



Dam the Mary River? Save the Mary River!

Save the Mary River Coordinating Group

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Dear Sir

**RE: EPBC act referral. Reference Number 2006/3150, 15 November 2006
Queensland Water Infrastructure Pty Ltd (QWIPL)/Water Management and Use/Mary
River/Queensland Traveston Crossing Dam**

Please consider our submission relating to the above referral.

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1. Introduction

We refer to Queensland Water Infrastructure Pty Ltd (QWIPL)'s referral to the Minister under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* for approval to construction and operation of Traveston Crossing Dam on the Mary River in South-East Queensland (SEQ), and the construction or relocation of associated infrastructure.

Public comment on the QWIPL referral submission was not invited. Nonetheless we feel strongly enough about this issue that we wanted to make sure you were aware of our opinions, shared we believe by many others in South East Queensland. Indeed, the opposition to the proposed Traveston Crossing Dam has very strong support from individuals, scientists and environmentalists across the country and around the globe. An indication of the support is the petitions to the Queensland Govt which had over 20,000 signatures. The plight of the vulnerable *Neoceratodus fosteri* (Australian Lungfish) – just one of the several species and ecosystems threatened with extinction / destruction by this dam – is particularly sensitive worldwide. These and other likely significant impacts of the proposed dam are set out in this submission.

We submit that this action should be declared to be a controlled action for the purposes of the EPBC Act and that six controlling provisions for this action should be declared (See also Figure 1 Location Map, Wide Bay Burnett Dams & Ramsar Wetland).

- Ramsar wetlands of international importance;
- World Heritage Areas
- Commonwealth Heritage Areas – Wide Bay Military Reserve
- Commonwealth Marine Areas
- Migratory Species protected under international agreements and
- Nationally threatened species

on the grounds the action is likely to have a significant impact on the following matters of national environmental significance (but not be limited to):

1. Nationally threatened species

- Elusor macrurus* (Mary River Tortoise) - Endangered
- Maccullochella peelii mariensis* (Mary River Cod) Endangered
- Neoceratodus fosteri* (Australian Lungfish; Queensland Lungfish)) -Vulnerable
- Mixophyes ieratus* (Giant Barred Frog) -Endangered
- Dasyurus maculatus* (Spotted-tail Quoll (southern subspecies)) - Endangered
- Pteropus poliocephalus* (Grey headed flying fox) - Vulnerable
- Floydia praealta* – (Ball Nut or Possum Nut) - Vulnerable
- Macadamia ternifolia* – (Macadamia Nut) -Vulnerable
- Xanthostemon oppositifolius* – (Southern Panda) -Vulnerable
- Caretta caretta* (Loggerhead Turtle) – Endangered
- Chelona mydas* (Green Turtle) – Vulnerable
- Derochelys coriacea* (Leatherback Turtle) – Vulnerable
- Natator depressus* (Flatback Turtle) – Vulnerable
- Eretmochelys imbricata* (Hawksbill Turtle) - Vulnerable

2. Migratory species protected under international agreements

Terrestrial

- Monarcha trivirgatus* (Spectacled Monarch)
- Monarcha melanopsis* (Black faced Monarch)
- Rhipidura rufifrons* (Rufous Fantail)
- Myagra cyanoleuca* (Satin Flycatcher)

Marine

- Megaptera novaeangliae* (Humpback whales)
- Balaenoptera acutorostrata* (Dwarf minke)
- Eubalaena australis* (Southern Right Whale)
- Dugong dugong* (Dugongs)
- Caretta caretta* (Loggerhead Turtle)
- Chelonia mydas* (Green Turtle)
- Dermochelys coriacea* (Leatherback Turtle)
- Lepidochelys olivacea* (Olive Ridley)
- Natator depressus* (Flatback Turtle)
- Tursis truncatus* (Indo Pacific Bottlenose)
- Eretmochelys imbricata* (Hawksbill Turtle)

3. Ramsar wetlands of international importance

-Great Sandy Straits

2. Summary

The proposed action should be declared to be a controlled action because of the likely impacts of the proposed action on the following relevant matters protected under the EPBC Act.

