the IQQM model, provides a number of reporting locations for EFO, with the mouth of the Logan River (AMTD 0.0 km) the only reporting location downstream of the Project. The WRP identifies mandatory percentages for 50% and 90% daily flows and target ranges/upper bounds target values.

The IQQM was used within the WRP process to model water flows in the Logan Basin before development, under current operating arrangements and after future developments including the Project. The IQQM is a hydrologic modelling tool capable of addressing water quality and environmental issues as well as water quantity issues.

I note that IQQM is the standard tool used in Queensland and NSW to simulate the impacts of water resource management on flows, and has been subject to rigorous and widespread scientific reviews and is well regarded.

The proponent used the IQQM to model the changes in flow associated with the Project, starting with the calibrated WRP model, produced by the DNRW, and modified elements of the model setup to predict predevelopment flows in the Logan Basin with all infrastructure and water licences removed, existing flows as currently operated, and future flows with the Project in place.

According to the EIS, the existing Teviot Brook flows are around 6% lower than predevelopment flows while flows on the remainder of the Logan River are around 11% to 13% lower. The existing extraction of water has not significantly impacted on the distribution of flows throughout the year, with largest flows experienced in late summer and relatively small flows in late winter to spring.

Future flows with the Project in place were modelled with the infrastructure in the existing case included as well as the additional infrastructure of Wyaralong Dam, Cedar Grove Weir and the BOS. Allowance was also made for fishway releases at Bromelton Weir and environmental releases at Cedar Grove Weir.

Given the characteristics and location of the Wyaralong Dam, it must necessarily be operated in conjunction with the other water storages in the catchment and modelling shows that the reliable supply at Cedar Grove Weir is increased from 3000 ML/a to 21 000 ML/a by the inclusion of Wyaralong Dam, with BOS increasing this to 26 000 ML/a. Wyaralong Dam will have an attributable yield of 18 000 ML/a of this total.

Releases from Wyaralong Dam will predominantly be for water extraction at Cedar Grove Weir. However a small component of modelled demand, 810 ML/a of medium priority allocation, is designated to maintain the existing access to water by irrigators on the lower reaches of Teviot Brook between Wyaralong Dam and the Cedar Grove Weir reservoir.

In accordance with the WRP, I note that any holders of existing unsupplemented water entitlements in the lower Teviot Brook (that is below the dam wall) are entitled to have their entitlements maintained at the reliability levels indicated in the WRP following the development of the Project.

If the water entitlements of any holders of existing water entitlements in the lower Teviot Brook are shown by any further Project related hydrological modelling to be adversely affected by the construction and operation of the Project, the proponent should arrange to provide those entitlement holders access to equivalent water entitlements or, alternatively, provide suitable financial compensation. I recommend that, if necessary, this is achieved through the ROP process and as a condition of the associated Resource Operations Licence (ROL) or through the application process associated with the obtaining an Interim ROL

When run of river flows are insufficient to meet demands from Cedar Grove Weir, releases will be triggered from Wyaralong Dam to create flows in Teviot Brook. This approach means that water will be flowing in the lower Teviot Brook when the system would have been naturally dry. These flows will typically be around 50 to100 ML/d (0.5-0.8 m flow depth). When releases are not required for demands from Cedar Grove Weir, releases of around 2 ML/d (approximately 0.1 m flow depth), are made to meet medium priority irrigation demands on the lower reaches of Teviot Brook. When releases to Cedar Grove Weir are not required, these demands will be important in maintaining low flows, with associated environmental benefits, in Teviot Brook.

According to the EIS, Teviot Brook is currently an intermittent stream, which flows during and immediately following flood events. However, for much of the time, Teviot Brook does not flow and the creek exists as a disconnected network of ephemeral channels and waterholes. From an aquatic habitat perspective, Teviot Brook therefore alternates between being highly fragmented, during dry periods when water bodies are disconnected, to a semi-contiguous to contiguous states, during high flow and flood periods.

Migration and other movement patterns of fish within intermittent streams such as Teviot Brook are constrained by hydraulic habitat conditions, particularly water depths and current velocities. The EIS notes that large sections of Teviot Brook particularly the lower sandy reaches are frequently dry and therefore prevent fish movements. The WRP does not specify EFOs in the vicinity of the Project. As a result, the proponent considered, as indicated in the EIS, that it was appropriate to undertake modelling that included the generation of relevant statistics that would apply if an EFO node actually existed downstream of the proposed dam at Teviot Brook AMTD 14.8 km.

This additional modelling shows that:

- currently no flow days occur 35% of the time. The Project will reduce no flow days to 7%, which compares more favourably with the predevelopment situation of no flow days occurring 2% of the time;
- currently, and in the predevelopment case, flows of less than1 ML/d occur 8% of the time. The Project will result in flows less than 1 ML/d less than 1% of the time. At flow rates of less than 1 ML/d, the average resulting water depth is less than 10 centimetres (cm) which prohibit's the movement of fish. Therefore, these flows are not viewed as ecologically critical;
- flows in the range of 1-3 ML/d currently occur 6% of the time, compared with 10% of the time for predevelopment case flows. With the operational rules used in the assessment, flows of 1-3 ML/d would increase to 57% of the time with the dam in place. The average resulting water depth of about 10 cm may allow movement of small-bodied fish and maintain ecological processes;
- flows in the range of 15 - 30 ML/d currently occur 4% of the time, with the average resulting water depth of around 0.5 m allowing the passage of most large-bodied fish species. Higher flows would allow the passage of fish species of all sizes, although not necessarily at peak flows due to high velocities and turbulence; and
- the Project will increase the frequency of flows between 20 ML/d and 100 ML/d due to downstream releases, with an overall decrease the frequency of flows less than 20 ML/d and greater than 100 ML/d, although the increase in the 0 to 3 ML/d range is noted above.

Flow supplementation (dam releases into Cedar Grove Weir) will mostly occur in spring and early summer. While I note that shorter dry periods and a greater occurrence of regulated low flows (< 3 ML/d) may have ecological benefits, these must be considered against increases in moderate to high dam release flows in spring that may disadvantage a number of fish and turtle species that require zero to low flows at this time for successful reproduction, and the seasonal changes to the flow regime may also be expected to affect some macroinvertebrate species. These matters are considered further in section 3.4 of this and are the subject of conditions discussed below.

Modelling shows that the Project will further reduce mean annual flows with the greatest reduction in Teviot Brook, where annual flows are reduced by 22% compared to existing flows. Reductions in the remainder of the Logan River are smaller, ranging from 13% downstream of Cedar Grove Weir to 8% at the mouth of the Logan River. Between Wyaralong Dam and Cedar Grove Weir, summer and autumn flows are significantly reduced while spring flows are significantly increased. Downstream of Cedar Grove Weir, there is little change in the distribution of flows throughout the year.

I note that modelling has confirmed that post-Project construction flows will meet the mandatory EFOs and WASOs specified by the WRP. Under the existing pre-Project case, some non-mandatory target EFOs are not being met and the Project would result in some further reductions in periods when these non mandatory target EFOs are met.

The Project will result in no major changes to the timing of high, medium, low and no flows in the downstream estuary. Both medium to high flows and mean annual flows with the Project in place are significantly lower compared to both the existing and predevelopment flows. The pattern of flows will remain similar, with highest flows in summer and autumn, and lower flows in spring. The Project is predicted to increase the frequency of no flow spells and low flow events in the estuary compared with both the predevelopment and existing cases. The EIS predicts little detectable change in the estuary as a result of the Project, although I have imposed monitoring and adaptive management requirements, within Condition 21 of Appendix 1, Schedule C, which are discussed further in section 3.4.4 and section 4 of this report.

The EIS notes that further optimisation of the operating rules to provide better environmental outcomes may be possible and suggests that releasing flows in pulses at higher rates may better mimic natural flow regimes, but that this would need to be assessed against the

resultant rapid change in water levels within the storage and in the reach between Wyaralong Dam and Cedar Grove Weir.

Prior to commencing operations of new instream water infrastructure, the owner / operator of the water infrastructure is in most situations required to obtain a Resource Operations Licence (ROL) or an interim ROL. In order to secure an interim ROL, detailed operating rules must be submitted to the DNRW, describing how the infrastructure will be operated in order to meet the objectives defined within a WRP and a ROP.

I consider that the modelling developed for an EIS process must necessarily build upon, and provide the next level of detail relative to, the modelling undertaken during a WRP process. It also should establish a solid baseline for further optimisation during a ROP process and provide confidence that a ROL is warranted for the Project. The operating rules or procedures applying to proposed infrastructure must be progressively developed and improved upon during each phase of the WRP, EIS, ROP and ROL process continuum.

Noting the further development of rules that will occur in the future as discussed above, the proponent has adopted a series of assumptions and key dam operating rules, which are consistent with the WRP, to underpin the modelling outcomes within the EIS and SREIS. To align with the modelling in the EIS, the actual operating rules the proponent will eventually adopt should be based on the following key assumptions and operating regime for the relevant water infrastructure:

- fishway flows from Wyaralong Dam and Cedar Grove Weir were not explicitly modelled, as they are likely to be small compared to the releases made to meet downstream demand requirements. For both structures, a portion of the releases made to satisfy downstream demands could be made via the fishway;
- BOS and Cedar Grove Weir were modelled consistent with their constructed designs. Wyaralong was modelled consistent with the Project description in section 1.2 of this report;
- releases from Cedar Grove Weir will be made virtually continuously to meet downstream demands and in many cases will satisfy downstream environmental requirements. In low situations, where this was not the case, environmental flows proportional to volumes in the weir were released up to a rate of 35 ML/d for volumes up to 300 ML in the Cedar Grove Weir;
- in the case of Wyaralong Dam, the adopted operational strategy is to maximise yield by releasing only when required to meet downstream demands; and
- demands downstream of the Logan-Teviot confluence which were unable to be met by instream flows were first assumed to be supplied from BOS at a rate, which varied between 115 ML/d to 75 ML/d as the storage volume varied between the full supply volume and the minimum operating volume. The balance of unmet demand was met by diverting orders firstly to Wyaralong Dam and then lastly to Maroon Dam.

From advice received, I understand that DNRW has reviewed and endorsed the use of the above assumptions. However, DNRW has raised concern with the assumption, adopted to date by the proponent, that diversion to BOS occur when Bromelton Weir is spilling and BOS is less than full, at a rate that ensures that the Logan River flow continues to be 35 ML/d below the BOS.

DNRW advise that this approach does not recognise more recent analysis undertaken by DNRW, following release of the EIS, relating to the requirement under section 10 (b) of the WRP for all water entitlements and other authorisations to be maintained below BOS.

As a result, the 35 ML/d flow assumption proposed by the proponent is subject to further development through the ROP optimisation process to address the section 10(b) WRP requirements. DNRW advises that its updated flow conditions for the operation for BOS will not compromise the combined system yield of the Project, Cedar Grove weir and BOS, but is likely to achieve improved environmental and user reliability outcomes.

In this regard, I consider that the proponent has demonstrated the ability, based on the above modelled operating regime, to continue to achieve the flow objectives of the WRP following

the development of the Project. I also consider that the above described operating regime represents a solid starting point for the development of operating rules, as well as an appropriate default position for further optimisation of operating rules aimed at achieving enhanced environmental outcomes. Optimisation is a standard objective of a ROP process and has been committed to by the proponent.

The recommended conditions in Schedule B, relating to the Interim Resource Operations Licence, require rules and procedures governing actual dam operations to be consistent with those identified above (in this section 3.2.1), unless they are demonstrated, to the satisfaction of the Chief Executive of the Department administering the *Water Act 2000*, as providing equivalent or better performance, against each EFO within the WRP, and relative to the performance levels indicated within the EIS and/or SREIS.

I also consider that additional flow objectives need to be established and adhered to in relation to flows in the area below the dam to the confluence of the Logan River. Given the potential aquatic ecological impacts outlined in section 3.4 of this report and the absence of a WRP node in the Lower Teviot Brook, I consider that additional guidance to support the finalisation of operating rules for the dam is desirable to achieve acceptable ecological outcomes. Key areas of concern for me are:

- the need to ensure that low flow and no flow statistics are maintained at reasonable levels to sustain turtle and fish species and that may increasingly inhabit this stretch of the Teviot Brook following the indicated increase in the consistency of base flows following the construction of the Project;
- the importance of determining and maintaining a defined low flow regime to protect enhanced species richness, abundance and diversity of communities that may arise due to the improved base flows that will be associated with the Project; and
- the need to ensure a flow release strategy that maintains turtle habitat, especially nesting sites. See section 3.4 of this report for information relating to my consideration of turtle related impacts.

At Appendix 1, Schedule C, Condition 1, I have mandated that additional flow objectives and associated dam operating rules relating to the lower Teviot Brook be developed and adhered to by the proponent. The operating rules must, as a minimum, achieve the six low flow objectives for the Project set out in Table 6.21 of the EIS (reproduced below) to address the key areas of concern discussed above.

Lower Teviot Brook Environmental Flow Statistics — Low flows (i.e. below dam)

Parameter	Units	Minimum flow objectives
Low Flow		
No Flow	% days in the simulation period	7
0 < Flow < 1 ML/d	% days in the simulation period	0.1
1 ≤ Flow < 3 ML/d	% days in the simulation period	57
No Flow Period Between 1 and 3 months	No. of occurrences in the simulation period	23
No Flow Period Between 3 and 6 Months	No. of occurrences in the simulation period	3
No Flow Period Greater than 6 Months	No. of occurrences in the simulation period	0

These flow objectives must be achieved while also conforming to the requirements of the WRP.

The Project will attenuate flood flows, resulting in lower peak flows and a greater duration of flow. The dam will have the greatest effect during smaller floods. Flow attenuation is greatest

immediately downstream of the dam, reducing with downstream distance from the dam. This is expected to have a positive benefit for a significant number of properties affected by the backwater of the Logan River.

Teviot Brook will be diverted during construction using an upstream coffer dam and bypass conduit system of sufficient capacity to pass a flood event in accordance with the requirements of the dam safety regulator. Dam safety requirements are addressed within section 3.11 of this report and by the conditions at Appendix 1, Schedule A – conditions for operational works that is the construction of a referable dam.

Construction of the dam will beneficially reduce the frequency and magnitude of floods within the Logan LGA, with an expected decrease in flood magnitude in the order of 0.1 m, and subject to its planning processes, in time Logan City Council (LCC) may consider revision of its flood management plans.

The spillway has been appropriately sized to pass the Probable Maximum Flood (PMF) – the most extreme flood that can be reasonably expected to ever occur, and the adopted embankment crest level conservatively provides for the peak PMF reservoir level plus the effects of waves and wind. I further note that a dam break analysis will be undertaken during detailed design, as required by Appendix 1, Schedule A.

The effect of the dam on flood levels in the vicinity of the reservoir is most significant at the dam site, diminishing to insignificant near the upstream end of the reservoir. This results from the relative steep slope of the bed in the upper part of the storage and upstream. I note that the location where the pre and post dam flood lines converged was a prime determinant of the Project land purchase boundary and land impacted by flooding (i.e. up to the 1 in 100 year flood event level) will be owned as part of the Project.

3.2.2. Climate change

Three climate change issues were raised in advice and submissions on the EIS. These are addressed in section 5.6 of the SREIS, and further information was provided in the SREIS on the potential impact of climate change, including possible rainfall and streamflow variability, on Project yield and reliability. Given the Project's role in the overall water supply for SEQ, the role of the water grid and the role of water restrictions and regulatory requirements in times of lower water supply, I consider that adequate information has been provided to me to determine the viability of the Project. I note however, that future modelling of possible future climate change variability utilising the IQQM model may be of use to QWC to examine the effect of climate change induced rainfall variability on yield to assist with the ongoing management of water supplies.

It has been generally accepted that climate change will mean that in the future, SEQ will experience increased climate variability. The Australian Bureau of Meteorology and Commonwealth Scientific & Industrial Research Organisation (CSIRO) have predicted that climate variability may result in more frequent, longer, drier droughts interspersed with extreme wet weather periods. Climate studies have predicted potential changes in average annual rainfall in some regions of Queensland of -13% to 7%. This is within the range of observed variability in historic data. Based upon the stochastic modelling and Regional Climate Models, the QWC have adopted a conservative climate change scenario of 10% reduction in surface water availability in SEQ in its prudent yield modelling.

The proponent has adopted the work undertaken by QWC as being the most recent and scientifically acceptable indication of impacts to water availability that could reasonably be anticipated from climate change in SEQ. QWC has also proposed Level of Service (LoS) objectives that would be implemented during periods of drought enabling medium-level water restrictions to be introduced early enough so as to reduce the severity of the water restrictions that need to be imposed. The SEQ Water Grid is also currently under construction and will allow water to be taken from areas where there is more water available and transported to areas where there is less water available.

The prudent yield of Wyaralong Dam and Cedar Grove Weir combined is 21 000 ML/a and BOS adds a further 5000 ML/a. For the purposes of the impact assessment, a total yield of

28 000 ML/a was modelled, which is 2000 ML/a or 8% greater than the desired take of 26 000 ML/a, to provide some allowance for climate change, in addition to the QWC prudent yield 10% allowance.

I consider that, given the above management approaches, Wyaralong Dam in conjunction with other water infrastructure can sustainably supply 21 000 ML/a to the water grid of SEQ. Further, the presence of the dam has the potential to improve the downstream ecological processes under changed climate conditions. Under some circumstances, there may be opportunities where water can be released from the storage during a period when needed to promote ecological processes downstream of the dam or to encourage aquatic fauna migration at specific times of the year.

3.2.3. Groundwater

The dam will be designed to limit groundwater seepage below the dam wall through the dam foundations and an underlying grout curtain will further limit this downstream movement. Foundation investigations suggest that the foundation rock strata are generally of low permeability.

Most groundwater at the dam site appears to be confined to the narrow band of alluvium along and adjacent to the Teviot Brook channel and it is highly likely that there is some existing downstream movement of groundwater through this alluvium. Groundwater downstream of the dam wall is expected to be replenished by seepage from downstream releases through the generally permeable sandy streambed and aquifers are confined to a narrow zone in the vicinity of the streambed. Additionally releases from the reservoir may provide more constant flows than the natural flow patterns in Teviot Brook increasing the opportunity for recharge. There are some groundwater occurrences in the sandstones surrounding the site but these appear to be minor and confined to joints and fractures and the grout curtain will minimise downstream groundwater movement.

The proponent has committed to monitor groundwater downstream of the reservoir for dam safety reasons and to ensure that recharge is adequate. At Appendix 1, Schedule C, Condition 5, I have conditioned that monitoring bores must be installed within the alluvium downstream from the proposed dam wall and ongoing monitoring undertaken to determine annual and seasonal changes in water levels and water quality to provide data on groundwater level change in the shallow alluvium in response to stream flow events (rainfall).

Groundwater usage within the proposed reservoir is limited to irrigation areas, and stock and domestic supplies (often used as a reserve supply during dry periods). A bore has been observed within the reservoir area that is in regular use for stock and domestic purposes. Others are used when required. I have conditioned, at Appendix 1, Schedule C, Condition 5, that monitoring bores must be installed adjacent to the reservoir to assess the impacts to local groundwater resources due to inundation. Prior to filling of the reservoir, a survey of existing groundwater users must be undertaken, with the data used to assess potential groundwater impacts and assist the development of the monitoring bore requirements for the dam operation phase.

The EIS explains that the potential for saline outbreaks due to groundwater fluctuation is not well understood. Groundwater within the underlying aquifers is naturally saline; however it is unclear whether, as a result of inundation and subsequent groundwater level rises, saline groundwater will be pushed closer to the surface, particularly on the fringes of the inundation area resulting in land salinisation. This does not appear to have happened with other dams in SEQ.

Notwithstanding the low likelihood of an outbreak occurring, the implementation of a groundwater monitoring network, recording both groundwater level response and salinity, is prudent. I have therefore conditioned, at Appendix 1, Schedule C, Condition 5 and 17, that a groundwater monitoring network must be designed and located in areas close to the edge of approximated inundation and where topography is depressed.

As part of the EMP, assessment must be undertaken of the monitoring data, and if salinisation is predicted to occur, a mitigation plan must be prepared for approval by the

Coordinator-General and implementation by the proponent. I note that the proponent has suggested that a groundwater extraction system or some similar measure could be installed to lower water levels to prevent evapotranspiration effects, and that any groundwater extracted would be discharged into the dam. The case for any mitigation proposed will need to be justified as part of the mitigation plan approval process.

It is noted that the proponent has committed to the following measures, which are consistent with my above requirements:

- collect point source water level and water quality data from existing bores, including private and established piezometers. Water quality samples will include analysis of electrical conductivity (EC), pH, dissolved oxygen (DO), and major cations and anions;
- identify presence of springs and obtain water samples (same analytes as described above);
- obtain information from landholders regarding the behaviour of any springs present;
- correlate proposed dam levels with local groundwater levels;
- correlate groundwater levels with hydrographic data from Teviot Brook and its affected tributaries;
- correlate groundwater quality results with surface water quality data to define potential interactions;
- identify any water quality variations along length of alluvium upstream and downstream of the proposed dam; and
- identify any areas of potential salinisation due to elevated water levels and mobilised salts − baseline water quality data compiled from the proposed monitoring bores downstream from the dam will indicate if salinity levels are on the increase. The salinity levels will be controlled with periodic water releases as/or when levels exceed the initial baseline water quality concentrations.

In conclusion, five groundwater issues were raised in three submissions on the EIS, these issues are responded to in section 5.6.1 of the SREIS. Concerns included the potential for groundwater related salinity outbreaks, the absence of groundwater allocations in the IQQM and the assessment of sustainable groundwater yield. I have considered these issues in my deliberations, and have set conditions to address them as discussed above.

3.2.4. Water quality

Base flows in the reach of Teviot Brook upstream of the proposed dam are slightly saline, but tend to decrease downstream as a result of a change in geological conditions. Catchment inflows, which typically have low salinity, tend to reduce salinity concentrations within receiving waters. During no flow periods, the existing water bodies located within and adjacent to the proposed reservoir area typically have lower DO concentrations; however, there is significant variation over time and between water bodies. The frequency and timing of streamflow therefore has an important bearing on DO concentrations in small ephemeral pools.

Existing water quality in Teviot Brook and the Logan River is poor and generally does not comply with the relevant aquatic ecosystem water quality objectives and guidelines. The waterways generally do not comply with nutrient, sediment, or coliform Water Quality Objectives (WQO) in state government regulations. The quality of water stored in the dam is predicted to be of a better quality most of the time than water currently in Teviot Brook, at least above the thermocline as the reservoir is likely to thermally stratify to some extent. The water quality data and modelling of this storage indicates that the water quality will be relatively good and similar to other storages in SEQ.

I note that, as with other SEQ storages, the Project's reservoir may experience stratification and possibly turnover events with resulting impacts on water quality, most notably in relation

to DO. The EIS does discuss possible mitigation measures as used in other SEQ storages and notes that ongoing monitoring is required to understand and manage the issue. In that regard I have conditioned as discussed below in this section requirements for monitoring as recommended by the proponent.

Twenty three water quality issues were raised within submissions about the EIS by eight submitters. These are addressed in section 5.6.2 of the SREIS. Concerns included the need for an integrated water quality management plan, assessment of the Bromelton SDA and downstream development as part of the Project, riparian vegetation management, potential contamination from the Boonah Landfill and stormwater system, impacts of erosion and sediment, estuarine water quality and the suggestion that the Project should be included in modelling undertaken by the Healthy Waterways Partnership. I have considered these issues in my deliberations, and have set conditions to address them as discussed below. I further note that any future modelling of water quality from the Logan catchment undertaken by the Healthy Waterways Partnership may need to consider the impact of Wyaralong Dam, depending on the purpose for which that modelling is undertaken.

Impacts on water quality downstream will need to be managed by selective withdrawal through the multi level offtake and reoxygenation through release via cone dispersion valves. Experience at nearby storages indicates that algal blooms are likely from time to time. Where practicable, releases should be avoided during algal blooms. I note that it is likely during first filling that turbid water will be delivered to the storage, impacting on the quality of the stored water. Releases during this first-filling stage will need to be managed to reduce the water quality impacts downstream.

I am requiring, at Appendix 1, Schedule C, Condition 17, that monitoring must be undertaken to detect the presence and required management strategies if toxin-producing blue-green algae species do occur.

I note that blue-green alga is best managed through both the prevention of relevant nutrient flows into the reservoir and water treatment. These measures will need to be considered in the preparation of any integrated water quality management plan (WQMP) and the design and operation of the proposed future water treatment plant associated with water extractions from Cedar Grove Weir. I note that the proponent is committed to participate in the development of a suitable WQMP, but that a range of stakeholders would need to be involved to achieve optimal outcomes for all land uses in the catchment.

It has been recommended in the EIS that broader catchment scale works be undertaken to align with best management practice, including bunding of watering and feedlots, construction of livestock transport bridges across contributing streams and the provision of education programs. As noted in the EIS, these broader catchment scale works would not solely be undertaken by the proponent. I recommend that, before dam operations commence, an integrated WQMP be prepared to address water quality in the storage, diffuse and point sources of pollution in the catchment and downstream of the dam and that responsibly for required actions should be committed to by the relevant parties.

The delivery of inflow pollutant loads will have an impact on in-reservoir water quality. Salinity loads are related to the underlying geology of one subcatchment while elevated nutrient levels and low dissolved oxygen content are a result of land management practices, riparian zone clearing, and direct access by cattle to the water and sewage effluent disposal from Boonah.

The existing Boonah WWTP is upstream of the impoundment. It is noted that the proponent has committed to provide a financial contribution to upgrade the Boonah WWTP to enhance the current discharge water quality.

I consider it prudent for the predicted discharge from the proposed upgraded WWTP to be managed to be consistent with the requirements of the uses of the impounded water. These uses include possible recreational activity in the impoundment and the extraction of water for drinking purposes after release downstream to Cedar Grove Weir. As a result, and in accordance with advice from Queensland Health, I am requiring the proponent to conduct a qualitative risk assessment and document the procedures to ensure that suitable water quality is achieved within the impoundment and immediately downstream of the dam wall, having regard to:

- the uses of the water;
- the Queensland Water Quality guidelines and the National Health and Medical Research Council Guidelines for primary and secondary contact environmental values;
- the water discharges from the upgraded WWTP; and
- any other relevant water quality mitigation or management measures, including consideration of the Boonah stormwater system.

The risk assessment and procedures must be developed in consultation with Queensland Health, EPA and the SRRC for approval by me in consultation with the EPA and Queensland Health. I encourage the proponent to engage in early consultation with these agencies. I have conditioned, at Appendix 1, Schedule C, Condition 1, that any WWTP upgrade works required to achieve suitable water quality must be completed prior to the dam becoming operational.

By letter dated 28 August 2008, the proponent advised me that it will contribute $2 million to the proposed upgrade of the Boonah WWTP and I have reflected this commitment in Appendix 2 and in Appendix 1, Schedule C, Condition 1.

The proponent has also committed to preserve the well vegetated northern areas surrounding the reservoir as environmental reserve with no grazing or agriculture permitted, and to work with landowners on the southern side of the reservoir with the intent of developing designated cattle watering points, preferably away from the main reservoir. These items will have a positive impact on water quality outcomes within Teviot Brook. I have conditioned performance requirements in relation to these matters at Appendix 1, Schedule C, Condition 8.

I note monitoring is a key element of the mitigation strategy for reservoir water quality, and will provide an assessment of the ongoing performance of the reservoir, determine the need for mitigation measures and inform the development of measures if required. I therefore require in Appendix 1, Schedule C, Condition 17 that monitoring of the reservoir water quality be undertaken to understand storage water quality, sediment nutrient recycling and reservoir stratification. This monitoring must include temperature, dissolved oxygen, salinity, full speciated (and total) nutrients, suspended solids, heavy metals (especially manganese and iron), chlorophyll-a (including speciation and cell counts) and pathogens (potentially using E Coli as an indicator). I note that the EIS includes a recommendation for an initial two week intensive sampling program followed by a less frequent regime possibly monthly depending on ongoing water quality results, and supplemented by additional monitoring flow events.

In conclusion, I consider that the dam will not directly affect the catchment upstream but the range of measures discussed above such as improved riparian vegetation, increased community education and improvements to Boonah WWTP will improve upstream water quality. The reservoir may from time to time stratify and suffer algal blooms. Experience from other storages in SEQ indicates that these impacts are manageable.

3.3. Terrestrial environments

3.3.1. Regional ecosystems and flora

The Project bisects a north-south corridor of remnant vegetation, which provides useful habitat of approximately 10 km in width for fauna species not confined to remnant forested areas and 4 km wide for species that rely more on continuity for movement and dispersal. While there is no contiguous remnant vegetation in the north-south corridor, there are approximately five linkages where little disturbed vegetation is linked by relatively cleared vegetation regrowth or isolated clumps of trees or individual trees. This corridor forms part of a larger north-south corridor of regional significance that extends to southern Brisbane as shown on Figure 7.8 of the EIS.

Around three quarters, or 990 ha, of the approximate 1400 ha area impacted by inundation below FSL and Project dam wall and road works has been cleared. Of this area, 227.5 ha contain vegetation classified as remnant vegetation. Non remnant vegetation communities occupy 290 ha (not including cleared grazing areas).

The non remnant vegetation communities are unlikely to provide habitat for populations of Endangered, Vulnerable or Rare (EVR) fauna species under the EPBC Act and/or the *Nature Conservation Act 1992(Qld)* (NC Act). However, non remnant tree and shrub vegetation provide particularly important ecological functions in riparian areas often providing connectivity between isolated patches of remnant vegetation and may be rich in species. There are several locations of woodland communities contiguous with riparian communities.

There are no protected areas under the NC Act within the Project area.

Similarly, there are no listed threatened communities under the EPBC Act within the Project area. However, there are 34.3 ha of ecosystem mapped as Regional Ecosystem (RE) 12.3.3 and described as *Eucalyptus tereticornis* woodland to open forest on alluvial plains. RE 12.3.3 is classified as endangered under the *Vegetation Management Act 1999* (VM Act). There are also 6.5 ha of RE12.9 – 10.8 (*Eucalyptus melanophloia, E. crebra* grassy woodland) which is classified as endangered, and 3.3 ha of RE 12.3.8 (Swamplands with *Cyperus spp*., *Schoenoplectus spp.*), classified as "of concern". There are 183.3 ha of "not of concern" remnant regional ecosystems. I note that, within table 5-11 of the SREIS, the proponent has nominated an estimated potential offset requirement of 66 ha for RE 12.3.3, based on an estimate of 22 ha of area impacted using EPA RE mapping and a clearing to offset ratio requirement of 1:3. However, I consider that the minimum offset requirement should be based on the 34.3 ha estimate generated through the use of the mapping presented in the EIS and the 1:3 ratio requirement, totalling at least 103 ha.

The analysis within the EIS is based on detailed mapping and survey assessment undertaken during the ecological survey and presents a higher level of interpretation and accuracy than is afforded in the certified 1:50 000 scale RE mapping (EPA, 2007 (Version 5, 2003)). The EIS analysis has identified some additional REs and some discrepancies in the certified RE mapping.

Groundcover and shrub layers in almost all REs have been disturbed by grazing and there are weeds present in variable densities. There has been severe degradation of both canopy and ground cover strata due to invasion by exotic species. This was particularly so for the riparian areas mapped within RE 12.3.7 where many areas are under considerable threat by infestations of pest species.

The riparian communities fringing Teviot Brook are narrow, relatively continuous and regularly include highly degraded non-remnant vegetation with *Eucalyptus tereticornis* and *Casuarina cunninghamiana* having been removed from the system in many areas as a result of historic land clearing and timber extraction.

Endangered open forests of *Eucalyptus tereticornis*, mapped as RE 12.3.3, remain only as isolated remnants on the floodplain of Teviot Brook with better preserved remnants found on alluvial outwash plains associated with minor tributary streams in the central northern portion of the Project area. On the floodplain, the shrub and ground layers have been modified with exotic grasses and herbs by the ongoing impacts of intensive grazing. On the outwash plains, however, the shrub and ground layers remain relatively intact, (although Lantana infestations generally remain in the shrub layer), due to connectivity being maintained to woodland communities on adjoining hill slopes.

In remnant, non-riparian areas, the impacts associated with timber extraction, land clearing and ongoing grazing pressure manifest in the widespread occurrence of *Lantana camara*, which often dominates lower shrub layers, and species such as *Lantana montevidensis* and *Heliotropium amplexicaule* in the groundcover.

The EIS details that the Project area was found to support 300 species of terrestrial flora. Database searches suggest that 41 plant species listed as EVR, under the NC Act and/or the EPBC Act, have the potential to be present. While extensive survey efforts were designed to

cover areas where significant species might be found, no EVR flora species were found during the preparation of the EIS.

On the basis of habitat suitability, seven EVR species are considered to have potential to occur within the Project area based on habitat suitability. Of these seven species, Hairy – joint Grass, Shiny-leaved Coondoo and Boonah Tuckeroo are not expected to be present given that suitable habitat has been disturbed. Similarly, while Lloyd's Native Olive and Slender Milkvine cannot be totally discounted, targeted searches for the two species failed to return a collection and potential for occurrences is considered very low. If post EIS survey work (see conditions of approval in Appendix 1, Schedule A, Condition 19 – operational works for vegetation clearing) identifies the presence of any of these species, the Vegetation Offset Proposal described below must involve translocation and/or propagation activities that will ensure that there is no net loss of these species as a result of the Project.

Potential habitat for Frogbit occurs in wetlands mapped as RE 12.3.8, in microwetland habitats associated with Teviot Brook, and in farm dams. The species was not recorded in the field survey but a thorough aquatic flora investigation of farm dams was not carried out. Its ability to recruit by stolons and seeds may indicate that the species will be advantaged as a result of proposed water storage. As a result, I have determined that no specific further investigations or mitigation measures are warranted for frogbit.

While *Picris conyzioides* has previously been found 8 km south of Beaudesert, beside the highway, where it is recorded as abundant, its preferred habitat is grassy eucalyptus forest/woodland and disturbed areas. While the species has been recorded in *E. tereticornis* woodlands (RE 12.3.3), disturbed roadsides and cultivation paddocks, this species was not recorded during the EIS field surveys.

Exotic species constitute approximately 27% of the total flora species recorded. Eight of these are declared weeds under *Land Protection (Pest and Stock Route Management) Act 2002* (LP(P&SRM) Act) and they are so widespread that it is not possible to distinguish their distribution on a suitable scale map. Accordingly, the requirement for the implementation of a comprehensive and effective weed management plan in relation to construction and revegetation activities is an important element of the conditions of approval that are being applied to the Project.

There is an estimated 43 970 m^3 of millable timber in the Project area with an estimated value of $1.2 million. In accordance with advice from the relevant agencies, I have imposed conditions to ensure that this timber is utilised.

Issues raised in submissions on the EIS in relation to the following matters (labeled as issues 7.1, 7.2, 7.5 and 7.7 in the SREIS):

- the source of regional ecosystem mapping
- details about the approach to environmental/vegetation offsets
- the possibility of creating new vegetated stepping stones for overall regional benefit.

In section 5.7 of the SREIS, the proponent responds to these abovementioned matters. The response builds on the analysis within the EIS and, collectively, the offset commentary within the SREIS and EIS commits the proponent to offsetting lost remnant REs of various types (totaling 227.5 ha) in accordance with the requirements of the VMA and the associated Policy for Vegetation Management Offsets. Various clearing to offset ratios will be applicable to different REs and the final ratios are subject to the quality of the specific offset localities to be identified by the proponent and agreed with DNRW. For example, in relation to RE12.9-10.7, the ratio could vary between from 1:1 for high quality offset area covered by a relevant land clearing permit to a 1:4 requirement for area requiring substantial management intervention. Regardless of these specifics, I consider that a minimum overall clearing to offset ratio of at least 1:2 is appropriate. Within this overall requirement, I further consider that a 1:3 ratio must be achieved for endangered RE 12.3.3. This approach will suitably address fauna habitat requirements (e.g. for Koalas) as further discussed in section 3.3.3 of this report.

In summary, I am satisfied that the proponent, in section 5.7 of the SREIS, has suitably responded to the flora and vegetation issues raised in submissions, although I have conditioned, as explained further below and detailed in Appendix 1, the development and

implementation of a Vegetation Offset Proposal and an Environmental Corridor Proposal, among other things, to ensure the achievement of net gain outcomes, in relation to the Project's impact on flora and regional ecosystems.

3.3.2. Wetlands

All the wetlands in the Project area and downstream, except the Carbrook Wetlands, are cleared and provide little by way of fauna and flora values when not inundated. The impacts of any possible loss of foraging areas due to flood reductions are likely to be minor.

The Carbrook Wetlands are remnants of lowland forest on the northern floodplain of the Logan River about 5 km from its mouth, and approximately 95 km downstream from the Teviot Brook confluence. The total area is 354 ha. The wetlands are of local and regional significance and include remnant vegetation, plant communities, plant species and vertebrate species of national, state and local significance. In relation to fauna species known to be present, alterations in hydrological regimes will affect feeding and/or sheltering opportunities.

However, the proponent has indicated that the relevant area of the Carbrook Wetlands are primarily fed by shallow groundwater and freshwater inflows and flooding from Native Dog Creek, and are only inundated by overflow from the Logan River during major flood events. The last such inundation is indicated to have occurred during the 1974 floods. Modeling indicates that the recurrence interval of such major flooding will not be affected by the proposed Wyaralong Dam.

3.3.3. Fauna

The databases searched indicated that the following fauna had previously been recorded in the Project area and the surrounding region:

- 14 frog species
- 25 reptile species
- 216 bird species
- 18 mammal species.

The EIS indicates the Project area may potentially support up to 55 species of conservation significance including those listed as Endangered, Vulnerable or Migratory under the EPBC Act; those listed as EVR or Special Cultural under the NC Act; those identified by the EPA as non-EVR priority species and those species listed as significant under the Beaudesert and Boonah Planning Schemes and related policy.

Nine species listed under either or both of the EPBC Act and NC Act were recorded in the Project area during the EIS surveys. These were:

- koala
- powerful owl
- short beaked echidna
- grey headed flying fox
- five types of migratory birds.

Within the Project area, based upon the results of field investigations and an assessment of the habitat available, it is likely that the population density of koalas is low. Signs of koala presence were recorded from one forest and one mostly cleared fauna survey transect during field surveys. It is likely that the landscape is sparsely inhabited by the species, but that the vegetation of the alluvial plains is particularly significant to the ability of individuals to persist in the local area during times of drought. In addition to the remnant vegetation, there are areas of non remnant vegetation and cleared areas with isolated trees in and around the Project area that potentially function as feeding, breeding, movement and dispersal habitat for koalas.

Koala habitat maps have been generated for the Project area based on the REs actually recorded in the more intensive mapping undertaken for the Project. This mapping identifies more habitat than the EPA certified RE mapping. See figures 7-9 and 7-10 in the section 7.4.7 of the EIS. These maps and the associated commentary confirm that the various REs

comprising the 227.5 ha to be lost to inundation all contain koala habitat. As a result, my requirements for there to be a 1:2 clearing to offset ratio will ensure that there is a net gain in koala habitat because of the Project. That is, the proponent is required to provide suitable offset areas totalling at least 455 ha. Powerful owls have been recorded within the region. During the field investigations, an individual was recorded from a survey site downstream of the dam wall. The survey identified suitable roosting habitat in the Project area, though no pellets were identified during the field survey.

Short-beaked echidnas were observed and their characteristic diggings were recorded during the field investigations in fringing riparian vegetation and cleared (non-remnant) sites. The species specialises in feeding on ants, termites and beetle larvae and occurs in almost all terrestrial habitats throughout Australia except for intensively managed farms.

Grey headed flying foxes have been recorded in the area, and during the field study individuals were recorded within riparian vegetation (RE 12.3.7). Although listed as a vulnerable species under the EPBC Act, they are commonly recorded in most fauna surveys across Queensland. The listing is primarily designed to protect camps and for controlling agricultural endeavours where the animal is considered a pest species.

Two habitat characteristics are important for grey headed flying foxes, namely foraging resources and roosting sites.

No camps of the species were recorded within the Project area during the field investigations, and the animals recorded from the riparian habitat were not present in very high numbers, though the numbers present would vary from season to season as the population forages in different areas depending on flowering events.

As provided in Appendix 1, Schedule A, Condition 18 (Operational Works for clearing native vegetation made assessable by Schedule 8, Table 4, items 1A to 1G of the IP Act), I have imposed a condition on the proponent requiring no net loss of EVR species habitat within the lands totalling at least 455 ha requiring revegetation, rehabilitation and associated management action.

In addition, approximately 30 EVR species were not recorded by EIS surveys but are predicted or likely to occur within the Project area or immediate surrounds.

However, the EIS indicates that no major impacts are expected in relation to these species due to assessments and/or reasons for particular species such as:

- the Project is not considered to pose a significant threat to the particular species at a regional scale though some habitat may be lost locally;
- some suitable woodland habitats would be lost due to inundation, probably without any serious impact on any possible resident pair of the particular bird species;
- although some suitable waterbody habitats may be lost, additional habitat that will be created by the dam should more than offset any loss of habitat;
- the Project is not expected to have any impact on the species in question;
- the inundation would benefit the particular species;
- the particular species is likely to be absent due to insufficient suitable habitat;
- the species probably occur in the Project area only as rare visitors;
- the species may visit flowering trees within the area proposed for the dam, however, the majority of suitable trees in the immediate locality would lie outside the proposed area of inundation;
- there is very little suitable habitat for the species in the Project area; and
- no camps of this species were found in the study area and very little food resources would be lost due to the Project.

Without suitable mitigation, clearing of vegetation associated with the Project will result in a reduction of the overall amount of habitat and populations of flora and fauna, isolation of

habitats and populations, changes to remaining vegetation that cause the loss of food and shelter resources for fauna, and exposure to introduced species that are either competitors or predators.

Removal of vegetation will result in direct loss of plants and likely mortality of some of the fauna present at the time of clearing. There will also be indirect changes such as the loss of large trees suitable for nesting and secondary changes resulting from alteration of the environment at and above the soil surface.

The results of the proposed clearing will affect regional fauna movement and flora and fauna dispersal opportunities, and these changes will be greatest once water is impounded.

Environmental changes during construction and operation of the roads and dam may include:

- disturbance from noise and dust within adjacent habitat;
- light pollution if work is extended past daylight hours and this may impact the behaviour of fauna, both vertebrate and invertebrate;
- entrapment of animals, particularly reptiles and small mammals in excavations that remain open for any period of time without adequate means of escape;
- increased risk of animal/vehicle collisions on local roads;
- introduction and/or spread of weed species;
- contamination through spills if not adequately contained and cleaned up;
- creation of a large permanent water body with habitats ranging from deep water to shallow water and edges with a range of food resources for a variety of water birds, including EVR and migratory species listed under the EPBC Act and NC Act;
- creation of a water body with sections that may be suitable for platypus;
- creation of a water body with sections that may be suitable for native or introduced aquatic plants;
- changing water levels that will affect soil moisture levels and affect shoreline vegetation composition and survival, including potential colonization by weeds;
- fluctuations in downstream flow that may alter riparian vegetation;
- increased reliability of downstream flows that may favour some native species including platypus;
- removal of some road barriers to fauna movement and creation of others;
- creation of edge effects along the borders of all roads and the reservoir area;
- creation of isolated habitat patches between the roads and the reservoir area;
- creation of islands at FSL that may trap mammals but will provide protected nesting sites for birds;
- the creation of a water barrier to the dispersal of terrestrial non-flying fauna through the present regional north-south corridor; and
- inundation of the present riparian corridor along Teviot Brook.

Broad strategies proposed by the proponent to mitigate negative impacts and enhance neutral or positive impacts include:

- planning construction work and operation of the Project to minimise impacts;
- rehabilitating adjacent terrestrial habitats to provide new habitats to compensate for those lost and to maintain or improve connectivity of wildlife movement corridors;
- providing new wetland habitats on the margins of the reservoir that will maintain localized refuges for aquatic species free from fluctuations in reservoir level;

- providing vegetation offsets in accordance with the VM Act;
- managing the quality and temperature of water released downstream through selective withdrawal using the multilevel offtake;
- managing water releases to maximise environmental outcomes; and
- providing for safe movement of fauna under the road.

Other specific mitigation measures, which the proponent has committed to implement, include:

- ensuring the presence of fauna spotter/catchers present during clearing operations;
- offsetting affected ecosystems and species through habitat restoration and enhancement of comparable ecosystems in the local area, particularly riparian areas near and above FSL;
- rehabilitating and restoring habitats to rebuild the regional wildlife corridor further interrupted by the Project;
- using seeds or seedlings of local provenance for significant flora species in habitat rehabilitation and restoration in the local area;
- ensuring nesting sites for hollow-dependent species are available by providing nest boxes;
- developing and implementing a Weed Management Plan;
- monitoring impacts on the riparian habitat downstream of the dam wall and take remedial action as appropriate to maintain ecological vegetation and habitats;
- developing and implementing an Animal Pest Species Management Plan;
- revegetating selected parts of dam edges and creation of wetland areas through small dam construction;
- ensuring exclusion of cattle or control of grazing and control of feral predators from specifically zoned refuge areas;
- ensuring environmental flows are maintained downstream of dam wall; and
- incorporating fauna crossing areas into Beaudesert–Boonah Road realignment section.

In summary, issues raised in submissions on the EIS were in relation to the following matters (labelled as issues 7.3, 7.4 and 7.7 in the SREIS):

- ability of fauna to self relocate;
- the need for detail about the location size and other features of the proposed fauna underpass and type and location of fencing;
- detail on how and where vegetation is to be protected and established to improve water quality;
- detail on wetland functionality and protection; and
- detail of the EMP for issues regarding islands.

I consider that the proponent, in sections 5.7 and 5.18 of the SREIS, has provided satisfactory responses to the fauna-related issues raised in submissions and that, the identified relevant impacts of the Project can be suitably mitigated with some enhancements to the actions proposed by the proponent.

I consider that the proponent's impact mitigation commitments, as set out in the EIS and SREIS and summarized above, need to be extended, particularly to accommodate the intent of the abovementioned Vegetation Offset Proposal and Environmental Corridor Proposal

requirements. I require that these proposals must be developed by the proponent and be approved by me prior to the commencement of construction.

Maintaining and enhancing the integrity of the north-south habitat corridor, shown in figures 7.8 and 7.11 of the EIS, has been a key and compelling consideration for me as I have determined the requirements that must be adhered to in relation to the Vegetation Offset Proposal and the Environmental Corridor Proposal.

In the absence of the mitigation measures that I am requiring, I consider that the Project may still represent a further threat to the ecological values associated with an important regional habitat corridor, which is already subject to a range of threatening processes. This habitat corridor extends for over 70 km from southern Brisbane to the Border Ranges.

The habitat corridor is of obvious vital importance to SEQ in the context of the increasing urban nature of SEQ and the well-documented (www.epa.qld.gov.au/nature_conservation/wildlife/koala_plan) adverse impacts that past urban expansion has had on species such as the koala. That is, impacts that occur when development is not accompanied by suitable mitigation measures. The requirements that I am imposing are not an unreasonable impost given the actions that the proponent is already committing to and the need to stabilize and reverse the worsening long-term trend in the extent and range of threatening processes for fauna in the vicinity.

3.3.4. Conclusion

I consider that the impacts of clearing and construction and operation of the dam will not have an irreversible effect on biodiversity and are able to be mitigated and/or offset.

I am satisfied that the broad strategies and specific mitigation and compensatory measures identified in Tables 7.22 to 7.25 of the EIS, along with the conditions that I have imposed, will reduce identified terrestrial flora and fauna impacts to levels that will not cause permanent harm to significant ecosystems or flora and fauna populations.

The conditions that I have placed on the Project, and that the proponent is bound to implement are detailed within this report, within both Schedule A and Schedule C of Appendix 1.

3.4. Aquatic environments

3.4.1. Aquatic habitats

Teviot Brook is a summer flow dominated intermittent stream, which flows during and immediately following flood events. However, for considerable periods, Teviot Brook does not flow (35% of the time the flow is 0 ML/d) and the creek exists as a disconnected network of ephemeral channels and waterholes.

Therefore, from an aquatic habitat perspective, Teviot Brook alternates from being highly fragmented to semi-continuous states. This contrasts to the perennial to contiguous flow regime of the Logan River. The Teviot Brook sub-catchment is 18.7% of the total waterway length of the Logan Albert catchment.

There are four geomorphic reaches within the Teviot Brook sub-catchment.

The water storage plus water downstream of the storage is situated within the lower Teviot reach (T4). On the basis of geological and soil characteristics, this reach can be further divided into the T4 (i) upstream and T4 (ii) downstream subreaches. Muds and clays dominate the upstream sub-reach whereas sands dominate downstream.

The upstream sub reach consists of a series of long semi-contiguous pools that would form run and glide habitats during low flow events. The lower reach contains a series of isolated sandy pools of variable size that would also form run and glide habitats during low flow events. Backwater habitats were generally poorly represented in the Project area. Riffles were largely absent – most likely reflecting the low stream gradient.

There are also low order intermittent streams, which are typically dry except immediately following rainfall events, and approximately 12 small wetlands (each 2-5 ha or less in size) present within the Project area and close to the river between the proposed dam wall and the Logan River confluence. In addition, there are three wetlands in the freshwater reaches of the Logan River downstream of the confluence with Teviot Brook. These are heavily grazed areas of approximately two ha each.

With the exception of several of the drier wetlands within the storage area and downstream on Teviot Brook which contain RE 12.3.3 blue gum communities on alluvial floodplains, these floodplain wetlands do not contain REs that are of concern or endangered. None of the wetlands are considered to be highly reliant on river flows and are assessed to be of minimal value to aquatic ecosystems. The EIS indicates that they are likely to be recharged by local overland flow or groundwater sources given their elevations.

Aquatic microhabitat diversity is relatively high throughout the Project area and in general terms, there is a:

- high cover of large and small woody debris, root cover and terrestrial leaf matter;
- emergent and submergent macrophyte cover is consistently low across the Project area (probably due to factors such as high turbidity, periodic flood scour and unstable substrate particularly in lower sandy subreach); and
- over-stream riparian vegetation cover is highly variable, with riparian vegetation zone typically being less than 30 m wide and in a highly disturbed state. Around 70% can be classed as very poor and 32% rated as poor.

Most studies to date conclude that Teviot Brook is in moderately impaired condition as a result of past clearing and ongoing pressures from a range of land uses. This rating is similar to mid and upper subcatchments within the Logan River basin but better than the poor rating given to the lower and tidal Logan reaches.

Bank stability within Teviot Brook is mainly good (over 80% of sites tested), with 17% rated as very poor. Bed and bar stability is poor to very poor (70%), although other sections, most likely in the upper reaches, were rated as very good (30%).

Water quality is strongly influenced by past and present catchment activities as well as geological conditions and the intermittent nature of flow.

Small pools tend to have dissolved oxygen concentrations of <1 milligram per litre (mg/l), whereas larger water bodies rarely have day time dissolved oxygen concentrations of < 3 mg/l.

Salinity tends to be higher in the upper reaches on average and this is likely to be associated with saline groundwater.

Nutrient and faecal coliform concentrations are generally elevated across the Project area and there are potentially harmful concentrations of blue-green algae in lower Teviot Brook reaches.

Despite general degradation, the Teviot Brook catchment contains a suite of microhabitats known to be of importance to maintenance of aquatic ecosystems.

3.4.2. Aquatic flora

There was a paucity of aquatic flora found in the EIS surveys. This is likely to be a consequence of a highly variable flow regime, plus a combination of high turbidity, shading from riparian vegetation and/or disturbance by cattle.

Emergents are the dominant type of flora/macrophytes and were restricted to the shallow littoral margins of low and high order drainages and streams. Most common species were sedges, rushes, water couch and knotweed. In general terms, this type represents a patchy habitat resource for aquatic fauna with the availability varying over time in response to water level fluctuations.

Fluctuating water levels leads to desiccations of littoral/emergent vegetation. However, it is notable that most widespread and abundant aquatic macropythes in Teviot Brook are tolerant of fluctuating water levels. Irregular pulsed events together with periods of low to no flows (as occurs at present) would tend to maintain current patterns in macrophyte community structure.

The most abundant submerged macrophytes included water primrose, hydrilla, hornwort, curly pondweed and water snowflake. Instream cover was less than 5% at all but one site.

The percentage cover of free floating macrophytes (e.g. water fern, water hyacinth and duckweed) was found to be consistently below 1%. At sites where submerged macrophytes were present, macroinvertebrate richness and abundance was typically higher than at other sites with bed and bank edge habitat only. It is also known that small bodied fish use macrophytes as a spawning site. Large surface areas and low water velocities within storages can provide suitable habitat for free floating species (e.g. native azolla, and duckweed and exotic species such as water hyacinth).

The narrow fringe of mesic littoral vegetation, and to a lesser extent emergent vegetation, was the only vegetation types that could be described as widespread and abundant throughout the Project area. This fringe was most dense and common around permanent and semipermanent pools. It is notable that these sites typically had the highest cover and richness of aquatic flora. Macrophyte species richness was generally less than or equal to two species per site. Mackay 2006, as quoted in the EIS, notes that low macrophyte cover not in itself to be indicative of human impacts as it could be a function of habitat suitability.

No known outstanding values of aquatic vegetation from a scientific educational or historical perspective are present in the area affected by the Project.

In relation to species of conservation significance, there are two vulnerable aquatic macrophyte species (listed under NC Act and EPBC Act) potentially occurring and affected. These are frogbit and *Lychrothamnus* (green algae). However, these species have not been recorded as present (may be considered to have a low likelihood of occurrence) and both may be advantaged by proposed water storage and any reduction in cattle disturbance.

3.4.3. Exotic and declared pest species.

There are eight introduced aquatic macrophyte species that have been recorded in the Logan river catchment. Of these, only water hyacinth is a class 2 declared plant under LP (P & S R M) Act. It has only been recorded in low numbers at two sites downstream of the Project area. Salvinia is another common weed species in Queensland but has not been found or recorded in the catchment, with the exception of a recording in California Creek by LCC in 2001.

3.4.4. Estuarine habitats and vegetation

The following marine plants of significance have been recorded downstream of the Project area:

- large seagrass beds outside of the Logan River mouth, the nearest being approximately 300 m from the mouth. They are thought to be ephemeral and to vary in response to flow and ambient turbidity;
- approximately 535 ha of remnant mangroves along the lower Logan River;
- approximately 35 ha of salt marsh at Carbrook near the confluence of the Logan and Albert rivers. Extensive damage has been done to these areas through regular and ongoing vehicular access;
- approximately 27 ha of swamp Oak along the Logan River. The most extensive swamp oak stands (12 ha) are at Carbrook; and
- approximately 248 ha of estuarine floodplain wetlands along the Logan River, once again, the most extensive areas are within the Carbrook area.

Little detectable change is expected in the estuary because any beneficial water quality changes due to the Project will be masked by other catchment influences.

However, in the upper estuary, penetration of saline waters due to flow reductions can be expected to modify the distribution extent of estuarine fauna and flora and there may be a change in fisheries productivity within the Logan River estuary as a result of reduced water flows, though any such impact is expected to be minor because high flows are maintained at reasonable levels. While no detectable or measurable impacts to the aquatic ecology of Ramsar listed wetlands are expected to occur, I have required the establishment of an estuarine ecology monitoring and management program at condition 21, Appendix 1, Schedule C.

3.4.5. Macroinvertebrates

The richness of macroinvertebrate communities in the freshwater reaches is similar to other SEQ rivers. During the EIS, 85 taxa (mainly to the family level) were collected. Site richness varied from 8 to 48 taxa. This is similar to the results of previous studies.

The richness and abundance is typically highest at sites with greatest range of habitats available, with nonbiting midges, freshwater shrimp, freshwater snails and water boatmen the most abundant taxa. In general, differences in community structure between habitats were greater than differences between sampling times (i.e. seasons). Edge habitats appear to support significantly richer communities than bed habitats and richness was also relatively high in macrophyte habitats and lower in tree root habitats.

The macroinvertebrate fauna in Teviot Brook are adapted to extended periods of no flow or very low flow and soft substrates, a situation that will largely continue following construction. The existing common macroinvertebrate taxa typically have opportunistic life histories and a relatively wide tolerance of environmental changes and hence are expected to be common within the storage after filling. This expectation of overall minimal change is particularly underpinned by the expectation of storage level stability, similar or better turbidity and the successful colonization and growth of the existing dominant macrophyte types in the shallow edge habitats. These edge habitats will continue to support the most abundant and diverse microinvertebrate communities. The abundances of taxa, such as freshwater shrimp that typically prefer slower flowing waters, are expected to increase.

3.4.6. Macrophyte responses

Despite the conversion of the ephemeral river within the Project area to a lentic environment, the EIS indicates that a range of aquatic macrophytes will recolonise the storage following construction. The storage shoreline is expected to be relatively stable which is expected to promote the establishment of submerged and emergent macrophytes in the shallow littoral zone. These submerged and emergent macrophytes will be limited to the edge of the storage and their distribution will be most strongly associated with the extent of shallow water habitat (< 2 m depth).

It is proposed to construct small weirs in selected embayments to act as a source of propagules when water levels rise and thereby assist with the re-establishment of macrophytes following dieback associated with extended drought conditions. This measure is also designed to recreate some of the small pool habitat and wetlands that will otherwise potentially be lost within the footprint of the dam. Within the conditions at Appendix 1, Schedule A (Conditions for Waterway Barrier Approval) I am requiring the provision of a detailed plan for my approval prior to construction commencement.

Below the dam wall, the shorter dry periods and lower occurrences of very low flows associated with the dam is expected to support a greater abundance and/or diversity of emergent and submerged macrophytes.

The expected ongoing presence of macrophytes will be advantageous as they absorb nutrients and provide an important habitat resource for aquatic fauna. Excessive quantities, particularly of floating species, can be problematic mainly due to potential for deoxygenation. Prolific levels of growth within the storage will be prevented through the application of

herbicide at the first observed growths of all nuisance macrophyte (e.g. water hyacinth) species. Excessive growth of pest macrophytes has rarely been a problem in large SEQ storages and where issues have emerged, the occurrences were prior to the implementation of the control methods that have been recently applied by SEQWater and others in recent years, and are to be implemented with this Project. The intermittent flow regime is expected to continue to limit the abundance of floating macrophytes downstream of the dam wall.

Only a few issues were raised in submissions in relation to aquatic flora. The issues largely related to the submitters holding a contrary view in terms of the extent of value of existing aquatic habitats and the significance of long term impacts on flood plain and wetland features and functionality. I consider that these matters have been satisfactorily addressed by the proponent in section 5.8 of the SREIS.

3.4.7. Freshwater fish and turtles

A total of 40 freshwater fish species have been recorded in the Logan River catchment. This includes approximately 30 native species and none of the species are known to be restricted to the catchment. Most species can broadly be described as common and widespread.

Approximately 20 of these species commonly occur in Teviot Brook.

The EIS indicates that 10 species tend to numerically dominate. EIS surveys suggest that the remaining 10 species account for less than 1% of the total numbers of individuals.

The dominant species are identified in section 8.2.5.2 of the EIS and include the Eastern Gambusia (an introduced pest), Duboulay's Rainbow fish, Western Carp Gudgeon and Australian Smelt as the four most abundant fish species.

No species listed under the EPBC Act were recorded nor were they expected. Marjorie's Hardyhead is listed as restricted by the Australian Society of Fish Biology and approximately 50 individuals were identified at one site within the Project area during one EIS survey. Otherwise, no freshwater fish species of conservation significance were found within the vicinity of the Project area.

Some of the fish within the area are thought to be migratory or to take broad scale movements. For example, the Sea Mullet, Australian Bass and Long-Finned Eel migrate from freshwater to the sea to breed. Australian Smelt and possibly some Gudgeon species move wholly within freshwater (e.g. upstream to spawn). However, large sections of Teviot Brook, particularly the lower sandy reaches, are frequently dry and therefore prevent fish movements.

During extended drought periods there is currently very little opportunity for fish movements during periods of no flow that exceed 6 months. There were 23 occurrences over the simulated periods for the existing situation, compared to none with the Project in place, which is similar to only 2 occurrences for the pre-development case.

While flows greater than 10 cm are expected to enable small fish to move, flows of 0.5 m and above are required to enable large bodied fish to move.

The EIS indicates that, after the construction of the Project, the Teviot Brook will cease to flow for approximately 7% of the time, compared with 35% of the time in the existing pre-dam situation. For around 6% of the time, for the current situation, flows are of sufficient depth to allow for movement of small bodied fish (e.g. gudgeons). This increases to 57% of the time with the dam in place. The necessary flows to enable large-bodied fish to move are currently occur about 4% of the time and this percentage is expected to be similar or increase with the Project in place.

As discussed in section 3.2 of this report, I am requiring that additional flow objectives be established and adhered to in relation to flows in the area below the dam to the confluence of the Logan River. Specific operating rules for the dam are desirable to ensure low flow and no flow statistics are maintained at reasonable levels to sustain turtle and fish species and that may increasingly inhabit this stretch of the Teviot Brook following the indicated increase in the consistency of base flows following the construction of the Project. Determining and maintaining a defined low flow regime is important to protect enhanced species richness,

abundance and diversity of communities that may arise due to the improved base flows that will be associated with the Project.

Approximately 30 separate aquatic fauna issues were raised in seven submissions in response to the EIS.

These are summarised as issues 8.2, 8.3 and 8.4 in section 5.8 of the SREIS. The submitters raised concerns in relation to matters including the suggested:

- understating of habitat values within the EIS;
- insufficient discussion of the impact of flow changes and other dam related impacts on turtles and fish, including Mary River Cod; and
- concerns for the welfare of turtles associated with damage that may be inflicted by dam wall and other elements of the Project.

In response, among other generally satisfactory responses, the proponent acknowledges that, following construction of the dam, proposed moderate to high flows in Teviot Brook below the dam are expected to disadvantage some fish and turtle species that require zero to low flows at this time for successful reproduction. Further elevated flows in spring may drown turtle nests laid close to the water.

Sections 8.3.2.6 and 8.3.2.7 of the EIS and section 5.8 (under issue 8.7 of the SREIS) provides information about various impacts on four turtles species, which can suitably be described as common species, which are not contained on statutory based lists of EVR species.

Nevertheless, a series of turtle impact mitigation measures have been committed to by the proponent. These include the protection of the northern bank of the dam as a conservation area and the relocation of sand bars and other measures to provide new nesting habitat and reduce the possibility of turtle injuries arising from collisions with structures associated with the Project. While the precise location, timing, quantity and other aspects of the proposed works and management activities are yet to be specified, I consider that the proposed broad measures are appropriate to the type and extent of impacts that are expected. I note that the proponent has committed to further development and refinement of the Project's design to address potential impacts on turtles.

In accordance with the intent of the commitments by the proponent, I have mandated that the necessary details of turtle impact mitigation measures must be developed and submitted to me for approval prior to the implementation of construction activities within the banks of the Teviot Brook. I have imposed suitable conditions, as set out in the Turtle Management Proposal components of Appendix 1 Schedule C, Condition 8, to ensure that acceptable outcomes are achieved in relation to the proponent's objectives relating to the mitigation of turtle impacts.

The Department of Primary Industries and Fisheries (DPI&F) has advised that the further diminishment of riverine fish habitat associated with the Project will compound the cumulative impacts of past water infrastructure development on fish and fish habitat in the Logan catchment. As a result, DPI&F considers that permanent, structural upstream and downstream fishway(s) will be needed to be incorporated into the dam structure. DPI&F does not support trap and transfer as a means of providing for fish passage at this site, except in the very short term, or in exceptional circumstances. The DPI&F recommended fishway design principles and design finalisation processes have been provided to the proponent and are included in Appendix 4 of this report.

The proponent suggests (e.g. on page 5-147 of the SREIS) that it has a preference for trap and transfer (otherwise referred to as catch and carry) techniques to support fish movement through from one side of the dam to the other. I consider that the DPI&F position on the need for a fishway is supported by a number of factors, particularly relevant provisions of the *Fisheries Act*. Further, the DPI&F position and recommended design principles and process are also essentially uncontested by the analysis and evidence set out by the proponent within

the EIS documentation. In fact, the proponent endorses the DPI&F recommended process as per the details on pages 5-147 and 5-148 of the SREIS.

Intuitively, the intermittent nature of the flow within Teviot Brook and the fact that there limited species of conservation significance in the vicinity, suggests that that a multi-million dollar high elevation fishway (similar to the one at Paradise Dam) represents a over-engineered solution to the impact of the dam barrier on aquatic fauna movement capabilities in the Logan catchment.

However, the proponent has acknowledged that some fish species will be disadvantaged by the dam. In addition, in the absence of further contrary analysis, the clear implication of the current positions set out by DPI&F and the proponent, coupled with the relevant provisions of the *Fisheries Act*, is that the dam construction should only proceed if it incorporates a high elevation structural fishway, based on the design principles and process contained in the DPI&F submission. Should any contrary evidence arise during the post EIS design process investigations, the proponent would need to submit a request for project change in accordance with section 35D of the SDPWO Act. Any request for project change in this regard would need to be supported by robust and comprehensive analysis, including expert opinion, and may require further public notification.

It is important for all stakeholders to understand that, in order to suitably mimic natural conditions as far as possible, the fishway must only operate intermittently.

I am satisfied that the adoption of the DPI&F recommended design principles and process, in conjunction with some other factors, will ensure that the post dam situation for aquatic species will be improved, relative to the pre-dam situation. The other key factors in support of this conclusion are the:

- proponent's riparian vegetation rehabilitation commitments; and
- more regular base water flows that will occur in the lower Teviot Brook as a result of the dam.

While I am satisfied that the fishway and other measures will mitigate and offset the environment impacts, and perhaps improve the situation, I encourage the participants within the DPI&F proposed design process to remain focused on the timeframe for construction completion established by regulation under the *Water Act 2000*. I am requiring the proponent to, as soon as practicable, provide me with a forward program of design work that suitably addresses both the regulation timeframe as well as the biological needs of the relevant species. These requirements are included within Appendix 1, Schedule C, Condition 8 and Appendix 1, Schedule A, "Conditions for Waterway Barrier Approval" of Schedule A.

3.4.8. Conclusion

I consider that the impacts of clearing and construction and operation of the dam will not have an irreversible effect on biodiversity and are able to be mitigated and/or offset. I am satisfied that the broad strategies and specific mitigation and compensatory measures identified in the EIS, along with the conditions that I have imposed, will reduce identified aquatic flora and fauna impacts to levels that will not cause permanent harm to flora and fauna populations.

The conditions that I have placed on the Project, and that the proponent is bound to implement in relation to flora and fauna are detailed within this report at Appendix 1, Schedule A and Schedule C.

3.5. Air

The EIS identifies the existing air quality in the Project area to be characteristic of a largely undeveloped rural environment, with key air emission sources expected to include a combination of general rural/residential activities and the use of local roads.

The EIS confirms that air emissions will result from Project activities; particularly dust from excavation, quarrying, concrete batching, material handling and storage, drilling and blasting,

and from vehicles using the haul roads, the dam access road and Beaudesert-Boonah Road. Small quantities of gaseous pollutants will be emitted from internal combustion engines in construction equipment and from traffic along– Beaudesert-Boonah Road however, ambient concentrations of these substances are expected to be low compared to compliance levels advised in relevant guidelines.

The air quality modelling in the EIS indicates that during construction of the southern end of the dam access road, the residence immediately to the west of the southern end of the dam access road (Modelled Receptor 4) will experience Daily Total Suspended Particulate (TSP) Matter Deposition in exceedance of the EPA's Environment Protection (Air) Policy 1997 (EPP Air) of 120 $mg/m^2/day$, where works are being undertaken within 800-1,000 m of the receptor. Further, the modelling indicates that this residence will experience exceedances of the National Environmental Protection Measure (NEPM) goal of 50 ug/m^3 24-hour PM10 during construction of the southern end of the dam access road, however this is modelled scenario is still within the EPA's EPP Air criteria of 150 ug/m^3.

During blasting associated with construction of the southern end of the dam access road and the Beaudesert-Boonah Road realignment, the EIS indicates that receptors 2, 3, 4, 5, 6, 7 and 8, may experience exceedances of the EPA's EPP Air criteria of 150 ug/m^3 and/or NEPM goal of 50 ug/m^3 24-hour PM10.

Where specific exceedances are predicted to occur, I consider that that the proponent is obliged to implement specific proactive mitigation measures targeted to minimise potential impacts on the receptor. These measures may include the measures listed in table 10-9 of the EIS, for example, pre-event notification and offers of temporary relocation for people with the potential to be adversely affected.

In addition, I note that the proponent has developed performance criteria to reduce dust impacts and comply with EPA and NEPM standards. Outcomes in accordance with the performance criteria are to be achieved through the implementation of impact mitigation measures tied to an ongoing dust-monitoring program within the construction EMP. For example, these measures include:

- regular watering of construction sites, haul roads, and exposed areas, such as stockpiles, with consideration of chemical stabilisation should water use prove inefficient;
- restriction of vehicle movements to dedicated haul roads and speed limits to minimise dust;
- detailed optimising of blast design to minimise dust emissions; and
- rehabilitation of cleared areas, including reseeding, as soon as practicable.

Further, I note that specific activities, such as crushing, screening, concrete batching and quarrying are ERA's and to operate will require a detailed air quality assessment and management plan as part of the development approval process for each ERA, to be approved by the EPA.

The issues raised in submissions on the EIS relating to air quality can be summarised by:

- concerns that proposed mitigation measures are insufficient to demonstrate compliance with relevant air quality goals; and
- the need for consideration of the cumulative air quality impacts of the proposed Wyaralong Dam, and the Bromelton SDA.

In response, section 5.10.1 of the SREIS emphasises that the proponent has used conservative assumptions to produce a worst case assessment of the potential air quality impacts. In addition, the proponent argues that the identified mitigation measures, when applied are usually effective in achieving compliance with the relevant air quality goals. Further, the proponent has indicated that, where all available practical mitigation measures have been employed, but monitoring demonstrates that air quality goals are still being exceeded, a short term scaling back of operations will need to be undertaken to ensure that the air quality goals are met. For the purposes of clarity, the conditions that I have imposed at

Appendix 1, Schedule C, Condition 6 oblige the proponent to adhere to this escalation process of remedial action to ensure acceptable impacts on sensitive receptors.

With the commitment to a Construction EMP Air Quality Sub-Plan to be developed as part of the Construction EMP, including a monitoring program, and the need for specific ERA activities to require a detailed air quality assessment and management plan as part of the approval process for each ERA, to be approved by the EPA, I am satisfied that the management and monitoring strategies will be sufficient to manage potential air quality impacts.

In relation to cumulative impacts associated with the Bromelton SDA, I consider that the potential cumulative air quality impacts would be suitably dealt with as part of the development of the Bromelton SDA. Prior to the approval of any specific assessable development within the SDA, appropriate protection measures would be required to protect environmental values and adjacent land uses, including water supply facilities such as the dam and the downstream environment generally.The EPA has provided me with a range of suggested conditions, relating to environmentally relevant activities of relevance to the Project, which are designed to minimise the potential for unacceptable impacts. As a result, in addition to the conditions referred to above, the conditions set down in Appendix 1, Schedule A, must attach to any development approval granted for the Project to minimise environmental nuisance at any dust-sensitive place resulting from activities during the construction phase of the Project.

3.5.1. Greenhouse gas emissions

The EIS presents an assessment of the likely greenhouse gas emissions and their significance, reporting the result as tonnes of carbon dioxide equivalent (t CO2-e).

The greenhouse gas calculation for the Project has been carried out in accordance with the guidelines issued by the Australian Greenhouse Office, and is based on:

- construction energy consumption;
- land use change; and
- indirect emissions.

The generic greenhouse gas emissions, applicable to all dam construction options is calculated at approximately 270,000 t CO2-e, with embodied emissions specific to individual dam construction options indicating a worst case of an additional 17,350 t CO2-e.

The EIS concludes that the greenhouse gases related to the construction energy consumption and indirect emissions are not significant when compared to the emissions due to land use change that contribute the majority of Project emissions. Further, the EIS states that Project emissions are equivalent to approximately 2.6% of Queensland's 2005 total greenhouse gas inventory (category for flooding).

The issues raised in submissions on the EIS relating to greenhouse gas emissions can be summarised by:

- concerns the EIS does not adequately discuss greenhouse gas issues, including the emissions resulting from cement manufacturing and aggregate required for concrete; and
- concerns that the greenhouse calculations do not take into account methane production from the dam during operation.

In section 5.10.3 of the SREIS the proponent recognises that although the emissions associated with cement manufacture are considered by the Department of Climate Change to be Scope 3 emissions (i.e. indirect emissions which are the consequence of the organisations actions but are not from a source owned or controlled by that organisation), that without the Project the concrete would not be required and the greenhouse gases associated with production of the cement would not occur. The SREIS identifies that dependent on the type of dam wall construction, there could be up to an additional 16,020 t CO2-e emitted as a

result of the Project due to the manufacture of cement. This is additional to the amounts specified in the EIS and outlined above.

The proponent goes further, in the SREIS, to estimate a conservative scenario (100% imported to site from Bromelton quarry) of emissions associated with quarrying the aggregate required to mix with the cement to produce concrete, which is estimated to produce an additional 1,684 t CO2-e.

The Project's estimated construction related greenhouse gas emissions is summarised below:

Construction Related Source:	**Estimated Greenhouse Gas Emissions t CO2-e**
Generic Emissions applicable to all dam construction options	270,000
Embodied Emissions specific to individual dam construction method (worst case)	17,350
Emissions resulting from cement manufacture (worst case)	16,020
Emissions resulting from quarrying of aggregate required to produce concrete (worst case)	1,684
TOTAL	305,054

In relation to the issue of methane production from the dam itself during operations, I note the 'Brief Literature Review on Greenhouse Gas Emissions from Reservoirs' by Dr Tim Blumfield presented in Appendix F of the SREIS, which identifies uncertainty relating to emissions from reservoirs in sub-tropical environments, and concludes that "significantly more research needs to be undertaken on a global scale to better understand the role of such impoundments, as carbon sinks as well as emitters, in the overall carbon cycle." In response to the findings outlined by Dr Blumfield, I have included a conditions at Appendix 1, Schedule C, Condition 6 (g, h & i), that the proponent prepare a research plan, for my approval, to advance research into the issue of greenhouse gas emissions and carbon sink capacity and options for dams. The research project should be targeted at further understanding the role of dams as carbon sinks as well as emitters.

Further I note that the proponent identifies that mitigation measures can be developed through adaptive management to minimise greenhouse gas generation, such as catchment management improvements to reduce the mass of organic material entering the storage. In Appendix 1, Schedule C, Condition 17 (xvi) I have imposed requirements that mandate the implementation of the proponent's commitment relating to adaptive management to minimise greenhouse gas emissions.

I note that the proponent aims to achieve greenhouse neutrality for the construction phase of the Wyaralong Dam Project through environmental revegetation on site associated with in-filling in the conservation area on the northern side and rehabilitation of the proposed wildlife corridors and riparian zones on the eastern and western ends of the Project, along with native hardwood plantations in the Traveston area, should the proposed Traveston Crossing Dam be approved. For the purposes of clarity, the condition that I have imposed at Appendix 1, Schedule C, Condition 6, obliges the proponent to, at a minimum, offset the carbon footprint of the construction phase of the Project as outlined in section 10.5 of the EIS, section 5.10.3 of the SREIS and summarised above.

I consider that the mitigation measures proposed by the proponent in section 10.5.5 of the EIS, the SREIS and EMP, combined with the condition I have imposed at Condition 6,

Appendix 1, Schedule C, will ensure a suitable reduction in the potential generation of greenhouse gases as a result of the Project.

3.6. Noise and vibration

In Chapter 11 of the EIS, the proponent indicates that the background noise levels in the Project area were found to be characteristic of a largely undeveloped rural environment, with noise sources such as the Beaudesert-Boonah Road, factories at Bromelton, a quarry, some light industry and agricultural activities contributing to background noise levels in the area.

The EIS confirms that the main potential for impact on noise amenity will result from Project construction activities, particularly dam and road construction works, blasting, sandstone quarrying, haulage of construction material, and traffic on realigned roads.

Dam construction and operational activities

The noise modelling in the EIS indicates that, during construction activities at the dam wall site for any of the proposed construction options, the noise levels at sensitive receptors are in compliance with the construction noise level goals adopted from the Department of Main Roads (DMR) *Draft Code of Practice* during the day, evening and night. The EIS does recognise that given the rural nature (with relatively low existing background levels) and the subjective nature of noise nuisance, that some receivers may experience nuisance even if compliance with the Project goals are achieved, therefore it is important to implement noise management measures as presented in the EIS and EMP.

The EIS indicates that during the construction and operation (during dam construction) of haul roads and the dam access road, that receivers 27, 28, 29, 30, 31, 32 and 33 as shown in Chapter 11 of the EIS, will experience elevated noise levels, with noise levels at all receivers complying with the Project goals (DMR *Draft Code of Practice*, and World Health Organisation – *Guidelines for sleep disturbance*), except receptor 29 (the residence immediately to the west of the southern end of the dam access road). This noise sensitive receptor 29 is also identified as sensitive receptor 4 in relation to dust. See section 3.12 of this report for a discussion of cumulative impacts.

The operational noise sources associated with the dam include the spillway, dispersion valves, and pumps. The noise associated with these sources is expected to be at moderately low levels, and it is not expected to have impacts on sensitive receptors, fauna or livestock. The EIS notes that should large pumps be required, acoustic housing may be required to ensure operational noise level goals are met (EPP Noise).

Beaudesert-Boonah Road realignment

The noise modelling in the EIS indicates that, during the construction of the Beaudesert-Boonah Road realignment, noise levels above background will be experienced by a range of receptors, however only one receptor (receiver 23) exceeds the Project goals (DMR *Draft Code of Practice*).

The EIS proposes that a construction noise management plan be developed specific to the Beaudesert-Boonah Road realignment, inclusive of management measures identified in section 11.5.1 of the EIS, to minimise the potential for impacts at nearby residences.

The EIS noise modelling shows that road traffic noise levels at all sensitive receivers along Beaudesert-Boonah Road realignment during operation meet the DMR criteria for a new road opening in 2009, however by 2019 it is predicted to exceed the criteria at receiver 24.

During the planning and design phase of the Beaudesert-Boonah Road, the proponent will need to investigate the predicted exceedence, and ensure management measures are implemented to ensure compliance with the DMR criteria.

Vibration

The EIS finds that given the distances between the location of all sensitive receptors and the dam and road construction activities, there are not expected to be any human comfort impacts or potential damage to buildings or structures from vibration caused by construction equipment at the dam construction site, haul roads, dam access road and Beaudesert-Boonah Road realignment.

Further, the EIS finds that vibration associated with the dam and road operational activities are expected to be negligible.

Blasting

The EIS finds that during blasting the air blast overpressure will be the determining factor in achieving the Project's air blast overpressure and vibration criteria outlined in the EPA Guideline *Noise and Vibration from Blasting* (EPA 2006). Initial modelling shows that blasting associated with construction of the southern end of the dam access road and the western end of the Beaudesert-Boonah Road realignment the EIS indicates that a number of receptors may experience exceedances of the air blast overpressure criteria.

The issues raised in submissions on the EIS relating to noise and vibration can be summarised by:

- concerns that the noise from the proposed dam access road has not been adequately addressed; and
- concerns that it is unclear how it will be determined if blasting is required.

Section 5.11 of the SREIS outlines the assumptions used in the EIS for where blasting will occur, and summarises some of the actions to be carried out by the construction contractor in determining the location and blast design, including:

- excavation depth, size and characteristics;
- proximity to dwellings;
- geological characteristics; and
- noise and vibration limitations set out in the EIS, legislation, regulations, standards and approval requirements.

I note that the EIS and EMP identify that a detailed blasting management plan will need to be developed by the blasting contractor to ensure compliance with the Project's criteria. I further note that where compliance with the Project's criteria cannot be achieved or is marginal, the proponent proposes to liaise with affected sensitive receptors to determine if a short-term exceedance from blast is preferable to continuous noise over an extended period from mechanical excavation options. I have mandated construction noise goals listed in Table 4 of Appendix 1, Schedule C, Condition 7.

In addition, I note the concerns raised in submissions on the EIS relating to the assessment of noise associated with the Dam Access Road, particularly the potential noise and air blast overpressure impacts at sensitive receiver 29. In the SREIS the proponent outlines potential mitigation measures that may be implemented to achieve an acceptable environmental outcome, including managerial methods (e.g. purchase of property or relocation of occupants) and physical methods (e.g. noise barriers or architectural acoustic treatments to the premises). Further, I note the proponent recommends that unattended ongoing environmental noise monitoring be maintained at the affected premises throughout the Project, should physical mitigation measures be used. I am satisfied that through the implementation of mitigation measures outlined in the EIS, SREIS (particularly table 6-6), as well as my condition relating to this sensitive receiver, as outlined in section 3.12, that potential impacts can be managed to achieve an acceptable environmental outcome.

Construction water pipeline

The key potential noise impact identified in the SREIS relating to the construction water pipeline is the noise associated with the operation of the pump or booster station(s). The SREIS commits to locating all noise sources within a dedicated pumping house, designed to attenuate noise, however it is noted that even with this attenuation noise impacts may still

occur depending on the location of sensitive receptors and site specific conditions. I am satisfied that noise mitigation measures outlined in section 11.4 and table 6-6 of the SREIS, combined with the condition I have imposed at Appendix 1, Schedule C, Condition 7 will satisfactorily minimise the potential noise impacts associated with the pump and/or booster stations as a result of the Project.

Conclusion

The proponent has established target goals for noise and vibration levels to guide construction planning and management. I have adopted and, in some cases, enhanced these goals, as per the conditions set down in Appendix 1, Schedule C, Condition 7 in accordance with advisory agency advice.

While noise and vibration will not be able to be eliminated, given the strategies provided in the EIS, SREIS and processes within the EMP regarding noise and vibration mitigation, together with appropriate conditioning described within this report, I am confident that predicted effects can be suitably mitigated.

3.7. Waste management

The existing environment is typical of a largely undeveloped rural environment. Existing key waste sources associated with the Project area include domestic waste and sewage from farm holdings as well as limited amounts of scrap metal, timber, hydrocarbons, insecticides and herbicides associated with on farm activities.

The construction of the dam and associated new roads will contribute new and significantly greater volumes of waste to the existing environment during construction. The waste volumes for spoil in particular will vary depending on the chosen design, however under all options all spoil will be reused within the Project area.

During the mobilisation and road construction phase, the major waste stream generators will be vegetative waste associated with land clearing; excess spoil from cutting & filling; regulated wastes (waste oil, filters, grease, oily water) associated with fleet maintenance; wastewater from road runoff; and ablutions water which will require either a package sewage treatment plant capable of tertiary treatment or a pump-out system.

During the dam construction phase, the concrete batching plant operations will contribute additional wastewater as will vehicle wash-down activity. Any proposed construction camp will be connected to council sewerage systems.

The operational phase of the dam will create only minor waste streams such as wastewater at on site offices and accommodation, general office waste and woody debris within the impoundment itself. The volumes expected during operations can be readily managed by the proponent's proposed management and mitigation measures as set out in section 12.4 of the EIS and section 5.12.2 of the SREIS and discussed further below. Submissions received in relation to waste generation and management raised concerns and provided advice in relation to:

- the relevant legislation to apply to waste management activities; and
- the potential burning of vegetative waste rather than reuse or recycling.

In response to the waste management issues raised in relation to relevant legislation, the SREIS included confirmation that the applicable legislation, regulations and/or policies will be:

- the Environmental Protection (Waste Management) Policy 2000 (EPP Waste) applicable to all regulated waste;
- the EP Act applicable to the storage, handling, transport and management of any hazardous contaminants; and
- the *Environmental Protection Regulation 1998.* The proponent indicated that the regulation will only apply if contaminated soil is removed from site.

I note that the proponent is seeking to maintain burning as an option and burning continues to be used on other infrastructure projects where non burning options are cost prohibitive or otherwise impracticable. In response to concerns regarding the impacts of burning vegetative waste, the proponent has committed, and I have conditioned, in Appendix 1, Schedule C, Condition 10, the adherence to the guidelines for burning proposed by the proponent as outlined in section 5.12.2 of the SREIS. These guidelines must be addressed within the Waste EMP Sub-Plan within the Construction EMP and seek to reduce risks associated with burning as well as reducing nuisance from burning activities.

The proponent has committed in the EIS and the Waste Management EMP of the SREIS to implementing waste management practices for the Project consistent with the waste management hierarchy outlined in the EPP Waste policy. This includes, for example:

- cut and fill earthworks will be balanced to ensure maximum reuse of fill material on site, which will minimise the need for stockpiling and shaping of material;
- recyclable materials will be collected in separate bins for ease of collection and disposal;
- wastewater from construction activities will be captured, treated and reused on site; and
- ablutions water not connected to Council sewerage networks will be captured and removed from site by licensed contractors.

In relation to the burning of vegetative waste, I consider this option should represent a last resort for managing complex mixtures of vegetation and weed types and where access or excessive cost is concerned. Offsite burning should only occur for purposes of energy recovery and where energy recovered will be greater than energy expended.

Further, I consider that the making of a transparent decision making process in accordance with the waste management hierarchy and inclusive of a third party review mechanism, will ensure optimised beneficial reuse of vegetative waste. As a result, I have imposed the above requirements into Appendix 1, Schedule C, Condition 10.

Subject to these imposed conditions, above, I believe the proponent has demonstrated suitable and workable strategies within the EIS and associated EMP to effectively control waste management matters.

3.8. Transport and access arrangements

Within Chapter 13 of the EIS and section 5.13 of the SREIS, the proponent provided an assessment of the impact of the Project on the existing road users and the road network within the vicinity of the Project. This assessment included changes to traffic and/or road arrangements during construction and operation of the Project. Safety during construction and ongoing property access after inundation of the storage were key issues raised by submissions on the EIS made by local residents and agencies.

3.8.1. Current road conditions

The state controlled roads in the vicinity of the Project are the Beaudesert-Boonah Road bounded by the Mount Lindesay Highway to the east and the Ipswich-Boonah Road to the west.

The Beaudesert-Boonah Road is an important arterial road in the area. It is 33.1 km in length and runs adjacent to and south of the proposed dam and Teviot Brook. The road is a two lane rural road with intersections and property accesses interspersed along its length.

The eastern 4 km section of the Beaudesert-Boonah Road, to the intersection with Sandy Creek Road, is indicated to be of a sufficient standard to readily accommodate existing traffic demands. The eastern end of the Beaudesert-Boonah Road currently carries around 3500 vehicles/day but traffic reduces progressively travelling west of Beaudesert to 2500 vehicles/day to Sandy Creek Road. The proponent considers that this section of road could comfortably carry up to 15 000 vehicles/day.

The 9 km section of the Beaudesert-Boonah Road west of Sandy Creek Road to the proposed dam access road carries on average from 2500 to 1600 vehicles/day. The traffic numbers progressively decline to the west. The proponent considers that this section of road could comfortably carry up to 10 000 vehicles/day. While capacity seems sufficient, the EIS notes there is a 3 km section of the road with longer curves combined with increased grades and some narrow unsealed shoulders.

The 18 km section of the Beaudesert- Boonah Road from the proposed dam access road to the Ipswich - Boonah Road currently carries around 1600 vehicles/day with a carrying capacity of about 12 000 vehicles/day.

The Mount Lindesay Highway connects Brisbane, through Beaudesert, with Tenterfield in NSW. The highway south of Jimboomba to Beaudesert is predominantly a two-lane road of good standard with traffic volumes of approximately 7 500 vehicles/day. The highway north of Jimboomba is a good standard four lane and two-lane road with road upgrade works in progress south of Park Ridge. The road currently carries approximately 18 000 vehicles/day.

According to road inspections and traffic observations conducted for the EIS, in general, traffic flows freely along the Mount Lindesay Highway in the vicinity of the Project. Further, the intersection of the Beaudesert-Boonah Road with the Mount Lindesay Highway, just south of Beaudesert, is wide and uncongested.

The Ipswich-Boonah Road runs north-south connecting the towns of Boonah and Ipswich west to the Cunningham Highway. The two lane road has frequent intersections and accesses with traffic volumes of approximately 3000 vehicles/day and a capacity of 12 000 vehicles/day. I consider that the state controlled roads are adequate for current purposes in terms of overall capacity.

Local government controlled roads in the vicinity of the proposed dam include Undullah Road, Old Beaudesert Road, Hawkins Road, Knethrs Road, Nixon Road, Smith Road and Sandy Creek Road. The 3 km section of Sandy Creek Road between the quarry site to Beaudesert-Boonah Road currently carries 700 vehicles/day of which 30% are commercial vehicles including quarry trucks and light vehicles associated with the Bromelton quarry and farming activities. I consider that the current condition of this section of Sandy Creek Road is not sufficient to accommodate substantive increases in heavy vehicle numbers.

There is currently no public road access to the proposed dam wall site. The site is remote and current access is via a four wheel drive standard gravel track through privately owned property. The track is below the proposed FSL for most of its length.

3.8.2. Proposed changes to road network

Section 13.2 of the EIS outlines the expected impacts on the road network (both state and local government controlled roads) in the immediate vicinity of the Project. The network changes include:

- replacing the 11.9 km section of the Beaudesert-Boonah Road that will be inundated or flood prone with a newly constructed road section of 10.6 km via a shorter route on higher ground to the south. The realigned road will be state controlled;.
- increasing the duration of flood inundation of two low sections on the western section of Beaudesert-Boonah Road for up to an additional 2 hours and 40 minutes for a 1 in 100 AEP flood;
- closing Smith Road as property access will no longer be required;
- closing 2.5 km of the 3.5 km Nixon Road as property access on this section will no longer be required;
- constructing a 5.5 km dam access road between the construction site and Beaudesert-Boonah Road (at approximately 13 km from the intersection with the Mount Lindesay Highway);

- widening the existing road formation at the intersection of the dam access road with the Beaudesert-Boonah Road, to include two metre shoulders, 3.5 m through lanes and dedicated turning lanes. Speed limits at the intersection will be 80 km/hour during construction and 100 km/hour during operation of the dam; and
- the closure and relocation and/or raising of sections of Old Beaudesert Road and Knethers Road.

As per Schedule B - Transport Infrastructure Construction, the construction of the Beaudesert-Boonah Road realignment will be subject to approval of the final design by the DMR, and approval will also be required under section 33 of the *Transport Infrastructure Act 1994* to enter and conduct works.

Old Beaudesert Road, east of Knethrs Road, will be inundated as it is below FSL. The proponent is proposing to close this section of Old Beaudesert Road and construct an alternative road within Lot 31 on SP104293. Also, small sections of the 4.15 km section of Old Beaudesert Road, west of Knethrs Road, which provides access to properties and grazing land, will be inundated. Some longer sections, which have been subject to flooding to date, will remain flooded for longer periods with the proposed dam. Approximately 0.25 km of Knethrs Road will also be flooded by the dam. The proponent is proposing to raise both of these low sections of the two roads to approximately 65.5 m AHD to provide additional flood protection.

Given the preliminary nature of the property access reinstatement designs for the Old Beaudesert Road and Knethrs Road, the design finalisation process will need to involve specific input from affected landholders and the SRRC, as the relevant road authority.

In this regard, the proponent is obliged to consult by the requirements of the conditions that I have imposed as set out in Appendix 1, Schedule C, Condition 14. That is, direct discussions and further explanation of the proposed arrangements will be necessary as design details are developed. It will be a requirement for the proponent, in conjunction with the SRRC, to consult with the landholders directly affected by road changes.

The dam access road will provide access to construction traffic, dam operation and maintenance traffic. Subject to SRRC's asset ownership considerations, the access road may also provide access to public recreational traffic and possibly private properties following the Project construction period.

The dam access road will ideally be transferred to SRRC following the completion of Project construction. However, the proponent and the SRRC are yet to reach agreement on arrangements that would enable a mutually satisfactory transfer of asset control. I understand that the proponent is prepared to design and construct the road to a standard commensurate with its intended use, being construction access, operational access and potentially public recreational access, and any applicable SRRC standards. In this regard the proponent has provided, in section 4.15 of the EIS, preliminary design specifications. The matters are addressed by Condition 14 of Appendix 1, Schedule C.

The proponent also proposes to transfer ownership to the SRRC following the completion of construction on the basis that the SRRC takes responsibility for maintaining and repairing the road in the longer term. At the completion of construction the proponent must ensure the pavement condition will deliver the agreed design life. In light of the above, it is appropriate that the net present value of operation and maintenance costs over a suitable period be estimated and provided by the proponent to the SRRC.

It is noted that SRRC will benefit from reduced maintenance costs associated with the permanent closure of Smith Road and a portion of Nixon Road, as outlined above.

In these circumstances, I would expect that SRRC be willing to accept ownership of the dam access road, particularly as any potential public access related benefits, such as public recreation related opportunities, could be lost if the access road was maintained as a private road for dam operation purposes only.