The Mary River catchment has significant ecological conservation values. It is situated in a biogeographical transition zone between tropical and temperate environments, and supports a large number of plant and animal species of high conservation significance. This including species that are endemic¹ to the catchment (Mary River Cod, Mary River Tortoise – both listed as endangered under EPBC) and have restricted geographical ranges, the Australian Lungfish, Grey headed Flying Fox, (listed as vulnerable under EPBC), Giant Barred frog and the spotted-tail Quoll (both listed as endangered under EPBC). The Mary River is the best remaining option for restoration and protection of the wild populations of Australian Lungfish, Mary River Tortoise and Mary River Cod. It is also the only large river in South-East Queensland without a major mainstream dam.

Impacts on Matters of National Environmental Significance are summarized under following five headings:

1. The impacts of altered downstream flows on aquatic ecosystems and biodiversity

Efforts to minimise the impacts of changes in flow regime in this proposed action have relied on measures to restore the streamflow regime through the setting of environmental flow releases. The current Mary Basin Water Resource Plan does not adequately protect the river health and is not endorsed by the Community Reference Panel. It also does not account for linkages between runoff, river water and ground water. Choosing 85% of average annual flow at the mouth of a river as an adequate figure to maintain health of a river is flawed. (Burgess and Edwards 2006). The statistic used should be the median annual flow and the scientific basis of the number 85% has no documented empirical basis (Arthington et al 2006.).

References to the maintenance of 85% of mean annual flows at the river mouth are deliberately misleading as the Mary River is characterized by extreme flood events and significant periods of relatively low flow. As an example, the Mary Basin Water Resource Plan allows less than 1 megalitre of flow per day at Gympie for 20 years out of the next 110 years. Currently, in the driest month of the year, the average flow at Gympie is 171 megalitres per day, whereas the WRP, as legislated, will permit the operator to reduce this to just 1 megalitre per day if the need arises.

Even if 85% of pre-development mean annual flow volume is maintained at the river mouth, the likely environmental impacts of a markedly altered cease-to-flow regimes in the estuary, and severe changes to the flow regimes in the middle reaches of the river in highly likely to have significant impacts on critical habitats for the Australian Lungfish, Mary River Tortoise and Mary River Cod. Because of the incredibly variable nature of flows in the Mary River, the ability to maintain 85% Mean Annual Flow (MAF) at the river mouth is simply a consequence of the fact that the dam will have a negligible effect on mitigating the large flood events in the Mary River. (Brizga *et al*, 2005)

In addition to likely flow and salinity impacts, the consequence of reduced sediment also extends to long stretches of coastline where the erosive effect of waves is no longer sustained by sediment inputs from rivers and hence is likely to have impact on the Great Sandy Straits and Fraser Island.

2. The impacts on terrestrial ecosystems and biodiversity

The majority of known populations of endangered *Mixophyes iteratus* (Giant-Barred Frog) in the Mary River catchment are known from lowland tributaries of the Mary River within the proposed dam footprint comprising the lower altitudinal limit of their range – the dam proposal will destroy this strong-hold. This strong-hold is also the northern limit of the core Giant-barred Frog population in Australia. Here they inhabit stretches of creek that are characterised by slow pools and stable creek banks with under-cuts for egg laying. Healthy riparian vegetation is essential for providing leaf litter, bank stability and detritus for tadpoles. Canopy closure is normally a feature of this frog's habitat as it provides cool temperatures, cover and abundant leaf-litter

Several maternal colonies of *Pteropus poliocephalus* (Grey Headed Flying Fox) occur in the vicinity of the proposed dam and feed within a 50km radius which includes the proposed inundation area of the dam. High protein food (36-48%) is critical for feeding young during the Oct-Dec period and is found within the gallery rainforest along the lowland tributaries of the Mary River (per comment Dr Les Hall 2006). About 20% of the remaining gallery rainforest in the region is within the proposed footprint of the dam and is listed by the State as Endangered Regional Ecosystem.