I consider that the asset transfer of the completed access road to the SRRC would be in the public interest. Further, given that public access to recreation opportunities associated with

the dam may be favoured by the local community, I encourage both parties to work together to satisfactorily finalise suitable arrangements prior to the completion of dam construction. This is clearly a matter that should be resolved on the basis of the value that both parties no doubt associate with the proposed asset transfer and I do not consider that I need to provide any further guidance at this time.

3.8.3. Construction and operational traffic

The transportation of materials for road and dam construction will generate the greatest Project related traffic impacts. This traffic is programmed to be heaviest during the 18 month period from late 2008 to mid 2010.

The approximate number of truck movements required to transport material for the period of the Project using the highest impact scenario of the RCC dam option is 60 000 truck movements. Approximate truck movements along various routes will be:

- 52 000 truck movements between Sandy Creek Road and the dam access road;
- 4000 truck movements on the Mount Lindesay Highway;
- 2600 truck movements on the Ipswich-Boonah Road;
- 1000 truck movements originating in Beaudesert and surrounding areas; and
- 400 truck movements originating in Boonah and surrounding areas.

Excluding roads with limited discernible Project related traffic increases, notable increases in traffic movements are identified on certain roads in the EIS as follows:

- Beaudesert-Boonah Road (section from Beaudesert to Sandy Creek Road): 20 trucks/day and 200 light vehicles/day and 6 buses/day to transport workers;
- Beaudesert-Boonah Road (section from Sandy Creek Road to dam access road): 160 trucks/day and 200 light vehicles/day and 6 buses/day to transport workers on average. Peak truck traffic is anticipated to reach 45 trucks/hour. This will be a 50% increase above current commercial vehicle numbers and possible 100% increase in terms of current large truck usage;
- Beaudesert-Boonah Road (section from dam access road to Ipswich-Boonah Road): western end: 15 trucks/day, 100 light vehicles/day and 4 buses/day. central section: 40 trucks/day, 200 light vehicles/day on average with peak truck traffic of up to 60 trucks/day and 11 trucks/hour; and
- Sandy Creek Road (section from quarry site to Beaudesert-Boonah Road): 145 trucks/day on average with peaks of approximately 220 trucks/day and 40 trucks/hour. This represents an increase of over 100% relative to current commercial vehicle movements.

Construction traffic travelling through the intersection of the Mount Lindesay Highway and Beaudesert-Boonah Road, is anticipated to be around 20 to 25 trucks/day and 150 to 200 light vehicles/day on average.

All of the state controlled roads intended for haulage are designated B-double routes. The proponent has indicated that transport of over dimension and excess mass loads is not anticipated. Most of the construction materials are to be extracted from nearby quarries.

Removal of portions of the redundant Beaudesert-Boonah Road pavement material will also result in on-road haulage of an estimated 4000 truck movements.

The proponent proposes that the workforce will travel on the local road network to the construction site either via buses or cars or other light vehicles. In the highest impact scenario this will equate to 10 bus movements/day and 300 car movements/day.

Following construction, dam operation-related traffic will be negligible. However, recreational traffic to the dam on weekends is likely to increase traffic on the dam access road and surrounding roads. This will be influenced by the final dam access road ownership

arrangements and potential recreational and tourism opportunities discussed in the previous section and section 3.10 of this report.

3.8.4. Key impacts and conclusions

The proponent has indicated that the environmental impacts such as noise, vibration, air quality and amenity, to be caused by materials and equipment haulage are relatively minor. The impact of the increase traffic on these items is discussed in sections 3.1, 3.5 and 3.6 of this report.

There are no local public transport services operating in close proximity of the Project area, however, one bus service uses the Mt Lindesay Highway. Two school buses operate in the Project area, one over 10 km of the eastern end of the Beaudesert-Boonah Road from Beaudesert to Upper Allen Creek Road and the other over less than 1 km of the western end of the Beaudesert-Boonah Road at Coulson.

The safety of the road for road users and school buses, particularly at collection and drop off points and turning locations, is to be addressed by the proponent through measures to be identified in the investigation mentioned by the proponent in section 13.5.1.2 of the EIS. I have conditioned, at Appendix 1, Schedule C, Condition 14(h), that this investigation and resulting measures be finalised prior to the commencement of relevant construction activities in consultation with Queensland Transport, Department of Education, Training and the Arts (DETA), DMR and SRRC.

This investigation is to identify any specific road safety risks and specific mitigation measures. The measures will include, as a minimum, an appropriate reduction in Project related truck movements through signed school zones during school drop-off and pick-up periods (e.g. 8.00am to 9.00am and 2.30pm to 3.30pm) on school days.

Intuitively Project related traffic could conflict with existing traffic and pedestrian movements in the main shopping precinct within Beaudesert. However, I understand that existing traffic flow arrangements within this area currently enable suitable precinct safety outcomes and would be capable of handling the expected increase of less than 5% in traffic due to the construction of the dam.

The major increase in heavy vehicle traffic is on Sandy Creek Road and the section of Beaudesert-Boonah Road connecting to the dam access road as these roads will be used as a haulage route for materials for the Sandy Creek Quarry. Sandy Creek Road is not in good condition (as described in section 13.3 of the EIS) and there is potential for pavement damage to occur. The proponent has advised that the SRRC proposes to progressively upgrade the road, in width and pavement standard to meet quarry haulage needs, from contribution funds from the quarry operators.

I have imposed a condition, at Appendix 1, Schedule C, Condition 14(f)(ii) that Project related haulage on this road cannot proceed until the necessary works programmed by the SRRC and/or any associated traffic management arrangements are in place to enable safe haulage on a pavement that can be demonstrated as being likely to withstand the increased loads.

The impact of the additional truck movements to the construction site would almost double the pavement loadings on the westbound lane of a 9 km section of the Beaudesert-Boonah Road over the construction period. This impact may precipitate pavement failures and, as a result, I have conditioned at Appendix 1, Schedule C, Condition 14 (f) that it be monitored by the proponent in consultation with DMR over the construction period, with pre and post construction dilapidation reports prepared.

As per Appendix 1, Schedule C, Condition 14 (c), the proponent must also develop and undertake management measures to ensure safe transportation of redundant pavement material from the relevant section of the Beaudesert-Boonah Road.

Direct emergency vehicle access is to be incorporated into the design of recreational trails and activity locations around the dam, the dam wall and associated foreshores. Emergency vehicle directional signage is to be installed by the proponent prior to commencement of early works.

Issues raised in submissions on the EIS by local residents and agencies were in relation to the following matters (labeled as issues 13.1 to 13.7 in the SREIS):

- traffic safety issues regarding school bus routes, pedestrians and cyclists;
- the proximity of the proposed access road to an existing residence; and
- the impact on landowner access and property management due to closure of local and property access roads and construction of new roads.

I am satisfied that the proponent, in section 5.13 of the SREIS, has suitably responded to the traffic safety and access issues raised in submissions. In order to ensure clarity and that suitable outcomes are achieved, I have required, as conditioned in Appendix 1, Schedule C, Condition 14, the development and implementation of a Traffic EMP Sub-Plan within the EMP. This must incorporate all transport and traffic related objectives, commitments, and performance measures contained in Tables 6-13 and 6-24 of the SREIS.

I am satisfied with the EIS conclusion that there will not be any significant impacts on the regional and local road network in terms of traffic capacity, road safety or pavement deterioration with the exception of the Beaudesert-Boonah Road between Sandy Creek Road and the dam access road. I am satisfied that these impacts are manageable by implementing the mitigation measures recommended by the proponent and conditioned within this report at Appendix 1.

I have conditioned at Appendix 1, Schedule C, Condition 3 of this report the commitments made by the proponent on minimising traffic impacts and maximising safety. On the matter of the proposal that a bus service be provided for the construction workforce in order to lessen traffic, I note that while use of these buses cannot be enforced, I encourage the proponent to identify and implement measures to promote the use of the services by the Project's workforce.

3.9. Cultural heritage

3.9.1. Indigenous cultural heritage

Section 14 of the EIS indicates there is a registered native title claim in the name of the Jagera People over land on the northern side of Teviot Brook. The registered claim includes the site of the dam wall and the northern extent of the inundation area from the mid-point of Teviot Brook. There is no registered native title claim, nor any determined native title holders, for the area to the south of Teviot Brook. A negotiating team for the area south of Teviot Brook has been identified, and is being referred to as the Mununjali People. The majority of the land affected by the Project is held in freehold tenure where native title has been extinguished, and therefore the negotiation of native title issues is relevant to the beds and banks of Teviot Brook where native title still exists.

The EIS confirmed that consultation had commenced to develop a Cultural Heritage Investigation and Management Strategy (CHIMS) to meet the duty of care requirements under the *Aboriginal Cultural Heritage Act 2003* (ACHA) that would either take the form of an Approved Cultural Heritage Management Plan (CHMP) or a cultural heritage agreement forming part of an ILUA for the Project.

The EIS noted the proponent's resolution to conclude ILUAs with:

- Jagera People who are the registered native title claimants for the parts of the Project area north of the Teviot Brook. The Jagera People agreed to negotiate an ILUA, including a cultural heritage agreement, with QWI and negotiations were successfully concluded in July 2007. I note that the ILUA has been registered by the National Native Title Tribunal on 26 February 2008 (Ref: QI2007/025); and
- a wider group commonly known as the Mununjali People, who were identified through a process of advertisements and public meetings to identify those people who assert a native title interest in the Project area to the south of the Teviot Brook, as no native

title claims, registered or otherwise existed over this area. The wider group selected a group of authorised representative's to negotiate an ILUA, including cultural heritage agreement, with QWI and negotiations were successfully concluded. I note that the ILUA has been registered by the National Native Title Tribunal on 14 May 2008 (Ref: QI2007/024).

I note that the results of the initial investigations into Indigenous Cultural Heritage in the EIS identify no listed or formerly nominated heritage places.

The issues raised in submissions on the EIS relating to indigenous cultural heritage can be summarised by the following:

- the Ugarapul People were not involved in ILUA and cultural heritage management negotiations;
- a request from the Mununjali People request that the proponent involves them in the decision making process relating to the Project;
- insufficient clarity that the ACHA duty of care requirements have been met; and
- concerns that no formal cultural heritage surveys have been completed.

On the basis of the proponent's responses to these issues, provided in the section 5.14 of the SREIS, I am satisfied that the proponent has suitably engaged with the broader indigenous community in relation to the ILUA and cultural heritage agreement for the Project area to the south of the Teviot Brook. I also recognise the role of the National Native Title Tribunal (NNTT) in relation to the formal registration of the ILUA under relevant State and Commonwealth legislation and that the NNTT has registered both ILUAs for the Project.

Further, I am satisfied that the cultural heritage agreement forming part of the ILUA satisfies the duty of care requirements under the ACHA, and that the CHIMS will ensure adequate identification and management of cultural heritage places and objects between QWI and the relevant aboriginal people as custodians of their cultural heritage.

I note that through the development and implementation of the ILUA and CHIMS, Aboriginal People will be involved in the decision making of the aspects of the Project relating to them.

Mitigation measures to address indigenous cultural heritage issues are proposed to be confirmed through the ongoing development and implementation of the CHIMS for the Project's construction phase, providing for the initial cultural heritage assessment, management of cultural heritage values during construction and post-construction heritage management measures.

I acknowledge the overview of the CHIMS presented in the EIS, and note the wide range of principles with respect to cultural heritage management that the proponent has committed to. It is noted that these principles will be refined in the further development of the CHIMS with the relevant Aboriginal People.

The construction water pipeline arrangements, detailed in Appendix C of the SREIS, falls outside the area covered by the ILUAs negotiated with the Jagera or Mununjali People.

The SREIS confirms that the proponent has commenced the process of developing an approved CHMP, consistent with the relevant principles from the abovementioned ILUAs, to ensure compliance with the duty of care requires of the ACHA.

I note that QWI has publicly notified its intention to enter into an approved CHMP, and has committed to negotiating with endorsed parties to ensure an approved CHMP is in place prior to commencement of pipeline construction.

In summary, I conclude that the proponent has made, and I have conditioned at Appendix 1, Schedule C, Condition 9, satisfactory commitments relating to Indigenous Cultural Heritage. The proponent is obliged to meet the duty of care standards set by the ACHA.

3.9.2. Non- Indigenous cultural heritage

The proponent found, as per section 14.2 of the EIS, that there are no sites of non-indigenous cultural heritage within the Project area listed on registers maintained by State and Commonwealth agencies.

However, two locations were identified through the literature review that are adjacent to the Project area and hold significance for locals and provide links to past activities. These two homesteads are known as “The Overflow” and “Wyaralong” homesteads.

It is noted that both homesteads are situated on spurs overlooking the valley of the Teviot Brook, and are both situated outside the 1 in 100 AEP flood level. This means that the buildings will not be subject to inundation.

A range of other features that may hold general historic significance or links to the past were also identified in the Project area, including:

- low level log/hardwood bridges;
- culverts;
- remains of huts, yards, fences and farm complex; and
- Lillybrook homestead complex.

The proponent has committed to commission additional field assessment to examine the entire Project area to determine the significance of all places/items identified during the investigations, and develop detailed management strategies based on the nature of the impact, to be agreed with the EPA and Queensland Heritage Council. Further, the proponent has committed to consulting on the management strategies to be implemented with the National Trust of Queensland and any local historical societies who express an interest.

The issues raised in submissions on the EIS relating to non-indigenous cultural heritage can be summarised by:

- loss of the Wyaralong Homestead setting, which is integral to its value;
- cultural heritage impacts have been overlooked as places do not appear on State or Commonwealth registers; and
- no mention of dairy heritage and materials from World War 2 activities.

In its response to these matters, within section 15.4.2 of the SREIS, the proponent emphasises the wide range of sources it has reviewed within the EIS investigations and confirms that the EIS presents a comprehensive review of the cultural landscape within the Project area.

On the basis of the investigations conducted to date, I concur with the proponent’s view that the possibility that impacts on items of non-indigenous cultural heritage within the locality are such that substantive constraints and/or required design modification to the Project are unlikely to be warranted. Further, I consider that requirements imposed at Appendix 1, Schedule C, Condition 9 and the proponent’s commitment to additional field assessment and further consideration of management strategies as necessary is sufficient to manage potential unforeseen impacts on non-indigenous cultural heritage. The abovementioned conditions require suitable ongoing consultation with local heritage societies, the National Trust, EPA and Queensland Heritage Council.

The SREIS confirms that the searches conducted during the EIS for places, objects and values of non-indigenous heritage, includes the entire temporary water pipeline corridor.

For the purposes of clarity, the areas traversed by the pipeline corridor must be included into the additional field assessments to be conducted by the proponent. Similarly, the general Project related consultation requirements mentioned above, involving organisations such as the EPA and Queensland Heritage Council, also apply to the pipeline route.

3.10. Social impact assessment and economics

3.10.1. Methodology

The EIS Chapter 15 provides socio-economic information regarding the former LGAs of Boonah and Beaudesert as well as for the major population centre of the Gold Coast which is expected to provide a significant proportion of services to the Project.

The social assessment within the EIS includes:

- a summary of the existing socio-economic conditions in the surrounding LGAs based primarily on data from the 2006 Census;
- an assessment of the social impact of the proposed Project on affected communities;
- commentary on the significance of social impacts; and
- a description of measures to mitigate adverse impacts and enhance benefits.

The economic assessment within the EIS identifies and assesses the direct and indirect economic impacts associated with the construction and operation of the Project. The economic assessment relied on:

- economic profiling of the combined Beaudesert–Boonah region and their relativity within the greater Queensland economy;
- computable General Equilibrium Modelling (CGE) to assess the direct and indirect economic impacts of the Project; and
- social benefit cost analysis to assess the benefits and costs of the Project under the "with" and "without" project scenarios.

3.10.2. Property impacts

The Project will require the purchase of two whole properties, partial areas of a further 17 properties (eight of which are currently owned by the State Government), and may also necessitate the acquisition of other interests in land in the Project area.

Those affected by property impacts are at risk of suffering emotional impacts, including changes to and uncertainty about future plans, severance of family history and ties, and disruption to lifestyle.

In recognition of these expected impacts, QWI's Land Purchasing Policy provides for land purchases based on market valuations and also seeks to minimise the potential adverse effects of the land purchase process on landowners.

Further details on the property purchase arrangements and impacts are in section 3.1 of this report.

Property outside of the FSL but within the flood-buffer of the reservoir will only be inundated when the river is in flood, and the original owner may be granted contractual rights to use the land at other times, under appropriate management conditions, for activities such as grazing. Some land on the northern side of the dam is intended to be protected from any agricultural activities, providing possible vegetation offsets or recreation areas.

One residence, a worker's cottage, is within the dam inundation area. The primary residence on the property will not be affected.

As outlined in section 3.1 of this report, inundation will affect private infrastructure, such as dams, bores, and sheds. Other on-farm activities will also be affected, including a sand and gravel extraction and machinery sales and repairs business.

A further six properties will be affected by severance, with changes to either access to the property, or within the property due to the location of the dam or realignment of Beaudesert-Boonah Road. The impact on these properties is outlined in Table 15.10 of the EIS and does not include properties which will be completely purchased or those currently owned by the Queensland Government.

The road relocation and inundation of the dam area will alter access to some properties but access from the new Beaudesert–Boonah Road will be reinstated. In some cases, the properties will be provided with upgraded access arrangements. Some access from the Old Beaudesert–Boonah Road and Knethrs Road will be maintained, with raising or relocation of sections of the roads if required, as discussed in section 3.8.2 of this report. It is not expected that travel times will be increased.

A submitter advised that the EIS incorrectly identified the Department of Communities as the administrator of the Business Adjustment Scheme and the Worker Assistance Program.

The Business Adjustment Scheme (BAS) is a government-sponsored scheme, administered by Queensland Rural Adjustment Authority (QRAA) on behalf of the Departments of Tourism Regional Development and Industry (TRD&I) and DPI&F, which has been developed to assist eligible businesses to develop and implement strategies to improve their on-going viability and to restructure in preparation for the economic changes arising from construction of the Project. The program includes exit assistance for those businesses in circumstances where this is the only realistic option.

A Worker Assistance Program (WAP), also administered by the TRD&I, is available to provide access to training, job preparation, relocation and wage subsidy assistance for eligible workers who have lost their job as a result of the government's decision to build the Project.

3.10.3. Communication and consultation

The Queensland Government via the Community Futures Task Force (CFTF) and QWI have undertaken work with residents, landholders, stakeholders and SRRC to reduce and manage potential social impacts associated with the Project.

Activities undertaken to consult and inform the community include:

- establishment of CFTF to work with stakeholders and government departments ;
- establishment of 1800 information hotline;
- establishment of Boonah One-Stop-Shop (closed March 2007);
- holding public meetings;
- providing counselling support through Lifeline; and
- communicating with directly affected property owners.

The CFTF advise there has been a low rate of access to the locally based emotional support services provided. I recommend that the proponent continue to work with the Department of Communities to monitor the need for these services and provide the most appropriate services to address the needs of affected landholders.

I am requiring, as a condition of approval within Appendix 1, Schedule C, Condition 2 that during the construction phase a complaints response system be established and maintained, including:

- provision and promotion of phone contact with construction management staff during hours of construction;
- a follow up procedure which notifies complainants within 24 hours of the intended response to the issue raised; and
- reporting of complaints resolution.

3.10.4. Community health and education and services

Some submissions raised concern that an influx of workers during construction may result in increased demands on local health and education services.

I consider the impacts of an increase in demand on community health and education services due to an increased workforce population can be readily managed on the basis of the following:

- Boonah & Beaudesert Hospitals have capacity to cope with increased general demand, as combined annual treatments have declined from their 2001/2002 peak;
- Boonah State School and Boonah State High School advise that any increase in student numbers would be positive, and with adequate warning additional enrolments could be readily catered for; and
- the proponent's commitment to ongoing consultation with relevant departments on workforce numbers.

The proponent has committed to liaise with the health care and education providers to advise of increases in workforce composition (e.g. to identify peaks) to ensure there are adequate services to respond to any increased demand as a result of the Project.

As a condition of project approval I require that the proponent continue to consult with government agencies as directed in Appendix 1, Schedule C, Condition 13.

3.10.5. Construction impacts (localised disruption)

Construction impacts related to noise, air, transport and traffic can be expected in the delivery of large infrastructure such as a dam.

The Construction EMP process will ensure these issues are managed appropriately. Impacts and the associated mitigations are addressed in detail in sections 3.5, 3.6, and 3.8 of this report.

3.10.6. Impacts on local housing (construction camp)

The Project is expected to directly employ 300 workers during the two to three year construction period.

The former Boonah Shire Council raised concern that the increased demand for workforce accommodation will lead to a spike in rental prices in the region and negatively affect local residents.

The Department of Housing advised there will be a need for the inclusion of a construction camp to house the workforce as outlined in the EIS due to insufficient accommodation in Beaudesert and Boonah against the expected level of demand.

Rental properties in the combined Boonah and Beaudesert LGAs make up less than 20% of all dwellings compared to over 30% in Queensland. In response to the issues raised by submitters I am requiring at Appendix 1, Schedule C, Condition 13 that the proponent develop the Workforce Management Proposal in consultation with the SRRC which will address the following :

- analysis of the proportion of identified workers that do not already reside within the SRRC local government area;
- the development of any temporary or permanent residences within the SRRC local government area to house project workers;
- the establishment of infrastructure to support temporary workforce facilities;
- documented workforce commuting arrangements (possibly involving buses); and

- the design, planning and siting of any construction worker accommodation, to ensure that future potential use is optimised for the local community (e.g. affordable housing, recreational use, functional open space).

If a construction camp is deemed necessary to mitigate impacts of an increased workforce, the measures above aim to ensure the construction camp is developed with optimal future use in mind (e.g. as additional tourist accommodation) to benefit the local community. Therefore, I recommend the proponent consult with the SRRC on the development of the Workforce Management Proposal for my approval at least six months prior to construction activity at the dam wall.

3.10.7. Impact on labour market (workforce employment & training)

At the local and regional level, the Project will generate a number of opportunities through the injection of capital during construction of the Project.

These benefits include employment and training opportunities for the local workforce and the supply of materials, equipment and services by local businesses.

While these opportunities will provide transient benefits initially, typically more enduring benefits are also obtained through improvements in the skills base of the local workforce and an increase in the competitiveness of local businesses via increased capacity and capability.

At peak construction a workforce of approximately 300 people will be employed. Based on previous experience with the construction of the Paradise Dam, 30% to 40% of the workforce is expected to come from the local area.

The Queensland Government's 10 percent Training Policy is designed to maximise the potential of government capital works projects to address skill shortages, and to create additional employment opportunities for apprentices, trainees and cadets.

I acknowledge that the EIS states that the proponent will adhere to the intent of the policy on a voluntary basis. I recommend the proponent formalise its commitment to the 10 percent Training Policy with the Department of Employment and Training.

Submitters raised the concern that the temporary additional economic activity generated by the dam would drive up demand for labour and this competition for labour would be to the detriment of local businesses.

Consultation highlighted that Boonah, like many other areas of Queensland, has a relatively low unemployment rate. However, stakeholders consulted during the EIS noted the potential for the Project to provide additional work choice and options.

The Project is located within the SEQ region, and local business are not expected to experience the significant difficulties that businesses in more remote locations experience with large projects recruiting from their skilled workforces. It is likely, because of the close proximity of the Project to major population centres such as the Gold Coast and Brisbane, that the equilibrium in labour demand will be met either through direct labour employment or backfilling of employment needs in local businesses from the significant labour pool in SEQ.

The Project is expected to provide a long term employment and skills benefit to the local region. Extensive skills development and training is expected to be provided to workers employed to work on the Project. In the long term, this will increase the skill base for workers from the local region.

I consider the additional skilling of workers and the increased capability and capacity of local businesses will be a significant and enduring benefit to the local region.

3.10.8. Economic benefits of construction

The EIS identified that the construction of the Project would provide opportunities for the supply of materials, equipment and services by businesses within the SRRC LGA and surrounding regions such as Ipswich, Gold Coast and Brisbane.

Based on the experience of the Paradise Dam, the proponent expects more than 40% of goods and services would be sourced from the surrounding regions. It was found that more than 90% of the total value of goods and services required for the construction of Paradise Dam was spent in Queensland.

The proponent is to ensure that opportunities to maximise local industry participation are provided by this Project. To that end the proponent will have to package and present work so as to offer opportunities for capable and competitive local suppliers. The proponent will be required to provide information on business opportunities in the local area and surrounding regions prior to the release of these packages, and tenders will be advertised locally.

In preparation for construction of the proposed dam, QWI has prepared a Local Industry Participation Plan. This plan is in accordance with the Queensland Government's *A Fair Go for Industry* policy.

The proponent is required as part of their Project commitments to develop plans to outline how local industry participation will be achieved and monitored.

A submitter was of the view that the local area would suffer from a post construction downturn and therefore the benefits of construction are not significant.

On balance, I consider the delivery of the Project will provide local businesses with long term benefits through the up-skilling of the local workforce as well as the increased capability and capacity of local businesses who increase in scale via the winning of supply contracts for the Project.

I consider the additional skilling of workers and the increased capability and capacity of local businesses will be a significant and enduring benefit to the local region.

3.10.9. Tourism facilitation as a potential mitigation

The EIS found the dam is likely to have positive impacts on tourism in the area. The region currently has two dams with recreation opportunities, being Maroon Dam and Moogerah Dam. A third dam in the area may further boost the attraction of the area for water based activities.

It is anticipated the large water body will have some scenic amenity value, and there will be additional benefits associated with recreation and tourist opportunities at the dam site.

Numerous submissions from government departments and government bodies raised the potential for the Project to increase the tourism potential of the region.

Submissions mentioned numerous plans in existence or in stages of development focussed on the development of the region's tourism potential and that the Project should contribute further to the development or implementation of these plans.

Matters contained within submissions, included requests that the proponent:

- develop appropriate infrastructure (BBQs, trails, boat ramps etc) at the dam site, including allowance for suitable ongoing maintenance;
- contribute to and integrate with existing bodies' development plans for tourism; and
- financially contribute toward specific "catalyst" events or infrastructure in the local region.

The EIS identified a number of initiatives that the proponent will implement to assist the region positively. In particular, a Recreational Master Plan will be developed by the proponent in consultation with state agencies, including Sport & Recreation Queensland, SRRC, Queensland Outdoor Recreation Federation and other interested parties. The master plan development process will determine the activities, including boating, suitable for the proposed dam site.

The proponent will also:

- actively participate in the ongoing planning and implementation of recreational facilities associated with the dam in conjunction with SRRC, Sport & Recreation

Queensland, the Department of Infrastructure and Planning, and appropriate sporting and community organisations in the area as required;

- contribute towards the facilitation of the planning, funding and development of recreational planning initiatives to enhance the area's future capacity to provide for the recreational needs of locals and tourists, including recreation and opportunities as part of the Project;
- facilitate and provide support to land use and infrastructure planning studies to investigate the impacts and opportunities of the Project on existing land uses and infrastructure;
- provide appropriate promotion, public relations and advertising towards the end of the construction period indicating when the recreational facilities will be opened to the public and what facilities will be available; and
- ensure the contractor considers any construction accommodation camp's potential future use (e.g. affordable housing, recreational use, functional open space) when designing, planning (in consultation with SRRC) and siting any workforce accommodation.

Local tourism development offers an opportunity to offset adverse impacts on agricultural output. In light of the advice received in submissions and noting the details contained in the State Planning Policy 1/92 (development and conservation of agricultural land), particularly the mention of tourism within paragraph 3.3 of the SPP, I have required at Condition 13 of Appendix 1, Schedule C that the proponent allocate a sum of at least $4 million to be allocated over the four years 2008-09 to 2011-12. This funding is to be allocated to a prioritised list of tourism initiatives to offset the long term loss of local farm output on the agricultural land inundated as a result of the dam.

The priority of tourism initiatives is to be agreed with SRRC and Tourism Queensland (TQ). If no agreement is reached on the prioritisation of tourism related initiatives by 31 July 2009, I shall decide the priority of initiatives to be funded in consultation with the three identified groups above.

The SRRC have highlighted the need not to add costs to the SRRC as a result of the proposed dam (for example ongoing cost of a Ranger for the area) and Sport & Recreation Queensland advised of the need for ongoing maintenance costs to be provided. The above allocation of funds can be used to ensure additional costs are not incurred by the SRRC for the four year period identified above.

The funding may be used for (but not limited to) options such as those identified in the EIS, including those within thethe Tourism Action Plan developed with the assistance of TQ.

This contribution can be in the way of provision of resources to this value or in the form of tied direct funding to an appropriate authority.

The amount of $4 million is consistent with the loss of gross farm output over the construction period. This funding contribution is being required to provide a catalyst for the development of a sustainable local tourism industry.

The impacts in the local community must be balanced against the future prosperity delivered to the wider SEQ region. This commitment to assist in the development of the local tourism potential of the scenic rim region is aimed at assisting to mitigate the loss of existing income sources to the local community.

3.10.10. Impacts to agriculture

The Project will result in a change in land use of approximately 2304 ha including 1230 ha of predominantly grazing land to use for water storage, 932 ha for a buffer area, 106 ha for the realignment of the Beaudesert-Boonah Road and 36 ha for the dam access road. These changes in land use will result in the loss of grazing land, including 741 ha of land classified as GQAL.

The Project will require approximately 1230 ha of land for inundation with additional land being purchased for roads which is currently used for grazing. This represents approximately 1% of the identified 135 321 ha of grazing land within the previous Boonah LGA, according to Core Economics (2007). The estimated annual gross output effect lost is expected to be between $0.76 million and $1.1 million per year. This annual loss is intended to eventually be offset by a gain in tourism activity. The $4 million investment in tourism-related initiatives, as outlined above, is to act as a catalyst to enable this intended outcome.

Issues raised by submitters included:

- clarification as to whether additional water allocations would be made available to agriculture; and
- the need for mitigation measures for the loss of agricultural production locally, including agri-tourism.

The EIS in section 1.2.2 identifies the objectives of the Project as forming a component of the SEQ Water Grid, to be linked via the Southern Regional Water Pipeline. Therefore, water from the Wyaralong Dam could potentially be used to supply Brisbane, Gold Coast, Ipswich and Logan local government areas via the SEQ Water Grid.

The rationale for the Project is essentially to contribute to a reliable water supply in SEQ including contributing to the sustainability of enterprises in the local area and beyond. The Project was not intended to supply additional water allocations for agriculture.

The loss of grazing land and GQAL is low as a proportion within the catchment and it is not considered to adversely affect the availability of adequate rural land in the catchment nor affect the ongoing rural activities in the balance of the catchment.

The loss of the annual gross output while not substantial in the context of the SEQ economy, is an impact on the local economy and the proponent will be required to fulfil commitments in relation to tourism development, addressed in section 3.10.9 of this report, as a mitigation of this impact.

DPI&F advises the Boonah Rural Futures project requires new sources of funding to continue its work and recommends the proponent commit to ongoing funding to support the continuation of the project and implementation of key strategies. As discussed in section 3.10.9 of this report, I have conditioned in Appendix 1, Schedule C, Condition 13 for the provision of at least $4 million in expenditure to be agreed with SRRC and TQ that may be used for this purpose if desired.

3.10.11. Operational impacts

Once land purchase and the construction of the dam are complete, few ongoing negative impacts are expected during the operation phase. There are likely to be limited impacts of the dam operation on the local social environment or economy as there is expected to be only one part-time staff member required for the operation of the dam. Accordingly, demands on local housing, community infrastructure and services will the negligible.

Upon completion of the dam, positive impacts will be felt throughout the wider SEQ with the expected benefits of improved supply and reliability of water. The dam operation is likely to have minor positive benefits for local businesses providing services to additional visitors to the dam and surrounds as mentioned previously in this report.

3.10.12. Conclusion

The proponent has provided sufficient information for the assessment of the social and economic impacts of the Project. The SREIS has adequately captured and responded to the issues raised via the submission process.

The Project benefits as outlined in the EIS include, at the national level, discounted national welfare benefit in the order of $745 million; real Gross Regional Product (GRP) in SEQ expected to increase in the construction period by approximately $42 million and in the operational period by approximately $75 million. At the local level, the injection of $333

million for Project construction will have significant flow on benefits for the local community. Aggregate employment in SEQ will increase during the construction period by approximately 350 jobs.

The Project will provide a range of positive social benefits to the local Project area and the surrounding region, as well as some localised negative social impacts.

During construction of the Project there will be some negative impacts, particularly to directly impacted property owners. The Project will require the purchase of two complete properties and part of a further nine properties in addition to the eight which are already owned by Queensland Government.

The loss of property may result in changes to property use and management, uncertainty and concern to property owners. Impacts include the emotional impacts to property owners, including changes to and uncertainty about future plans, severance of family history and ties, and disruption to lifestyle.

There may also be some negative short term impacts such as road diversions or changes, dust and noise, stemming from construction activities, but with careful management these impacts will be minimal.

Construction of the Project will result primarily in positive impacts. A large workforce will be required during the construction phase and this will provide a range of benefits to the local community through an increased in business activity through use of local services and facilities as well as employment and training opportunities.

Impacts during the operational stage of the Project will be largely positive, with the completed dam expected to provide benefits by improving the supply and reliability of water to the region. Any negative impacts during operation of the Project will be mainly associated with changes to directly affected properties and land management practices.

As explained above, I have mandated a series of conditions within Appendix 1, Schedule C Condition 13 of this report, including mandating the commitments made by the proponent, that will suitably minimise social and economic impacts on the local area surrounding the proposed dam wall and associated Project works.

3.11. Hazard and risk

The EIS and SREIS identify the issues in relation to hazards and risks associated with construction activities of building the dam and its ongoing operation. These reports provide the results of the preliminary hazard analysis undertaken by the proponent and a qualitative risks analysis of occurrence of such hazards. The reports also detail appropriate disaster planning and mitigation measures to manage the risk, particularly in relation to catastrophic failure of the dam.

I find that hazard identification, planning and management matters are addressed in the EIS and SREIS. However, I note that the dam designs for the different types of dam construction are only preliminary, based on the *Wyaralong Dam Preliminary Design Report of May 2007*, prepared by Sunwater, so no dam break study has been completed, a failure impact assessment has not been undertaken, no quantitative risk assessment has been provided and no risk contours have been calculated.

From preliminary investigations, the proponent considers it likely that the sunny day hazard category will be extreme, the Failure Impact Assessment (FIA) will be Category 2 and the incremental flood hazard category will be high A. As a result, the proponent has developed the preliminary designs based on a capacity to safely pass the PMF, the highest possible category of flood.

Issues raised in submissions on the EIS were in relation to the high risk of dam failure (labeled as issue 16.2 in the SREIS). I am satisfied that the proponent, in sections 5.3.3 and 5.16 of the SREIS, has suitably responded to the issues raised in submissions, by advising why certain analysis of dam failure has not yet been conducted. Therefore, I have conditioned, as explained further below and detailed in Appendix 1, Schedule A, the

development of a dam break analysis, a failure impact assessment and risk contours when the type of dam construction is decided by the proponent and detailed designs completed. I have conditioned that the dam will be designed, constructed and operated in accordance with the Australian National Committee on Large Dams (ANCOLD) Guidelines and the Queensland Dam Safety Management Guidelines to ensure that the risk of dam failure is reduced.

As per Appendix 1, Schedule A the proponent must undertake a failure impact assessment and review in accordance with the *Water Supply (Safety and Reliability) Act 2008* as part of the development application for Operational Works that is the construction of a referable dam under the IP Act.

The EPA has assessed the EIS and SREIS and has identified the ERAs to be triggered, as per section 2.8 of this report, during the construction phase of this Project. Conditions for these ERAs are contained in Appendix 1, Schedule A.

I have also conditioned at Appendix 1, Schedule C, Condition 3 and Condition 20, that the proponent must undertake all hazard and risk proponent commitments made in Table 6.24 of the SREIS. The proponent must also adhere to the hazard and risk components of Table 6.11 (Construction EMP) and Table 6.21 (Operation Implementation Plans) of the SREIS.

The implementation of the necessary emergency plans and actions is to be in cooperation with the Department of Emergency Services (DES). DES has provided recommendations to apply to preparation of suitable emergency action plans. The proponent and the dam operator must liaise with DES contacts, provided to the proponent, on an ongoing basis.

The Construction Hazard and Risk EMP Sub-Plan, is to include a helicopter landing site for both construction and operation phase of the Project. A dedicated helicopter landing pad is to be designed, constructed and maintained by the proponent at the dam site to allow any required evacuation (e.g. accident victims) during construction of the Project and operation as a water storage and recreational site as per my condition in Appendix 1, Schedule C, Condition 11 and 20.

I have conditioned that additional design work is required and detailed plans and specifications are to be submitted to the Chief Executive, DNRW, for assessment of dam safety before the development approval for Operational Works - Referable Dam can be issued.

3.12. Cumulative impacts

For the Project cumulative impact assessment, each environmental impact was assessed against the likelihood and consequence that the impact will have. The assessment was ranked by defining a consequence from a scale from 'major' to 'insignificant' and likelihood from 'almost certain' to 'rare'.

For the purposes of considering downstream impacts, the proponent's hydrological assessment of the impact of the Project on flow regimes took account of all existing infrastructure (Maroon Dam, Bromelton Weir, South McLean Weir and Luscombe Weir), and also included all approved future development (Cedar Grove Weir and BOS). I note that Cedar Grove Weir and BOS are now constructed.

Although contaminated land was a key identified criteria, the impacts do not arise as a result of the Project, but rather from previous land use impacts. Therefore, they cannot be assessed as a Project impact. The proponent indicated that dam construction activities will actually improve the current level of contamination through appropriate remediation, and the Project can therefore be seen as having a positive overall influence in that regard.

The key environmental impacts and key issues that were considered in the cumulative assessment phase included:

- land use and land tenure impacts;
- infrastructure impacts;
- topography and geomorphology;

- visual amenity;
- land contamination;
- surface water hydrology;
- groundwater;
- water quality;
- terrestrial flora and fauna;
- aquatic flora and fauna;
- socio-economic; and
- hazard and risk.

More specifically, the key environmental impacts assessed as likely to result from the Project included:

Land use

- loss of approximately 1230 ha grazing land to water storage, 106 ha to road development (including loss of approximately 741 ha of GQAL); and
- acquisition (whole or part) of 19 properties (eight currently owned by State Government) and a mining lease.

Infrastructure

- inundation of 11 km of the Beaudesert-Boonah Road and four Council controlled access roads;
- submerging and isolation of 6.4 km of high and low voltage power line;
- submerging and isolation of 11.5 km of fibre optic and copper telecommunications cable; and
- inundation of privately owned farm infrastructure (fences, sheds, etc), mostly replaced or relocated to support continuation of current land use.

Topography and Geomorphology

- Beaudesert-Boonah Road realignment and the dam access road will require substantial cut and fill activities. The geotechnical conditions are favourable;
- creation of five island ranging in size between 0.3 ha and 14 ha - improved wildlife habitat for birds, turtles and other species; and
- trapping of sediment in the dam will result in downstream flows scouring the streambed but will reduce sediment reaching the coast (it is currently highly elevated).

Visual Amenity

- improved view over new water body; and
- low visual impact on the landscape by both dam wall and the realignment of the Beaudesert-Boonah Road.

Land contamination

- 15 livestock dips and three other sites on 16 Lots;
- 22 lots UXO potential; and
- section of the realigned Beaudesert-Boonah Road has 'substantial' potential for UXO.

Surface water hydrology

- flood flow reduction in downstream reservoir;
- altered seasonality of low flow regime; and
- inundation of 1230 ha, 26 km of the Teviot Brook main channel or 5% of the total stream length (currently no such inundation). Currently 19 km of main channels in catchment inundation rising to 45 km, or 58 km including Cedar Grove Weir.

Groundwater

- increased water movement into alluvial aquifers upstream of the dam wall;
- water inflow bunded during construction causing a decline in water level immediately downstream of the dam wall construction site;

- impacts on any groundwater dependent ecosystems downstream to be determined (Hydrocensus); and
- some bores used for livestock watering will be inundated. One used for domestic supply will need to be relocated.

Water quality

- increased turbidity during construction;
- sedimentation in streams and altered habitats during construction;
- contaminant spills (including concrete - pH levels) during construction;
- thermal stratification impacts influencing in storage water quality and possibly quality of water released, during operation;
- reduced sediment loads reaching estuarine habitat will result in a positive impact.
- reduction in flow volumes discharging into the estuary; and
- slight increases in salinity in upper estuary due to reduction in freshwater flows.

Terrestrial flora and fauna

- 40.8 ha of regional Ecosystems with a classification of "endangered" will be lost;
- 3.3 ha of wetland classified as "of concern" will be lost;
- minor potential impacts on wetland habitats downstream as a result of reduced surface water flows;
- impacts on downstream habitats are a result of flow regime changes;
- fragmentation of fauna habitats and corridors;
- changes in local species composition as a result of the presence of an open water body; and
- no substantial impacts on flora or fauna species of conservation significance.

Aquatic flora and fauna

- downstream water quality impacts are largely positive and will cause local shifts in ecosystem functions of the upper reaches of the estuary;
- no anticipated impacts on threatened or protected flora or fauna. Area not considered critical foraging and refuge habitats;
- increases in fish populations within the dam;
- changes to aquatic macrophytes, macroinvertebrates, fish and turtle assemblages within the inundation area;
- residual barrier effect on movement, allowing fish transfer across dam wall;
- reduced flushing flows in Teviot Broo;k
- possible tidal intrusion in upper estuary during low flows; and
- minor reduction in flood flows reaching estuary.

Socio-economic

- increased GDP at state level;
- increase welfare by some $745 million at national level;
- increased job creation opportunities;
- increased population and use of local services and facilities;
- improvement of skills base of the local work force;
- loss of grazing land and change in land use;
- some land acquisition will be required, causing uncertainty and distress to existing local landowners, particularly related to potentially less viable properties and local family history;
- improved water security to the region; and
- passive recreational recreation use opportunities of the dam and surrounds.

Hazard and Risk

- improvement of road network has the potential reduce crash rates by 30% through improved roadwork standards and shortened length;
- the potential risk of increased traffic accidents are considered significant during the construction phase; and

- the consequence of dam failure is high but the probability of this happening is considered extremely small.

Construction activity impacts suggested by the cumulative impact assessment include the dam wall construction and road realignment impacts. Cumulative construction phase impacts identified in the EIS as requiring careful and detailed mitigation are dominated by water quality issues. Erosion and sedimentation control plans for these activities require particular focus due to their cumulative nature. Water quality issues appear to be most significant, however, the proponent has indicated and I believe that the potential impacts can be adequately mitigated by standard engineering best practice.

Furthermore, the dam wall and road construction activities also indicated varying degrees of negative impacts across the entire range of key environmental criteria, with the exception of socio-economic impacts which the proponent assessed as being net positive.

A significant amount of land is required for the permanent change to a water storage or road. Consequently, there will be some Project activities that will have negative impacts that cannot be mitigated. These impacts include issues such as land use and land tenure impacts, impacts to topography and geomorphology, groundwater and to some extent flora and fauna.

Operational impacts discussed by the proponent in the EIS, as a result of the inundation of the land, will result in the most significant negative cumulative impact. Flora and fauna impacts associated with the inundation of the land carry a major significance value. The flora and fauna impacts require significant mitigation as a result of loss of habitats and habitat fragmentation. Activities associated with the operation of the dam and its ability to supply primary water to the South-East Queensland grid were assessed as resulting in a significant overall positive impact. However, although the water supply activity will be significantly positive with substantial socio-economic benefit, the dam operation activities will have a mix of positive and negative impacts. Overall, the proponent has assessed the cumulative impact to be positive.

Overall, four key environmental criteria were considered significant by the proponent, including socio-economic impacts, land contamination impacts, flora and fauna impacts and water quality impacts, of which flora and fauna impacts and water quality impacts will require detailed attention in the EMP phase as a result of their cumulative nature.

Socio-economic impacts of the various key activities carry an overall major positive rating. The impacts were not only regionally based but also included state and national benefit. When considering the significance of the positive impacts versus the significant of the negative impacts, the proponent concluded that the positive impacts far outweigh the negative impacts, although acknowledged that local landowners may not see it this way. I have included Condition 13 at Schedule C of Appendix 1 which requires the proponent to incorporate mitigation measures in the Construction EMP and Social and Economic Construction EMP Sub-plan, such as the development of a Recreation Master Plan. I believe these measures will help address and mitigate local scale socio-economic impacts directly felt by landowners.

The Project will have a major positive overall influence on land contamination impacts, as dam construction activities will result in appropriate remediation and rehabilitation of contaminated land identified as a result of previous land use impacts. I have included Condition 12 at Schedule C of Appendix 1 which requires the development of a Construction Contamination Land EMP Sub-Plan that will implement measures to prevent land contamination.

Flora and fauna impacts resulting from the inundation of the land are acknowledged by the proponent as significant and largely unable to be directly mitigated. The inundation will result in habitat loss and fragmentation of flora and fauna. Terrestrial flora and fauna in particular will result in a major negative impact and significant mitigation effort will be required. I have included Condition 8 at Schedule C of Appendix 1 which provides for the development of the Flora and Fauna Construction EMP Sub-Plan and requires mitigation measures such as vegetation offsets and environmental corridors. Aquatic flora and fauna will also be impacted, however to a lesser degree. The provision of fish transfer arrangements at the dam wall will

assist in significantly reducing the impact of the Project on fish species with migration-dependent reproduction requirements. I have conditioned for this at Appendix 1, Schedule C.

The cumulative impact assessment suggested that water quality impacts for the dam will not act in a cumulative manner. I believe construction activities are able to be well managed and mitigated through appropriate design and EMP implementation. I have included Condition 5 to this effect. Water quality impacts during the operation phases will be mitigated through management and design measures to such an extent that I believe the anticipated impacts will be largely eliminated. Mitigation measures have been required at Condition 17, Appendix 1, Schedule C.

I am particularly concerned that the occupants of the premises at receptor 4, as identified in Chapter 10 of the EIS, and identified as receptor 29 of Chapter 11 of the EIS, may be particularly subject to cumulative impacts. This residence may suffer unacceptable amenity impacts resulting from construction traffic, dust, blasting and noise, which may result in a significant reduction in quality of life for periods during the construction phase.

I have imposed requirements in Appendix 1, Schedule C, Condition 3 for the proponent to consult with the occupants of premises at this receptor to develop sufficient mitigation measures to allow the occupants to maintain an acceptable quality of life. I require the proponent to report to me the outcomes of this consultation including details of discussion about mitigation measures targeted at this receptor for my approval prior to commencement of construction of the dam access road. Proposed mitigation measures must be based around a specific monitoring and corrective action program.

4. Assessment of the relevant impacts of the Project on matters of national environmental significance

4.1. Introduction

This section addresses the requirements as expressed in part 5 of the State Development and Public Works Organisation Regulation 1999 (SDPWO Regulation). In part, the SDPWO Regulation determines specifications for the Coordinator-General's Report for project proposals that are:

- declared as a significant project for which an EIS is required; and
- for which the Commonwealth has accredited assessment of the relevant impacts pursuant to the SDPWO Act.

The SDPWO Regulation and the bilateral agreement requires the Coordinator-General's Report for the project to contain:

- a description of the project, the places affected by the project and the controlling provisions for the project;
- a summary of the project's relevant impacts;
- a description of feasible mitigation measures, changes to the project or procedures, to prevent or minimise the project's relevant impacts, proposed by the proponent or suggested in relevant submissions;
- to the extent practicable, a description of feasible alternatives to the project identified in the EIS process, and the likely impact of the alternatives on matters of national environmental significance;
- a statement of conditions of approval for the project that may be imposed to address impacts, identified in the EIS process, on matters of national environmental significance; and
- a statement of requirements for, and conditions of, approval applying, or proposed to apply, to the project when the report is prepared, including a description of the monitoring, enforcement and review procedures applying, or proposed to apply, to the project.

4.2. The Project

The Project is the construction and operation of the Wyaralong Dam. The Project is described at section 2.2 of this report. The proponent of the Project is Queensland Water Infrastructure (QWI).

4.3. Controlling provisions of the Project

On 13 December 2006, the then Commonwealth Minister for the Environment and Heritage determined that the Wyaralong Dam Project (EPBC reference 2006/3157) was a 'controlled action ' under section 75 of the EPBC Act.

The controlling provisions of part 3 division 1 of the EPBC Act that apply to the Project are:

- Sections 16 and 17B (Ramsar wetlands);
- Sections 18 and 18A (listed threatened species and ecological communities); and

- Sections 20 and 20A (listed migratory species).

4.4. Matters of national environmental significance: values relating to the Project area

Ramsar Wetlands

Moreton Bay is one of Australia's larger Ramsar wetland sites and covers more than 110 000 ha. Although located outside the proposed Wyaralong dam reservoir footprint, it is located within the same catchment and downstream (approximately 70 km) of the proposed Wyaralong Dam, and is therefore hydrologically linked to Teviot Brook.

Listed threatened species and ecological communities

The EIS indicates that field studies confirmed only one species listed as vulnerable under the EPBC Act was identified as present within the Project area, being the Grey-headed Flying-fox.

However, desktop studies indicated that six flora species may potentially occur within the study area, including:

- Hairy-joint Grass (*Arthraxon hispidus*) vulnerable
- Shiny-leaved Coondoo (*Pouteria eerwah*) endangered
- Boonah Tuckeroo (*Cupaniopsis tomentella*) vulnerable
- Lloyd's Native Olive (*Notelaea lloydii*) vulnerable
- Slender Milkvine (*Marsdenia coronata*) vulnerable
- Frogbit (*Hydrocharis dubia*) vulnerable

Furthermore, eight fauna species may potentially occur within the Project area, being:

- Swift Parrot (*Lathamus discolour*) endangered
- Australian Painted Snipe (*Rostratula australis*) vulnerable
- Regent Honeyeater *(Xanthomyza Phrygia*) endangered
- Large-eared Pied Bat *(Chalinolobus dwyeri*) vulnerable
- Spotted-tailed Quoll (*Dasyurus maculatus maculates*) endangered
- Brush-tailed Rock-wallaby (*Petrogale penicillata*) vulnerable
- Australian Lungfish (*Neoceratodus fosteri*) vulnerable
- Mary River Cod (*Macculochella peeli mariensis*) endangered

Listed Migratory Species

The EIS indicates that field studies have confirmed five fauna species listed under the EPBC Act as present within the Project area, including:

- Glossy Ibis (*Plegadis falcinellus*);
- White-bellied Sea-eagle (*Haliaeetus leucogaster*);
- Rainbow Bee-eater (*Merops ornatus*); and
- Marsh Sandpiper (*Tringa stagnatilis*).

Desktop studies also indicate that 11 migratory species are predicted or likely to occur within the Project area, including:

- Magpie Goose (*Anseranas semipalmata*);
- Fork-tailed Swift (*Apus pacificus*);
- Latham's Snipe (*Gallinago hardwickii*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Black-faced Monarch (*Monarcha melanopsis*);
- Spectacled Monarch (*Monarcha trivirgatus*);
- Satin Flycatcher (*Myiagra cyanoleuca*);

- Australian Cotton Pygmy-goose (*Nettapus coromandelianus albipennis*);
- White-tailed Tropicbird (*Phaethon lepturus*);
- Rufous Fantail (*Rhipidura rufifrons*); and
- Painted Snipe (*Rostratula benghalensis s. lat.*).

4.5. Summary of relevant impacts and proposed mitigation measures

For the purpose of assessing the impacts of the Project on matters of National Environmental Significance, this section describes the relevant impacts as required under the SDPWO Regulation and the bilateral agreement.

In the case of Wyaralong Dam Project, the relevant impacts are those that the Project has, will have, or is likely to have, on the controlling provisions. The relevant impacts of the Project are summarised below for the controlling provision.

Ramsar Wetlands

The EIS indicates that a total of 43 species of wading birds use intertidal habitats in the bay, 33 of which are listed migratory species.

A number of fish species are listed under the EPBC Act as potentially occurring in the Logan River estuary and southern Moreton Bay. The EIS indicates that the Great White Shark and Grey Nurse Shark are listed as totally protected under the Queensland *Fisheries Act 1994*, however they are unlikely to regularly occur within the Logan estuary or southern Moreton Bay due to lack of favourable habitat. Pipefish, seahorses and ghost pipefish are all types of syngnathiformes, which are protected under the EPBC Act and little is known about their distribution. The estuarine reaches of the Logan River could represent habitat for several estuarine species.

The Green, Loggerhead and Hawksbill turtles have resident populations in Moreton Bay while Leatherback, Olive Ridley, and Flatback turtles are seasonal visitors to the region. Although it is an important feeding area, Moreton Bay is not a turtle breeding ground. The Green Turtle is most likely to inhabit near shore areas close to the Logan River and it is listed as a Migratory and Marine species under the EPBC Act.

Dugongs are believed to move in and out of Moreton Bay in ranging movement patterns, but principally through the South Passage. It is likely that dugongs will feed in the seagrass beds located adjacent to the Logan River mouth. Nevertheless, this area is not known as a key dugong feeding habitat and they are unlikely to utilise the waterways within the Logan River estuary on a regular basis due to lack of feeding habitat.

The two most common dolphin species in Moreton Bay are the common bottlenose and the Indo-Pacific humpback dolphin. The inshore form of the common bottlenose dolphin occurs in Moreton Bay. The Indo-Pacific humpback dolphin may frequent estuarine reaches of the Logan River.

The most common species of whale in the region is the Humpback whale. Whales are unlikely to frequent the Logan River mouth region due to its distance from the bay's northern entrance and the shallow and confined nature of waterways around the river mouth.

Overall, no impacts to the status of local turtle, dugong populations, habitats or food resources in Moreton Bay or the Ramsar wetland are expected. The potential for impacts to wader bird will be minimal. No detectable impacts to the status of invertebrate and fish populations, habitats or food resources in Moreton Bay are expected, except perhaps at local spatial scales. Any changes are not expected to result in broad-scale changes to the 'ecological character' of the Ramsar wetland.

The Project does not entail any works in the wetland, so no direct physical disturbance or impacts will occur. However, there is potential for impacts due to changes in hydrology, sediment movement and water quality as a result of the dam.

Over the extent of increased tidal penetration during periods of low river flow, a gradual change in benthic invertebrate community structure is predicted, with a reduction in the downstream distribution of freshwater taxa and an increase in the upstream distribution of estuarine taxa.

The Wyaralong Dam and Cedar Grove reservoirs are predicted to result in an estimated 15-24% long-term reduction in the total load of pollutants discharging to the estuary. The EIS predicts that the dam will reduce sediment loads and turbidity in the lower estuary in the short-term. However, the rate of transport is currently significantly higher than natural, so a reduction is more likely to be beneficial than harmful.

Decreases in turbidity can lead to changes in macro-invertebrate and possibly fish community structure, associated with increased light penetration for plant growth and changes to respiration and feeding patterns.

The Project will result in no major changes to the timing of flows to estuarine areas. However, together with Cedar Grove Weir, the Project is expected to reduce the magnitude of all flows in estuarine reaches of the Logan River. Estimated mean annual flows at the mouth of the Logan River are expected to decrease post-development by approximately 8%, which is predominantly due to an approximately 10% decrease in mean annual flows upstream of the Logan-Albert confluence. Changes to specific medium and high flow statistics meet the requirements of the WRP but are also indicative of levels of change that are not yet threatening.

The statistics show that key medium and large flow events are reduced by between 4% and 20% relative to predevelopment conditions. This is again a cumulative impact as it takes into account changes due to existing extraction. This level of change is generally thought to be indicative of minor risks of limited impact.

Within the tidal reaches of the Logan River and particularly downstream of the confluence with the Albert River, flood levels are very much dependent upon the local tidal conditions during the flood peak. For example, the predicted changes in flood levels (pre and post dam) at Carbrook (approximately 0.0 – 0.3 m for all floods from 1 in 2 year events to 1 in 100 year events) are approximately 1/3 to 1/6 of the variation due to the rise and fall of the tide. Thus, the predicted magnitude of change in flood levels at Location D (Carbrook) may be completely offset by the prevailing tidal conditions, depending upon the height of the tide during the flood peak. Overall, no major impacts to the ecology of estuarine floodplain wetlands or their associated aquatic flora and fauna are expected as a result of the Project.

Variations in river flows are correlated with the catch of a range of macro invertebrates of significance to both commercial and recreational fishers (predominantly crustacea). However the degree of change to the higher flow statistics that are the driver of productivity through delivery of carbon and nutrients, is not of a level where substantial impacts on estuarine macro-invertebrate communities would be expected.

Major changes in the extent and distribution of estuarine morphology and vegetation, which ultimately determine the distribution and extent of fish habitats, are not expected.

Overall, the EIS concludes that no detectable impacts to the ‘aquatic ecological character’ of the Ramsar wetland are likely to occur as a result of the predicted changes to the key ecosystem drivers operating in the wider region, except perhaps at highly localised spatial scales in the upper estuary during times of low flow in the river.

A multi-level off-take release strategy will also be utilised to minimise impacts upon the environment downstream of the dam and upstream of the Ramsar wetland.

Submissions questioned the conclusion that there will be no significant impact on Moreton Bay, in particular raising issues such as the reduction in end of system flows at southern Moreton Bay, effects of water temperature, potential economic impact on commercial fisheries, sedimentation, impact in conjunction with climate change and the degraded, stressed and over-allocated state of the Logan River Catchment.

In response to the submissions, the SREIS provides further detail of the changes to flows and the risk of impact upon the Ramsar site. The SREIS further discusses the potential impact

upon estuarine fishing productivity and concludes that downstream environmental values will be protected by the mitigation measures proposed. The SREIS also clarifies the data supporting the sedimentation impact conclusions. An ongoing monitoring program is proposed by the proponent, and it is my opinion that this will be sufficient to recognise any issues associated with the Project. I have therefore required at Condition 21 of Appendix 1, Schedule C, the development and implementation of a monitoring program to review potential impacts of the Project on the estuary. As part of that program, a suite of environmental management and response measures must be developed, in order to respond to any potential impacts from the Project.

I am satisfied that the SREIS has adequately addressed the matters raised in submissions on the EIS. In considering the strategies cited in the EIS and the SREIS, I am of the opinion that the effects of the Project on Ramsar wetlands will be minimal and able to be to be managed through best practice strategies included in the Project's finalised EMP.

Listed threatened species and ecological communities

The following Project activities have the potential to compromise environmental values during the construction phase:

- construction of the dam itself and directly associated works (camps, stockpiles etc);
- extraction of construction materials from local quarries or the river bed;
- relocation or upgrade of local roads;
- realignment of the Beaudesert-Boonah Road; and
- relocation of telecommunications and power infrastructure.

In the operations phase, the actions are:

- the capture and storage of water;
- the release of water to downstream users and the environment; and
- the treatment of the extracted water and delivery via the Southern Interconnector Pipeline.

There is one threatened species that is known to occur in the Project footprint - the Grey-headed Flying -fox.

Grey-headed Flying-fox
Grey-headed flying-foxes have been recorded in the area and within riparian vegetation.

Although individuals were record, no camps of the species were recorded within the study area during the field investigations. The animals recorded from the riparian habitat were not present in very high numbers, although the numbers present would vary from season to season as the population forages in different areas depending on flowering events.

Potential impacts of the Project on the Grey-headed Flying Fox could occur through loss of feed trees by clearing or inundation in the reservoir area and due to the Beaudesert-Boonah Road realignment. The preliminary impact of this clearing was assessed in the EIS as either minor or negligible. The mitigation measure proposed was an offset that re-established the north-south wildlife corridor, together with rehabilitation or restoration of comparable habitat in the local area. The residual impact after these measures are effected is assessed as being minor or negligible.

The EIS notes that there are a number of species that were not recorded during the field investigations but that are predicted potentially to occur in or near the Project area, including Hairy-joint Grass, Shiny-leaved Coondoo, Boonah Tuckeroo, Lloyd's Native Olive, Slender Milkvine, Frogbit, Swift Parrot, Australian Painted Snipe, Regent Honeyeater, Large-eared Pied Bat, Spotted-tailed Quoll, Brush-tailed Rock-wallaby, Australian Lungfish and Mary River Cod. Overall, the preliminary impact assessment indicated that impact on these species is considered negligible, minor or moderate, however after mitigation and compensatory measures the residual impact will be negligible or minor.

The mitigation measures proposed by QWI in the EIS include developing a Habitat Rehabilitation Management Plan, which will include fauna crossings and maintain connectivity between habitat areas and will rehabilitate lands to serve as wildlife movement corridors.

I am satisfied that the proponent has provided a strong and feasible case for mitigating impacts on significant species and ensuring their commitments are translated into tangible outcomes.

Listed Migratory Species

Listed migratory species known from the Project area include the Cattle Egret, Glossy Ibis, White-bellied Sea-eagle, Rainbow Bee-eater and Marsh Sandpiper. The species were recorded during field investigations. The EIS also notes a number of species that were not recorded during field investigations but that the effects of the presence of the dam on habitat connectivity for these species may be relevant. These include, Magpie Goose, Fork-tailed Swift, Latham's Snipe, White-throated Needletail, Black-faced Monarch, Spectacled Monarch, Satin Flycatcher, Australian Cotton Pygmy-goose, White-tailed Tropicbird, Rufous Fantail and Painted Snipe.

The preliminary impact assessment on the listed migratory species found or likely to occur in the Project area found that the impact is likely to be minor and that the residual impact after mitigation and compensatory measures are taken will be minor, negligible or non-existent or minor with a positive impact.

I am satisfied that the EIS and the SREIS satisfactorily addressed these issues and proposed mitigation measures to reduce the impact upon matters of national environmental significance.

To address potential impacts on listed migratory species, I have required at Appendix 1, Schedule C, Condition 21 for the development and implementation of an estuarine ecology management plan to monitor and manage any Project related impacts on the estuary.

Specifically, the Plan is required to monitor the following:

- potential changes in relative distributions of the saltmarsh and mangrove habitats in the upper estuary;
- the reduction in the magnitude of flows resulting from the Project and its impact on estuarine fisheries; and
- the proposed changes on estuarine fisheries habitat and productivity.

While the EIS assessed that Ramsar wetlands was the only controlling provision that the Project may potentially impact upon, the proponent has proposed a number of mitigation measures that will be implemented for the construction and operation of the Project that provide further confidence that any unforeseen potential impacts on matters of national environmental significance will be mitigated. These measures, replicated from elsewhere in this report, include:

- use of a multi-level offtake and cone dispersion valves to improve the dissolved oxygen levels and water temperature of releases;
- monitoring environmental flows, including release temperature, turbidity, pH, conductivity and dissolved oxygen in flows, and monitoring the predicted reduction in magnitude of flows resulting from the Project and its impact on coastal fisheries;
- implementing the following measures to enable a systematic and an adaptive management response to any combined and unforeseen effects that climate change and the Project may have on Moreton Bay Marine Park:
    - ongoing refinement of climate change prediction models in SEQ
    - optimisation of the operation of the dam
    - licensing and operating rules set out under the WRP
    - design and implementation of the monitoring programs.

- establishing offsets, including re-establishment of the north-south wildlife corridor and rehabilitation or restoration of comparable habitat in local area;
- developing and implementing a Pest Animal and Weed Management Plan;
- training and employing a fauna spotter/catcher during clearing to identify and capture listed threatened species;
- revegetation of dam edges and creation of wetland areas through weir construction, exclusion of cattle and control of feral predators;
- developing a Habitat Rehabilitation Management Plan; and
- developing a fishway to minimise impacts on aquatic species.

I have imposed conditions at Appendix 1, Schedule C to address each of these mitigation commitments.

4.6. Project alternatives and economic and social considerations

I note that one of the Commonwealth Environment Minister's considerations in making his decision under section 133 of the EPBC Act is social and economic matters (see section 136 EPBC Act). Detail of my assessment of social and economic impacts of the Project can be found at section 3.10 of this report.

5. Conclusions and recommendations

The Wyaralong Dam Project would be a key component of the Queensland Government's strategy to provide secure water supplies for SEQ. The Project would contribute to addressing the current water supply shortfall and in particular, the Project would provide a prudent increase in surface supply options as part of the overall mixed supply strategy.

The Project would complement other water supply related projects and demand management initiatives either completed (e.g.BOS), planned (e.g. Traveston Crossing Dam), or underway (e.g. Tugun Desalination Plant).

Having regard to the documentation and information provided during the EIS process and the SREIS process, including submissions, I am satisfied that the requirements of part 4 and division 3 of the SDPWO Act have been satisfactorily fulfilled. Sufficient information has been provided to enable me to finalise the required evaluation of the potential impacts, attributable to the Project.

The various impacts, identified in both the EIS and the SREIS, are recognised, and justified on the basis of the various mitigations offered and benefits generated by the Project.

In addition to the provision of additional surface water supplies the Project provides the opportunity to provide recreation benefits and tourism opportunities to the people of the region.

As a result of my consideration of the Project, I have established conditions in Appendix 1 of this report to ensure suitable mitigation of potential environmental effects arising, including those aspects relating to the:

- property impacts;
- construction impacts (including air, noise, transport);
- social impacts;
- fauna and flora impacts; and
- matters of national environmental significance.

On the basis of the information provided, including advice from the advisory agencies, I am satisfied that the adverse environmental, economic and social impacts associated with the proposed change are able to be suitably addressed through: the implementation of the commitments in the EIS and the SREIS; and implementation of the conditions in Appendix 1.

I recommend that the Project, as described in section 1.2 of this report, proceed in accordance with the conditions in Appendix 1, the proponent's commitments in Appendix 2 and my recommendations as made throughout this report. In the event that there is a conflict between the Proponent's commitments and my conditions in Appendix 1, my conditions prevail to the extent of the inconsistency.

My recommendations, replicated from elsewhere in this report, are as follows:

1. If in the future a community infrastructure designation is made for the Project, then I recommend that the conditions set out in Appendix 1, Schedule C should be included in that designation in accordance with section 43 of the SDPWO Act.
2. If the water entitlements of any holders of existing water entitlements in the lower Teviot Brook (that is below the dam wall) are shown by any further Project related hydrological modelling to be adversely affected by the construction and operation of the Project, the proponent should arrange to provide those entitlement holders access to equivalent water entitlements or, alternatively, provide suitable financial compensation. I recommend that, if necessary, this is achieved through the ROP

process and as a condition of the associated Resource Operations Licence (ROL) or through the application process associated with the obtaining an Interim ROL.

3. Before dam operations commence, an integrated Water Quality Management Plan should be prepared to address water quality in the storage, diffuse and point sources of pollution in the catchment and downstream of the dam and responsibility for required actions should be committed to by the relevant parties as soon as possible.
4. When preparing policies and procedures to meet health and safety requirements under legislation, the proponent should specifically consider the risks identified in relation to Unexploded Ordinance (UXO), as outlined in the EIS and SREIS. In particular:
    a) all personnel on site must be trained in recognition of UXO and procedures to follow if UXO is found as part of their site induction, and the approach reviewed if there is any change to the level of assessed risk;
    b) for the lots identified as having 'other' UXO potential in the EIS, no work involving ground disturbance be undertaken unless UXO investigation and remediation has been undertaken before work commences. and
    c) for the lots identified as having 'other' UXO potential in the EIS, the proponent must require that all areas within the relevant lots purchased by the proponent carry clear warning signs setting out the possible UXO hazard.
5. The proponent formalise its commitment to the 10 percent Training Policy with the Department of Employment and Industrial Relations.

This report will now be provided to the Commonwealth Minister for the Environment, Heritage and the Arts, pursuant to section 17(2) of the SDPWO Regulation, to enable a decision on approval of the controlled action for this Project pursuant to section 133 of the EPBC Act.

A copy of this report will be provided to the proponent and advisory agencies and will be made publicly available on the Department of Infrastructure and Planning website, at www.dip.qld.gov.au/projects/water.

I would like to take this opportunity to thank all individuals, organisations and advisory agencies that have contributed to the EIS process by providing submissions on the Terms of Reference and the EIS. This input has contributed to the development of appropriate and reasonable conditions that are to apply to the Project to ensure best practice. I would particularly like to thank advisory agencies for their responses to my requests for advice and input, which has assisted the completion of this report.

Colin Jensen
Coordinator-General
Director-General

Appendix 1: Conditions to apply to the Project

Schedule A: Conditions under section 39 of the *State Development and Public Works Organisation Act 1971*

Schedule B: Recommended conditions under section 52 of the *State Development and Public Works Organisation Act 1971*

Schedule C: Imposed conditions under Part 4, Division 8 of the *State Development and Public Works Organisation Act 1971*

Schedule D: Jurisdiction for Conditions

Schedule A: Conditions under section 39 of the State Development and Public Works Organisation Act 1971

Environmentally Relevant Activities

The proponent has indicated that Environmentally Relevant Activities (ERAs) 7, 11, 17, 20, 22, 28 and 62 will be triggered during the construction phase of this project. The Project proponent has also identified that ERAs 83 and 84 may be triggered by the project. Where ERAs are triggered the following conditions apply for a material change of use for an ERA. Based on the EIS and the SREIS the following ERAs may be triggered but this may change depending on the detailed development of the project. Where ERAs are triggered the following conditions apply to a development approval for a Material Change of Use.

ERA 7 Chemical storage—storing chemicals (other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of more than 10m3.

ERA 11 Crude oil or petroleum product storing—storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 10000L or more.

ERA 17 Fuel burning—any process involving the use of fuel burning equipment (including, for example, a standby power generator) that is capable of burning (whether alone or in total) 500kg or more of fuel an hour.

ERA 19 Dredging material—dredging material from the bed of any waters (other than dredging by a port authority of material for which a royalty or similar charge is not payable) using plant or equipment having a design capacity of—
(a) not more than 5000t a year
(b) 5000t or more, but less than 100000t, a year
(c) 100000t or more a year.

ERA 20 Extracting rock or other material—extracting rock (other than rock mined in block or slab form for building purposes), sand (other than foundry sand), clay (other than clay used for its ceramic properties, kaolin or bentonite), gravel, loam or other material (other than gravel, loam or other material under a mining tenement or petroleum authority) from a pit or quarry using plant or equipment having a design capacity of—
(a) not more than 5000t a year
(b) 5000t or more, but less than 100000t, a year
(c) 100000t or more a year.

ERA 22 Screening etc. materials—screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth (other than under a mining tenement or petroleum authority) or by dredging using plant or equipment having a design capacity of—
(c) 100000t or more a year.

ERA 28 Motor vehicle workshop—operating a workshop or mobile workshop in the course of which motor vehicle mechanical or panel repairs are carried out in the course of a commercial or municipal enterprise (other than on a farm or under a mining tenement) or on a commercial basis.

ERA 62 Concrete batching—producing concrete or a concrete product by mixing cement, sand, rock, aggregate or other similar materials in works (including mobile works) having a design production capacity of more than 100t a year.

ERA 83 Regulated Waste Transport – transporting regulated waste commercially or in quantities of more than 250kg in a load:

1) for tyres
2) for 1 or more, but less than 36, licensed vehicles; or
3) for 36 or more licensed vehicles.

ERA 84 Regulated Waste Storage – operating a facility for receiving and storing

(i) on a farm for use as a soil conditioner or fertilizer in carrying out an agricultural activity; or
(ii) for use in manufacturing a saleable product under another item or this schedule; or
(iii) for incineration under item 76; or
(iv) recycling, reprocessing or reconditioning under items 77 to 79 or 81.

The following ERAs may also be triggered:

ERA 59 Asphalt manufacturing—manufacturing asphalt.

ERA 76 Incinerating waste—operating a waste incineration facility for incinerating—
(a) vegetation.

Environmental Protection Agency (EPA) Interest - General

Prevent and/or minimise likelihood of environmental harm.

(A1) In carrying out the activities, all reasonable and practicable measures must be taken to prevent and / or to minimise the likelihood of environmental harm being caused.

Maintenance of Measures, Plant and Equipment.

(A2) The registered operator for the works must:

(a) install all measures, plant and equipment necessary to ensure compliance with the EPA's conditions;

(b) maintain such measures, plant and equipment in a proper and efficient condition; and

(c) operate such measures, plant and equipment in a proper and efficient manner.

In this condition, "plant and equipment" includes:

i. plant and equipment used to prevent and/or minimise the likelihood of environmental harm being caused;

ii. devices and structures to contain foreseeable escapes of contaminants and waste;

iii. devices and structures used to store, handle, treat and dispose of waste;

iv. monitoring equipment and associated alarms; and

v. backup systems that act in the event of failure of a primary system.

Site Based Management Plan.

(A3) From commencement of the ERAs, a site based management plan (SBMP) must be implemented. The SBMP must identify, in relation to the activities, all sources of environmental harm, including but not limited to the actual and potential release of all contaminants, the potential impact of these sources and what actions will be taken to prevent the likelihood of environmental harm being caused. The SBMP must also

provide for the review and 'continual improvement' in the overall environmental performance of all ERAs that are carried out.

(A4) The SBMP must address the following matters:

(a) environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals;

(b) identification of environmental issues and potential impacts;

(c) control measures for routine operations to minimise likelihood of environmental harm;

(d) contingency plans and emergency procedures for non-routine situations;

(e) organisational structure and responsibility;

(f) effective communication;

(g) monitoring of contaminant releases;

(h) conducting environmental impact assessments;

(i) staff training;

(j) record keeping; and

(k) periodic review of environmental performance and continual improvement.

(A5) The SBMP must not be implemented or amended in a way that contravenes any condition.

Records

(A6) Any record or document required to be kept by any EPA conditions, must be kept at the place of works for the construction period of the project and be available for examination by an authorised person under the *Environmental Protection Act 1994.*

Alterations

(A7) No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided by EPA's conditions.

An example of a substantial increase in the risk of environmental harm is an increase of ten percent (10%) or more in the quantity of the contaminant to be released to the environment.

Equipment Calibration

(A8) All instruments and devices used for the measurement or monitoring of any parameter under any EPA condition must be calibrated, and appropriately operated and maintained.

Acid Sulfate Soils

(A9) The latest edition of the Queensland Environmental Protection Agency's INSTRUCTIONS FOR THE TREATMENT AND MANAGEMENT OF ACID SULFATE SOILS, 2001, ('the Instructions') must be complied with when treating and managing acid sulfate soils.

(A10) Acid sulfate soils must be managed such that contaminants are not directly or indirectly released to any waters.

(A11) All ponds used for the storage or treatment of acid sulfate soils or other contaminants must be constructed, installed and maintained:

(a) so as to prevent any release of contaminants through the bed or banks of the pond to any waters(including ground water);

(b) so that a freeboard of not less than 0.5 metres is maintained at all times; and

(c) so as to ensure the stability of the ponds' construction.

(A12) Suitable banks and/or diversion drains must be installed and maintained to exclude stormwater runoff from entering any ponds or other structures used for the storage or treatment of contaminants including acid sulfate soils or wastes.

(A13) All acid sulfate soils must be disposed of or managed within the authorised place.

(A14) Any temporary or permanent dewatering ponds or water bodies used to contain or treat acid sulfate soils must not be constructed on a watercourse.

Notification

(A15) The registered operator of the ERA to which this approval relates must telephone the EPA's Pollution Hotline as soon as practicable after becoming aware of any release of contaminants not in accordance with the conditions of this development approval or any event where environmental harm has been caused or may be threatened.

Information about Spills.

(A16) A written notice detailing the following information must be provided to the EPA within 14 days of any advice provided in accordance with condition (A15):

(a) the name of the entity responsible for the works;

(b) the name and telephone number of a designated contact person;

(c) quantity and substance released;

(d) vehicle and registration details;

(e) person/s involved (driver and any others);

(f) the location and time of the release;

(g) the suspected cause of the release;

(h) a description of the effects of the release;

(i) the results of any sampling performed in relation to the release,

(j) actions taken to mitigate any environmental harm caused by the release; and

(k) proposed actions to prevent a recurrence of the release.

Trained / Experienced Operator(s)

(A17) The registered operator for the works, including but not limited to employees and contract staff must be trained in the procedures and practices necessary to comply with the conditions and prevent environmental harm during normal operation and emergencies.

Monitoring

(A18) A suitably qualified person(s) must conduct any monitoring required.

Spill Kit

(A19) An appropriate spill kit, personal protective equipment and relevant operator instructions/emergency procedure guides for the management of wastes and chemicals associated with the ERA must be kept at the site, and in each vehicle used if the activity is a mobile ERA.

Spill Kit Training

(A20) Anyone operating under this approval must be trained in the use of the spill kit.

Complaint Response

(A21) The registered operator for the works must record the following details for all complaints received and provide this information to the EPA on request:

(a) time, date, name and contact details of the complainant;

(b) reasons for the complaint;

(c) any investigations undertaken;

(d) conclusions formed; and

(e) any actions taken.

Community Consultation

(A22) In consultation with the administering authority, cooperate with and participate in any community environmental liaison committee established in respect of either the construction phase of the project.

EPA Interest : AIR

Odour Nuisance

(B1) The release of noxious offensive odours or any other noxious or offensive airborne contaminants resulting from the activities must not cause an environmental nuisance at a nuisance sensitive place.

Dust and Particulate Emissions

(B2) Emissions of dust and/or particulate matter resulting from the activities must not cause an environmental nuisance at a nuisance sensitive place.

(B3) An environmental nuisance caused by dust and/or particulate matter includes a release to a dust sensitive place that exceeds either of the following limits at that place:

(a) dust deposition of 120 milligrams per square meter per day, when monitored in accordance with Australian Standard AS 3580.10 of 1991;

(b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometer (μm) (PM_{10}) suspended in the atmosphere of 150 micrograms per cubic meter over a 24-hour averaging time, at a dust sensitive place downwind of the approved place, when monitored in accordance with:

(i) Australian Standard AS 3580.9.6 "Ambient air - Particulate matter - Determination of suspended particulate PM_{10} high-volume sampler with size-selective inlet - Gravimetric method"; or

(ii) any alternative method of monitoring PM_{10} which may be permitted by the "Air Quality Sampling Manual" as published from time to time by the EPA**.**

(B4) When requested by the administering authority, dust and particulate monitoring must be undertaken to investigate any complaint of environmental nuisance caused by dust and/or particulate matter, and the results notified within 14 days to the EPA following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected dust sensitive place and at upwind control sites and must include:

(a) for a complaint alleging dust nuisance, dust deposition; and

(b) for a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere over a 24hr averaging time.

Excavation and Stockpiles

(B5) Stockpiles must be maintained using all reasonable and practicable measures necessary to minimise the release of wind blown dust and particulate matter to the atmosphere. Reasonable and practicable measures may include but are not limited to:

(a) use of water spray as required during winds likely to generate such releases;

(b) use of dust-suppressant shielding; and

(c) storage in bunkers.

Crushing and Screening Equipment / Batching Plants

(B6) Fine misting sprays, where practicable, shall be fitted and operated at each transfer point while crushing and screening is carried out as necessary to minimise the release of dust and wind blown particulate matter to the atmosphere.

(B7) Screens shall be fitted with dust covers on the top deck and dust seals between decks to prevent emissions of dust.

(B8) Stationary dust generating activities (including concrete batching / rock crushing) should be located as far as practical from sensitive places.

(B9) In work areas close to residents, dust emission unable to be controlled by watering or other means should be ceased during excessively dry and windy condition.

(B10) An effective static precipitator system must be installed to provide a dust extraction system to collect and contain dust generated in the loading and unloading areas for the cement and fly-ash silos.

(B11) All fabric filter dust collectors must be cleaned daily either by the mechanical shaking method or reverse pulse.

(B12) Controls for shaking and cleaning the filter are to be located at ground level.

(B13) The fabric filter dust collector must be inspected weekly for the integrity of the filter.

(B14) The fabric filter element must be replaced as soon as practicable but not later than 24 hours after the failure of the filter has been identified.

(B15) A test circuit for simulating high-level conditions in the silos is to be used before each bulk delivery.

(B16) The filling of all silos must be controlled by automatic devices, which prevent silos from being filled beyond their nominal capacity.

(B17) The concrete loading area must be screened on both sides and roofed. The walls and roof are to be impervious to dust and particulate matter.

(B18) All collected material removed from the fabric filter dust collector must be removed and disposed of in a manner that will not cause the release of contaminants to the atmosphere.

Conveyor Belts

(B19) The registered operator for the works must take all reasonable and practicable measures necessary to prevent and/or minimise the release of particulate matter and dust to the atmosphere from the material conveyor systems serving the crushing and screening plant. Reasonable and practicable measures may include but are not limited to:

(a) the installation of windshields or barriers to suppress dust emissions;

(b) keeping the material conveyed in a moist state; and

(c) conveyor systems should be designed to minimise drop heights.

Trafficable Areas

(B20) Trafficable areas must be maintained using all reasonable and practicable measures necessary to minimise the release of wind blown dust and traffic generated dust to the atmosphere. Reasonable and practicable measures may include but are not limited to:

(a) keeping surfaces clean;

(b) sealing with bitumen or other suitable material;

(c) using water sprays;

(d) adopting and adhering to speed limits; and

(e) using dust suppressants and wind breaks

Aggregate Transport Trucks

(B21) The registered operator for the works must take all reasonable and practicable measures necessary to prevent spillage and/or loss of particulate matter and windblown dust from trucks used for transporting aggregates from the place of work. Reasonable and practicable measures may include but are not limited to:

(a) wetting down the load prior to transport;

(b) having the entire load covered with a tarpaulin or similar material for the duration of transport; and

(c) clearing of spillage from side rails, tail gates and draw bars of trucks prior to departure from the approved place and prior to departure from the premises to which the load has been delivered.

Blasting and Rock Drilling

(B22) Dust collectors must be used as necessary to minimise the release of wind blown dust to the atmosphere while rock drilling is carried out**.**

(B23) Dust deposits must not smother or damage vegetation.

(B24) Blasting must be restricted when strong winds are blowing in the direction of nuisance sensitive places.

(B25) Dry and fine material within the blasted area should be wetted down to suppress dust evolution.

(B26) All blasting must be carried out in a proper manner by a competent person in accordance with best practice environmental management to minimize the likelihood of adverse effects caused by impact of air blast over pressure and ground borne vibrations at noise sensitive places and commercial places and on people living in/ or using the surrounding area.

Vibration Nuisance

(B27) Vibration emitted from the activity must not cause an environmental nuisance at any nuisance sensitive place or commercial place.

Vibration Monitoring

(B28) When requested by the EPA, vibration monitoring and recording must be undertaken to investigate any complaint of vibration nuisance, and the results notified within 14 days to the EPA. Monitoring must include:

(a) peak particle velocity (mm/s);

(b) location of the blast/s within the site (including which bench level);

(c) atmospheric conditions including temperature, relative humidity and wind speed and direction;

(d) the level and frequency of occurrence of impulsive or tonal noise;

(e) atmospheric conditions including wind speed and direction;

(f) effects due to extraneous factors; and

(g) location, date and time of recording.

Agency Interest: WATER

Surface Waters Monitoring Program.

(C1) Prior to commencement of the works, an ongoing Surface Waters Monitoring Program must be developed and implemented to monitor the quality of surface waters affected, or likely to be affected, by the works.

The proposal for the Surface Waters Monitoring Program must include but not be limited to the following:

(a) in-situ testing and sampling point locations which are representative of at least one upstream and one downstream location relative to the place of works;

(b) suitably qualified person performing all determination of the quality of contaminants; and

(c) provisions for monitoring the parameters as prescribed in Table 1 – Surface waters impact monitoring.

(C2) The person conducting the works must monitor and keep records of the surface waters characteristics and at the frequency specified in Table 1 – Surface waters impact monitoring.

Table 1 – Surface waters impact monitoring.

QUALITY CHARACTERISTICS	UNITS	FREQUENCY
Turbidity	ntu	On commencement and weekly thereafter
pH	scale	On commencement and weekly thereafter
Electrical conductivity	µS/cm	On commencement and weekly thereafter
Nitrate (as Nitrogen)	mg/L	On commencement and weekly thereafter
Total Nitrogen (as Nitrogen)	mg/L	On commencement and weekly thereafter
Total Phosphorous (as Phosphorus)	mg/L	On commencement and weekly thereafter

(C3) All determinations of the quality of surface waters must be made in accordance with methods prescribed in the latest edition of the Environmental Protection Agency's Water Quality Sampling Manual.

Release of Contaminants to Waters

(C4) Contaminants that may cause environmental harm must not be directly or indirectly released from the place of works to any waters or the bed and banks of any waters other than:

(a) as permitted under the stormwater management schedule; or

(b) to a sewer as permitted or otherwise agreed from time to time by the relevant Local Government.

Groundwater

(C5) The extraction of materials must not have a detrimental impact on groundwater quality or levels.

EPA Interest: STORMWATER MANAGEMENT

Release of Contaminated Stormwater Runoff

(D1) Except as otherwise provided by the conditions of the stormwater management schedule and the water schedule of EPA's conditions, the ERAs must be carried out by such practicable means necessary to prevent and/or minimise the release or likelihood of release of contaminated runoff from the place of works to any stormwater drain or waters or the bed or banks of any such waters. "Contaminated runoff" for the purposes of this condition means stormwater and/or stormwater runoff that contain contaminants that may cause environmental harm.

Stormwater Management Plan

(D2) The registered operator for the works must implement an effective Stormwater Management Plan which details how the registered operator for the works will manage the actual and potential impacts resulting from the contamination of stormwater at the place of works.

(D3) The Stormwater Management Plan must address at least the following matters:

(a) prevention of stormwater and stormwater runoff from contacting contaminants and minimising runoff from the extraction area during overburden removal;

(b) minimisation of the amount of soil disturbed by staging works;

(c) details of sediment control measures;

(d) separation of clean and contaminated storm waters;

(e) measures for continuous improvement; and

(f) measures for periodic reporting and implementation of continuous improvement measures.

(D4) The registered operator for the works must submit a copy of the Stormwater Management Plan to the EPA.

(D5) A copy of the Stormwater Management Plan and any amendment of the Stormwater Management Plan must be kept at the place of works and be available for examination by an authorised person under *The Environmental Protection Act 1994,* on request.

(D6) The registered operator for the works must not implement the Stormwater Management Plan where such implementation or amendment would result in a contravention of any condition of EPA's conditions.

Maintenance and Clean Up

(D7) The maintenance and cleaning of vehicles and any other equipment or plant must be carried out in areas from where contaminants cannot be released into any waters, roadside gutter or stormwater drainage system.

(D8) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable. Such spillages must not be cleaned up by hosing, sweeping or otherwise releasing such wastes, contaminants or material to any stormwater drainage system, roadside gutter or waters.

Sediment and Erosion Control

(D9) Effective erosion and sediment control structures must be designed, installed and maintained wherever necessary to prevent the erosion of disturbed areas and the release of sediment to waters.

(D10) Erosion control and sediment control structures must be maintained at all times during the period of construction and checked, repaired or replaced as required after each rain event.

(D11) The total storage volume of any sedimentation basin for the place of works must be the larger of:

(a) 450m^3 for every hectare of the catchment area of disturbed land; or

(b) one and a half times the volume of water that will enter the basin during six minutes of a five year ARI one hour rain event.

The storage depth must be at least one metre over two thirds of the basin area. Sediment must be removed when accumulated sediment reaches 33% of the total volume. A depth indicator for 33% must be set into the internal banks of sedimentation basins and a spillway at 100% with a minimum 750mm freeboard for the banks above the spillway. Sedimentation basins for the rock quarry catchment must discharge over the primary spillway outlet directly into the reservoir behind Wyaralong Dam.

(D12) All sedimentation basins must be designed by a suitably and experience engineer.

(D13) Stockpile areas must be bunded to direct runoff from such areas to the settlement ponds on the site.

(D14) Clear and uncontaminated stormwater must not be allowed to enter the sedimentation ponds.

(D15) Releases of treated stormwater from the sedimentation basins must not exceed 40 NTU.

Oil Separators

(D16) Collected waste oil and sludge removed from each separator must be disposed of in a manner which does not cause contamination of any waters or land.

(D17) A record must be maintained of the time and date of the desludging and maintenance of each oil interceptor.

(D18) Collected waste oil and sludge is to be removed from site by a licensed waste contractor in accordance with condition G7.

(D19) Detergents or other emulsifying agents must be prevented as far as practicable from entering the separator.

EPA Interest: LAND

Preventing Contaminant Releases to Land

(E1) Contaminants must not be released to land.

(E2) Spillage of all chemicals and fuels, must be contained within an on-site containment system and controlled in a manner that prevents environmental harm.

NOTE: All petroleum product storages must be designed, constructed and maintained in accordance with AS 1940- Storage and Handling of Flammable and Combustible Liquids.

Bunding

(E3) All above ground chemical and fuel tank storages must be bunded so that the capacity of the bund is sufficient to contain at least 100 percent of the largest storage tank plus 10 percent of the second largest tank within the bund.

(E4) All chemical and fuel drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 25 percent of the maximum design storage volume within the bund.

(E5) All bunding must be constructed of materials, which are impervious to the materials stored.

(E6) All bunding must be roofed where practicable.

(E7) Where it is impractical to completely roof a bunded area the registered operator for the works must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

(E8) All empty drums must be stored on a concrete hardstand area with their closures in place.

High Level Alarms

(E9) The registered operator for the works must ensure that effective and appropriate measures are used to prevent the overfilling of vessels or containers containing petroleum products and prevent the spillage of material during material transfer operations. Effective and appropriate measures may include but are not limited to the use of high level alarms and operator diligence.

(E10) A tank overfill protection system is to be installed with a mechanical shut off valve and visual/audible alarm for all petroleum product storages.

Tank Dewatering

(E11) Contaminants arising from tank dewatering operations must not be released within any tank bund.

(E12) Contaminants arising from tank dewatering operations must not be released to land.

(E13) Contaminants arising from tank dewatering operations must not be released to waters except in accordance with the requirements of EPA's condition.

Land Rehabilitation

(E14) Topsoil must be removed and stockpiled prior to carrying out the ERAs.

(E15) Rehabilitation of areas disturbed by the ERAs, apart from those areas currently being utilised for the ERAs, must take place progressively and must commence within six months of cessation of the ERAs in an area.

(E16) Native seeds endemic must be collected and propagated for use in revegetation.

(E17) Excavations that are to remain after cessation of the ERAs on the site must be made safe and accessible to native animals.

(E18) The water quality of any residual water bodies (other than the impoundment) must comply with the water quality guidelines for livestock drinking water stated in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000.

(E19) The site (including all disturbed areas such as slopes, sedimentation dam(s) and stockpile areas) must be rehabilitated in a manner such that:

- suitable native species of vegetation are planted and established;
- effective erosion control measures are implemented in rehabilitated areas;
- the quality of stormwater, other water and seepage released from the site is such that releases of contaminants such as suspended solids, turbidity, total dissolved salts, pH, total iron, total aluminium and total manganese are not likely to cause environmental harm;
- the likelihood of environmental nuisance being caused by release of dust is minimised;
- the water quality of any residual water body meets relevant criteria for the post-site use and does not have the potential to cause environmental harm;
- the final land form is stable and not subject to slumping; and
- any actual and potential acid sulfate soils in or on the site are either disturbed; or submerged, or treated so as to not be likely to cause environmental harm.

(E20) At least six (6) months prior to ceasing carrying out the ERAs at the place of work, you must submit a Draft Site Rehabilitation and Decommissioning Report to the EPA in accordance with the matters prescribed in condition E22.

(E21) At least three (3) months prior to ceasing carrying out the ERAs at the place of works, submit a Final Site Rehabilitation and Decommissioning Report to the EPA. The Final Site Rehabilitation and Decommissioning Report must include any amendments made to the Draft Site Rehabilitation Report arising from consultation with the EPA.

(E22) The Site Rehabilitation and Decommissioning Report must address at least the following matters:

(a) description of what land use is ultimately proposed for the site;

(b) where appropriate revegetation of the site, including ground preparation, species used, methods, density, irrigation, weed control, use of native species endemic to the area where appropriate, staging and timing of revegetation works;

(c) the proposed landform design to be implemented, including design profile and batter slopes;

(d) nature of materials utilised and techniques to be employed for any proposed backfilling of extracted areas such as filling, compaction, topsoiling, overburden return and any other soil amelioration leading to vegetation establishment;

(e) stability of the final landform, including assessment of any changes to the flood gradient, assessment of the stability of slopes and susceptibility to soils slumping;

(f) stability of the final land surface (i.e. erosion control) including assessment of susceptibility of soils to erosion and anticipated erosion control measures;

(g) provision and protection of riparian and wildlife corridor widths and any appropriate linkages to other habitat areas;

(h) identification of any habitat areas that have been formed either directly or indirectly as a result of the extractive works or associated activities that may be adversely affected by decommissioning works, for example, any habitat pools upstream and downstream of a weir or causeway, and measures to protect these areas;

(i) potential long term impacts on environmental values and measures proposed to address these, for example, restoration of desired environmental values;

(j) expected short term and long term water quality within any lakes or ponds, with reference to likely uses of the waters, environmental values, appropriate water quality criteria, proposed remedial measures in the event that criteria are not met, and who will be responsible for maintenance of the water bodies in the long term;

(k) a proposed maintenance program, including maintenance of erosion control measures, vegetation being established (e.g. watering, weed control, fencing, site security) and water quality of any lakes or ponds;

(l) in the event that actual or potential acid sulfate soils are present, appropriate management measures for the soils including avoidance, submergence and treatment;

(m) prevention or minimisation of windblown dust from overburden stockpiles, remnant raw material stockpiles and rehabilitation earthworks;

(n) prevention or treatment of the release of contaminated stormwater runoff from remnant material stockpiles, disturbed areas and any lakes or ponds created to the bed or banks of any watercourse;

(o) a proposed monitoring program, for example, plant growth, plant health, stormwater quality, water body water quality, erosion protection measures and stability;

(p) records to be kept and reporting of outcomes, including the monitoring program results and rehabilitation outcomes achieved;

(q) the staging and timing of the expected work;

(r) any bonds kept for rehabilitation, for example, by the local authority; and

(s) submission of written advice to the EPA within fourteen (14) days of completion of site rehabilitation and decommissioning works.

(E23) The registered operator for the works must provide a written report to the EPA at the completion of site rehabilitation and decommissioning works within thirty (30) days of completing the works.

Rehabilitation - Fill Material

(E24) The only material to be used for the filling of voids must be clean rock, clay, gravel, sand or soil (excluding any contaminated rock, clay, gravel, sand or soil):

(b) obtained from the place of works; or

(c) another uncontaminated source.

(E25) Rehabilitation of disturbed areas must take place progressively as works are staged and new areas of extraction are commenced.

Agency Interest:- NOISE

Emission of Noise

(F1) A Construction Noise and Vibration Management Plan must be developed to assess the impact of the works on nuisance sensitive places and must identify the specific management measures to minimize noise nuisance from construction activities.

(F2) All noise from the activities must not exceed the levels specified in table 1 at any noise sensitive or commercial place.

(F3) Notwithstanding (F2), the activities must not cause an environmental nuisance at any noise sensitive place or commercial place.

TABLE 1

Noise level dB(A) measured as	**Monday to Saturday**			**Sundays and public holidays**		
	7am - 6pm	**6pm - 10pm**	**10pm - 7am**	**9am - 6pm**	**6pm - 10pm**	**10pm - 9am**
	Noise measured at a 'Noise sensitive place'					
$L_{Aeq, 1hr}$	Bg* + 10	Bg + 5	Bg + 3	Bg + 5	Bg + 3	Bg + 0
$L_{A1, adj, 10 mins}$	Bg + 15	Bg + 10	Bg + 6	Bg + 10	Bg + 6	Bg + 0
	Noise measured at a 'Commercial place'					
$L_{Aeq, 1hr}$	Bg + 15	Bg + 10	Bg + 6	Bg + 10	Bg + 6	Bg + 0
$L_{A1, adj, 10 mins}$	Bg + 20	Bg + 15	Bg + 9	Bg + 15	Bg + 9	Bg + 0

* Bg is the background sound pressure level, $L_{A90,15 min}$

(F4) Notwithstanding table 1, the operation of rock breaking, rock hammering, crushing or screening equipment which result in impulsive or tonal noise shall not be carried out:

(a) outside the hours of 6.00 am to 6.00 pm Mondays to Fridays;

(b) outside the hours of 6.00 am to 4.00 pm Saturdays;

(c) on Sundays; and

(d) on public holidays.

Noise Monitoring

(F5) When requested by the EPA, noise monitoring must be undertaken to investigate any complaint of noise nuisance, and the results notified within 14 days to the EPA following completion of monitoring.

Monitoring must include:

(a) air blast overpressure [dB (Lin) Peak] (for blast monitoring only);

(b) peak particle velocity (for ground vibration monitoring only);

(c) $L_{Aeq, 1hr}$;

(d) LA 1, adj, 10 mins;

(e) $L_{A90,15\ min}$;

(g) the level and frequency of occurrence of impulsive or tonal noise;

(h) atmospheric conditions including wind speed and direction;

(i) effects due to extraneous factors such as traffic noise;

(j) location, date and time of recording; and

(k) details of measurement instrumentation and measurement procedure.

(F6) Should noise levels be exceeded and monitoring results indicate environmental nuisance, the registered operator for the works must:

(a) address the complaint including the use of appropriate dispute resolution if required; or

(b) immediately implement noise abatement measures so that emissions of noise from the ERAs do not result in further environmental nuisance.

(F7) The method of measurement and reporting of noise levels must comply with the Environmental Protection Agency Noise Measurement Manual, Third Edition, March 2000, or more recent additions or supplements to that document as become available.

Explosive blasting nuisance

(F8) Explosive blasting for the ERA must not cause a nuisance at any sensitive place.

(F9) Explosive blasting on the site shall be carried out once per day within the hours of 09:00 am and 06:00 pm unless otherwise approved from time to time by the administering authority due to meteorological conditions.

(F10) Every explosive blast for the ERA shall be designed by a suitably qualified person.

Explosive blasting monitoring

Noise Limits – Blasting

(F11) Blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise sensitive place, then the air blast overpressure:

a) must be not more than 115 dB (linear) peak for nine out of any ten consecutive blasts initiated, regardless of the interval between blasts; and

b) must not exceed 120 dB (linear) peak for any blast.

Vibration – Blasting

(F12) Blasting operations must be carried out in such a manner that if ground vibration should propagate to a noise sensitive place, the ground borne vibration:

- must not exceed a peak particle velocity of 5 mm per second for nine out of any ten consecutive blasts initiated, regardless of the interval between blasts; and
- must not exceed a peak particle of 10mm per second for any blast.

Explosive blasting monitoring

(F13) Noise monitoring must be undertaken for explosive blasting. For the purposes of this condition monitoring must be done by a competent person in accordance with Australian Standard 2187.2 – Explosives Storage, Transport and Use - Part 2 Use of Explosives, and include:

- peak particle velocity (mm/s);
- air blast overpressure level (dB linear peak);
- location of the blasting within the site;
- atmospheric conditions including temperature, relative humidity, wind speed and direction;
- affects due to extraneous factors; and
- location, date and time of measurements.

(F14) Noise from blasting shall be measured using noise measurement equipment with a lower limiting frequency of 2Hz (- 3dB response point of the measurement system) and a detector onset time of not greater than 100 microseconds as assessed in accordance with AS –1259.1 clauses 8.5 and 10.4.

(F15) Vibration instrumentation must be capable of measurement over the range 0.1mms^{-1} to 300mms^{-1} with an accuracy within 5 percent and have a frequency response flat to within 5 percent over the frequency range of 4.5Hz to 250Hz.

EPA Interest: WASTE MANAGEMENT

General

(G1) Procedures must be implemented to ensure that wastes are minimised, recycled, stored, handled and transferred in a proper and efficient manner and that any disposal of waste (except any release of waste provided for by the EPA's conditions) is to a facility appropriate to accept such waste.

Waste Management Plan

(G2) From commencement of activities to which these conditions relate, a Waste Management Program must be implemented. The Waste Management Plan must address at least the following matters:

(a) the types and amount of waste generated by the activity;

(b) how the waste will be dealt with, including a description of the types and amounts of waste that will be dealt with under each of the waste management practices mentioned in the waste management hierarchy(section 10 of the Environmental Protections (Waste Management) Policy2000);

(c) procedures for identifying and implementing opportunities to improve the waste management practices employed e.g. opportunities for beneficial reuse of biosolids;

(d) procedures for dealing with accidents, spills and other incidents that may impact on the waste management;

(e) details of any accredited management system employed, or planned to be employed, to deal with the waste;

(f) how often the performance of the waste management practices will be assessed(at least annually); and

(g) the indicators or other criteria on which the performance of the waste management practices will be assessed.

(G3) A copy of the Waste Management Plan must be submitted to the administering authority prior to any works commencing.

(G4) The registered operator for the works must not implement the Waste Management Plan where such implementation or amendment would result in a contravention of any condition.

Waste Handling and Off Site Movement of Regulated Waste

(G5) Waste generated in the carrying out of the ERAs must be stored, handled and transferred in proper and efficient manner.

(G6) All regulated waste removal from the site must be removed by a person who holds a current approval to transport such waste under the provisions of the *Environmental Protection Act 1994.*

(G7) Where regulated waste is removed from site (other than by a release as permitted under any EPA condition), the registered operator for the works must monitor and keep records of the following:

(a) the date, quantity and type of waste removed;

(b) name of the waste transporter and/ or disposal operator that removed the waste; and

(c) the intended treatment/disposal destination of the waste.

Note: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition.

Notification of Improper Disposal of Regulated Waste

(G8) If a person removes regulated waste associated with activities at the site and disposes of such waste in a manner which is unlawful, the registered operator must notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal as soon as practicable.

Regulated Waste Transport[8]

(G9) Regulated wastes are only authorised to be transported by road vehicles (not by train, boat, aircraft, pipeline or other means).

(G10) Regulated waste transport must be carried out in accordance with the *Code of environmental compliance for certain aspects* of regulated waste transport (ERA 83) –Regulated Waste Transport*.

Integrated Environmental Management System (IEMS)

(G11) The registered operator for the works must implement an Integrated Management System (IEMS) which provides for the effective and appropriate management by the registered operator of this development approval of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities.

[8] Note that if the proposed activity meets the appropriate criteria, the code – Code of environmental compliance for certain aspects of regulated waste transport EPA July 2006 Version 1 – may apply.

(G12) The Integrated Environmental Management System must provide for at least the following functions:

(a) the monitoring of releases of contaminants into the environment and an environmental assessment of the releases;

(b) staff training and awareness of environmental issues;

(c) the conduct of environmental and energy audits;

(d) waste prevention, treatment and disposal;

(e) a program for continuous improvement; and

(f) reporting arrangements on the effectiveness of the environmental management of the activities.

(G13) A copy of the Integrated Environmental Management Plan must be kept at the place of works.

(G14) The registered operator for the works must not implement the integrated Environmental Management System or amend the Integrated Environmental Management System where such implementation or amendment would result in a contravention of any condition of this development approval.

For ERA 84a only, the following condition applies.

Tyre Storage.

(G15) Waste tyres must not be stored in the open for any length of time that exceeds five (5) days unless:

(a) the waste tyres are covered so as to totally exclude water;

(b) waste tyres are made totally incapable of holding water; or

(c) the waste tyres are individually treated with larvicide. The concentration of the larvicide must always be of a strength to stop the breeding cycle of the mosquito.

The dimensions of each tyre stack/stockpile, must not exceed:

a. five (5) metres as the maximum width of the base;

b. fourty-five (45) metres for the maximum length of the base; and

c. three (3) metres for the maximum height of the stack.

The minimum distance between the tyre stacks/stockpiles and any other flammable or combustible material including grass or weeds shall be at least ten (10) metres in any direction.

Cleared Vegetative Material

(G16) Vegetation including trees, shrubs and under growth should be recycled where possible, including selling any millable timber and mulching of suitable vegetation (non-weed) for rehabilitation and erosion control on site.

EPA Interest:– BIODIVERSITY

(H1) A qualified fauna spotter is to be engaged to work ahead of the site clearing works.

(H2) In the event that native fauna is present, clearing works are to cease until such time as the fauna spotter is able to safely relocate the native fauna.

MONITORING AND REPORTING for ERAs

Environmental Impact Analysis Reporting

(I1) The registered operator for the works must ensure the monitoring data gathered in accordance with conditions is analysed and interpreted, by an expert in the field of each monitoring program, to assess the nature and extent of any environmental

impact of the ERAs. The data, analyses and assessments must be available to the authorised officer of the *Environmental Protection Act 1994* (EP Act) on request.

DEFINITIONS for ERA Conditions

Words and phrases used for the ERA conditions in Schedule A are defined below. Where a definition for a term used is sought and the term is not defined within this Schedule the definitions provided in the relevant legislation shall be used.

"Activity" or "Activities" means the environmentally relevant activity, or aspect of the ERA (including activities necessarily associated with the ERA) to which this condition relates.

"ADG Code" means the *Australian Code for the Transport of Dangerous Goods by Road and Rail*, sixth edition, or more recent versions as they become available. The ADG Code is available for purchase from Canprint Publications — Telephone: 1300 656 863.

"Anniversary day", for a registration certificate is defined in Schedule 3 of the EP Act.

"Asbestos-containing material" means any material, object, product or debris that contains asbestos.

"Asbestos waste" means all removed asbestos-containing materials and disposable items used during the asbestos removal work, such as plastic sheeting used for an enclosure or to cover surfaces in the asbestos work area, disposable coveralls, disposable respirators and rags used for cleaning etc.

"administering authority" means the Environmental Protection Agency or its successor.

"annual return" means the return required by the annual notice (under section 316 of the EP Act) for the section 73F registration certificate that applies to the development approval.

"approval" means 'notice of development application decision' or 'notice of concurrence agency response' under the IP Act.

"approved plans" means the plans and documents listed in the approved plans section in the notice attached to this development approval.

"authorised place" means the place authorised under this development approval for the carrying out of the specified ERAs.

"Code of environmental compliance" means a code of environmental compliance approved or made under a regulation of the EP Act.

"commercial place" means a place used as an office or for business or commercial purposes.

"dredge spoil" means material taken from the bed or banks of waters by using dredging equipment or other equipment designed for use in extraction of earthen material.

"dwelling" means any of the following structures or vehicles that is principally used as a residence –

(a) a house, unit, motel, nursing home or other building or part of a building;

(b) a caravan, mobile home or other vehicle or structure on land; or

(c) a water craft in a marina.

"Incompatible wastes" means wastes that are likely to interact and increase the risk to human health and/or the environment when mixed or brought into contact.

"intrusive noise" means noise that, because of its frequency, duration, level, tonal characteristics, impulsiveness or vibration –

- is clearly audible to, or can be felt by, an individual;
- annoys the individual; and

- In determining whether a noise annoys an individual and is unreasonably intrusive, regard must be given to Australian Standard 1055.2 – 1997 Acoustics – Description and Measurement of Environmental Noise Part 2 – Application to Specific Situations.

"$L_{Aeq, 1hr}$**"** means the time average A-weighted sound pressure level, within the meaning given by AS 1055.1, for a one hour time interval.

"$L_{A90,T}$**"** Background sound pressure level $L_{A90,T}$ is the A-weighted sound pressure level obtained using time-weighting 'F' exceeded for 90 per cent of the measuring period 'T'.

"$L_{A\ 1,\ adj,\ 10\ mins}$**"** means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 1 per cent of any 10 minute measurement period, using Fast response.

"land" in the "land schedule" of this document means land excluding waters and the atmosphere.

"Liquescent waste" means waste tending toward a liquid state; waste that is not spadeable.

"mg/L" means milligrams per litre.

"noise sensitive place" includes –

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises;
- a motel, hotel or hostel;
- a kindergarten, school, university or other educational institution;
- a medical centre or hospital;
- a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- a public thoroughfare, park or gardens.

"noxious" means harmful or injurious to health or physical well being.

"nuisance sensitive place" includes –

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises;
- a motel, hotel or hostel;
- a kindergarten, school, university or other educational institution;
- a medical centre or hospital;
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area;
- a public thoroughfare, park or gardens; or
- a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

"offensive" means causing offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive.

"Packaged regulated waste" means regulated waste in a container with:

- a capacity of not more than 450 litres; and
- a nett mass of not more than 400 kilograms.

"protected area" means –

- a protected area under the *Nature Conservation Act 1992*;

- a marine park under the *Marine Parks Act 1992*; or
- a World Heritage Area.

"quarry material" means material on State coastal land, other than a mineral within the meaning of any Act relating to mining. Material includes for example stone, gravel, sand, rock, clay, mud, silt and soil, unless it is removed from a culvert, stormwater drain or other drainage infrastructure as waste material.

"**registered operator**" mean a entity (usually a person) holding a registration certificate given under section 73F of the EP Act.

"Registration certificate" means a registration certificate given under section 73F of the EP Act to the operator of an ERA.

"regulated waste" means non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 1998* (whether or not it has been treated or immobilised), and includes -

- for an element - any chemical compound containing the element; and
- anything that has contained the waste.

"Regulatory agency" means the agency of a State or Territory that has responsibility for regulating the transport of regulated wastes in that State or Territory.

"Release" of a contaminant into the environment, includes:

- to deposit, discharge, emit or disturb the contaminant;
- to cause or allow the contaminant to be deposited, discharged, emitted or disturbed;
- to allow the contaminant to escape; and
- to fail to prevent the contaminant from escaping.

"Rigid vehicle" means a vehicle the load carrying area of which is fixed to the vehicle's chassis or frame (as defined in the ADG Code).

"Risk phrase" means a phrase stated in the National Occupational Health and Safety Commission's (NOHSC's) document entitled *National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]*, or more recent versions, that gives information about the substance's hazards.

"Road tank vehicle" means a truck, trailer or semi-trailer or unit in a road train, incorporating a tank, or having a tank or tanks mounted thereon, either permanently or temporarily (as defined in AS 2809.1–1999 — *Road Tank Vehicles for Dangerous Goods*).

"Safety phrase" means a phrase stated in National Occupational Health and Safety Commission's document entitled *National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]*, or more recent versions, that gives information about:

- the safe use of the substance; or
- the personal protective equipment for the substance.

"Standard environmental conditions" for a code of environmental compliance, means the standard environmental conditions approved for the ERA, or aspect of the ERA, under section 549 of the EP Act.

"site" means land or tidal waters on or in which it is proposed to carry out the development approved under this development approval.

"Ullage" means a vapour space which is left above the liquid surface after filling, to permit a degree of thermal expansion of the liquid without loss of cargo (as defined in AS 2809.1–1999 — *Road Tank Vehicles for Dangerous Goods*)

"watercourse" means a river, creek or stream in which water flows permanently or intermittently-

- in a natural channel, whether artificially improved or not; or
- in an artificial channel that has changed the course of the watercourse.

"waters" includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part-thereof.

"works" or "operation" means the development approved under this development approval.

"you" means the holder of this development approval or owner / occupier of the land which is the subject of this development approval.

Operational Works for clearing native vegetation made assessable by Schedule 8, Table 4, items 1A to 1G of the *Integrated Planning Act 1997*.

Vegetation Management Act 1999

1. Development approvals for assessable development for operational work that is clearing of native vegetation must be obtained prior to clearing assessable vegetation that is pursuant to the *Vegetation Management (VM) Act 1999* and Schedule 8 part 1 table 4 of IPA.
2. Site specific sediment, erosion and drainage controls must be implemented prior to commencement of clearing of assessable vegetation and remain in place during the construction phase and operational phase if sections of the Project area are still susceptible to erosion.
3. A property vegetation management plan, consistent with the Clearing Management Plan as detailed in the EMP, must be provided with the development application to ensure the application is assessed against the Regional Vegetation Management Code for Southeast Queensland Bioregion.
4. The property vegetation management plan must detail the location and extent of the area proposed to be cleared, the purpose for clearing and the manner in which the proposed clearing meets the performance requirements of the Regional Vegetation Management Code for the construction and operational phases of the Project. The extent of clearing must be limited to that which is necessary for the construction phase and operational phase of the Project.
5. No clearing approval will exist after a currency period of five years from the date of any development approval.
6. The proposed RE mapping amendments identified in the EIS and any subsequent changes to any essential habitat mapping must be submitted to the Queensland Herbarium and finalised prior to any development application for operational works for clearing native vegetation being submitted.
7. Any clearing or activities associated with clearing within the Project area must be by mechanical methods or inundation only.
8. Any clearing or activities associated with clearing within the Project area must not adversely impact on native vegetation outside the Project area.
9. All disturbed and excavated soil must either be contained within the Project area or alternatively securely stockpiled or respread in a location where its placement will not result in the clearing of vegetation that is regulated under the *Vegetation Management Act 1999.*
10. All vegetation mechanically cleared must be stockpiled in a location where its placement will not result in the clearing of vegetation that is regulated under the *Vegetation Management Act 1999* without approval.
11. Land clearing debris must not be pushed into gullies, watercourses, other drainage lines or waterlogged areas.
12. Where clearing occurs on unallocated State Land, Reserves or Trust land (as defined the *Land Act 1994*), the supervising DNRW forest products officer must be contacted by the proponent and advised of the timing of proposed clearing activities 10 business days in advance of the commencement of clearing to allow the officer to organise any forest product of a merchantable size to be paint marked with a yellow “s” prior to clearing. The proponent must ensure that the marked trees are merchandised and placed in a cleared storage area owned by the proponent or the State which is accessible and contains a safe loading area.
13. Any harvested forest product of a merchantable size taken from unallocated State Land, Reserves or Trust land (as defined the *Land Act 1994*), must be harvested in accordance with the Department of Natural Resources and Water Forest products utilisations

standards (NB: available from DNRW and DNRW will provide training if necessary). Logs must be cut to a minimum length of 2.4 metres and increase in intervals of 0.3 metres with a top end diameter of no less than 30 centimetres under bark.

14. Where clearing occurs on unallocated State Land, Reserves or Trust land (as defined the *Land Act 1994*), all miscellaneous timbers must be cut prior to the clearing of vegetation in accordance with DNRW Forest products utilisations standards. These will be marked by the officer with an "r" or a "sp". The officer may organise a cutter to cut these products in consultation with the proponent.

15. The proponent must develop and implement a Vegetation Offset Proposal to offset the loss of approximately 227.5ha of mapped remnant vegetation (i.e. REs 12.3.3, 12.9-10.8, 12.3.8, 12.9-10.7, 12.3.7, 12.9-10.2) that will occur as a result of the Project works.

16. The Vegetation Offset Proposal must include at least 103 ha of Regional Ecosystem 12.3.3.

17. Unless otherwise agreed by the agency administering the VM Act, the Vegetation Offset Proposal must:

    - be provided to the agency administering the VM Act in conjunction with the development application to clear native vegetation;
    - involve the finalisation of deed of agreement about offset activities with the agency within 12 months of lodging the final development application under the VM Act for the Project;
    - address the requirements of the Policy for Vegetation Management Offsets to ensure compliance with the Regional Vegetation Management Code for Southeast Queensland Bioregion and the Queensland Government Environmental Offsets Policy;
    - involve revegetation, rehabilitation and associated management actions on lands totalling at least 455 ha, representing an overall clearing to offset ratio of at least 1:2, to enable the vegetation on this land to be classified as remnant within 20 years from the date of this Coordinator-General's report. The land must:
        - be freehold land owned and controlled by the proponent or be land subject to suitable enduring protective covenants or tenures or access agreements that enable the proponent or its agent to access the land for vegetation creation and maintenance purposes on ongoing basis;
        - contain mostly non remnant or disturbed vegetation, advanced regrowth or cleared land with the potential to support the remnant REs described in the EIS and SREIS;
        - ideally be within the Teviot Brook Catchment area, but other areas in the Logan Catchment can be utilised with the agreement of the agency administering the VMA; and
        - have vegetation rehabilitation, creation and management activities applied to it. Activities such as translocation and propagation of locally occurring native species; fire and weed control practices to protect rehabilitated vegetation and the exclusion of non-complementary land uses.

18. The Vegetation Offset Proposal is to result in no net loss to native vegetation flora species, and no net loss of habitat for fauna species, listed as endangered, vulnerable or rare (EVR) under the EPBC Act or the NC Act, taking account of the positive and negative impacts of the dam construction and operation and the implementation of the offset actions.

19. The Vegetation Offset Proposal must incorporate suitable translocation and/or propagation activities that must be applied to any EVR flora species, including species of National Environmental Significance (NES), to ensure no net loss of the relevant species

in the case of any relevant species in the affected area being identified after the completion of the EIS process.

20. To minimize the risk of inadvertent impacts on EVR flora or fauna species, environmental awareness training of employees must include targeted training in relation to the identification of species. If previously unknown species or individuals are discovered, these individuals and habitat surrounding them must not be subject to clearing, and the relevant State or Commonwealth Department must be notified within 10 business days.

21. The procedures included in the Environmental Management Plan (EMP) (table s6-18 and 6-19 of the SREIS) must also be implemented so that weeds are suitably managed in relation to the retained and rehabilitated habitats associated with the Project and the Vegetation Offset Proposal.

22. The Vegetation Offset Proposal must address requirements for vegetation under Policy 11 of the Nature Conservation (Koala) Conservation Plan and Management Program 2006-2016. The Vegetation Offset Proposal must maximise, as far as practicable, the use of species preferred by Koalas, for example *Eucalyptus tereticornis, E. fibrosa, E. propinqua, E. umbra, etc.*

23. If the proponent identifies, and demonstrates to the satisfaction of the Chief Executive administering the VM Act, practical difficulties in achieving the above actions in relation to a proportion of the required offset land, it may employ a broker to secure a proportion of the necessary offset outcome. The broker must be approved by the Chief Executive administering the VM Act or the Coordinator-General.

Operational Works that is the construction of a referable dam as defined under the *Water Supply (Safety and Reliability) Act 2008*

Note: the dam safety provisions were transitioned out of the *Water Act 2000* from 1 July 2008.

Referable Dam Category Assessment:

1. Failure Impact Assessment Category: Failure Impact Assessment Category to be determined via design process.

Basic Description of the Dam:

2. Location: Teviot Brook (AMTD 14.8km)
3. Purpose: Town Water Supply

MAIN EMBANKMENT

4. Construction Type: Earth and Rock Fill or Concrete-Faced Rockfill or Roller Compacted Concrete
5. Total Length: 500m (approximately)
6. Embankment Crest Level:
    a. 74.0m (Earth and Rock Fill or Concrete-Faced Rockfill); and
    b. 72.5m (Roller Compacted Concrete)
7. Maximum Embankment Height:
    1. 48m (Earth and Rock Fill or Concrete-Faced Rockfill); and
    2. 47m (Roller Compacted Concrete)
8. Full Supply Level: 63.6m
9. Storage Capacity: 103 000ML
10. Spillway – Fixed Crest Profile: Ogee Crest, rated to safely pass the loading generated by the Probable Maximum Flood (PMF)
11. Fixed Crest Level: 63.6m
12. Length: 100 to 200m (to be confirmed following detailed design)

NOTE: Levels quoted are to Australian Height Datum (AHD)

General

13. The dam is to be kept safe at all times.

Documentation

14. Any documentation prepared in order to comply with these conditions must be stored securely until such time as the dam is decommissioned.
15. The documentation must be made available for inspection by the Chief Executive, DNRW, within seven (7) days of a written request for access being received by the dam owner.
16. On change of ownership of the dam, all documentation prepared in compliance with these conditions must be transferred to the new owner.

Incidents and Failures

17. In addition to the requirements detailed within the Emergency Action Plan (EAP), the dam owner must report in writing all incidents and failures (as defined in the *Queensland Dam Safety Management Guidelines – February 2002)* to the Chief Executive, DNRW, within seven (7) days of becoming aware of the incident or failure.
18. The dam owner must advise the Chief Executive, DNRW, of any proposed remedial actions in writing within thirty (30) days of the incident or failure.

Design Report

19. The Preliminary Design Report for Wyaralong Dam is the *Wyaralong Dam Preliminary Design Report of May 2007*, prepared by SunWater.

20. The dam owner must update this design report in accordance with this condition and the *Queensland Dam Safety Management Guidelines – February 2002*, and provide a copy of the updated design report to the Chief Executive, DNRW,

    (a) at least one (1) month prior to the dam being capable of storing water, and

    (b) within three (3) months of practical completion of construction.

21. The update of the Design Report must detail changes since the previous version and show how the works will satisfy the design criteria given in initial Design Report. It should include:

    (a) Results of any additional hydraulic model studies since the preliminary design phase;

    (b) results of foundation and other investigations carried out since the investigation and preliminary design phase;

    (c) complete set of construction drawings and specifications;

    (d) final instrumentation arrangement for the dam;

    (e) design modifications necessary as a result of information obtained during the construction phase; and

    (f) managing risk during construction.

Design and Construction

22. The dam is to be designed and constructed to comply with the relevant DNRW and ANCOLD guidelines (Including requirements for the completion of a dam failure impact assessment).

23. The Wyaralong Dam must be constructed as per the final design drawings approved by the Chief Executive, DNRW.

24. The dam owner must advise the Chief Executive, DNRW, of the 'practical completion of construction' of the works within seven (7) days of that point of construction being reached.

25. Construction of any temporary works must be carried out in accordance with current engineering practice and standards.

26. Any remedial works or reconstruction of the dam must be carried out in accordance with current engineering practice to ensure that the dam remains in accordance with the documentation listed within this condition.

27. Where remedial, reconstruction or upgrade works are proposed, a copy of the final design and construction methodology must be forwarded to the Chief Executive, DNRW, for consideration no later than thirty (30) days prior to commencement of any construction works.

Data Book

28. The dam owner must prepare a Data Book in accordance with this condition and the *Queensland Dam Safety Management Guidelines – February 2002.*

29. The Data Book must be prepared by no later than 90 days after 'practical completion of construction' of the dam.

30. The Data Book must include all information as is required in the *Queensland Dam Safety Management Guidelines – February 2002* including:

    (a) all pertinent records and history relating to the dam;

(b) documentation of investigation, design, construction, operation, maintenance, surveillance, monitoring measurements and any remedial action taken during construction and subsequent operation of the dam; and

(c) known deficiencies such as seepage, cracking.

31. The dam owner must ensure the Data Book is reviewed (and if necessary updated) in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the 1st day of October of each calendar year.

32. A written notification confirming that the Data Book has been reviewed (and if necessary updated) must be signed by the dam operator and submitted to the Chief Executive, DNRW, by the 31st day of October of that same calendar year.

'As Constructed' Documentation

33. The dam owner must develop 'as constructed' documentation for Wyaralong Dam in accordance with this condition and the *Queensland Dam Safety Management Guidelines – February 2002.*

34. The owner must provide one (1) copy of the 'as constructed' documentation to the Chief Executive, DNRW, on or within three (3) calendar months of "practical completion of construction".

35. The 'as constructed' documentation must include:

(a) a record of any decisions to adapt the nominated design to suit actual field conditions;

(b) 'as constructed' drawings indicating the actual lines, levels and dimensions to which the structure is built;

(c) a description of the construction process;

(d) systematically compiled and comprehensive photographs of the construction;

(e) summary of material test results;

(f) summary of construction inspection reports;

(g) initial instrumentation data; and

(h) certification by RPEQ that the works have been constructed in compliance with all relevant engineering standards.

Standard Operating Procedures

36. The dam owner must develop Standing Operating Procedures (SOP) in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.* The SOP must include the following activities:

(a) Personnel training and procedural issues:

1. operator Training;
2. documentation Control and Review; and
3. setting of Normal Operation Criteria.

(b) Emergency Action and Incident Reporting;

1. accident and Incident Report;
2. review of EAP including verification of emergency contact numbers;
3. communication procedures and procedures covering loss of communication; and

4. maintenance of Dam Log Book for recording of surveillance inspections, equipment testing, planned and unplanned maintenance and incident details.

(c) Critical Operating Procedures

1. inspection, testing and maintenance of critical mechanical and electrical equipment;
2. water level monitoring procedures; and
3. communication security and failsafe procedures

(d) Monitoring and Surveillance

1. owner's routine dam safety inspection including check lists and reporting requirements;
2. dam Safety five yearly Comprehensive Inspection (DS 11);
3. inspection during and after flood or seismic events; and
4. water level and piezometer monitoring procedures.

37. The dam owner must submit a copy of the SOP to the Chief Executive, DNRW, within 30 days of the 'practical completion of construction'.

38. The dam must be operated in accordance with the SOP.

39. The dam owner must ensure the SOP are reviewed prior to Full Supply Level for Wyaralong Dam being achieved for the first time and by the 1st day of October of each calendar year, and updated and/or added to if necessary.

40. Where amendments are made to any SOP, the updated documents are to be forwarded to the Chief Executive, DNRW, by the 31st day of October of that same calendar year.

41. Where no amendments are necessary, a written notification confirming that the SOP have been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, DNRW, by the 31st day of October of that same calendar year.

Detailed Operation and Maintenance Manuals

42. The dam owner must prepare detailed Operation and Maintenance Manuals in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*

43. The Operation and Maintenance Manuals must be prepared and finalised by three (3) months following the date of practical completion of construction.

44. The dam owner must ensure that the Operation and Maintenance Manuals provide a comprehensive set of instructions on all equipment operated at the dam.

45. The dam must be operated and maintained in accordance with the Operation and Maintenance Manuals.

46. The dam owner must ensure the detailed Operating and Maintenance Manuals are reviewed, and if necessary updated, by the 1st day of October of each calendar year.

47. A written notification confirming that the Operating and Maintenance Manuals have been reviewed, and if necessary updated, shall be signed by the dam owner and forwarded to the Chief Executive, DNRW by the 31st day of October of that same calendar year.

Special Inspections

48. When directed by the Chief Executive, DNRW, a Special Inspection must be carried out at the cost of the dam owner and a report must be prepared in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*

49. The Chief Executive, DNRW shall be advised in writing of the date of the inspection and may elect to observe any or all procedures involved in the inspection process.

50. The dam owner must provide one copy of the Special Inspection Report to the Chief Executive, Department of Natural Resources and Water within thirty (30) days of completion of inspection.

Annual Periodic Inspections

51. The dam owner must undertake an annual (periodic) inspection of the dam in accordance with the Queensland Dam Safety Management Guideline – February 2002 on or before the 1st day of May of each calendar year.

52. The Chief Executive, DNRW shall be advised in writing of the date of the annual inspection and may elect to observe any or all procedures involved in the inspection process.

53. The dam owner must produce a written record of these annual inspections and each written record is to be incorporated into the Comprehensive Inspection Report.

54. A written notification confirming that the annual inspection has been carried out in accordance with the Queensland Dam Safety Management Guideline – February 2002 shall be signed by the dam owner and forwarded to the Chief Executive, DNRW by the 31st day of May of that same calendar year.

55. In addition to the items listed in the Queensland Dam Safety Management Guideline – February 2002, the Annual Periodic Inspection Reports must address the following:

    (a) evidence of any concrete cracking, spalling, or other identified deficiency;

    (b) evidence of any leakage through the structure;

    (c) test operation of all equipment;

    (d) evaluation of all surveillance data; and

    (e) any other issues the inspecting engineer considers appropriate.

Comprehensive Inspections

56. The dam owner must carry out a Comprehensive Inspection of the dam in accordance with the *Queensland Dam Safety Management Guidelines – February 2002*, within one (1) month of "practical completion of construction" of the Wyaralong Dam, and on or before every fifth anniversary thereafter.

57. The Chief Executive, DNRW, shall be advised in writing of the date of the Comprehensive Inspection and may elect to observe any or all procedures involved in the inspection process.

58. A Comprehensive Inspection Report detailing the findings of the Comprehensive Inspection in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* must be submitted to Chief Executive, DNRW, within three (3) months after completion of the Comprehensive Inspection.

Safety Review

59. The dam owner must carry out a Safety Review in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the 1st day of May 2030.

60. The dam owner must prepare a Safety Review Report and provide one (1) copy of the Safety Review Report to the Chief Executive, DNRW, within three (3) months of completing the review.

61. Further Safety Reviews are to be carried out at twenty (20) year intervals, but may be required at more regular intervals by the Chief Executive, DNRW, in such cases as:

    (a) an absence of adequate documentation;

    (b) detection of abnormal behaviours of the structure;

    (c) changes to design standards, construction standards; and

    (d) a regulatory requirement.

Emergency Action Plans and Event Reports

62. The dam owner must prepare and maintain an Emergency Action Plan (EAP) in accordance with this condition and the requirements of the *Queensland Dam Safety Management Guidelines – February 2002.*

63. The EAP must be in place prior to construction of Wyaralong Dam commencing and be progressively updated as the construction of Wyaralong Dam proceeds to meet the requirements of the *Queensland Dam Safety Management Guidelines – February 2002.*

64. The dam owner must provide a copy of the EAP to the Chief Executive, DNRW prior to commencing construction of the dam wall for the Wyaralong Dam project.

65. The emergency events described in the EAP shall cover those events as outlined in the *Queensland Dam Safety Management Guidelines – February 2002,* and include such failure modes as:

    (a) sunny day embankment failure;

    (b) overtopping embankment failure; and

    (c) failure of control structures such as intake and outlet works.

66. Inundation mapping shall be developed as outlined in the *Queensland Dam Safety Management Guidelines – February 2002*, and shall be at a sufficiently large scale to easily identify those areas subject to possible danger. Mapping shall be developed, for all failure modes described in the EAP, prior to commencing construction of the dam wall for the Wyaralong Dam project and submitted to the Chief Executive, DNRW.

67. The EAP must be disseminated by the proponent to those who have responsibilities under the EAP prior to commencing construction of the dam wall for the Wyaralong Dam and shall:

    (a) determine and identify those conditions that could forewarn of an emergency and specify the actions to be taken and by whom;

    (b) identify all jurisdictions, agencies and individuals who could be involved in the EAP (for example, local governments, the Queensland Police, State Emergency Services and downstream residents);

    (c) identify primary and secondary communication systems, both internal (between persons at the dam) and external (between dam personnel and outside entities);

    (d) identify all resources, special tools, equipment, keys and where they can be located if required in an emergency; and

    (e) list and prioritise all persons and entities involved (including contact details) in the notification process and the roles and responsibilities assigned to them (eg. A flow chart may be useful).

68. The dam owner must ensure the EAP is reviewed by the 1st day of May of each calendar year.

    (a) where amendments are made to any EAP, a copy of the updated document is to be forwarded to the Chief Executive, DNRW, by the 31st day of May of that same calendar year;

    (b) where no amendments are necessary, a written notification confirming that the EAP has been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, DNRW, by the 31st day of May of that same calendar year;

69. If the EAP is changed between the normal review periods, the dam owner must provide one (1) copy of the changed EAP to the Chief Executive, DNRW, within thirty (30) days of the changes being made;

70. The dam owner must ensure that in addition to any copy or amended copy of the EAP provided to the Chief Executive, DNRW, in compliance with this condition, current versions of the EAP are also provided to the following parties:

(a) scenic Rim Regional Council;

(b) local Counter Disaster Coordination Committee; and

(c) any additional group with responsibilities under the EAP.

71. In all emergencies, the dam owner must respond in accordance with the EAP.

72. In the event of an emergency, the dam owner must notify the Chief Executive, DNRW, within forty-eight (48) hours. The notification shall include a brief description of the event and the time of activation of the EAP.

73. Within thirty (30) days of the event, the dam owner must prepare an Emergency Event Report and provide a copy of the report to the Chief Executive, DNRW. The Emergency Event Report must include:

(a) a description of the event;

(b) instrumentation readings (where appropriate);

(c) description of any observed damage;

(d) photographs;

(e) details of communication and actions which took place during the emergency; and

(f) how the EAP was implemented during the event and comment on the adequacy of the EAP and any changes proposed.

Decommissioning

74. The dam must not be taken out of service (decommissioned) except in accordance with a Decommissioning Plan submitted to and accepted by the Chief Executive, DNRW.

75. The Decommissioning Plan must indicate how the dam is to be rendered safe in the long term and how the contents are to be drained in a controlled and safe manner.

76. The Decommissioning Plan must indicate how the dam fish passage will be maintained during and after decommissioning.

Definition

'Practical completion of construction'. For the purpose of these conditions, the dam construction shall reach the stage of "practical completion of construction" when:

(a) the dam embankment is capable of storage to full capacity; and

(b) the inlet/outlet works are operational (minor components may not necessarily be installed).

Operational Works that is taking or interfering with, water from a watercourse, lake or spring under the *Water Act 2000*

(a) The permittee must notify the Chief Executive of the completion of the approved works within 30 business days after such completion. The notification must be given in writing to the Chief Executive of the DNRW.

(b) The permittee must, to the satisfaction of the Chief Executive of the DNRW, and at the permittee's own expense, maintain the bed and banks of the watercourse adjacent to the permitted works.

(c) The permittee must provide a copy of the permit to any person contracted to construct the works approved by this permit.

(d) The works authorised by this permit must be located and constructed in accordance with the plan(s) and design reports identified in the Dam Safety Condition Schedule. Any plans in addition to those already mentioned will need to be included with the application for assessment.

(e) The permittee must within 90 business days after construction of the authorised works provide the Executive with two (2) copies of "as built" plans of the constructed works. These "as built" plans must be in the same scale and line form as the approved design drawings.

Operational works that is constructing or raising of a waterway barrier works

1. A Fishway(s), as defined in the *Fisheries Act 1994*, must be incorporated into the waterway barrier or dam wall structural works.
2. The Fishway must be constructed in accordance with Fishway Design Documentation developed in consultation with DPI&F (i.e. the agency administering the Fisheries Act 1994).
3. The Fishway Design Documentation must include dam operating rules and/or procedures, which accommodate both upstream and downstream passage of native fish species present in the Teviot Brook and in the Logan River in the vicinity of the confluence with Teviot Brook.
4. The Fishway Design Documentation must be finalised, and provided to the Coordinator-General for approval, at least 40 business days prior to the commencement of Project construction activities within the banks of the Teviot Brook.
5. The Fishway Design Documentation must:
    (a) be developed at the proponent's cost in consultation with DPI&F, DNRW and any relevant additional experts identified by DPI&F in consultation with the proponent (maximum of three individuals with experience or qualifications relevant to fish biology and/or fishway engineering, unless otherwise agreed by the proponent);
    (b) include a description and record of completed design process activities and proponent undertakings that are generally consistent with the process requirements set out in Appendix 4 of this Coordinator-General's report, with the exception of items that may not be applicable (e.g. the tendering related process elements associated with previous dam projects);
    (c) include a description of dam operating rules and/or procedures (e.g. relating to the fishway, outlet works, spillway etc) that are required for the movement of native fish species within Teviot Brook and consistent with condition 5b within schedule C of this Coordinator-General's Report (Appendix 1);
    (d) include a description of fish movement performance criteria developed in conjunction with DPI&F as part of the design process activities described above;
    (e) unless otherwise agreed in writing by DPI&F, include, as a minimum, fish movement performance criteria involving the ability of large-bodied native fish species (e.g. bass) to move from upstream of the dam to the confluence with the Logan River, and vice versa, in at least 5% of an average year measured over a 10 year or longer period using the flow and rainfall data underpinning the WRP. This may be demonstrated through the use of the hydrological model underpinning the WRP and associated discussion about the operating characteristics of the transfer system;
    (f) unless otherwise agreed in writing by DPI&F, include, as a minimum, fish movement performance criteria involving the ability of small-bodied native fish species (e.g. gudgeon) to move from upstream of the dam to the confluence with the Logan River, and vice versa, in at least 40% of an average year measured over a 10 year or longer period using the flow and rainfall data underpinning the WRP. This may be demonstrated through the use of the hydrological model underpinning the WRP and associated discussion about the operating characteristics of the transfer system;
    (g) include a monitoring and reporting regime for the operation of the fishway(s) and associated operating information (e.g. relating to flows or releases through or over the dam, headwater and tailwater levels, and maintenance, downtime and repair procedures);
    (h) an explanation of how non-compliance with approved performance criteria, as identified within the abovementioned monitoring and reporting regime, will be rectified after the completion of construction and during the operational phase of

the Project. This must involve triggers for the development of rectification proposal for the consideration of DPI&F;

(i) make provision for fish passage while the dam is filling, as endorsed by DPI&F;

(j) include an explanation of design specifications for all of the various stream barriers, diversions or crossing structures proposed to be associated with the Project, including proposed small weir structures on selected embayments described in the EIS;

(k) include an explanation of reasons for exclusions for each embayment within the impoundment if less than three small weir structures on embayments are proposed to be included in the Fishway Design Documentation for implementation;

(l) include correspondence from DPI&F providing DPI&F's opinion about design specifications and location of the small weir structures on the selected embayments; and

(m) be developed in accordance with Fishway Design Program that must be provided to be Coordinator-General as soon as practicable and no later than 6 months after the completion of the EIS Evaluation Report.

6. The Fishway Design Program must include descriptions of planned fishway design activities and associated timings. This program must relate to both the proposed dam barrier and the proposed small weir structures on at least three embayments within the impounded stretch of the Teviot Brook as outlined in the EIS. The program must be developed in consultation with DPI&F. The Fishway Design Program must be submitted together with an explanation of DPI&F's confirmation of support for the program or, alternatively, an explanation of DPI&F's views on key items (e.g. activity descriptions and durations, activity milestones such as those relating to required workshops, the time or other gains that may be associated with the proponent funding to support a dedicated staff resource within DPI&F, consultation exercises with experts, the finalisation of relevant documents and/or key points of agreement etc) within the program.

7. After the Fishway Design Program is submitted, the proponent must advise the Coordinator-General, as soon as practicable, in writing about any substantive actual or forecast variances from the identified timing of key milestones. This advice must include an explanation of the reasons for the variation and the revised estimates for remaining milestones.

8. The Fishway Design Program may be varied from time to time with the agreement of the Coordinator-General and in consultation with DPI.

9. The Fishway Design Program must include, as a final milestone, the completion of the Fishway Design Documentation.

10. After considering relevant draft design documentation, or the final Fishway Design Documentation, provided at any time by the proponent, and considering any other relevant material that the Coordinator-General may identify such as advice from any other person, the Coordinator-General has the discretion to require the proponent to implement up to 3 small weir structures on selected embayments.

Material change of use for land on the environmental management register or premises used for a notifiable activity

1. Undertake site history investigations of the Project Area to identify areas of potential contamination. Land suspected of being contaminated must be adequately investigated by a suitably qualified person in accordance with the Environmental Protection Act 1994 (EP Act).
2. Investigations must be undertaken in locations where earthworks or inundation may potentially encounter contaminated soils (i.e. land that is listed on the Environmental Management Register (EMR) or land that is subject to a notifiable activity, or identified areas from a site history and observations analysis). The Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland May 1998 and the National Environmental Protection Measure (Assessment of Site Contamination) must be adhered to in these investigations. Any land identified as having contaminated soil must be notified to the EPA Contaminated Land Unit.
3. Contaminated soil can only be removed from land listed on the EMR with prior EPA Contaminated Land Unit approval and under a disposal permit in accordance with the EP Act.
4. Prepare and implement a Site Management Plan for contaminated land in the Project Area where that land is not being removed from the EMR or CLR prior to any surface disturbance of the soil or inundation of the land, in accordance with:
   (a) draft Guidelines for the Assessment and Management of Contaminated Land in Queensland May 1998 and the the National Environmental Protection Measure (Assessment of Site Contamination); and
   (b) the EP Act.
5. For sites without a Site Management Plan that are listed on the EMR, validation sampling and appropriate analysis must be conducted following remediation or covering. Analysis must be undertaken by a suitably qualified person in accordance with the EP Act.

Schedule B: Recommended Conditions under section 52 State Development and Public Works Organisation Act 1971

Riverine Protection Permit
Water Act 2000

a) These conditions relate to all crossings of watercourses as defined under the *Water Act 2000* associated with construction of pipelines relating to the Wyaralong Dam Project.

b) To ensure clearing does not result in erosion and/or sedimentation, a Project Sediment and Erosion Management Plan containing Site specific sediment, erosion and drainage controls must be developed in accordance with the Institute of Engineers, Australia Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites, 1996 and be finalised prior to the commencement of construction within the banks of the Teviot Brook.

c) In relation to watercourse crossings, and any Project-related riverine works or construction activities, including the destruction of vegetation and excavation and placing of fill within a watercourse, these activities must be undertaken in accordance with the Project Sediment and Erosion Management Plan. The Plan must include:

   (a) the provision of written notices to the Chief Executive of the agency administering the *Water Act* within five days after the completion of activities at each watercourse crossing site;

   (b) the undertaking of riverine works/activities being carried out in a way that does not impound or otherwise unduly interfere with the flow of water in the watercourse and provision must be made for the maintenance of low flows past the location of the activities;

   (c) no lowering or destabilisation of natural controls creating waterholes in the bed of the watercourse;

   (d) vehicle assess tracks constructed within the watercourse not exceeding the minimum width necessary for the safe passage of vehicles and equipment using the crossings;

   (e) where possible cuttings in the watercourse banks are to be aligned in the downstream stream direction;

   (f) native vegetation in the watercourse may only be destroyed to the extent that is reasonable and necessary for access and construction purposes;

   (g) where native vegetation is to be destroyed, it must be cut off at the ground level and the ground and root mass are not to be disturbed, except as required by excavation; and

(h) material may be excavated and fill may be placed in the watercourse only to the extent that is reasonable and necessary for access and construction purposes.

d) The existing course of the low flow channel of the watercourse is not to be altered by the activities.

Condition: Road and Traffic: Works on the state-controlled road network

e) The proponent is to obtain a Section 33 and 50 approval from the chief executive of the DMR under the *Transport Infrastructure Act 1994*, to enter and conduct works on the state controlled road network. The application for this approval must include a Road-use Management Plan (RuMP), a scheduled program of delivery and detailed construction plans.

f) Prior to the construction of any new private accesses or alterations of existing accesses to any State-controlled road, the proponent is to gain approval under section 62 of the *Transport Infrastructure Act 1994.*

Condition: Interim Resource Operations Licence

g) Operating rules for Wyaralong Dam require approval from the Chief Executive of DNRW.

h) Operating rules, including environmental release rules for Wyaralong Dam and or any new infrastructure, require approval from the Chief Executive of DNRW. It is the proponent's responsibility to provide their proposed rules for assessment and approval in accordance with the Water Act 2000, Water Resource (Logan Basin) Plan 2007 and Logan Basin Resource Operation Plan (when finalised).

i) All volumes of water for any proposed additional take that are currently not covered by an existing authorisation under the Water Act 2000, require assessment and approval in accordance with the Water Act 2000, Water Resource (Logan Basin) Plan 2007 and Logan Basin Resource Operation Plan (when finalised).

j) The rules and procedures governing actual dam operations, for a ROP, must consider the intentions specified in section 3.2.1 of the Report. Any differences or variances must be supported and demonstrated, to the satisfaction of the Chief Executive of the Department administering the Water Act 2000, as providing equivalent or better performance, against each EFO and WASO within the WRP, relative to the performance levels indicated within the EIS and/or SREIS.

Schedule C: Imposed Conditions under Part 4, Division 8 State Development and Public Works Organisation Act 1971

Part 1: General Matters

1. Water Quality and Flow

(a) Within 12 months of this report, or such longer period as agreed in writing by the Coordinator-General, the proponent must conduct a qualitative risk assessment in consultation with Queensland Health, the SRRC and EPA to identify and document procedures required to achieve suitable water quality outcomes for human health purposes, having regard to:

(i) the permitted recreational uses of the waters within the impoundment area;

(ii) extraction of water at Cedar Grove Weir for treatment and distribution for human consumption;

(iii) the Queensland Water Quality Guidelines and the National Health and Medical Research Council Guidelines for primary and secondary contact environmental values;

(iv) the water discharges from the upgraded Boonah Waste Water Treatment Plant; and

(v) any other water quality mitigation or management measures that result from particular point sources upstream of the impoundment;

(b) The risk assessment and procedures must be submitted for approval by the Coordinator-General, in consultation with the EPA and Queensland Health. The approved procedures must be implemented as part of the Construction EMP required by Condition 3 and the Operation EMP required by Condition 16;

(c) The proponent must develop flow objectives and associated dam operating rules relating to the lower Teviot Brook (i.e. below the dam wall of the Project) that achieve or exceed the minimum low flow objectives (below);

Lower Teviot Brook Environmental Flow Statistics — Low flows (ie below dam)

Parameter	Units	Minimum flow objectives
Low Flow		
No Flow	% Days in the simulation period	7
0 < Flow < 1 ML/d	% Days in the simulation period	0.1
1 ≤ Flow < 3 ML/d	% Days in the simulation period	57
No Flow Period Between 1 and 3 months	No. of occurrences in the simulation period	23
No Flow Period Between 3 and 6 Months	No. of occurrences in the simulation period	3
No Flow Period Greater than 6 Months	No. of occurrences in the simulation period	0

(d) The operating rules and flow objectives developed in Condition 1(c) must be included as part of any application for an interim resource operations licence or resource operation licence in accordance with the *Water Act* and Division 3 and Division 4 of the Water Resource Plan; and

(e) Unless otherwise agreed in writing by the Coordinator-General, the Project must be operated consistent with the operating rules and flow objectives developed in Condition 1(c).

Part 2: Construction Phase

2. Community Engagement

(a) To keep stakeholders informed during the construction phase of the Project, a community engagement process must be developed and implemented which includes, but is not limited to:

(i) early establishment of community information services which must include a toll-free telephone service with 24 hour-7 day servicing, letter-box drops, Project website and email service, regular newsletters, scheduled information sessions or open days;

(ii) availability of information through the Project website generally;

(iii) responses to specific inquiries about environmental performance;

(iv) early and on-going engagement with owners and occupants of premises adjacent to proposed works, and works associated with impact mitigation measures;

(v) early notification of owners and occupants of premises adjacent to proposed haulage routes through residential areas within Beaudesert or other SRRC townships;

(vi) a complaints process, which delivers a prompt response to community concerns with relevant information, action where required, and reporting of incidents, integrated within a wider environmental reporting framework established in the Environmental Management Plans (EMPs); and

(vii) where required, special procedures to respond to complaints, issues or incidents, such as face-to-face meetings and on-going communications with affected parties and a documented process for issues resolution.

3. Construction Environmental Management Plan

(a) A "Construction EMP" must be prepared and implemented. The Project must be constructed in accordance with the Construction EMP, including Construction EMP Sub-Plans. The Construction EMP must:

(i) be developed generally in accordance with the Draft EMP (Construction) in Chapter 6 of the SREIS;

(ii) incorporate all of the conditions for construction of this Schedule C;

(iii) incorporate the proponent's commitments as set out at Appendix 2 of this report, except where the matter is addressed by these Conditions and then to the extent required by these Conditions;

(iv) identify elements of the Construction EMP require ongoing action in the operational phase of the Project; and

(v) demonstrate how the elements in (i) to (iv) above have been included in the EMP.

(b) The Construction EMP may be developed and implemented in stages to address each relevant component of construction;

(c) The Construction EMP may allow for progressive assessment of predicted impacts and design of mitigation measures prior to the relevant stages of construction works;

(d) Twenty business days prior to the commencement of a particular component of construction works (e.g. access road), the relevant Construction EMP or EMP Sub-Plan update for those works must be submitted to the Coordinator-General. Unless the Coordinator-General provides a written notice to the proponent that the Construction EMP update is not acceptable within 20 business days after the day the Construction EMP update is provided to the Coordinator-General, the construction works may proceed in accordance with the Construction EMP or Sub-Plan update. If the Coordinator-General provides notice that the Construction EMP update is not acceptable, relevant construction must not commence until the Coordinator-General provides notice that the Construction EMP update is acceptable;

(e) A comprehensive outline, structure and schedule of updates relating to the overall Construction EMP must be submitted to the Coordinator-General, for approval, at least 40 business days prior to the

commencement of construction activities for the Project within the banks of the Teviot Brook;

(f) Where further investigative or predictive studies are required to finalise the design of certain mitigation measures, arising from proponent commitments or conditions within this report, those investigative or predictive studies must be separately identified and provided to the Coordinator-General with the relevant component of the Construction EMP;

(g) The Construction EMP must accord generally with the following framework:

(i) **environmental objectives and performance criteria –** The Construction EMP must, as a minimum, adopt and incorporate the environmental objectives and performance criteria set out in the SREIS Chapter 6 (section 6.14) Draft Outline EMP (Construction) updated where necessary to incorporate these Conditions;

(ii) **EMP Sub-Plans** – The Construction EMP is to incorporate the following sub-plans as required by these Conditions to address in detail specific environmental impacts of the construction works:

1. Landscape Design and Visual Amenity;
2. Construction Sediment, Erosion, Surface and Groundwater;
3. Construction Air Quality;
4. Noise and Vibration;
5. Flora and Fauna Construction;
6. Cultural Heritage Construction;
7. Waste;
8. Hazard and Risk;
9. Contaminated Land;
10. Social and Economic; and
11. Traffic.

EMP Sub-Plans must include measures designed to comply with the relevant industry standards for environmental management, including those within in Table 6-2 of the SREIS;

(iii) **design of mitigation measures -** Mitigation measures must be designed in response to the predicted impacts, with detailed design measures to address localised impacts where necessary.

Mitigation measures may include a wide range of measures such as, but not limited to, changes in work procedures and

practices, physical interventions to separate or buffer places from predicted construction impacts or physical relocation of affected parties for agreed periods of time. Such measures must be directed to achieving the environmental objectives and performance criteria within the Construction EMP, the statutory requirements, and must be consistent with these Conditions. They may include the mitigation measures contained in the Draft Outline EMP (Construction) in Chapter 6 of the SREIS or may include other measures, provided those other measures achieve the environmental objectives and performance criteria, the statutory requirements and these Conditions;

(iv) **monitoring** – The Construction EMP must contain a program and procedures for on-going monitoring to identify the effectiveness of the mitigation measures, having regard for the environmental requirements established in the Construction EMP (including the various sub-plans set out below). Monitoring must include a range of activities such as but not limited to scientifically-conducted measurements of specified parameters, visual inspections, recordings of events, and communications with affected property owners and occupants. Monitoring results must be reported in the form required by the Construction EMP;

(v) **consultation** – The Construction EMP must include consultation procedures, which must, as a minimum, include the community engagement measures described in Condition 2 of this Schedule and the following requirements:

A. consultation with property owners and occupants in the Project area and/or potentially affected people identified through investigative or predictive studies, (e.g. consultation with the wider community if indicated to be necessary), must be conducted for the duration of the construction period;

B. consultation with affected property owners and occupants must be conducted with confidentiality where requested by the owners or occupiers of premises and at a level of detail sufficient to address specific construction impacts and mitigation requirements; and

C. active engagement with affected landholders to minimise disruption and to facilitate, where practicable, the continuation of current land use in the vicinity of the Project consistent with the commitments within section 5.5.5 (Issue 5.16) of the SREIS and the referenced Land Purchasing Policy;

(vi) **review, response and modify** – There must be a regular review of the Construction EMP. A process for review of mitigation measures must be outlined in the Construction EMP. The process should provide for further mitigation measures or review of mitigation measures to be implemented as soon as practical in response to monitoring results (where non-compliance is identified) and the outcomes of community consultation;

(vii) **complaints** – As an extension of the consultation process, there must be a formal process for receiving and dealing quickly and effectively with complaints about construction issues. This process must be established before the commencement of construction works and should adopt a consultative and negotiated basis rather than an adversarial basis. The complaints procedure must be easy to use, with information about its implementation provided on the Project website and through the visitor's information service;

As a minimum, the complaints process must include the following elements:

A. a protocol establishing the responsibility for receiving and addressing complaints, and the means of notifying the community of this protocol (eg. publication of a complaints telephone service, website advice, and address for notices and other correspondence);

B. identification of the complainant, the identity of the person who received the complaint, the manner in which the complaint was made, the time and date on which the complaint was made, and the matter to which the complaint relates;

C. a process wherein, upon receipt of a complaint, an investigation commences forthwith into the cause of the complaint and any actions reasonably required to address the complaint. Feedback to the complainant must be provided as soon as practicable about the action to be taken, and subsequently, the results of any action taken. Relevant authorities, if any, must also be notified of such actions;

D. a database for tracking complaints, issues, the subject of complaints, responses and corrective actions taken. A means of reporting each complaint, such as a complaints register, must include identification of the entity responsible for addressing the complaint, the time and date on which the complaint was addressed and closed out, a brief summary of any action taken to address the complaint, and a notation as to the satisfaction or dissatisfaction of the complainant with the outcome; and

E. monthly reporting of complaints as part of an overall performance and compliance report provided to the Coordinator-General for publication or distribution at the Coordinator-General's discretion;

(viii) **non-Conformance** - A process for dealing with circumstances where thresholds are exceeded during critical construction activities must be established prior to the commencement of construction works. This process must establish a mechanism for reporting, taking corrective action where required, and indicating responsibilities and timing for such action; and

(ix) **reporting** – A mechanism for reporting on compliance must be established in the Construction EMP, generally consistent with the following hierarchy of reporting.

Table 1: Construction – Reporting on Compliance and Performance

Report	Frequency and Scope
Construction Compliance Report	three-monthly: • undertaken by an independent and appropriately qualified person; • compliance with Coordinator-General's conditions and details of any non-compliances; • compliance with the Construction EMP; • compliance with the Proponent's commitments and details of any non-compliances; • response to incidents of non-compliance, including corrective actions, revised construction practices, responsibility and timing; and • all other matters pertaining to environmental performance during construction.
Construction Incidents and Exceedance Report	Interim Report: • within 2 days of incident or an exceedance or non-compliance with a condition, goal or requirement being identified; and • details of incident and initial response. Full Report: • within 14 days of incident or an exceedance or non-compliance with a condition, goal or requirement being identified; and • details of incident, response, corrective action, responsibility and timing.
All reporting must be to the Coordinator-General, and must be available to relevant agencies on request.	

(h) at least 20 business days prior to commencement of construction of the dam access road, the proponent must provide a report to the Coordinator-General for approval the outcomes of consultation including details of discussion about mitigation measures relating to occupants of the dwelling at sensitive receptor 4 (as identified in chapter 10 of the EIS). This report must address impacts associated with construction traffic, dust, blasting and noise, and ensure mitigation measures are implemented to achieve acceptable environmental outcomes for the occupants of the abovementioned dwelling.

4. Landscape Design and Visual Amenity

(a) Construct the Project in accordance with the Construction EMP and a Landscape Design and Visual Amenity EMP Sub-Plan incorporating the objectives, performance criteria, mitigation measures and other matters contained within Table 6-4 of the SREIS.

(b) The following mitigation measures must be incorporated in the Landscape Design and Visual Amenity EMP Sub-Plan to reduce visual impact on the landscape:

(i) tree planting around parts of the dam edges to soften the edges and blend the lake more naturally into the rural landscape;

(ii) management of the construction site around the dam wall to minimise impacts on existing vegetation and Teviot Brook, and rehabilitation of construction sites above FSL;

(iii) locate new driveways to blend into the landscape, and ensure that they are sited to minimise earthworks and avoid ridgelines and trees, subject to consultation with landowners;

(iv) offer residents identified as having a potentially high or moderate visual impact the opportunity to have additional tree planting on their properties to filter views of the dam. Those with new driveways will be offered tree planting to reduce the visual impact of these new features; and

(v) Rehabilitate decommissioned sections of existing roads as described in section 3.1.4 of this report.

5. Erosion, Sediment and Surface and Ground Water

(a) Construct the Project in accordance with the Construction EMP and a Construction Sediment, Erosion, Surface and Ground Water (CSESGW) EMP Sub-Plan incorporating the objectives, performance criteria, mitigation measures and other matters contained within Table 6-3 and Table 6-5 of the SREIS.

(b) The CSEGSW EMP Sub-Plan must:

(i) be based on predictive modelling for areas where construction works or the impounded waters are likely to intercept groundwater or cause the movement of groundwater or cause erosion or cause sediment runoff or where there is a specific relevant risk identified in the EIS or SREIS which must also include the Boonah landfill site;

(ii) Include the design and location of a groundwater monitoring network in areas close to the edge of inundation where topography is depressed or as informed by a survey of existing users who may be impacted by the inundation area;

(iii) Include collection and assessment of the monitoring data obtained from the above network, and if salinisation is predicted to occur, prepare a mitigation plan for approval by the Coordinator-General and implementation by the proponent;

(iv) contain measures to avoid, or mitigate and manage impacts on groundwater and surface water quality by construction works;

(v) contain measures for the interception, treatment if required and disposal of highly saline groundwater that is entering, construction sites or the Teviot Brook;

(vi) contain measures for the interception, treatment if required, and disposal of contaminated surface water on construction sites and spoil placement sites; and

(vii) on the basis of the above assessments, prepare draft Operational EMP Sub-Plans setting out measures to manage identified potential impacts that may extend into the operational phase of the Project, and submit these draft sub-plans to the Coordinator-General for approval prior to commencement of operations.

(c) The CSESGW EMP Sub-Plan must incorporate detailed measures relating to the following management approaches within the Project area and/or the upstream area:

(i) surveying and documenting the condition and extent of existing riparian vegetation upstream and around the area of inundation from 1.5 metres below FSL to the 1 in 100 year flood level and for 5 km upstream;

(ii) surveying and documenting existing instream sediments between 5 km upstream of FSL and 1 km downstream of the dam wall;

(iii) monitoring, maintaining and enhancing catchment and riparian vegetation, particularly in the vicinity of the reservoir, consistent with condition 8b;

(iv) retaining trees tolerant of wet conditions in the first 1.5 m below FSL, consistent with condition 8b;

(v) encouraging the recruitment of endemic tree and shrub vegetation tolerant of wet conditions as far as is practical into the reservoir – depending on release strategies, species that can tolerate flooded conditions for some months may survive a metre or so below FSL establishing trees just above and below FSL tolerant of both wet and dry conditions such as blue gum (Eucalyptus tereticornis), tea tree (Melaleuca spp.) and bottle brush (Callistemon viminalis) and river oak (Casuarina cunninghamiana);

(vi) placing partly buried logs and tree stumps just below FSL to break up wave action and to also provide habitat for aquatic species; and

(vii) facilitating the proposed upgrade to the Boonah Wastewater Treatment Plant to an appropriate standard that will improve the quality of water being discharged upstream of the impoundment while meeting all other legislative requirements. The upgrade, or another solution approved by the Coordinator-General, must be completed prior to the commencement of dam operations.

(d) The CSESGW EMP Sub-Plan must incorporate detailed measures relating to the following management approaches in the area downstream from the dam wall to the confluence of Teviot Brook and the Logan River:

(i) surveying and documenting the condition and extent of existing riparian vegetation;

(ii) surveying and documenting existing instream sediments and bank condition;

(iii) design the spillway outfall and outlets from bridges, culverts and drains to minimise erosive flows and downstream disruption and provide erosion protection; and

(iv) design spillway outfalls so that larger flood flows conform to natural patterns across the stream, adjacent terraces and floodplains and provide erosion protection in critical areas.

(e) The following management approaches must be addressed within the CSESGW EMP Sub-Plan in relation to the construction sediment and erosion control, soil management:

(i) diversion of overland or channelled flows away from disturbed areas;

(ii) installation of flow and sediment control structures on and below disturbed areas;

(iii) construct sediment barriers and sedimentation ponds as close as is practical to the disturbed areas;

(iv) construction and maintenance of sedimentation ponds;

(v) progressively clear sites, undertake works and permanently rehabilitate them so that areas are exposed for the minimum possible time;

(vi) minimize the exposure of dispersible soils;

(vii) works requiring high levels of soil disturbance and high traffic on surface soils will be timed for April to September inclusive to minimise compaction of wet soils and erosion risk as mean rainfalls and numbers of rain days are lowest over this period. If this is not practical then ripping must be implemented;

(viii) rehabilitation works involving revegetation will have plantings in place, with adequate temporary erosion protection, by the end of September of the relevant year so that spring / summer rainfall will aid establishment;

(ix) clay subsoil materials must not be left exposed where possible to avoid dispersion under rainfall and if stockpiles or excavated surfaces must be left exposed, temporary erosion protection, sediment traps and sedimentation ponds must be provided;

(x) shape disturbed surfaces to spread, not concentrate flows;

(xi) construct stockpiles so the surface is reasonably level, but with sufficient roughness to trap water and aid infiltration rather than large conical or elongated crested stockpiles where run-off will be rapid;

(xii) topsoil is to be stockpiled for the minimum practical time before it is used for rehabilitation to minimise loss of biota and where topsoil has been stockpiled for more that eight

weeks, a layer of material from a more recent stockpile about 0.05 m thick will be used at the immediate surface if available;

(xiii) avoid stockpiling soils in a compacted condition for long periods;

(xiv) before topsoils are reused they must be tested to determine whether fertiliser applications are required to aid the re-establishment of vegetation, and ensure that any fertiliser regime is compatible with native species used;

(xv) topsoil is only to be stripped and stockpiled for subsequent rehabilitation works down to the top of any clay subsoil or to an appreciable colour change including any bleached layer (pale grey or white when dry) as lower layers are generally infertile and may be sodic and/or saline;

(xvi) topsoil is to be returned to the area from which it was stripped (if above FSL) when used for rehabilitation wherever practicable to maximise return of plant propagules to their area of origin;

(xvii) use quick-growing groundcover plant species to protect stockpiles and similar sites but not letting them seed unless they are native to the area; and

(xviii) use run-off water and water from foundation dewatering as part of the water supply for construction.

(f) The following management approaches must be included within the CSESGW EMP Sub-Plan in relation to long-term erosion protection:

(i) use exposed rock, which is a natural feature of the local landscape, to provide protection where very steep slopes cannot be avoided;

(ii) monitor vegetation establishment and persistence and provide replacements, possibly with species found to be hardier in the situation, wherever required;

(iii) use locally endemic plant species that are known to be well adapted to the area and soils, including threatened species or species indicative of impacted regional ecosystems;

(iv) manage potential run-off so that flows are dispersed and flow concentration is avoided unless drainage structures have been provided;

(v) spread flows at culvert or drain outlets and providing structures to reduce discharge velocity if necessary;

(vi) for grassed surfaces shape landforms to provide slopes similar to or lower than those of the surrounding landscape, and establish grass as quickly as possible where it will be the primary vegetation cover for erosion protection. The following slopes must not be exceeded unless additional erosion protection measures such as graded contour banks or terraces using rock walls have been provided;

Table 2: Slope Goals

Soil type	Natural soils	Reconstructed soils
Deep well structured uniform-textured soils	slopes up to 20%	slopes up to 15%
Coarse and medium uniform textured soils, gradational textured soils and non-sodic texture contrast soils	slopes up to 15%	slopes up to 12%
Sodic texture contrast soils	slopes up to 8%	slopes up to 5%

(vii) for surfaces to be covered by trees and shrubs above FSL shape landforms to provide slopes similar to or lower than those of the surrounding landscape, place anchored, biodegradable erosion protection and establish trees and shrubs so they, and their leaf litter, will provide ground cover for erosion protection;

(viii) fencing must permanently exclude introduced livestock from areas where trees, shrubs and their leaf fall will provide long-term surface protection and to control grazing where grasses will provide long-term surface protection; and

(ix) ensure adequate soil material to support plant growth by placing a layer of material with appreciable water holding capacity to increase profile water storage and covering this with topsoil stockpiled during excavation.

(g) The following management approaches must be included within the CSESGW EMP Sub-Plan in relation to monitoring the effectiveness of erosion controls during construction:

(i) the effectiveness of sediment traps in preventing sediments leaving worksites;

(ii) sample sedimentation pond waters to ensure suspended sediments in released waters are no higher than 40 NTU; and

(iii) survey vegetative groundcover to ensure adequate surface protection has been established.

(h) The design and construction of the Project must provide suitable measures to intercept, treat if required and dispose of groundwater, liquid wastes, such as fire retardants, wash-down water, and contaminated stormwater, to avoid contamination of surface waters.

(i) Prior to the commencement of works in the vicinity of Teviot Brook, investigative or predictive studies must be undertaken to identify the risk of disturbing acid sulfate soils or potential acid sulfate soils, or causing the oxidation of such soils leading to impacts on the environment.

6. Air Quality

(a) Construct the Project in accordance with the Construction EMP and a Construction Air Quality EMP Sub-Plan incorporating the objectives, performance criteria, mitigation measures and other matters contained within Table 6-6 of the SREIS.

(b) The Construction Air Quality EMP Sub-Plan must incorporate measures that will avoid, or mitigate and manage the potential adverse environmental impacts of diminished air quality arising from construction activities and these measures must include:

(i) Identification of all areas where elevated off-site impacts may potentially occur (and the conditions under which these impacts may take place), including road works, worksite activities, vegetation disposal, movement or queuing of construction vehicles with diesel-powered motors adjacent to sensitive receptors, and long-term operation of diesel-powered plant and equipment at worksites;

(ii) An implementation plan detailing all approaches adopted and all reasonable and feasible mitigation measures to address environmental dust issues within the surrounding areas, including but not limited to:

A. wet suppression – regular watering of construction areas;

B. consideration of chemical stabilisation;

C. vehicle movements restricted to dedicate haul roads and speeds limited;

D. maintenance of established vegetation;

E. rehabilitation of disturbed surfaces as soon as practicable;

F. other mitigation measures as outlined in Table 6-6 of the SREIS and Table 10.9 of the EIS;

(iii) development of a strategy for communicating planned mitigation measures to potentially affected receptors;

(iv) regular monitoring of air quality for deposited dust, total suspended particulates (TSP) and particles (PM10) to determine whether environmental requirements of the Construction EMP are being met. The monitoring program, including the frequency of monitoring and the locations of monitoring stations, are to be established in the Construction EMP, including a monitoring station immediately adjacent to sensitive receptor 4 (as identified in Section 10 of the EIS); and

(v) where all available practical mitigation measures have been employed, but monitoring demonstrates that air quality criteria are still being exceeded, a short term scaling back of operations must be undertaken to ensure that the air quality goals are met.

(c) The release of dust from the construction works must not exceed the dustfall criteria set out in Table 3.

Table 3: Construction Air Quality Criteria

Pollutant	Construction Air Quality Criteria	
	Aim to Achieve	Not to Exceed
Particles as PM10	50 ug/m^3 (24 hour average)	150 ug/m^3 (24 hour average) 50 ug/m^3 (Annual average)
Total Suspended Particles	-	90 ug/m^3 (Annual average)
Particle Deposition	-	120 mg/m^2/day

(d) Monitoring for construction impacts on ambient air quality must include representative sampling of baseline air quality.

(e) Monitoring of construction air quality impacts must be reported in the Construction Compliance Report in accordance with Table 3 Records of monitoring results are to be maintained by the proponent at all times during the construction program and must be available for inspection by the relevant agency at any time.

(f) As part of the Construction Air Quality EMP Sub-Plan, the proponent must, at a minimum, provide an offset for the greenhouse gas emissions associated with the construction phase of the Project, as outlined in Section 10.5 of the EIS and Section 5.10.3 of the SREIS. The proponent must produce a Greenhouse Offset Plan within 6 months of commencement of construction within the banks of Teviot Brook, for the Coordinator-General's approval, detailing:

(i) the greenhouse gas emissions associated with the construction of the Project;

(ii) the proposed offsets, including the methodologies for calculating the greenhouse offsets; and

(iii) the proposed actions and associated monitoring program, including timeframes, to achieve the offset and an ongoing reporting regime relating to progress against subsequently approved timeframes.

(g) As part of the Construction Air Quality EMP Sub-Plan, the proponent must, within 6 months of commencement of construction with the banks of the Teviot Brook, prepare a research plan, for the Coordinator-General's approval, to advance research into the issue of greenhouse gas emissions and carbon sink capacity and options for dams. The research plan must identify:

(i) the objectives and scope of a proposed research project;

(ii) the budget for completion of such research project, including the funding contribution from the Proponent which shall not be less than $250,000;

(iii) the timeframe for the research project; and

(iv) the personnel to undertake the research project.

(h) The research plan must make provision for a final report to be provided to the Coordinator-General on the outcomes of the research.

(i) Upon approval by the Coordinator-General, the research plan must be implemented by the Proponent.

7. Noise and Vibration

(a) Construct the Project in accordance with the Construction EMP and a Construction Noise and Vibration EMP Sub-Plan incorporating the objectives, performance criteria, and other matters contained within Table 6-6 of the SREIS.

(b) The Construction Noise and Vibration EMP Sub-Plan must incorporate measures that will avoid, or mitigate and manage the potential adverse environmental impacts of noise and vibration arising from construction activities and these measures must include:

(i) a background noise survey to define background noise levels at all potentially affected sensitive receptors, and the establishment of specific noise criteria at these receptors in accordance with Table 4 – Construction Noise Criteria;

(ii) identification of all sensitive receptors where elevated off-site impacts may potentially occur (and the conditions under which these impacts may take place), based on predictive modelling having regard to the proposed construction methods and the proximity of residences and other relevant receptors;

(iii) an implementation plan detailing all approaches adopted and all reasonable and feasible mitigation measures to address environmental noise and vibration issues. The implementation plan must include specific measures for mitigation of predicted impacts on sensitive receptors where predictive modelling indicates exceedance of Project noise and vibration criteria as per Table 4, 5 and 6 below. Mitigation measures should include, but not be limited, to:

(A) programming of activities (e.g. hours of work) for particular circumstances;

(B) installation of acoustic screens;

(C) enclosure of worksites possibly with purpose-built sheds;

(D) operational techniques (e.g. use of particular construction techniques to suit circumstances);

(E) Other mitigation measures as outlined in Table 6-6 of the EMP and Table 11.17 of the EIS;

(iv) regular monitoring of noise and vibration to determine whether environmental requirements of the Construction EMP are being met. The monitoring program, including the frequency of monitoring and the locations of monitoring stations, are to be established in the Construction EMP, including a monitoring station immediately adjacent to

sensitive receptor 29 (as identified in section 11 of the EIS); and

(v) prior to commencement of construction, building condition surveys must be conducted of properties identified in the predictive modelling above as likely to be adversely affected by vibration and/or blasting.

(c) Where the predictive modelling predicts that noise criteria for the Project are likely to be exceeded by construction works, then consultation, reasonable and practicable mitigation and management measures, and a monitoring program must be adopted to ensure the criteria are complied with. These measures must be developed in consultation with owners and occupants of potentially-affected premises. The noise criteria are in Table 4 below.

Table 4: Construction Noise Criteria

Noise level dB(A) measured as	**Monday to Saturday**			**Sundays and public holidays**		
	7am - 6pm	**6pm - 10pm**	**10pm - 7am**	**9am - 6pm**	**6pm - 10pm**	**10pm - 9am**
	Noise measured at a 'Noise sensitive place'					
$L_{Aeq, 1hr}$	Bg* + 10	Bg + 5	Bg + 3	Bg + 5	Bg + 3	Bg + 0
$L_{A1, adj, 10 mins}$	Bg + 15	Bg + 10	Bg + 6	Bg + 10	Bg + 6	Bg + 0
	Noise measured at a 'Commercial place'					
$L_{Aeq, 1hr}$	Bg + 15	Bg + 10	Bg + 6	Bg + 10	Bg + 6	Bg + 0
$L_{A1, adj, 10 mins}$	Bg + 20	Bg + 15	Bg + 9	Bg + 15	Bg + 9	Bg + 0
	Sleep Disturbance Criteria					
The construction noise activities for the Project must not cause the indoor sound pressure level to exceed Lamax 45 dB(A) at a noise sensitive place from 10pm – 7am more than 10-15 times per night						
* Bg is the background sound pressure level, $L_{A90,15 min}$						

(d) As part of the Construction Noise and Vibration EMP Sub-Plan, the Beaudesert-Boonah road realignment must be designed as to ensure compliance with the operational traffic noise criteria outlined in the Mains Roads' Road Traffic Noise Management – Code of Practice (COP).

(e) Where the predictive modelling predicts that vibration criteria for the Project are likely to be exceeded by construction works, then consultation, reasonable and practicable mitigation and management measures, and a monitoring program must be adopted. These measures must be developed in consultation with owners and occupants of potentially-affected premises. The vibration criteria are in Table 5 and 6 below.

Table 5: Vibration Criteria - Levels for Minimal Risk of Cosmetic Damage

Vibration Type	Peak Particle Velocity (mm/s)		
	Heritage Listed	Residential	Commercial and Industrial
Transient Vibration	2	10	25

Note: Measured in the ground directly adjacent the building of concern

Table 6: Vibration Criteria - Levels for Human Comfort Within Buildings

Receiver	Time	Continuous or intermittent vibration 8-80 Hz (peak)	Transient vibration excitation with several occurrences per day 8-80 Hz (peak)
Residential	Day	2.9 to 5.8 mm/s	43 to 129 mm/s
	Night	1.6 mm/s	1.6 to 29 mm/s

Note: Measured in the ground directly adjacent the building of concern

(f) Where the predictive modelling predicts that the blasting criteria for the Project are likely to be exceeded by construction works, then consultation, reasonable and practicable mitigation and management measures, and a monitoring program must be adopted. These measures must be developed in consultation with owners and occupants of potentially-affected premises and be developed with regard to the relevant residents' attitudes about whether continuous noise over an extended period from mechanical excavation options is preferable to a short-term exceedance from blasting. The blasting criteria, measured at a sensitive receptor, are:

(i) the airblast overpressure must not exceed 120 dB (linear) peak for any blast;

(ii) the airblast overpressure must not be more than 115 dB (linear) peak for 9 out of any 10 consecutive blasts initiated regardless of the interval between blasts;

(iii) the ground borne vibration must not exceed a peak particle velocity of 5 mm/s for 9 out of any 10 consecutive blasts initiated regardless of the interval between blasts; and

(iv) the ground borne vibration must not exceed a peak particle velocity of 10 mm/s for any blast.

(g) To manage construction noise and vibration effectively, on-going, continuous monitoring must be commenced with occupants of affected premises prior to the commencement of construction works likely to cause exceedences of either the noise or vibration criteria.

(h) Monitoring of construction noise and vibration must be undertaken in accordance with accredited procedures. In circumstances where the criteria are not met, the reporting must describe the corrective actions

taken to mitigate and manage the impacts. Monitoring results must be reported in accordance with the requirements of Table 1 of Schedule C of these Conditions. Monitoring results and management actions regarding construction noise and vibration must be included in the required reporting.

8. Flora and Fauna

(a) Construct the Project in accordance with the Construction EMP, the Fishway Design Documentation (refer to Schedule A of these conditions) and the Flora and Fauna Construction EMP Sub-Plan, incorporating the performance criteria, mitigation measures and other matters contained in Tables 6-7 and 6-8 of the SREIS.

(b) The Flora and Fauna Construction EMP Sub-Plan must include sufficient land use control measures and/or management practices to support an assessment by an appropriately qualified expert(s) (before the commencement of dam operations) that the following 2 riparian re-vegetation outcomes are likely to be achieved.

(i) outcome 1: in relation to at least approximately 80% of the area defined by the length of the northern bank of the impoundment and the 1 in 100 year flood level (with dam), it is likely that the area will eventually have the characteristics of native vegetation (other than grasses) that is classified as remnant vegetation and the permanent exclusion of cattle is likely to be achieved; and

(ii) outcome 2: in relation to at least approximately 30% of the area defined by the length of the other banks (other meaning not the northern bank of the impoundment) and the 1 in 100 year flood level (with dam), is likely to contain native vegetation (other than grasses) with the characteristics of remnant vegetation and that the permanent exclusion of cattle are likely to be achieved.

(c) The Flora and Fauna Construction EMP Sub-Plan must not be inconsistent with the Vegetation Offset Proposal (also referred to in Schedule A of these conditions). The Vegetation Offset Proposal must result in no net loss to native vegetation flora species, and no net loss of habitat for fauna species, listed as endangered, vulnerable or rare (EVR) under the EPBC Act or the NC Act, taking account of the positive and negative impacts of the dam construction and operation and the implementation of the offset actions over the long-term.

(d) The Vegetation Offset Proposal must incorporate suitable translocation and /or propagation activities that must be applied to any Endangered Vulnerable or Rare flora species, including species of National Environmental Significance (NES), to ensure no net loss of the relevant species in the case of any relevant species in the affected area being identified after the completion of the EIS process.

(e) The Flora and Fauna Construction EMP Sub-Plan must include measures targeted at minimising the risk of inadvertent impacts on EVR flora or fauna species, particularly through environmental awareness training of employees including targeted training in relation to the identification of species. If previously unknown species or individuals are discovered, these individuals and habitat surrounding them must not be

subject to clearing, and the relevant State or Commonwealth Department must be notified within 10 business days.

(f) The Flora and Fauna Construction EMP Sub-Plan must include procedures (such as those within tables 6-18 and 6-19 of the SREIS) that ensure no sustained weed outbreaks in the retained and rehabilitated habitats associated with the Project and the Vegetation Offset Proposal.

(g) The Vegetation Offset Proposal (also referred to in Schedule A of these conditions) must address requirements for vegetation under Policy 11 of the Nature Conservation (Koala) Conservation Plan and Management Program 2006-2016.

(h) The Flora and Fauna Construction EMP Sub-Plan must not be inconsistent with the Environmental Corridor Proposal. The proponent must develop, in consultation with the EPA, an Environmental Corridor Proposal for the Coordinator-General's approval prior to the commencement of construction relating to the proposed dam wall within the banks of the Teviot Brook.

(i) The approved Environmental Corridor Proposal must be implemented. The total area of the re-vegetated wildlife corridor and/or "stepping stone" areas may be recognised within the offset areas within the Vegetation Offset Proposal where relevant.

(j) This Environmental Corridor Proposal:

(i) must include confirmation that sufficient land tenure or access arrangements are in place and/or that sufficient land management activities will be applied to support fauna movement in the areas marked as proposed wildlife corridor rehabilitation areas in Figure 7.11 of the EIS;

(ii) must include vegetation creation and rehabilitation activities and land management details for specified locations and vegetation types. This must include specified target survival rates for planted or rehabilitated vegetation at various points of time along with monitoring and corrective actions tied to targeted survival rates;

(iii) may include one or more "stepping stone" replacement areas for one of the two areas marked on Figure 7.11 of the EIS, along with suitable land tenure arrangements and land management activities, if the proponent identifies, and demonstrates to the satisfaction of the Coordinator-General, practical difficulties in securing a suitable corridor in one of the two locations marked on Figure 7.11 of the EIS;

(iv) may involve, at the discretion of the Coordinator-General, the implementation of the proposed "stepping stone" components instead of one of the areas marked on figure 7.11 of the EIS;

(v) must identify locations for any proposed "stepping stone" replacement area that are on properties within, or directly adjacent to, the Regional Corridor marked in Figure 7.8 of the EIS;

(vi) must involve rehabilitated wildlife corridor and/or stepping stone areas that are at least 100 metres wide as per Performance Requirement S.4 within the Regional Vegetation Management Code;

(vii) must include design specification commitments in relation to the approximately 20 fauna crossing sites marked on Figure 7.11 of the EIS plus associated roadside fencing. After considering the Proposal submitted by the proponent, and any associated relevant material, the Coordinator-General has the discretion to require the proponent to implement up to 20 fauna crossings;

(viii) must include an explanation of reasons for any marked site that is proposed to not contain a fauna crossing, if less than 20 crossing sites are proposed to be included for implementation;

(ix) must be submitted in conjunction with correspondence from the EPA explaining EPA's opinion about the proposed overall approach, unless EPA is unable or unwilling to provide correspondence; and

(x) must include discussion about the extent of consistency of fauna crossing and protection fencing with recent practice as per one or more relevant road development projects in SEQ or northern NSW, having regard to the requirements of the fauna in the relevant areas.

(k) The Flora and Fauna Construction EMP Sub-Plan must include the procurement of expert advice to support the development of a suitable method for estimating the number of hollows and nest boxes, and related implementation procedures, required to offset impacts on hollow-dependent species given the proponent's commitment to replace lost hollows with nest boxes. The relevant quantity estimates derived from the proponent's proposed method, developed in consultation with the EPA, must be finalised by the proponent and approved by the Coordinator-General prior to the commencement of construction within the banks of the Teviot Brook. The approved quantities must be implemented.

(l) The Flora and Fauna Construction EMP Sub-Plan must include a Turtle Management Proposal, for the Coordinator-General's approval, prior to the commencement of Project construction activities within the banks of the Teviot Brook. The Turtle Management Proposal, and associated explanatory advice from the proponent and correspondence from the EPA indicating its opinions on the Proposal, must include descriptions of design specifications, timing details, cost estimates and commitments for structural or management measures addressing items including:

(i) turtle nest protection and management in multiple specific sites that have potential to be used by turtles in vicinity of the Project (i.e. including the area around the impoundment and/or the area below the dam to the confluence of the Logan River and Teviot Brook);

(ii) land purchase details and associated land management activities relating to turtle nest protection and the promotion of turtle population recruitment;

(iii) design specifications for structural components of the dam wall and associated works that minimise risks of turtle injury;

(iv) a documented flow release strategy that includes estimated flow height levels at two specifically identified points (at least) on the Teviot Brook (including the impounded area) and associated flow release rules. These rules and flow height estimates are to be designed to improve turtle habitat conditions, particularly with regard to the preservation of nesting sites, within the impoundment and/or downstream of the dam; and

(v) analysis indicating whether measures to enable the movement of turtles from one side of the main dam barrier to the other would be beneficial to the sustainability of turtle populations in the Logan catchment. If analysis indicates that such movements would be beneficial, the Proposal must also include design specifications for a turtle transfer system.

(m) Within 60 business days of receiving the Turtle Management Proposal, and associated explanatory advice from the proponent and correspondence from the EPA indicating its opinions on the Proposal, and considering any other relevant material such as advice from any other person, the Coordinator-General may require the proponent by written notice to implement some or all of the Turtle Management Proposal.

9. Cultural Heritage

(a) Construct the Project in accordance with the Construction EMP, the Cultural Heritage Construction EMP Sub-Plan, incorporating the performance criteria, mitigation measures and other matters contained in Table 6-9 of the SREIS.

(b) As part of the Cultural Heritage Construction EMP Sub-Plan, the proponent must comply with the duty of care requirements under the *Aboriginal Cultural Heritage Act 2003*, either through:

(i) ensuring all site operations are carried out in accordance with the Cultural Heritage Investigation and Management Strategy (CHIMS) as agreed between the proponent and the Aboriginal Parties as part of the Indigenous Land Use Agreements; or

(ii) for areas not covered by an Indigenous Land Use Agreement (ILUA), a Cultural Heritage Management Plan (CHMP) under the *Aboriginal Cultural Heritage Act 2003* must be developed and approved, prior to any excavation, construction or other activity in an area that may cause harm to Aboriginal cultural heritage.

(c) As part of the Cultural Heritage Construction EMP Sub-Plan, the proponent must conduct archival recording of cultural heritage significance in accordance with the requirements of the ILUA and/or the Cultural Heritage Management Plan.

(d) The proponent must provide notices to the Coordinator-General and the DNRW within 6 months of the commencement of construction outlining the outcomes of the Cultural Heritage duty of care assessments.

(e) As part of the Cultural Heritage Construction EMP Sub-Plan, The proponent must complete a detailed field assessment, of non-indigenous cultural heritage within the Project area (including construction water pipeline) prior to construction commencing, with the purpose of:

(i) examining the entire inundation area, areas to be affected by Project-related infrastructure, realignment of Beaudesert-Boonah road and the construction water pipeline, for the purpose of identifying and recording any additional places or items of historic heritage in those areas;

(ii) determining the significance of any places or items identified during field investigations, and ascertain the nature of impact that the proposed development may have on such places or items – in determining significance, consideration is to be given to criteria stipulated in the Queensland *Heritage Act 1992*; and

(iii) developing management strategies for any places or items of historical significance. The management strategies should be discussed with the National Trust of Queensland, and any local historical society who express an interest in the matter. Further, management strategies should be agreed with the EPA and the Queensland Heritage Council.

(f) The relevant assessments (from (e) above) must be provided to the Coordinator-General, and the EPA, at least four weeks prior to the commencement of relevant construction.

10. Waste

(a) Construct the Project in accordance with the Construction EMP and the Construction Waste EMP Sub-Plan, incorporating the performance criteria, mitigation measures and other matters contained in Table 6-10 of the SREIS.

(b) The Construction Waste EMP Sub-Plan:

(i) must adopt and reflect the principles of 'reduce, re-use, recycle, energy recovery from waste, and waste disposal' (i.e. the Waste Management Hierarchy);

(ii) must identify the type, source and estimated quantities of waste;

(iii) must identify the procedures and responsibilities for dealing with an incident in which waste material with the potential for causing environmental harm, is released to the environment; and

(iv) may include the waste management measures contained in the Draft EMP (Construction) in Table 6-10 of the SREIS or may include other measures designed to meet the environmental objectives and performance criteria in table 6-10 of the SREIS Draft EMP (Construction).

(c) Burning of vegetative waste may be implemented as a last resort having regard to factors such as cost, potential beneficial reuses and vegetation types. Burning of vegetative waste may only occur in favourable weather conditions. The Construction Waste EMP must include a transparent decision making procedure for disposal of vegetative waste. This must:

(i) be developed in consultation with the EPA and SRRC;

(ii) address specific types and/or locations of vegetative waste;

(iii) be consistent with the Waste Management Hierarchy; and

(iv) involve third party review/audit of implementation (along with other people/organisations, EPA, SRRC may be the third party).

(d) Offsite burning may only occur for purposes of energy recovery and where energy recovered is greater than energy expended in transporting the waste.

(e) In circumstances where waste material is released to the environment, the incident must be reported immediately to the relevant authorities and such corrective or remedial action as required to render the area safe and to avoid environmental harm must be taken forthwith.

(f) All regulated waste must be transported by a licensed operator and disposed of at a facility licensed to accept such waste.

11. Hazard and Risk

(a) Construct the Project in accordance with the Construction EMP, AS4360:2004 Risk Management, and a Construction Hazard and Risk (CHR) EMP Sub-Plan, incorporating the objectives, performance criteria, mitigation measures and other matters contained within Table 6-11 of the SREIS.

(b) Prepare and implement the CHR EMP Sub-Plan having regard to the potential risks associated with dam construction including, among other things, flood during construction, fire hazard, chemical hazard, traffic hazards associated with construction traffic, accessibility for emergency services vehicles to the road network and construction sites, maintenance of essential services (e.g. water, power), transport and the use and storage of dangerous goods in construction sites, and communications during incidents.

(c) The CHR EMP Sub-Plan must incorporate specific emergency response actions and the design and construction of a helicopter pad, a communications tower and an emergency water-based vessel mooring and access prior to inundation.

(d) The CHR EMP Sub-Plan must be prepared and implemented in consultation with the relevant emergency services organisations for risk minimisation and incident management during construction.

12. Contaminated land

(a) Construct the Project in accordance with the Construction EMP and the Construction Contaminated Land EMP Sub-Plan, incorporating the contamination-management-related performance criteria, mitigation

measures and other matters contained in Tables 6-3, 6-5 and 6-11 of the SREIS.

(b) The Construction Contamination Land EMP Sub-Plan will include the following actions, to be implemented as soon as practicable to prevent land contamination:

(i) pumping out of all dips and fixed spray reservoirs below the 1 in 100 AEP flood level and appropriate disposal of contents;

(ii) removing of any portable spray reservoirs below the 1 in 100 AEP flood level and appropriate disposal of contents and reservoirs;

(iii) checking all sheds and yards below the 1 in 100 AEP flood level for chemical containers and appropriate disposal of contents and containers; and

(iv) removing and appropriate disposing of other potential sources of contamination below the 1 in 100 AEP flood level.

(c) The Construction Land Contamination EMP Sub-Plan must include the requirement that Material Safety Data Sheets must be obtained and communicated to all site personnel involved in the storage, handling, use and disposal of dangerous and hazardous substances and materials. The storage, handling and use of these materials/substances must be in accordance with current Australian Standards, industry codes of practice and best environmental management practices. Appropriate controls for these materials must be implemented avoid risks to employees, adjacent land users, general public and the environment.

13. Social and Economic

(a) Construct the Project in accordance with the Construction EMP and the Social and Economic Construction EMP Sub-Plan, incorporating the performance criteria, mitigation measures and other matters contained in Table 6-12 of the SREIS.

(b) The proponent must develop a Workforce Management Proposal for the approval of the Coordinator-General at least 6 months prior to the commencement of construction activities for the dam wall and clearing of the inundation area. This Proposal must:

(i) be developed in consultation with SRRC;

(ii) include analysis and related measures designed to deliver suitable worker and community safety and amenity outcomes;

(iii) demonstrate that the proposed measures are unlikely to cause significant adverse housing availability or affordability outcomes in the SRRC local government area; and

(iv) demonstrate consistency with the Construction Transport and Traffic EMP Sub-Plan.

(c) Having regard to the proportion of identified workers that do not already reside within the SRRC local government area, measures within the Proposal must address all of the following:

(i) the development of any temporary or permanent residences within the SRRC local government area to house Project workers;

(ii) the establishment of infrastructure to support temporary workforce facilities;

(iii) documented workforce commuting arrangements (possibly involving buses);

(iv) arrangements to liaise with health care and education providers to advise of increases in workforce numbers that may result in any increased demand for their services; and

(v) the design, planning and siting of any construction worker accommodation, to ensure that future potential use is optimised for the local community (e.g. affordable housing, recreational use, functional open space).

(d) The Social and Economic Construction EMP Sub-Plan must include the development of a Recreation Master Plan, for the Coordinator-General's approval, prior to the commencement of Project construction activities within the banks of the Teviot Brook. The Recreation Master Plan must be developed in consultation with SRRC and Tourism Queensland and address the implementation options identified in section 3.10.9 of this Coordinator-General's Report. It must also include descriptions of design specifications, timing details, cost estimates and commitments for structural or management measures addressing the identified implementation options.

(e) Within 60 business days of receiving the Recreation Master Plan, and associated explanatory advice from the proponent and correspondence from the SRRC indicating its opinions on the Plan, and considering any other relevant material such as advice from any other person, the Coordinator-General has the discretion to require the proponent by written notice to either:

(i) implement some or all of the Recreation Master Plan; or

(ii) provide at least $4 million to the SRRC or a State Government Department for use on specific recreational related activities that may be recommended by the SRRC or a State government department such as Tourism Queensland.

14. Traffic Management

(a) Construct the Project in accordance with the Construction EMP and the Construction Traffic EMP Sub-Plan, and consistent with the requirements of DMR in relation to activities on state controlled roads, and the requirements of SRRC in relation to activities on local government controlled roads, as set out in these conditions.

(b) Prior to commencement of relevant construction, a Construction Traffic EMP Sub-Plan must be prepared, in consultation with the relevant road

authority, to implement measures that avoid, where practicable, or minimise and mitigate, construction and traffic impacts associated with the Project.

(c) Project design, work methods and other mitigation measures must address the construction impacts of the Project (including materials haulage, the movement of redundant pavement from the realigned Boonah-Beaudesert road) on traffic flows, public safety generally, school buses and school pick-up and set-down arrangements, pedestrian movements, livestock, cycling activities, property access, parking and public transport.

(d) Construction, traffic and related safety management measures must include the mitigation measures for traffic and safety in the Draft Construction EMP in Chapter 6 of the SREIS.

(e) The design, construction methods and mitigation measures associated with the Construction Traffic EMP Sub-Plan must be developed at the proponent's cost, in consultation with SRRC and DMR, and be consistent with DMR's 'Guidelines of Assessment of Road Impacts from Development' and 'Road Planning and Design Manual'. Particular requirements include:

(i) in relation to the intersection of the Boonah-Beaudesert Road and the dam access road, a shielded right-turn lane of sufficient length to allow safe separation of trucks and vehicles from the through traffic lane, widened lanes and shoulders, specific turning lanes and tapers, signage, full width resealing and new line marking;

(ii) provision of one or more stopping areas (e.g. for buses, police) on Boonah Beaudesert-Road;

(iii) the acceptable resolution of land tenure arrangements including the re-establishment of suitable access arrangements for private properties; and

(iv) the design and construction of the dam access road to a standard commensurate with its intended use (construction access, operational access and potentially public recreational access) and any applicable SRRC standards and the preliminary design specifications provided in section 4.15 of the EIS.

(f) For materials haulage, the Construction Traffic EMP Sub-Plan must include:

(i) the use of nominated haulage routes, as shown in Figure-3 of the EIS, only (i.e. heavy materials transport may only occur on arterial roads which are designated B-double routes, the dam access road and Sandy Creek Road);

(ii) project-related haulage from quarries on the Sandy Creek Road not proceeding until the necessary works programmed by the SRRC or any alternative traffic management arrangements are in place to enable safe haulage on a pavement that can be demonstrated as being likely to withstand the increased load factors;

(iii) the restriction on transport of over dimension and excess mass loads, unless there is prior nomination of any exceptional circumstances where such transportation would be required, the specific approval is obtained from DMR and/or SRRC depending on roads to be used, and measures to be taken to minimise impacts are specified;

(iv) the identification and mitigation, at the proponent's cost, of the impact of Project-related truck movements to the construction site on the State-controlled road network, particularly on the pavement of the at-risk 9 km section of the Beaudesert-Boonah Road. Methods of pre-construction inspection and monitoring of impacts must be finalised in consultation with DMR;

(v) nominated hours for collection, haulage and unloading of materials to and from construction sites may be undertaken. The nominated hours are 7.00 am to 6.00 pm Mondays to Fridays and 7.00 am to 4.00 pm Saturdays. No haulage of materials along the Beaudesert-Boonah Road is to occur on Sundays or public holidays. (See also condition 14h regarding reduction in truck movements through school zones and bus routes);

(vi) measures to maintain safe and functional access to community facilities, and to ensure pedestrian, cyclist and livestock safety and movements on routes adjacent to construction traffic routes and worksites;

(vii) the proposed method of haulage vehicle management to:

A. avoid disruption to local traffic movements, particularly during school drop-off and pick-up times;

B. avoid haulage vehicles queuing beyond the limit of the right turn lanes on the Beaudesert-Boonah Road to turn into Sandy Creek Road travelling east or turning into the dam access road travelling west;

C. minimise and mitigate the adverse environmental and community impacts of construction vehicle operations;

D. encourage ongoing awareness of haulage contractors regarding haulage route usage as recreational ride route by motorcyclist traffic, especially on Saturdays; and

E. address safety, including accident & incident reporting routine and preventative vehicle maintenance.

(g) For construction traffic along Beaudesert - Boonah Road, the construction traffic EMP Sub-Plan must include the following:

(i) project-related truck traffic must not exceed 45 trucks/hour on any section of the road at any time during Project construction;

(ii) regular site deliveries are to be coordinated to occur at the same time each day;

(iii) additional signage, traffic control lights and cautionary 'road safety' marking is to be used during the construction phase particularly at road and driveway accesses where risks are increased; and

(iv) development and implementation of and ongoing awareness campaign with the construction workers regarding usage of Beaudesert-Boonah Road as recreational ride route by motorcyclist traffic, especially on weekends.

(h) As part of the Construction Traffic EMP Sub-Plan, the proponent must conduct and document an investigation aimed at identifying any specific road safety risks, taking particular attention to the current school bus routes and school zones. The Sub-Plan must identify specific mitigation measures to suitably address the identified risks. The measures must include, as a minimum, an appropriate reduction in Project related truck movements through signed school zones during school drop-off and pick-up periods (e.g. 8.00am to 9am and 2.30pm to 3.30pm) on school days. This investigation must be completed prior to the commencement of relevant construction activities and in consultation with Queensland Transport, DETA, DMR and SRRC.

(i) The Construction Traffic EMP Sub-Plan must be reviewed at least six-monthly and be updated by the proponent to address construction program requirements and construction sequencing. The construction traffic EMP Sub-Plan, and any updates following reviews by the proponent, must be provided to Queensland Transport, DMR and SRRC prior to implementation for approval. If a response from one of these organisations is not received within 15 business days, approval may be deemed by the proponent to have been received. If notices are received indicating that approval cannot or will not be provided, the Coordinator-General has the discretion to approve the EMP Sub-Plan in lieu of one or more of the other abovementioned entities following consideration of any advice from the proponent and/or the abovementioned agencies.

(j) The construction traffic EMP Sub-Plan must address the consultation and community engagement procedures set out in conditions 2 and 3 as well as the following matters:

(i) initial community engagement and consultation regarding transport and traffic is to be completed prior to commencement of haulage of materials for the Project;

(ii) in conjunction with SRRC, consult with the directly affected landholders and provide further explanation of the proposed arrangements for property access reinstatement designs for the Old Beaudesert Road and Knethrs works as design details are developed; and

(iii) keeping the community informed of road closures, road works for intersection and pavement upgrades and increased truck numbers on the Beaudesert-Boonah Road during the construction phase of the dam access road, the dam and the Beaudesert-Boonah Road relocation.

Part 3: Operation Phase

15. Community Engagement

(a) To respond to community concerns during the operational phase of the Project, there must be a mechanism for receiving and dealing with complaints about the operational aspects of the Project, including achievement of the environmental objectives for the Project. The complaints mechanism should:

(i) be similar to that established for the construction phase;

(ii) provide a mechanism to resolve operational impacts where the environmental performance criteria have not been met;

(iii) provide for prompt responses to complaints made, with information, corrective action where required, and reporting back to the complainant and proponent; and

(iv) be incorporated within the wider environmental reporting framework for the Project.

16. Operation Environmental Management Plan

(a) A "Operation EMP" must be prepared and implemented. The Project must be constructed in accordance with the Operation EMP, including Operation EMP Sub-Plans. The Operation EMP must:

(i) be developed generally in accordance with the Draft EMP (Operation) in Chapter 6 of the SREIS;

(ii) incorporate all of the conditions for operation of this Schedule C;

(iii) incorporate the proponent's commitments as set out at Appendix 2 of this report, except where the matter is addressed by these Conditions and then to the extent required by these Conditions;

(iv) incorporate the elements of the Construction EMP that have ongoing requirements for the operation phase of the Project; and

(v) demonstrate how the elements in (i) to (iv) above have been included in the EMP.

(b) The Operation EMP must be provided to the Coordinator-General at least 60 business days prior to commencement of operation of the Project for approval.

(c) The Operation EMP must accord generally with the following framework:

(ii) **environmental objectives and performance criteria** – The Operation EMP must adopt and incorporate the environmental objectives and performance criteria set out in the EIS Chapter 6 Draft EMP (Operation);

(iii) **EMP Sub-Plans** – The Operation EMP is to incorporate sub-plans as required by these Conditions to address in detail specific environmental impacts of the operational

aspects of the Project. EMP Sub-Plans must include measures designed to comply with the relevant industry standards for environmental management set out in table 6.2 of the SREIS;

(iv) **design of mitigation measures -** Mitigation measures must be designed in response to the predicted impacts, with detailed design measures to address localised impacts where necessary;

Mitigation measures may include a wide range of measures such as, but not limited to, changes in operation procedures and practices, and design interventions. Such measures must be directed to achieving the environmental objectives and performance criteria set out in the SREIS Chapter 6 Draft EMP (Operation), the statutory requirements and must be consistent with these Conditions. They may include the mitigation measures contained in the Draft EMP (Operation) in Chapter 6 of the SREIS or may include other measures, provided those other measures achieve the environmental objectives and performance criteria, any relevant statutory requirements and these Conditions;

(v) **monitoring** – On-going monitoring for operational impacts must be undertaken for some aspects of the Project, including Ramsar (limited period), aquatic fauna, surface water quality, and such other operational aspects as necessary to assess performance relative to the environmental objectives set out in the SREIS Chapter 6 Draft Outline EMP (Operation) or these Conditions. The form of monitoring must be appropriate to the issue and should adopt the parameters established in the Operation EMP. Where compliance and monitoring requirements for a particular matter are incorporated in another Project Approval or statutory instrument (e.g. ROP in relation to aquatic fauna), those requirements may replace the relevant requirements contained in these conditions;

(vi) **review, response and modifications** – There must be a regular review of the Operation EMP. A process for review of mitigation measures must be outlined in the Operation EMP. The process should provide for further mitigation measures or review of mitigation measures to be implemented as soon as practical in response to monitoring results (where shortfalls are identified) and the outcomes of community consultation;

(vii) **complaints** –There must be a formal process for receiving and dealing with complaints about the operation of the Project in relation to the environmental objectives. This process should be the same as that established during the construction phase;

(viii) **non-Conformance** - A process for dealing with circumstances where thresholds are exceeded during operation must be established prior to the commencement of operations. This process must establish a mechanism for reporting, taking corrective action where required and indicating responsibilities and timing for such action; and

(ix) **reporting** - Reporting on the compliance with the Coordinator-General's Conditions must be prepared and provided to the Coordinator-General (time-limited) in accordance with the hierarchy of reporting in.

Table 7. The report must identify aspects of non-compliance against the Conditions together with any complaints and the responses to such complaints.

Table 7: Operations – Reporting on Compliance and Performance

Report	Frequency and Scope
Operations Phase Compliance Report	Six-monthly: • Undertaken by a suitably qualified person; • compliance with Coordinator-General's Conditions; • compliance with the Proponent's commitments and details of any non-compliances; • satisfaction of environmental objectives and EMP requirements; • response to incidents of non-conformance, including where necessary corrective actions, revised operations practices, responsibility and timing; and • all other matters pertaining to environmental performance during operations.
Operations Incidents and Exceedance Report	Interim Report; • within 2 days of incident or an exceedance of a condition, goal or requirement, being identified; and • details of incident and initial response. Full Report • within 14 days of incident or an exceedance of a condition, goal or requirement, being identified; and • details of incident, response, corrective action, responsibility and timing.
All reporting must be to the Coordinator-General, and must be available to a relevant agency on request. Reporting is required only for a total period of 5 years from construction completion, or as otherwise confirmed in writing by the Coordinator-General.	

17. Water Resources, Waterway and Riparian Protection

(a) The Operation EMP Sub-Plan must contain measures:

(i) that avoid, control or mitigate of contaminated groundwater, stormwater and other potentially polluted water (eg wash-down water, fire retardants) on surface water resources;

(ii) to be initiated in the instance of an emergency or hazardous situation, to collect wastewater for subsequent removal and disposal to an authorised release point;

(iii) to manage fire and grazing in and around the reservoir area to maximise ground cover and aid re-establishment when water levels are low including allowing grasses to run to seed;

(iv) to enable suitable monitoring of sand deposition within the reservoir and enable for sand extraction if deposits are likely to unduly interfere with flows;

(v) surveying and documenting existing in-stream sediments and bank condition and, if significant bank erosion is occurring in the Teviot Brook downstream of the dam wall due to changes in the flow regime provide further mitigations to control bank erosion;

(vi) to enable monitoring, maintaining and enhancing downstream riparian vegetation to protect stream banks from undercutting and erosion;

(vii) encouraging in-stream vegetation;

(viii) monitoring to detect the presence and identified management strategies if toxin-producing blue-green algae species are detected;

(ix) to manage releases to, as far as is practicable, mimic natural low to moderate flows to maintain in-stream and riparian vegetation and habitats (see also the related water resources related conditions within Appendix 1, Schedule C, Condition 1 and Schedule A);

(x) to remove any vegetation that collapses into the stream as a result of bank undercutting to prevent further erosion;

(xi) to stockpile sediment downstream of the dam and replenish stream sediment if required;

(xii) to facilitate sand extraction from Teviot Brook downstream of the dam if monitoring indicates that sand is accumulating and deposits are not moving through the system;

(xiii) to monitor vegetation establishment and persistence and provide replacements, possibly with species found to be hardier in the situation, wherever required;

(xiv) to revegetate using locally endemic plant species that are known to be well adapted to the area and soils, including threatened species or species indicative of impacted regional ecosystems;

(xv) to mitigate and manage potential run-off so that flows are dispersed and flow concentration is avoided where constructed drainage structures may not be working as intended; and

(xvi) developed through adaptive management to minimise greenhouse gas generation, such as catchment management improvements to reduce the mass of organic material entering the storage.

(b) The Operation EMP Sub-Plan must describe how the groundwater monitoring system (developed in the Construction EMP) will be used to assess potential impacts on existing groundwater users, and the potential for land salinisation including monitoring programs, predictive

modelling if required and the development of mitigation measures if required. As part of this sub-plan, activities will include:

(i) collection of point source water level and water quality data from existing bores, including private and established piezometers. Water quality samples will include analysis of electrical conductivity (EC), pH, dissolved oxygen (DO), and major cations and anions;

(ii) identification of presence of springs and obtain water samples (same analytes as described above);

(iii) obtaining information from landholders regarding the behaviour of any springs present;

(iv) correlating proposed dam levels with local groundwater levels;

(v) correlating groundwater levels with hydrographic data from Teviot Brook and its affected tributaries;

(vi) correlating groundwater quality results with surface water quality data to define potential interactions;

(vii) identifying any water quality variations along length of alluvium upstream and downstream of the proposed daml; and

(viii) identifying any areas of potential salinisation due to elevated water levels and mobilised salts − baseline water quality data compiled from the proposed monitoring bores downstream from the dam will indicate if salinity levels are on the increase. The salinity levels will be controlled with periodic water releases as/or when levels exceed the initial baseline water quality concentrations.

(c) The Operation EMP Sub-Plan must describe how monitoring of the reservoir water quality will be undertaken. This monitoring must include:

(i) temperature, dissolved oxygen, salinity, full speciated (and total) nutrients, suspended solids, heavy metals (especially manganese and iron), chlorophyll-a (including speciation and cell counts) and pathogens (potentially using E Coli as an indicator); and

(ii) sampling, based on the EIS recommendation, for an initial two week intensive sampling program followed by a less frequent regime possibly monthly depending on ongoing water quality results, and supplemented by additional monitoring after major flow events.

18. Flora and Fauna

(a) Conduct the operation of the Project in accordance with the Operation EMP and the flora and fauna EMP Sub-Plan incorporating the performance criteria, mitigation measures and other matters set out in Tables 6-18 and 6-19 of the SREIS.

(b) Prior to the commencement of operations of the Project, prepare and implement a flora and fauna EMP Sub-Plan addressing the requirements of the EPA and DPI&F. This must include specific procedures, methods and action trigger thresholds to ensure pest plants and animals are controlled (within the vicinity of the Project) and fauna continues to have access to adequate habitat and food when islands are created within the impoundment area.

19. Waste

(a) Conduct the operation of the Project in accordance with the Operation EMP and an Operation Waste EMP Sub-Plan that incorporates the performance criteria, mitigation measures and other matters set out in Table 6-20 of the SREIS.

(b) Prior to the commencement of operations, prepare and implement an Operation Waste EMP Sub-Plan. This Sub-Plan:

(i) must adopt and reflect the principles of 'reduce, re-use, recycle';

(ii) must identify the type, source and estimated quantities of waste; and

(iii) must identify the procedures and responsibilities for dealing with an incident in which waste material with the potential for causing environmental harm, is released to the environment.

(c) In circumstances that such waste material is released to the environment, the incident must immediately be reported to the relevant authorities and such corrective or remedial action as required to render the area safe and to avoid environmental harm must be taken forthwith.

(d) All regulated waste must be transported by a licensed operator and disposed of at a facility licensed to accept such waste.

20. Hazard and Risk

(a) Conduct the operation of the Project in accordance with the Operation EMP and the Operation Hazard and Risk EMP Sub-Plan incorporating the performance criteria, mitigation measures and other matters set out in Table 6-21 of the SREIS.

(b) Prior to the commencement of operations of the Project, prepare and implement an Operation Hazard and Risk EMP Sub-Plan meeting the requirements of the Queensland Police Service, Department of Emergency Services, Queensland Fire and Rescue Service and Queensland Ambulance Service.

(c) The CHR EMP Sub-Plan must incorporate specific emergency response actions and the maintenance of a helicopter pad, a communications tower and an emergency water-based vessel mooring and access.

(d) The Operation Hazard and Risk EMP Sub-Plan must include:

(i) simulation exercises prior to commencement of operation of the Project;

(ii) provision for routine testing of emergency response systems; and

(iii) designation of responsibilities in the event of an incident.

Part 4: Construction and Operation Phase

21. Estuarine Ecology Management Plan

(a) The proponent must construct and operate the Project in accordance with an estuarine ecology management plan.

(b) The proponent must develop, implement and maintain the estuarine ecology management plan to monitor and manage any Project-related impacts on the ecological character of the Moreton Bay Ramsar Wetland and related ecological functions and processes.

(c) The estuarine ecology management plan must be provided to the Coordinator-General prior to the commencement of construction works within the banks of the Teviot Brook. The estuarine ecology management plan must be updated in response to any comments provided by the Coordinator-General.

(d) Specifically, the estuarine ecology management plan must include a description of the existing:

(i) relative distribution of the saltmarsh and mangrove habitats in the upper estuary;

(ii) estuarine fisheries productivity; and

(iii) extent, type and quality of estuarine fisheries habitat.

(e) The estuarine ecology management plan must provide for the monitoring of:

(i) the potential changes in the relative distributions of the saltmarsh and mangrove habitats in the upper estuary;

(ii) the reduction in the magnitude of flows resulting from the Project and its impact on estuarine fisheries; and

(iii) the potential changes on estuarine fisheries habitat and productivity.

(f) The estuarine ecology management plan must set out:

(i) the frequency of monitoring;

(ii) monitoring methodology;

(iii) threshold criteria which trigger management action; and

(iv) reporting of monitoring results.

(g) The estuarine ecology management plan must include specific actions to respond to the outcomes of the monitoring program.

(h) Where monitoring indicates threshold criteria has been exceeded that triggers management action, the specific actions in the estuarine ecology management plan must be implemented.

(i) The proponent must submit an annual report on performance against the requirements of the estuarine ecology management plan to the Coordinator-General by 30 July each year or as alternatively agreed by the proponent and the Coordinator-General. The report must identify any requirements in the estuarine ecology management plan that have not been fully met and appropriate strategies for meeting those requirements. Prior to submission, the annual report must have been independently audited by an appropriately qualified person, agreed by the Coordinator-General. The annual report must be published by the proponent by 30 August each year or as alternatively agreed by the proponent and the Coordinator-General.

(j) The proponent must comply with any requirements of the Coordinator-General in relation to the rectification of any performance failures identified in the annual report.

(k) The estuarine ecology management plan must be maintained for at least the first 5 years of operation of the Project.

Schedule D: Jurisdiction for Conditions

Condition Reference	Description of condition	Entity with Jurisdiction	Consultative Bodies
Schedule A - section 39(6) *State Development and Public Works Organisation Act 1971*			
Material Change of use for an Environmentally Relevant Activity		Chief Executive, Environmental Protection Agency	
Operational Work that is clearing native vegetation		Chief Executive, Department of Natural Resources and Water	
Operational Work that is constructing a referable dam		Chief Executive, Department of Natural Resources and Water	
Operational Work that allows the taking or interfering with water under the Water Act		Chief Executive, Department of Natural Resources and Water	
Waterway barrier works		Chief Executive, Department of Primary Industries and Fisheries	
Material change of use if all or part of the lot is on the EMR or is or was last used for a notifiable activity		Chief Executive, Environmental Protection Agency	

Condition Reference	Description of condition	Entity with Jurisdiction	Consultative Bodies
Schedule B			
Riverine Protection Permit		Department of Natural Resources and Water	
Interfering with a State-controlled road		Department of Main Roads	
Interim Resource Operations Licence		Department of Natural Resources and Water	
Schedule C - section 54B(3) *State Development and Public Works Organisation Act 1971*			
Schedule C, Condition 1(a), & (b)	Water Quality and Flow	Coordinator-General	Scenic Rim Regional Council, Environmental Protection Agency, Queensland Health
Schedule C, Condition 1(c) & (d)	Water Quality and Flow	Chief Executive Department of Natural Resources and Water	
Schedule C, Condition 1(e)	Water Quality and Flow	Coordinator-General	Department of Natural Resources and Water
Schedule C, Condition 2	Community Engagement	Coordinator-General	Environmental Protection Agency, Department of Main Roads, Department of Natural Resources and Water, Scenic Rim Regional Council
Schedule C, Condition 3	Construction Environmental Management Plan	Coordinator-General	Environmental Protection Agency, Department of Main Roads, Department of Natural Resources and Water, Scenic Rim Regional Council

Condition Reference	Description of condition	Entity with Jurisdiction	Consultative Bodies
Schedule C, Condition 4	Landscape Design and Visual Amenity	Coordinator-General	Environmental Protection Agency, Department of Main Roads, Department of Natural Resources and Water, Scenic Rim Regional Council
Schedule C, Condition 5	Erosion, Sediment and Surface and Ground water	Coordinator-General	Department of Natural Resources and Water, Environmental Protection Agency
Schedule C, Condition 6	Air Quality	Coordinator-General	Environmental Protection Agency
Schedule C, Condition 7	Noise and Vibration	Coordinator-General	Environmental Protection Agency
Schedule C, Condition 8	Flora and Fauna	Coordinator-General	Environmental Protection Agency
Schedule C, Condition 9	Cultural Heritage	Coordinator-General Department of Natural Resources and Water	National Trust of Queensland, Environmental Protection Agency, Queensland Heritage Council
Schedule C, Condition 10	Waste	Coordinator-General	Environmental Protection Agency, Scenic Rim Regional Council
Schedule C, Condition 11	Hazard and Risk	Coordinator-General	Queensland Police Service, Department of Emergency Services, Queensland Fire and Rescue Service, Queensland Ambulance Service
Schedule C, Condition 12	Contaminated Land	Coordinator-General	Environmental Protection Agency
Schedule C, Condition 13	Social and Economic	Coordinator-General	Scenic Rim Regional Council, Tourism Queensland

Condition Reference	Description of condition	Entity with Jurisdiction	Consultative Bodies
Schedule C, Condition 14	Traffic Management	Coordinator-General	Department of Main Roads, Scenic Rim Regional Council, Queensland Transport, Department of Education, Training and the Arts
Schedule C, Condition 15	Community Engagement	Coordinator-General	
Schedule C, Condition 16	Operation Environmental Management Plan	Coordinator-General	Environmental Protection Agency, Department of Natural Resources and Water, Scenic Rim Regional Council
Schedule C, Condition 17	Water Resources, Waterway and Riparian Protection	Coordinator-General Chief Executive, Department of Natural Resources and Water	Department of Natural Resources and Water
Schedule C, Condition 18	Flora and Fauna	Coordinator-General	Environmental Protection Agency, Department of Primary Industries and Fisheries
Schedule C, Condition 19	Waste	Coordinator-General	Environmental Protection Agency
Schedule C, Condition 20	Hazard and Risk	Coordinator-General	Queensland Police Service, Department of Emergency Services, Queensland Fire and Rescue Service, Queensland Ambulance Service
Schedule C, Condition 21	Estuarine Ecology Management Plan	Coordinator-General	

Appendix 2: Proponent's Commitments

The proponent commitments shown below are taken from Table 6-24 of the SREIS and from the proponent's letter to me dated 28 August 2008.

General

- The proponent will construct Wyaralong Dam in accordance with the Environmental Management System developed for the Project.
- The proponent will implement operating procedures as stated in a Resources Operations Plan.
- In conjunction with relevant government agencies, emergency services and other relevant local government and community representatives, the proponent will develop an optimisedflood management plan which balances the needs of both upstream and downstream stakeholders and the environment.
- The proponent will undertake the Project in accordance with an EMP which incorporates the elements of the draft EMP included in thisEnvironmental Impact Statement (EIS). Additional elements may be added to the draft EMP, where they relate to improvements, particular aspects to finalisation of design, construction timetables and the like.

Land

Topography, Geomorphology, Geology and Soils

- The proponent will prepare and implement a Topsoil Management Plan for the inundation area and any borrow/spoil areas outside of the inundation area required for the Project, to assist with re-establishment of the area and ongoing stability.
- The proponent will rehabilitate any borrow areas outside of the inundation area required for the Project as site works are completed, incorporating a selection of indigenous and fast growing plant species endemic to the area.
- The proponent will maintain existing vegetation within the flood margins of Full Supply Level (FSL), where required to stabilise the soil, reduce raindrop impact erosion and runoff velocities to minimise erosion.
- Prior to the commencement of each segment of construction works commencing on site, the proponent will undertake an erosion risk assessment to identify flow paths, suitable stockpile locations, soil cover type, and soil stability for the areas disturbed during construction of that segment of the Project.
- The proponent will prepare and implement erosion and sediment control plans in accordance with the Erosion and Sediment Control: Engineering Guidelines for Queensland Construction Sites (Witheridge and Walker, 1996).
- The proponent will develop and implement riparian management plans and manage weed infestation on all areas disturbed during construction of the Project .

Land Contamination

- All sites listed on the Environmental Management Register (EMR), located within the Project area, will undergo a staged phased site investigation (PSI) assessment process with subsequent investigative and remediation activities based on the assessment outcomes in accordance with EPA Draft Contaminated Land Guidelines (1998).
- The proponent will ensure that all high and medium potential risk sites are inspected by an experienced and qualified contaminated land professional. If the inspection

identifies actual notifiable activities or signs of contamination, these properties will be subject to the investigation process.

- In co-ordination with the relevant Council as the responsible authority, the proponent will provide for assessment and assist in remediation of septic tanks within the Project area, that are considered a risk to water quality of the storage.
- As part of the site construction EMP, the proponent will facilitate and participate in a proactive approach to identify and manage unexpected contamination as construction works areundertaken.
- The proponent will ensure all required contaminated land investigations, remediation and/or site management works are completed prior to inundation, as required to protect water quality of the storage.
- The proponent will ensure that a contaminated land management plan is prepared prior to materials being brought to site. The Plan will ensure that all material brought to the site meets the requirements of:
    - the National Environmental Protection (Assessment & Site Contamination) Measure; and
    - the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (1998).
- The proponent will ensure that all hazardous materials stored on the Project site are done so in accordance with the appropriate standards, guidelines or legislative requirements -i.e. Australian Standard 1940-2004, the Storage and Handling of Flammable and Combustible Liquids, and the *Dangerous Goods Act 1975* and the *Pesticides Act 1999*.
- The proponent will ensure that all hazardous material stored on the Project site, complies with the respective Material Safety Data Sheets (MSDS) requirements. MSDS' for products kept on site will be readily available to all site personnel.

Visual Amenity

- The proponent will prepare and implement a landscape plan for the dam wall, visually exposed infrastructure and associated areas. The plan will address:
    - landscaping of the area around the dam structure compatible with the recreational uses identified in this area;
    - significant visual impact issues;
    - use of a selection of indigenous and fast growing plant species endemic to the area; and
    - protection and management of native vegetation within the dam wall construction area footprint particularly immediately downstream riparian vegetation and remnant native forest and bushland vegetation above the spillway (for a non-RCC dam).
- The proponent will ensure that landscape plans are prepared for the Beaudesert-Boonah Road realignment and dam access road. The plan will identify significant visual impact issues and proposed landscape treatments.
- The proponent will prepare and implement a Landscape Master Plan(s) for the inundation area prior to major upstream clearing activities commencing, dealing particularly with:
    - the management of existing vegetation within the FSL;
    - the design and management of the FSL edge treatment to avoid erosion and protect steeper slopes and future "banks";
    - manage water level fluctuations and provide for the establishment of pioneer riparian plantings consistent with existing vegetation; and

- provide for a staged clearance of vegetation which retains fringe elements of vegetation to minimise the visual impact of clearance of the inundation area. These fringe elements can be cleared as a last stage in the clearing activity.

- The proponent will participate in the development of a Master Plan providing for the staged inundation of the water body, taking into consideration the aspects of adjoining landholders.
- The proponent will ensure that the lighting of the site conforms with the Australian standards AS 1158 Road lighting and AS 4282 Control of the obtrusive effects of outdoor lighting.

Infrastructure

- The proponent will liaise with the SRRC, DMR and affected landholders prior to and during the design and construction of the new local road relocations and realignments and intersection upgrades.
- The proponent will liaise with relevant utility companies and contractors to ensure that the relocation activities of their infrastructure is carried out via an activity specific EMP which embodies the principles of the Project EMP.

Water Resources and Water Quality

- The proponent will provide the SRRC with $2 million towards upgrading the Boonah WWTP.
- The proponent will ensure that throughout the design and construction phases of the Project, the natural flow in Teviot Brook is maintained.
- The proponent will ensure that the dam complies with all requirements of the Logan Basin Water Resource (Logan Basin) Plan 2007 and/or any water licences issued to the proponent.
- The proponent will ensure a Soil and Water Management Plan complying with erosion and sediment control guidelines (Erosion and Sediment Control: Engineering Guidelines for Queensland Construction Sites (Witheridge and Walker, 1996)) is prepared and implemented throughout the construction of the Project. Key sediment runoff control initiatives are outlined in the Draft EMP, Table 18-3.
- The proponent will ensure bore drilling, construction and development methods are carried out in accordance with the Minimum Construction Requirements for Water Bores in Australia (Land and Water Committee, 2003).
- The proponent will ensure emergency response procedures are developed and implemented, with chemical spill response kits issued at key construction points and staff trained in their use.

Terrestrial Environments

- The proponent will ensure that timber located within the full supply level that is millable, or suited to other commercial purposes, is salvaged (where appropriate and practicable) and large woody debris suitable as aquatic or terrestrial habitat saved for placement in critical locations. Suitable material remaining will be mulched for use in rehabilitation and landscaping.
- The proponent will ensure a Vegetation Clearance Management Plan is developed and implemented for the Project as outlined in Table 18-8 of the Draft EMP, to prevent excessive clearing and impact to vegetation.
- The proponent will ensure that progressive rehabilitation of the construction site in areas which will not be inundated is undertaken, by replacement of topsoil, contouring, revegetation with local native species, and mulching as soon as practicable after disturbance.

- The proponent will ensure a Vegetation Management Offsets (VMO) strategy mitigating impacts to significant regional ecosystems and vegetation communities is developed prior to construction of the relevant Project element commencing. The VMO will comply with the guidelines detailed in the Queensland's 'Policy for Vegetation Management Offsets' (DNRW, 2006). This plan will be developed in consultation with the EPA and DNRW.
- The proponent will ensure a weed management plan is prepared and implemented prior to the commencement of any relevant site construction works being carried out. Management measures are outlined in Table 18-8 of the Draft EMP.
- The proponent will ensure a Queensland Parks and Wildlife Service (QPWS) accredited spotter/catcher is on site immediately prior to vegetation clearance to inspect habitat trees (i.e. trees with hollows, fissures or with substantial food resource, mature trees or stag trees) to determine the presence of fauna and to implement a relocation plan for any significant native fauna found. Clearing will be undertaken using a staged approach to encourage fauna to migrate out of the area. The process of identifying habitat trees, removing hollows, flushing out fauna and caring of injured fauna will be included in a Project Terrestrial Fauna EMP.

Aquatic Environments

- Prior to construction of the dam wall commencing, the proponent will prepare and implement a management plan to monitor and control declared and aggressive aquatic weeds, such as Salvinia and Water Hyacinth including those found in tributaries that will become inundated by the dam.
- The proponent will identify selected areas of the fringe of the dam and on islands within the dam (i.e. areas within 1.5 m of FSL) that are available for the retention of vegetation and re-vegetating with native species tolerant of periodic inundation, which are known as sources of large woody debris, and will provide food for aquatic species (certain Melaleuca and Eucalyptus).
- The proponent will identify snag habitats within the storage which are suitable for fish and other aquatic species, such as turtles.
- The proponent will develop a fish transfer system in consultation with the Coordinator-General, DPI&F and EPA and other leading experts. This will include physical translocation of specimens of the species of interest. The proponent will monitor the efficacy of the fish transfer process to ensure their objectives are achieved.
- The proponent will identify operational activities that could aid in the management of habitat diversity.
- The proponent will participate in catchment management studies used to assist in the rehabilitation of the riparian area within the FSL and buffer area of Wyaralong Dam with links to the impacts on the water quality.

Air Quality/Greenhouse Gas

- The proponent will investigate the viability and consider contributing towards the establishment of a native hardwood timber plantation to offset carbon emissions.
- The proponent will establish a dust concentration and deposition monitoring network in the vicinity of identified sensitive receptors and construction works to assist with the quantification of background air pollutant levels (dust deposition). The monitoring will be conducted during construction of the Project, as required.
- The proponent will prepare and implement an air quality and meteorological monitoring plan as part of the construction Air Quality Management plan including a mechanism to indicate where additional mitigation measures may be required for air quality management. This may include on site visual monitoring by the site environmental officer as well as a complaints trigger.

Noise and Vibration

- The proponent will manage noise and vibration from the Project as set out in the Table 18-6 of the Draft EMP, including the preparation of detailed construction noise and vibration management plans for activities identified as having a high potential of creating a noise and/or vibration impact to the surrounding environment (e.g. blasting, earth works, drilling).The proponent will ensure that construction activities on the Project are carried out in accordance with the construction noise control guidelines described in Australian Standard AS 2436-1981 Guide to noise control on construction, maintenance and demolition sites (Standards Australia, 1981).
- Prior to the commencement of site works, the proponent will routinely inform the community of the upcoming activities and likely duration. The construction programme would continue to be developed taking into consideration the local community needs, including the scheduling of noisier activities (such as blasting) during least sensitive times of the day (refer Community Notification and Complaints commitment below).

Waste

- The proponent will manage all Project wastes as set out in the table 18-10 of the Draft EMP.
- The proponent will prepare and implement a site-specific Waste Management Plan prior to the commencement of site works addressing issues such as identification of waste materials, location and methods of storage, transport and disposal.
- The proponent will identify and implement measures for avoiding waste generation, reducing waste generation and reusing waste generated on site, where practicable.
- The proponent will enter into purchase agreements which require suppliers to take back packaging, where practicable.
- The proponent will ensure the transportation of regulated wastes, contaminated soils or other materials generated from the Project, is conducted by licensed contractors for disposal at licensed facilities, in accordance with requirements of part 2 of the Environmental Protection Regulation 1998.

Transport and Access Arrangements

- The proponent will prepare a Traffic Management Plan in consultation with the SRRC and DMR, for all elements of the Project, including measures to minimise the adverse effects on the road network. As a minimum, the plan will address:
    - a detailed schedule of construction works for road works which also addresses safety and convenience for all road users;
    - heavy vehicle operation to minimise the adverse effect on road users and the community;
    - analysis of the capacity of intersections and road links along the haulage routes in order to identify and mitigate against any operational impacts;
    - monitoring construction conditions;
    - maintaining one lane open during roadworks for emergency vehicles;
    - providing clearly marked on site parking for employees and visitors to the site during construction; and
    - road upgrades and relocations to ensure local and regional accessibility, including individual property access, is maintained.
- The proponent will ensure all construction employees and contractors are aware and are able to comply with the Traffic Management Plan for the Project.
- The proponent will consult with Queensland Police, Queensland Ambulance, Queensland Fire and Rescue Service and Queensland Transport regarding road

safety management for the general Project area during construction. The proponent will integrate consultation inputs into road planning and access arrangements.

- Each haulage contractor will be required to prepare a Road Use Management Plan (RuMP), which addresses the following key items associated with the haulage of materials:
    - o providing signage and delineation past the work site, including any diversion routes;
    - o obtaining a copy of the Alliance Traffic Management Plan and ensuring compliance with the RuMP;
    - o notifying the local communities about proposed changes to local traffic access due to construction activities and provide clear signage of changed traffic conditions; and
    - o providing adequate on site parking to accommodate the employees and site visitor vehicles and instruct the commuting employees to use the provided parking facilities in.
- order to avoid traffic disruption due to road side parking.
    - o providing buses for transportation of the construction workforce, where necessary; and
    - o maintaining at least one lane open for traffic on roads near the construction site.

Cultural Heritage

- The proponent will ensure that all site operations are carried out in accordance with the Cultural Heritage Investigation and Management Strategy (CHIMS) as agreed between the proponent and the Aboriginal Parties for the area.
- The proponent is committed to a process that affords the native title parties the opportunity to identify the nature and scale of the cultural heritage issues to be managed, and then develop and implement the necessary management processes. This process is located in the Indigenous Land Use Agreements that have been agreed between the proponent (QWI) and the native title parties.
- The proponent and the native title parties have specified the implementation of a management process that embodies culturally appropriate mechanisms for the management of their cultural heritage, in conjunction with Indigenous Land Use Agreement ‘s that provides for recompense for impact upon native title interests.
- The proponent will ensure that in the event that any items of cultural heritage significance are uncovered during the course of the construction of the Wyaralong Dam Project , work in the immediate area will cease and the finds immediately be reported to the Cultural Heritage Coordination Unit, DNRW on (07) 3238 3838 and the QWI Cultural Heritage Senior Project Manager.
- The proponent will conduct cultural heritage awareness training for all on site personnel identifying areas and items of cultural heritage significance.

Social & Economic

- The proponent will actively participate in the ongoing planning and implementation of recreational facilities associated with the dam. This will be done in conjunction with Scenic Rim Regional Council, Sport & Recreation Queensland, the Department of Infrastructure and Planning, and appropriate sporting and community organisations in the area as required.
- The proponent will contribute towards the facilitation of the planning, funding and development of recreational planning initiatives to enhance the area’s future capacity to provide for the recreational needs of locals and tourists, including recreation and opportunities as part of the Project.

- The proponent will facilitate and provide support to land use and infrastructure planning studies to investigate the impacts and opportunities of the Project on existing land uses and infrastructure.
- The proponent will prepare and implement a communication program to targeted residents in the immediate vicinity of pending works and the wider community as part of a Project Communications Plan.
- The proponent will prepare and implement a complaint response system for the duration of the Project, including promotion and provision of phone contact with construction management staff during hours of construction, and a follow up procedure which notifies complainants within 24 hours of the intended response to the issue raised.
- The proponent will provide appropriate promotion, public relations and advertising towards the end of the construction period indicating when the recreational facilities will be opened to the public and what facilities will be available.
- The proponent will facilitate planning for the upgrade of the Boonah Sewage Treatment Plant, in conjunction with the SRRC.
- The proponent will continue to operate a '1800' number along with mail, web based feedback forms and site visitation (taking safety into consideration) throughout the Project.
- The proponent will prepare an annual activity report which outlines the environmental, social and economic objectives of the Project, including sustainability, and progress against these for distribution within the regional community.
- In designing, planning and siting the construction accommodation camp, should it be required, the proponent will ensure the contractor considers its potential future use (e.g.affordable housing, recreational use, functional open space).
- The proponent will maintain Wyaralong Dam Business Capabilities Working Group to help local business prepare for the opportunities that will be available to them during the construction phase (e.g. acquiring necessary licences, permits, skills etc).
- The proponent will coordinate with the Industry Capability Network (Qld), a not-for-profit group assisting in the development of a Local Industry Participation Plan. The proponent will continue to promote a Local Business Opportunity Register, so that local businesses can register their interest in, and preparedness for, participating in construction works for a diverse range of goods and services.
- The proponent will continue to meet reasonable costs incurred by landowners in agreeing to a voluntary sale, including:
    - reasonable fees for legal, valuation, financial planning and accounting advice regarding the sale;
    - an allowance for stamp duty incurred on the purchase of another property (calculated based on the amount of stamp duty for the sold property); and
    - a lump sum amount for disturbance and general expenses to allow the landowner to relocate as agreed between QWI and the landowner.
- The proponent will encourage the recruitment of a workforce, where possible, to maximise the potential employment opportunities available to the local community and encourage the development of partnerships with local training providers regarding the timely provision of suitable training opportunities. Monitoring of local businesses need for labour and the impact of the Project on the local labour market will be undertaken as part of the recruitment strategy.
- The proponent will ensure contracts with suppliers, service providers and contractors maximise local industry participation where appropriate skills are available. Work will be packaged and presented to enhance opportunities for capable and competitive

local suppliers. Details on business opportunities in the surrounding regions will be provided prior to the release of these packages, and relevant tenders will be advertised locally.

Hazard and Risk

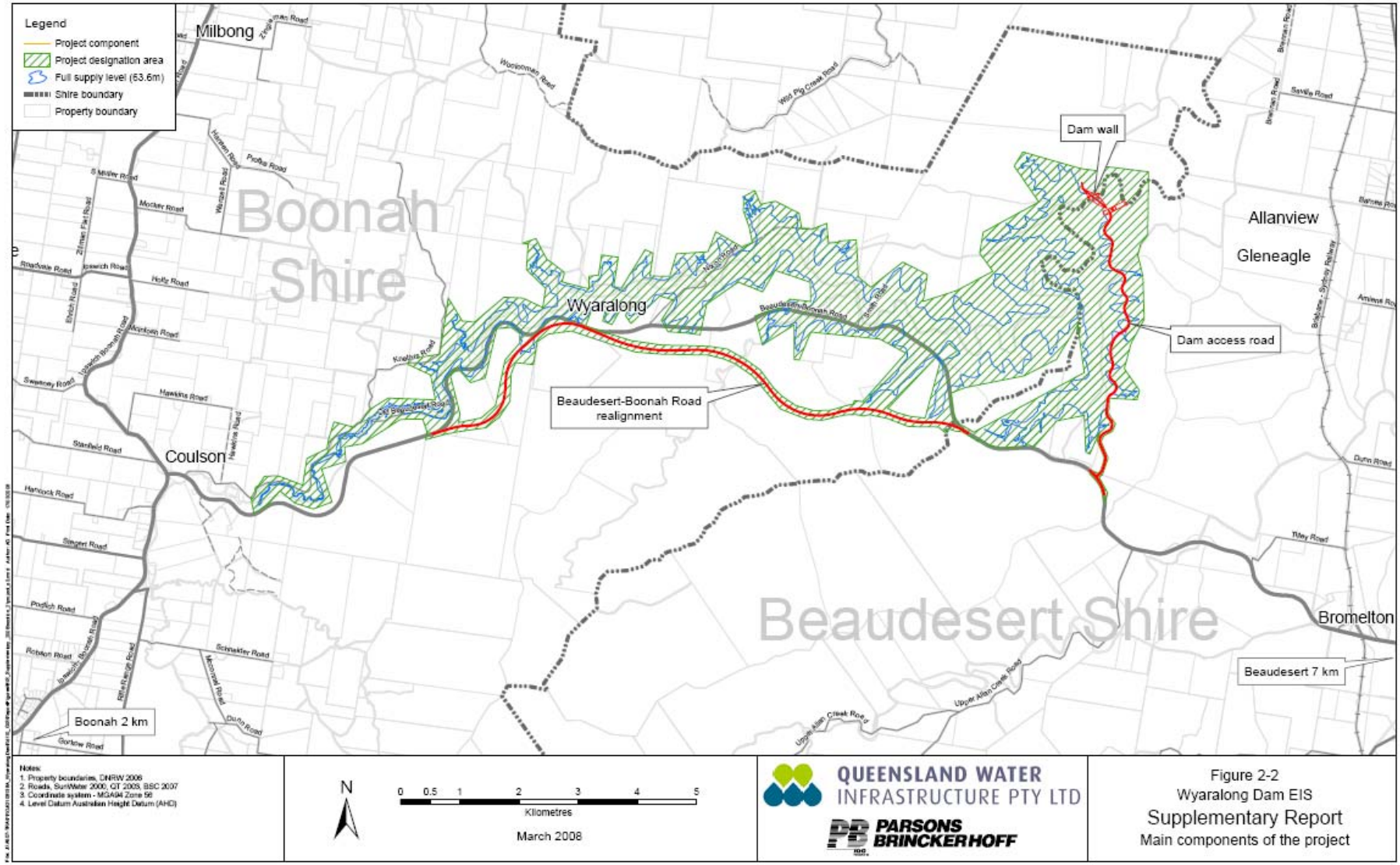
- The proponent will ensure that all significant hazards and risks identified within the EIS are managed as set out in the Draft EMPs.
- The proponent will undertake storage and transport of hazardous materials according to relevant Australian standards, guidelines and legislation, including:
    - AS4452 The Storage and Handling of Toxic Substances;
    - AS1940 The Storage and Handling of Flammable and Combustible Liquids;
    - AS3780 The Storage and handling of Corrosive Substances;
    - *Dangerous Goods Safety Management Act 2001;* and
    - Local council requirements.
- The proponent will ensure Licensed transporters operating in compliance with the Australian Dangerous Goods Code will undertake the transport of dangerous goods to the construction site. The transport of ammonium nitrate will be undertaken in compliance with the requirements of AS 1678.5.1.002-1998: Emergency procedure guide - Transport -Ammonium nitrate.
- The proponent will employ the services of a specialist explosives company to design, facilitate and carry out all blasting operations. The Contractor's personnel will be appropriatelylicensed and trained in the transport, handling, mixing and use of explosive materials.
- The proponent will ensure all waste fuels/oils/grease/chemicals are collected by a licensed contractor for recycling, treatment and/or disposal.
- The proponent will carry out a safety risk assessment of the Project to identify areas of high risk to public safety and ensure appropriate risk management mitigation measures are put in place.
- The proponent will prepare and implement a safety management system in accordance with Australian Standards AS 4801 and AS 4804.
- The proponent will ensure Material Safety Data Sheet's (MSDS) are readily available for all employees and contractors and personnel made aware of the environmental and safety requirements of these materials. The proponent will ensure that a register of hazardous materials, oils, chemicals and petroleum products used on site is maintained.
- The proponent will ensure emergency spill kits containing absorbent materials, neutralising chemicals and other spill containment equipment will be strategically located around the site, on board equipment and in vehicles for the types of spills likely to be encountered.
- The proponent will ensure all personnel are provided with Environmental Awareness training during induction sessions and taught spill control and containment procedures.
- The proponent will ensure that signs erected on roadways within the catchment state that the route is within a drinking water catchment and that all spills need to be reported.
- The proponent will ensure an Emergency Action Plan (EAP) or Dam Safety Emergency Plan is developed prior to the commissioning of the Project and include the following:

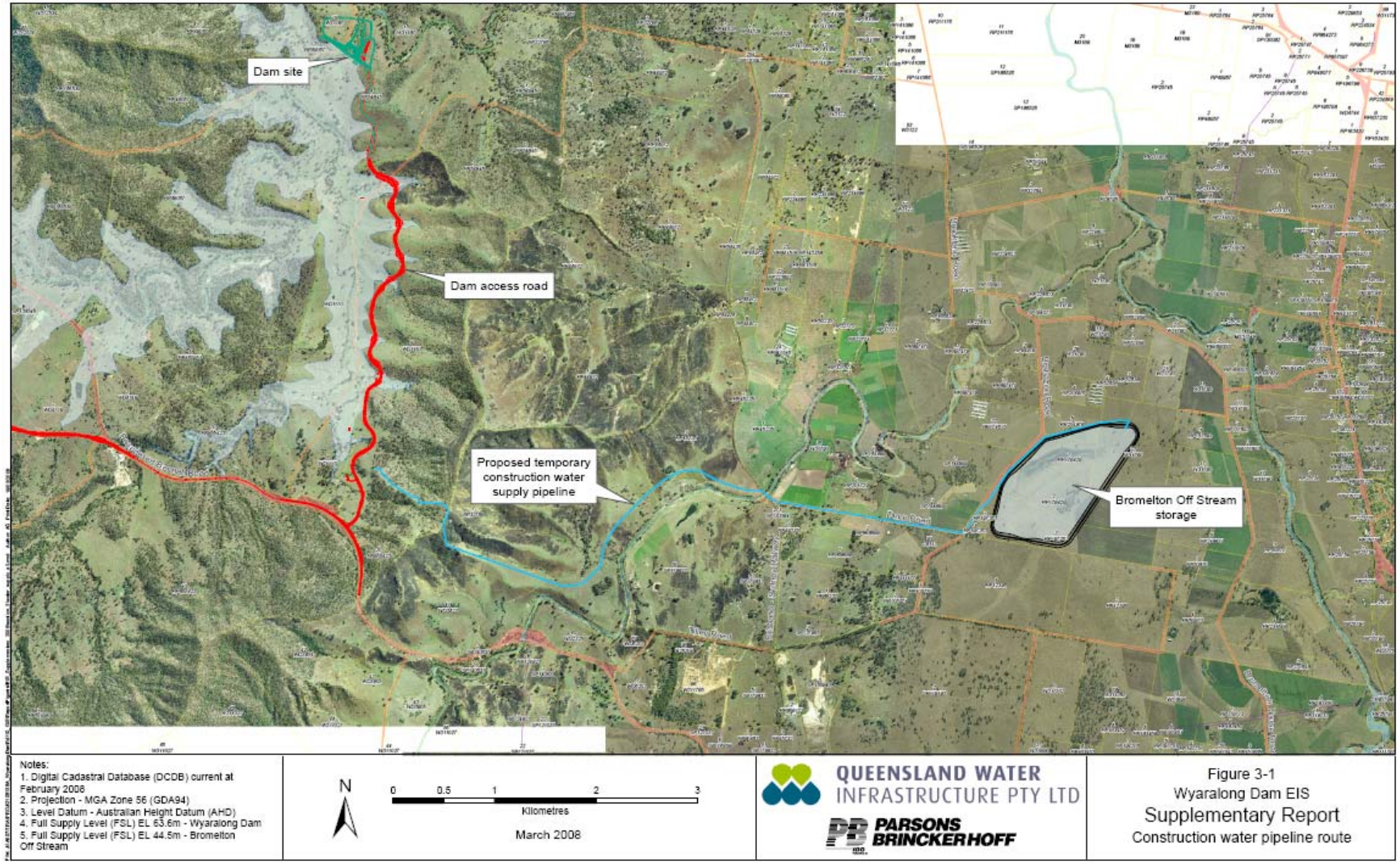
- identification of emergency conditions which could endanger the integrity of the dam;
- dam operation procedures to follow in the event that such emergency conditions are identified;
- warning systems for downstream communities;
- notification listing or flowchart – identifying responsibility for notification, the order of notification and who is to be notified;
- roles and responsibilities – of the dam owner, operator and dam personnel;
- area map – showing the access routes to the storage during fair and adverse weather conditions, including distance and travel times;
- a drawing of the storage catchment area;
- emergency events and actions list;
- description of typical problems, problem characteristics and when/what to check for during inspections;
- a dam failure inundation map – this will identify: downstream inhabited areas subject to danger, inundated areas, a narrative description of areas affected by dam break; and
- any other charts, rating tables, considered by the dam owners as necessary.

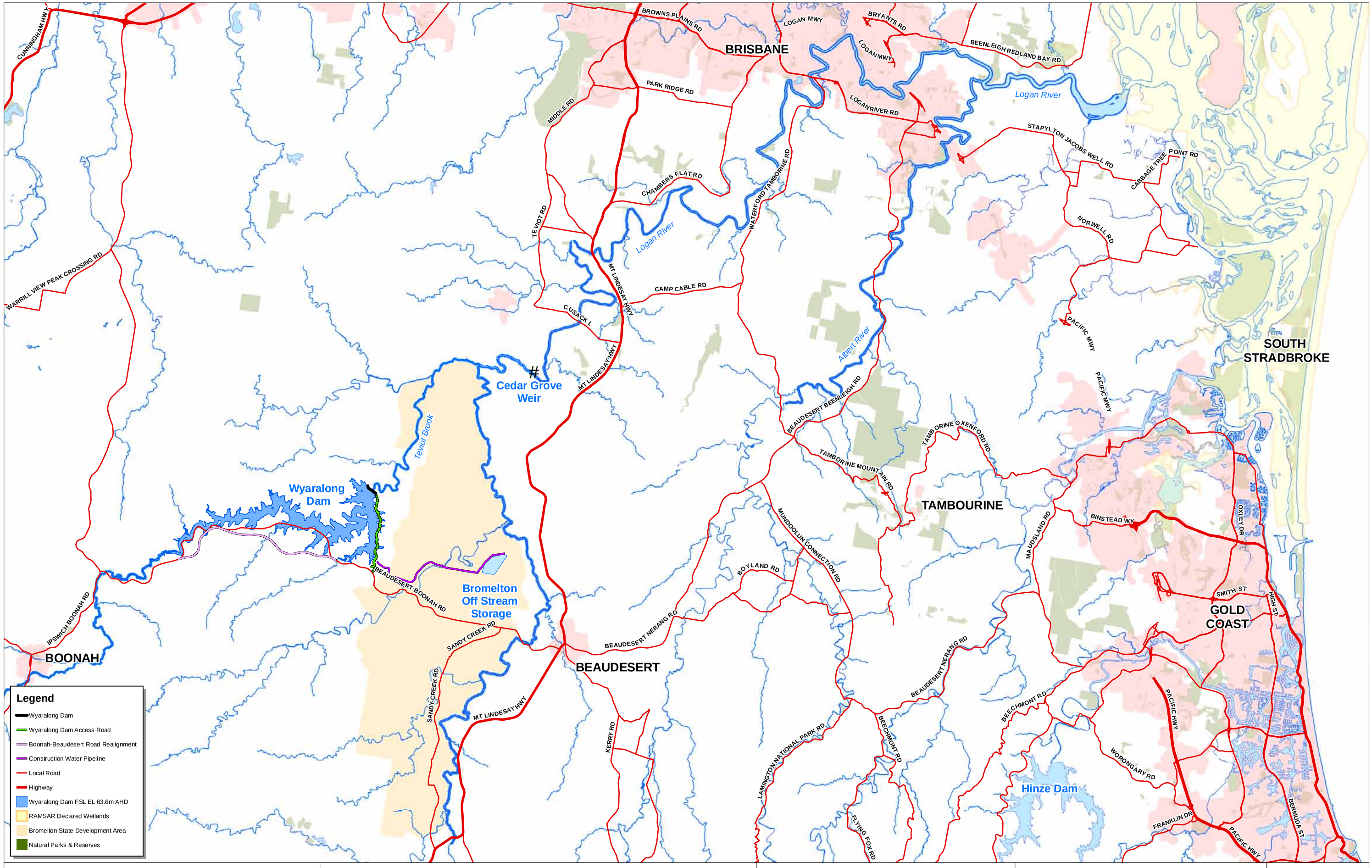
- Prior to commissioning of the dam, the proponent will prepare and implement spill response measures in accordance with the Emergency Management Response Plan.
- Prior to commissioning of the dam, the proponent will prepare an Operations and Maintenance manual for the dam. This will include procedures for the following:
  - operating the dam under normal conditions;
  - coordination with other flow regulating structures within the catchment;
  - maintaining environmental flows;
  - coordinating with emergency response and counter disaster agencies;
  - flood warning;
  - maintaining the dam, associated structures and associated equipment in accordance with the designer's operating criteria;
  - a program for surveillance and monitoring of the dam and all associated structures and equipment to allow for early detection of faults and deficiencies;
  - recording and reporting of routine and non-routine surveillance;
  - remedial action in the event of faults or deficiencies being identified by surveillance; and
  - periodic review, at regular intervals or when changes or other circumstances dictate.
- The proponent will ensure the manual is written such that persons unfamiliar with the dam can operate it properly. This is particularly important in an emergency situation.
- The proponent will ensure that construction workers operating vehicles on site will be trained and licensed, so that these vehicles are driven in a safe and appropriate manner.
- The proponent will ensure that speed control (signage), driving to conditions, and prescribed driving etiquette on the site will be used.

- The proponent will ensure that all site vehicles are fitted with radios for two-way communication.
- The proponent will ensure that adequate night lighting through the provision of lighting towers and vehicle headlights will be provided to ensure night operating and driving conditions are safe.
- The proponent will ensure that all blasting operations comply with the *Explosive Act 1999.*
- The proponent will ensure that appropriate PPE for construction sites is mandatory and worn as appropriate.
- The proponent will ensure that specific and detailed standard operating procedures are implemented that deal with high voltage.
- The proponent will consult with Queensland Police and Department of Emergency Services to address construction and operation planning issues (e.g. emergency response scenarios).
- The proponent will monitor changes to the hydrological regime regarding impact of the dam on flooding extent and frequency, and corresponding impact on the maintenance of floodplain water bodies, is minimised.
- The proponent will ensure that all construction and operational activities undertaken are managed in accordance with a Project EMP.

Appendix 3: Project locality map


Legend
Project component
Project designation area
Full supply level (63.6m)
Shire boundary
Property boundary
Milbong
Boonah Shire
Wyaralong
Coulson
Allanview
Gleneagle
Bromelton
Beaudesert Shire
Dam wall
Dam access road
Beaudesert-Boonah Road realignment
Boonah 2 km
Beaudesert 7 km
Notes:
1. Property boundaries, DNRW 2006
2. Roads, StuntWater 2000, QT 2003, BSC 2007
3. Coordinate system - MGA94 Zone 56
4. Level Datum Australian Height Datum (AHD)
N
0 0.5 1 2 3 4 5
Kilometres
March 2008
QUEENSLAND WATER INFRASTRUCTURE PTY LTD
PARSONS BRINCKERHOFF
Figure 2-2
Wyaralong Dam EIS
Supplementary Report
Main components of the project


Dam site
Dam access road
Proposed temporary construction water supply pipeline
Bromelton Off Stream storage
Notes:
1. Digital Cadastral Database (DCDB) current at February 2008
2. Projection - MGA Zone 56 (GDA94)
3. Level Datum - Australian Height Datum (AHD)
4. Full Supply Level (FSL) EL 63.6m - Wyaralong Dam
5. Full Supply Level (FSL) EL 44.5m - Bromelton Off Stream
N
0 0.5 1 2 3
Kilometres
March 2008
QUEENSLAND WATER INFRASTRUCTURE PTY LTD
PARSONS BRINCKERHOFF
Figure 3-1
Wyaralong Dam EIS
Supplementary Report
Construction water pipeline route



NOTES:

1. Digital Cadastral Database (DCDB) current at Sept 2008
2. Projection - MGA Zone 56 (GDA94)
3. Level Datum - Australian Height Datum (AHD)
4. Full Supply Level (FSL) EL 63.6m

0 2,000 4,000 8,000 12,000

Metres

Scale - 1:100,000(at A1)

REGIONAL MAP

BEAUDESERT REGION

DRAWING NUMBER

100XXX

DATE: OCT 2008

...\100XXX_Beaudesert_Region_081003.mxd Produced: 03/10/2008

Appendix 4: Fishway Design Process and Criteria – Wyaralong Dam (DPIF)

Design process

The process set out below details the steps DPI&F consider necessary for a successful design process. Essentially this summarises the process used for the design of the Paradise Dam fishways on the Burnett River which is considered the most positive fishway design exercise to date. While the detail may seem unnecessary it is DPI&F'S experience that the best fishways come out of a highly consultative process. Maximum use should be made of existing expertise among overseas and Australian fishway designers and biologists as this only adds to the quality of the outcome.

Design steps

1. Collate the following data collected in response to ToR or already existing:
    - Fish assemblages at the site, up and downstream of the site and any relevant behavioural data for those species;
    - Fish habitat at the site, up and downstream of the site;
    - As above for turtles;
    - Hydrology for the site;
        - exisiting (eg flow duration curves, Annual Exceedance Probabiilties, flow event curves); and
        - projected headwater/tailwater levels at a range of flows;
    - Relevant water management impacting on the site eg. environmental flow release requirements, ROP requirements; and
    - Likely dam operation.

    As far as possible this data should be provided for review prior to the first design meeting.

2. First meeting

    - Discuss existing data, identify data gaps;
    - Initiate steps to fill data gaps where practicable;
    - Identify a date by which additional data will be collected, and disseminated (before first site inspection);
    - Discuss possible design types;
    - Agree on how the preferred design type will be arrived at (eg. follow process used for Paradise Dam, where tenderers presented concept designs for consideration); and
    - Agree on date for site inspection.

3. Site inspection

    - Inspect site;
    - Inspect catchment below site to identify further impediments to fish passage that may be affected by changes in flow regimes;
    - Inspect catchment above site where additional instream works may be required eg. raising road crossings above FSL;
    - Determine how access to fishways will be provided for monitoring and maintenance purposes;
    - Relate hydrological data to site; and
    - Agree on date for workshop.

4. Development of design specifications

    The development of the design specs could be done during a discussion meeting or through collating submissions from DPI&F, QWI, EPA and any other players.

5. Design workshop

A design workshop model was used for developing the fishway designs for Paradise Dam and Kirar Weir. Tenders were invited on the functional specifications agreed to by Burnett Water and DPI&F from the outcomes of the previous meeting and site inspections. Fishway design concepts were then presented to DPI&F for consideration. The preferred concept design was chosen on the basis of applicability to the function specification and practicality of design and operation.

Fish passage issues to be discussed are:

- Fishways providing upstream passage across the dam;
- Fishways providing downstream passage across the dam;
- Fishways providing passage across temporary structures associated with theconstruction of the dam (eg. haul roads, bunds etc);
- Provision of fish passage during stream diversion; and
- Fishways at other sites within, up or downstream of the dam where passage opportunities are further limited by the presence/operation of the dam.

Concept designs agreed upon. Concept design to be disseminated prior to next meeting.

6. Post workshop meetings

- Discuss concept designs;
- Agree consultative process and contacts for input into the development of the design;
- Discuss monitoring requirements, including design elements related to monitoring;
- Establish processes for developing monitoring, budgets for monitoring, monitoring outcomes, contingencies for post-construction adjustments etc; and
- Establish processes for developing fishway management plan including operation and maintenance manual, maintenance program, contingency plans for fishway failure, continuous improvement program etc

7. Modelling

A scale model will need to be constructed and run under various flow scenarios to evaluate entrance and exit conditions and flow patterns at the dam wall. DPI&F should be present at this modelling exercise.

8. Ongoing input

- When any change is made to the fishway designs that could affect its capacity to pass fish, its operation or monitoring, DPI&F should be consulted; and
- Once a close-to-final design is available, this should be disseminated and a meeting date agreed upon.

9. Final Design meeting(s)

- Discuss final designs and agree on any further modifications;
- Final plans must be provided to DPI&F for inspection prior to commencement of fishway(s) construction;
- Agree process for consultation with DPI&F by the construction contractor in the event that any change is proposed to the implementation/realisation of the fishway designs (that could affect its capacity to pass fish, its operation or monitoring, DPI&F);
- Agree fishway inspection program during and close to completion of construction;
- Outline contents of Fishway Management Plan for the site;
- Set up ongoing management committee/process for the fishways to deal with issues arising such as:
    - monitoring outcomes;
    - associated modifications to the operation or structure of the fishways;
    - implementation of continuous improvement obligations;
    - operating contingencies; and
    - long-term outcomes;

- Look at community education programs relating to the completed fishways and biopasses to increase public acceptance of the technologies and to improve public ownership of the structures.

Key Players

1. Biological

- Input from DPI&F fishway biologists;
- Input from EPA turtle biologists;
- Expectation that the design engineers (successful tenderers) would have access to a fishway biologist with some experience in major fishway projects;
- Peer review of the design by independent (possibly overseas) fishway biologist with experience in providing fish passage at similar structures and preferably with comparable biota; and
- Input from independent (possibly overseas) turtle biologist with experience in providing for turtle passage at similar structures and preferably with comparable biota.

2. Engineering

- This should include peer review of the design by independent fishway and biopass engineer(s) with experience in providing fish and turtle passage at similar structures and preferably with comparable biota.

3. Operational

- Input should be sought from dam operators with experience of similar dams (and possibly fishways) to uncover any operational issues that may have been missed by the design engineers or fishway biologists.

4. Queensland Water Infrastructure (developer)

- There was great merit in having regular input from the highest level of Burnett Water management during the development of the Paradise Dam fishways designs. DPI&F would advocate a similar involvement of high level QWI management in the process.

Design Principles for Fish Passage (non-exhaustive)

General

- DPI&F advice on fishway design (including capacity and downstream passage) and operation will necessarily be conservative given the current knowledge available, the longevity of the dams and potential changes to the fish communities and fish behaviour over time.
- The fishways should cater for the whole fish community at each site in terms of size classes, swimming abilities and biomass. This includes all life stages of the fish species at each site.
- Fishways should provide both upstream and downstream passage all year round for the whole fish community.
- The fishways should be designed to be operational all year round when there is an inflow into the impoundment or a release from the impoundment.
- The fishways should operate down to minimum tailwater and 0.5 m below minimum headwater drawdown levels (dead storage level or minimum offtake level, whichever is lower and up to a 1 in 50 year flood or drownout (whichever is lower).
- All releases from the impoundments should be directed first through the fishway as a priority over the outlet works (design to take account of this operational requirement if necessary).
- Adjacent outlet works should be screened or otherwise designed and placed to prevent fish passing through or becoming trapped in these works.
- Spillway design, aprons, stilling basins and dissipater design should seek to minimise fish injury, mortality and entrapment.
- Quality of components used in the fishways should reflect the estimated lifetime or presence of structures to enable fishways to function throughout that lifetime.
- Fishway entrances need to be sited where fish can access them over the full operational range of the fishway.
- Outlet works need to be positioned so as not to interfere with fish access to the fishway entrance.
- Spillway overtopping flows should initiate and terminate adjacent to the fishway or be directed parallel to the fishway entrance.
- There should be a constant attraction flow at all times at the fishway entrance.
- Appropriate light levels should be maintained at fishway entrances.
- Specific water allocation should be made for the running of the fishways (including attraction flows).
- Allocated water volume should be at design levels for the fishways as opposed to minimum possible water usage.

UPSTREAM PASSAGE

Entrance

- The fishway entrance needs to be accessible under all flow conditions.
- Fish attracted to the spillway need to be able to access the fishway without having to swim back downstream.
- Attraction flow velocities should be sufficient to attract fish but not too high for smaller fish to navigate.
- Water supply for the fishways and attraction flows should be sourced from surface quality water.
- Adequate holding chamber dimensions.
- Adequate hydraulic conditions for all fish within the fishways.
- Attraction flow diffuser should be vertical and fixed on the back wall of the holding chamber.
- Turbulence and velocities need to be balanced to ensure attraction without precluding smaller fish.
- Entrance slot should be adjustable.

Exit

- Fish should exit so as to avoid entrainment in any outlet work screens and avoid being washed back over the spillway during overtopping.
- Cover should be provided for fish moving from the exit.
- Fish should exit at water level.

Outlet works

- Outlet works should be adjacent to the fishway.
- The orientation of the outlet works water jet should be angled so that it does not impinge on fish moving up the adjacent riverbank.
- High flow (slug release) should not cause confusing flows at the fishway entrance.

Screens

- Intake screens dimensions must be such that small fish are not drawn through the outlet works and velocities should be low enough that fish are not impinged on the screens.

Tailwater control structures

- Any tailwater control structures such as a gauging weir (proposed and existing), rock bar etc should be fitted with fish passage facilities.
- Any instream structure downstream of the proposed dams, whose barrier effect to fish passage is increased by changes in flow characteristics due to the proposed dams, should be fitted with fish passage facilities.

Downstream passage

- Downstream passage should be provided whenever the upstream fishway is operating.
- Fish should be delivered into the tailwaters at or below water level over the full range of tailwater levels including with no flow over the spillway.
- Appropriately screened to prevent blockage by debris but allow fish passage.
- Spillway design should minimise the potential for fish injury and mortality during passage over the spillway in overtopping flows.

Provision of fish passage during construction

Temporary fish passage must be provided during all phases of construction and during the period prior to the filling of the impoundment and operation of the fishway.

- Stream crossings for construction traffic should be provided for by full channel bridges;
- Where culvert type crossings are necessary, the culverts should be of suitable dimensions to pass alll flows up to drownout without constriction of the river channel; and
- Flow velocities within any culvert crossings must be controlled so as to permit fish passage over the full range of flows.

FISH PASSAGE AND DAM OPERATION

Spillway operation/releases through outlet works

The optimal operating regime for the fishways will be an outcome of the results of monitoring as well as a degree of trial and error. It is not expected that the fishway will be optimally operated from day one. However, there are some minimum operating requirements that the designers need to be mindful of:

- The fishways should be operated as per the design levels until monitoring results suggest otherwise;
- The operating range of the upstream fishways should be as recommended above (The fishways should operate down to minimum tailwater and 0.5 m below minimum headwater drawdown levels (dead storage level or minimum offtake level, whichever is lower and up to a 1 in 50 year flood or drownout (whichever is lower))'
- The minimum operating range of any downstream fishway should be set a level that is equal to or lower than the minimum operating level to be specified in the ROP;
- A specific water allocation to run the fishways may need to be quarantined from the yield of the dam to ensure that the fishways can be operated in the absence of other releases from the dam; and
- The fishways should be operated when there is an inflow into the impoundment or a release from the impoundment.

Appendix 5: Glossary and Abbreviations

Words, phrases and abbreviations used throughout the report are defined below. Where a definition for a term used in the conditions contained in Appendix 1 of this report is not defined within this Appendix, the definitions provided in the relevant Appendix shall be used.

Abbreviations

ACH Act	*Aboriginal Cultural Heritage Act 2003 (Qld)*
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AMTD	Adopted Middle Thread Distance
ANCOLD	Australian National Committee on Large Dams
BAS	Business Adjustment Scheme
BOS	Brometon Off-stream Storage
CFR Dam	Concrete-Faced Rockfill Dam
CFTF	Community Futures Taskforce
CGEM	Computable General Equilibrium Modelling
CHIMA	Cultural Heritage Investigation and Management Agreement
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
cm	centimetre
dB	Decibels
DES	Department of Emergency Services
DEWHA	Department of Environment, Water, Heritage and the Arts
DMR	Department of Main Roads
DNRW	Department of Natural Resources and Water
DO	Dissolved Oxygen
DPI&F	Department of Primary Industries and Fisheries
E&R Dam	Earth and Rockfill Dam
EAP	Emergency Action Plan
EC	Electrical conductivity
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
EFO	environmental flow objectives
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environment Management Register
EPA	Environmental Protection Agency
EP Act	*Environmental Protection Act 1994 (Qld)*
EPP Air	Environmental Protection (Air) Policy
EPP Noise	Environmental Protection (Noise) Policy
ERA	Environmentally Relevant Activities
ESD	Ecologically Sustainable Development
EVR	Endangered, Vulnerable or Rare
FIA	Failure Impact Assessment
FSL	Full Supply Level
GQAL	Good Quality Agricultural Land
GAB	Great Artesian Basin
GRP	Gross Regional Product
ha	hectares
HAT	Highest Astronomical Tide
ILUA	Indigenous Land Use Agreement
IP Act	*Integrated Planning Act 1997 (Qld)*

IQQM	Integrated Quantity-Quality Model
km	kilometres
KRAs	Key Resource Areas
LCC	Logan City Council
LoS	Level of Service
LGA	Local government area
LP(P&SRM) Act	*Land Protection(Pest and Stock Route Management) Act 2002 (Qld)*
m	metres
mg/l	milligrams per litre
ML	Megalitres
ML/a	Megalitres per annum
ML/d	Megalitres per day
mm	millimetres
MSDS	Material Safety Data Sheets
NEPM	National Environmental Protection Measure
NES	National Environmental Significance
NC Act	*Nature Conservation Act 1992 (Qld)*
NSW	New South Wales
NTU	Nephelometric turbidity units
NWI	National Water Initiative
PMF	Probable Maximum Flood
PPE	Personal protective equipment
PSI	Phased Site Investigation
QLD	Queensland
QPWS	Queensland Parks and Wildlife Service
QRAA	Queensland Rural Adjustment Authority
QWC	Queensland Water Commission
QWI	Queensland Water Infrastructure Pty Ltd
RCC	Roller Compacted Concrete
RE	Regional Ecosystems
ROP	Resource Operations Plans
ROL	Resource Operations License
RuMP	Road Use Management Plan
SDA	State Development Area
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SEQ	South East Queensland
SPP	State Planning Policy
SREIS	Supplementary Report on the EIS
SRRC	Scenic Rim Regional Council
t CO2-e	tonnes of carbon dioxide equivalent
ToR	Terms of Reference
TQ	Tourism Queensland
TSP	Total Suspended Particulate Matter
UXO	unexploded ordnance
VM Act	*Vegetation Management Act 1999(Qld)*
VMO	Vegetation Management Offsets
WAP	Workers Assistance Program
WASOs	water allocation security
WQMP	Water Quality Management Plan
WRP	Water Resources Plan
WRP (Logan Basin)	Water Resources (Logan Basin) Plan 2007

Glossary	
Adopted Middle Thread Distance	The distance from the mouth of the watercourse or the confluence of the watercourse with the main watercourse measured along the middle of the watercourse.
Alluvial (alluvium)	Weathered material transported and deposited by the movement of water.
Alluvial plain	A plain formed by the deposition of alluvial material over a long period of time.
Analyte	Substance or chemical constituent that is determined in an analytical procedure
Animal	Any member, dead or alive, of the animal kingdom (other than a human being)
Aquatic macrophyte	Submerged, emergent or floating aquatic vegetation that is visible to the naked eye.
Aquifer	A water-bearing stratum of permeable rock, sand, or gravel, able to transmit substantial quantities of water.
Attenuation	The reduction of flood peaks due to storage effects
Australian Height Datum	The datum used for determining elevations in Australia which uses a national network of bench marks and tide gauges, and has set mean seal level as zero elevation.
Backwater	Accumulation of water resulting from an obstruction, limited downstream channel capacity, high tide or high stages in a connecting stream.
Benthic	Pertaining to the bottom of a body of water.
Biodiversity	Biodiversity is short for “biological diversity”. It describes the natural diversity of native wildlife, together with the environmental conditions necessary for their survival and includes: a) regional diversity, that is, the diversity of the landscape components of a region, and the functional relationships that affect environmental conditions within ecosystems; b) ecosystem diversity, that is, the diversity of the different types of communities formed by living organisms and the relations between them; c) species diversity, that is, the diversity of species; and d) genetic diversity, that is, the diversity of genes within each species.
Biota	The total collection of organisms of a geographic region or a time period, from local geographic scales and instantaneous temporal scales all the way up to whole-planet and whole-timescale spatiotemporal scales

Bunding	An artificially created boundary, usually in the form of an embankment used to prevent sediment and substances from entering a water stream or storage facility.
Business day	Monday to Friday, excluding gazetted public holidays and the period from 26 December to 1 January inclusive
Catchment	The area of land which collects and transfers rainwater into a waterway.
Coffer dam	An enclosure beneath the water constructed to allow water to be displaced by air for the purpose of creatinga dry work environment.
Common	The wildlife is common or abundant and is likely to survive in the wild (also definition of wildlife of least concern)
Commonwealth Environment Minister	The Commonwealth Minister administering the Environment Protection and Biodiversity Conservation Act 1999 (Cth).
Community	An assemblage of interdependent populations of different species (plants and animals) interacting with one another, and living in a particular area.
Confluence	Area where two or more rivers come together to form one river.
Connectivity	Refers to the ease with which organisms move between particular landscape elements.
Construction completion	The date on which the infrastructure achieves practical completion as defined in the relevant construction contract agreement.
Construction EMP	The Environmental Management Plan for the construction phase of the Project required by Schedule C, Condition 2(a).
Construction EMP Update	The relevant update to the Construction EMP for relevant works submitted to the Coordinator-General under Schedule C, Condition 2 (b).
Controlled action	An action that a person proposes to take is a controlled action if the taking of the action by the person without approval under part 9 of the EPBC Act for the purposes of a controlling provision of part 3 would be prohibited by the provision. Controlling provisions include World Heritage, National Heritage, Wetlands of international importance, Listed threatened species and communities, Listed migratory species, Nuclear actions and Marine environment.
Covenant	An agreement or contract between two parties (i.e. landlord and Council)
Discharge	The rate of flow measured in volume per unit time (such as ML/d)
Downstream	In the direction of flow of a stream or river, i.e. away from the source.
Ecology	The study of the interrelationships of organisms with and within their environment.

Ecosystem	A biophysical environment containing a community of organisms.
Edge effect	All changes at an ecosystem boundary and within adjacent ecosystems; the negative influence of a disturbed habitat edge on the interior conditions of a habitat, or on species that use the interior habitat.
Effluent	Outflow of treated wastewater.
Embankment dam	Embankment dams are made mainly from natural materials. The two main types are earthfill dams and rockfill dams. Earthfill dams are made up mostly from compacted earth, while rockfill dams are made up mainly from dumped and compacted rockfill. The materials are usually excavated or quarried from nearby sites, preferably within the reservoir basin.
Embayment	Small bay between minor headlands.
Endangered	A species is endangered if: • there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife; or • the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction; or • the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction; or • the survival of the wildlife in the wild is unlikely if a threatening process continues.
Endemic	Restricted to a certain region or part of region.
Environment	The total of all the external conditions that act upon an organism.
Environmental flow	The flow of water that is required to maintain aquatic and riparian ecosystems in streams and rivers.
Environmental Flow Objective	Performance indicators set out in the Water Resource (Logan Basin) Plan 2007 for the measurement of the environmental performance of the Logan Basin.
Ephemeral	Transitory, short-lived.
Erosion	The process by which rocks are loosened, worn away and removed from parts of the Earth's surface. Seven processes of erosion discussed separately; in practice they overlap and it is often difficult to isolate the net effects of any one process. Rainsplash erosion: the detachment and removal of soil and debris by raindrop impact. Overland flow OR surface runoff: water flowing over the surface

	before being concentrated into definite streams. Sheet erosion, sheet wash, or slope wash: the combined effect of overland flow and rainsplash. Gully erosion: the rapid development of gullies, usually in first- or second-order tributaries of streams, BUT also in situations unrelated to an integrated drainage system (e.g. highly dispersive soils) Mass Movement: downhill movement of debris en masse rather than as individual particles. It can occur slowly (creep), or rapidly (rockfalls, slumps, landslides). Surface rock creep: the movement of stones down sloping surfaces. Fluvial erosion: the detachment and removal by streams of material in solution, suspension, or as bed load. Includes removal of debris supplied to the streams by slope wash, mass movement, and gullies.
Essential habitat	Vegetation in which a species of wildlife is known to occur that is listed as endangered, vulnerable, near threatened or rare under the Nature Conservation Act 1992 (Qld).
Estuarine	The mouth region of a river that is affected by tides.
Estuary	The wide part of a river where it nears the sea. Influenced by ocean tides, resulting in a mixture of salt water and fresh water
Evaporation	The process that changes a liquid or a solid into a gas. In the tropical hydrological cycle, this involves the conversion to water vapour and the return to the atmosphere of the precipitation (rainfall) that has reached the earth's surface.
Evapotranspiration	The combined effect of evaporation and transpiration.
Exotic species	Introduced species not native or endemic to the area in question.
Failure Impact Assessment (FIA)	An assessment carried out by a registered professional engineer who evaluates the number of people whose safety would be at risk if there was a dam failure. The assessment, if accepted by the chief executive of the Queensland Department of Natural Resources and Water, will result in the dam being given a failure impact rating according to the number of people at risk.
Fauna	The collective animals of a given region (see definition for 'animals').
Feral	An introduced or domestic animal living in the wild.
Fishway flow	Flows that are released through a structure designed to allow fish passage up or down stream where a hydraulic structure such as a dam blocks the natural channel. Specific flows are necessary to attract particular species to use the fishway.
Flood plain	That portion of a river valley that is covered during periods of high flood water.

Flora	The collective plants growing in a geographic area (see definition for ‘plants’).
Flow regime	The variation in flow characteristics, such as volume, for a particular stream over time.
Fragmentation	A process of landscape alteration in which natural areas are subdivided into smaller patches.
Full Supply Level	The maximum normal operating water surface level of a reservoir.
Geomorphology (geomorphological)	The form or shape of the landscape and the processes that modify and change it.
Glide	Area of the water column that does not form distinguishable pools, riffles, or runs.
Groundwater	Water found underground in porous rock or soil strata.
Habitat	The biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms.
Highest Astronomical Tide	The highest tide level which can be predicted to occur under any combination of astronomical conditions.
Historical No Failure Yield	This is the maximum volume of water that can be supplied from the dam for every year of the simulation period.
Intertidal	The area between high and low tide.
Inundation area	The area that will be flooded with water above the existing water level, from raising of the dam.
Left/Right bank	Defined for a water course with the observer facing downstream.
Lentic habitat	Standing or still water habitats such as lakes and ponds.
Listed species	A plant or animal included in a schedule of vulnerable, rare or endangered biota, such as the schedules in the Environment Protection and Biodiversity Conservation Act 1999 (Cth) or the Nature Conservation (Wildlife) Regulation 2004 (Qld).
m AHD	Metres (above the) Australian Height Datum. Refers to the number of metres above Australia's theoretical reference surface, approximately equivalent to the height above sea level.
Macroinvertebrate	Organisms without a backbone which are large enough to be seen with the naked eye.
Macrophyte	Emergent wetland plant.
Matter of National Environmental Significance	The matters of national environmental significance include: • listed threatened species and ecological communities • listed migratory species

	• Ramsar wetlands of international importance • the Commonwealth marine environment • World heritage properties • National heritage places • nuclear actions as defined by the Commonwealth Minister for the Department of Environment, Heritage and the Arts (see 'controlled action').
Mean	The everage value of a group of numbers
Median	The middle value of a group of numbers
Migratory species	A migratory species listed and protected under the provisions of the Environment Protection and Biodiversity Conservation Act 1999 (Cth).
Mitigation	The effort to eliminate or reduce impacts.
National heritage place	Under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), a World Heritage property is either: • an Australian property on the World Heritage List kept under the World Heritage Convention • a property declared to be a World Heritage property by the Commonwealth Environment Minister.
Native species	A species that is indigenous to Australia or an external Territory, or periodically or occasionally visits.
Native wildlife	Any taxon or species of wildlife indigenous to Australia.
Natural environment	The complex of atmospheric, geological, and biological characteristics found in an area in the absence of artefacts or influences of a well-developed technological human culture.
'Not of Concern' regional ecosystem	A regional ecosystem is listed as 'Not of Concern' under the Vegetation Management Act 1999 (Qld) if remnant vegetation is over 30% of its pre-clearing extent across the bioregion, and the remnant area is greater than 10,000 ha.
'Of Concern'	A regional ecosystem is listed as of concern under the *Vegetation Management Act 1999 (Qld)* if remnant vegetation is 10-30% of its pre-clearing extent across the bioregion or more than 30% of its pre clearing extent remains and the remanent extent is less than 10,000 hectares.
Operational EMP	The Environmental Management Plan for the operation phase of the Project required by Schedule C.
Opportunistic	When the conditions are ideal.

Percentile	The value below which a certain percentage of observations fall.
Perennial	A stream that would normally be expected to flow throughout the year.
Permeability	The capacity of a material (rock) to transmit fluids (groundwater)
pH	"power hydrogen". Negative logarithm of hydrogen-ion concentration; a numerical expression of acidity of alkalinity.
plant	A member, alive or dead, of the plant kingdom or of the fungus kingdom, and includes a part of a plant reproductive material.
Population	Occurrence of a species or ecological community in a particular area
Probable Maximum Flood	The flood resulting from the worst flood-producing catchment conditions that can be realistically expected in the prevailing meteorological conditions.
Project	The design, construction and operation of the Wyaralong Dam, as described in the EIS and Supplementary Report to the EIS and described in section 1.2 of this report.
Project Approval	A license, permit, development approval or other instrument in relation to the Project.
Proponent commitments	The Project commitments included within the SREIS, and at Appendix 2 of this Report.
Ramsar wetland	Under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), a Ramsar wetland is either: • an Australian wetland on the List of Wetlands of International Importance kept under the Ramsar Convention; or • a wetland declared to be a Ramsar wetland by the Commonwealth Environment Minister.
Rare	An animal is rare/near threatened if: • the population size or distribution of the wildlife is small and may become smaller • the population size of the wildlife has declined, or is likely to decline, at a rate higher than the usual rate for population changes for the wildlife • the survival of the wildlife in the wild is affected to an extent that the wildlife is in danger of becoming vulnerable.
Recharge	The process involving the infiltration of water from the surface to groundwater.

Reach/es	Definite portion of a stream channel, commonly taken between two gauging stations, but may be taken between any two specified points.
Regional ecosystems	Regional ecosystems were defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
Regrowth	A young, usually even-aged forest stand that has regenerated after disturbance.
Rehabilitation	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat.
Remnant vegetation	Small remaining areas of naturally occurring vegetation in a landscape that has been altered by human activity such as agriculture. These remnants were once part of a continuously vegetated landscape.
Riparian	Pertaining to, or situated on the bank of, a body of water, especially a watercourse such as a river.
Riparian Zone	Located alongside a watercourse
Riverine	Pertaining to rivers.
Roller Compacted Concrete	A zero slump concrete requiring no steel reinforcement and is compacted by vibratory rollers. In RCC dams, progressive layers of a relatively dry mix of concrete are laid, each being compacted down in turn by rollers, allowing dams to be built much faster and significantly cheaper than by traditional methods of construction.
Runoff	The amount of rainfall which actually ends up as strem flow, also known as rainfall excess.
Sandstone	Sedimentary rock composed mainly of feldspar and quartz. Varies in colour (similar to sand) through grey, yellow, red and white.
Sediment	Any usually finely divided organic and/or mineral matter deposited by air or water in non-turbulent areas.
Soil profile	The physical and chemical features of the soil imagined or seen in vertical section from the surface to the point at which the characteristics of the parent rock are not modified by surface weathering or soil processes.
Spatial	Relating to space as distinguished from time.
Species richness	A botanical term indicating a measure of the number of species of plants or animals occurring in a given area.
Spillway	The channel or passageway around or over aq dam through which excess water is diverted.

Spotter/catcher	An ecologist who is accredited by the Queensland Parks and Wildlife Service (QPWS) to capture and relocate fauna (mainly mammals) from trees prior to vegetation clearance.
Taxa	Taxonomic group of any rank (for example as species, genus, family, class, order).
Terrestrial	Pertaining to land, the continents, and/or dry ground. Contrasts to aquatic.
Tertiary	The period of geological time extending from about 65 to 2 million years ago.
Thermocline	The zone of rapid vertical temperature change in a thermally-stratified body of water.
Threatened species and ecological communities	Threatened species or ecological communities listed and protected under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.
Tributary	A stream or river that does not reach the sea but joins another major river, parent river, swelling its discharge. Sometimes described in terms of "left bank" or "right bank", referring to the bank of the parent river that the tributary connects to.
Topography	Description or representation of natural or artificial features of the landscape; the description of any surface, but usually the earth's.
Translocation	The transfer of plants and animals from one part of their range to another.
Turbidity	Degree of cloudiness in water caused by suspended solids.
Upstream	In the opposite direction of the flow of the stream or river, i.e.towards the source.
Vulnerable	A species is vulnerable if: • its population is decreasing because of threatening processes • its population has been seriously depleted and its protection is not secured • its population, while abundant, is at risk because of threatening processes • its population is low or localised or depends on limited habitat that is at risk because of threatening processes.
Weathering	Changes in the coherence, texture and composition of rocks and minerals by either physical (mechanical) or chemical processes as a result of exposure at the Earth's surface.
Weed	A plant that is considered undesirable because it threatens the persistence of native plants.

Weir	A small overflow type dam in a stream or river, generally used to raise the water level or divert its flow.
Wetlands	Low-lying areas regularly inundated or permanently covered by shallow water. Usually important areas for birds and other wildlife.
Wildlife corridor	A strip of habitat that facilitates fauna movement between otherwise isolated patches of habitat.