Inundation of riparian corridors is likely to have significant impact on migratory species which rely on forest vegetation to provide protection and food along their migratory path. . Land clearing is a listed threatening process.

3. The impacts of altering the groundwater and natural flood cycle on downstream floodplains

This proposed action will interrupt the groundwater flow in the middle of the Mary River catchment. This will likely have significant impacts on groundwater quality particularly salinity. This combined with the reduction in downstream annual flooding is likely to affect the natural productivity of riparian areas, floodplains and deltas of the Great Sandy Strait Ramsar Wetland.

This lack of groundwater will impact on the EPBC listed threatened species by loss of the trees along the banks of the river and floodplain, the source of large woody debris that is important for providing snag habitat for the *Maccullochella peelii mariensis* (Mary River Cod) and basking logs for the *Elusor macrurus* (Mary River Tortoise).

In summary, the proposed change in hydrological regime of the Mary River is likely to have adverse impacts on floodplains, agriculture, fisheries, pasture and woodlands. This constitutes the organising element of the community livelihood and culture that is typical of the Mary River catchment.

4. The impacts on fisheries in the upstream, reservoir and downstream areas

This proposal is for a very shallow impoundment, prone to extraordinarily high seepage (0.3meter to 3meters) and evaporation losses (> 1meter) and subject to serious water quality problems of high nutrient loads, low oxygen, toxic metal contamination, algae and subsequent weed infestation, greenhouse gas production and sedimentation. If constructed, at stage one it will have an average depth of only approximately **5 meters**, and at stage two an average depth of about **8 meters**. Much of the dam would be less than 2 meters deep.

***Neoceratodus fosteri* (Australian lungfish)**

Neoceratodus fosteri (Australian lungfish) is a much older species than any of the other living lobe-finned fish. It was alive as it is today during the Cretaceous, along with the now extinct dinosaurs

If this proposed action goes ahead, it combined with recent spawning habitat losses on the Burnett River will completely extinguish >80% of the lung fish's natural spawning and nursery sites following a lineage of 400 million years. There is no other lungfish living in the world today that can replace the Queensland lungfish in scientific significance. There is to date no scientifically researched data forthcoming from the State Government which can substantiate the effective application of the Paradise Dam Fishway, in mitigating lungfish passage

- *In addition the Australian lungfish is “ a sacred (totemic) fish of the Gubbi Gubbi people. They never killed or ate the fish, and saw it as important to protect.”*

***Maccullochella peelii mariensis* (Mary River cod)**

The proposed dam wall could severe impact on the seasonal movements and breeding requirements of *Maccullochella peelii mariensis* (Mary River cod). Radio tracking studies (Simpson, 1994) have shown that the Mary River cod migrate long distances along waterways, especially during spawning times. There is no evidence of the Mary River cod utilising a fish-way in its natural habitat.

Although the Mary River Cod can survive in dams there is no research evidence showing that they are capable of breeding within dams (hatchery ponds can not be considered as dams due to their artificially controlled food supply). The Mary River Cod relies on deep, cool, shaded pools containing large woody debris (snags) for it to successfully breed (Simpson, 1998).

***Elusor macrurus* (Mary River Tortoise)**

If this proposed action were to go ahead it will completely inundate about 80% of the Mary River tortoise nesting banks upstream of Traveston crossing bridge and it's associated riffle/pool habitat (Per comment Craig Latta 2006). Downstream there will likely be significant impacts on all the Mary River Tortoise nesting sites. There is no evidence of the Mary River Tortoise utilising a fish-way in its natural habitat and deaths of turtles have been reported when trying to go over dam walls.

5. The cumulative impacts of a series of barrages/weirs/dams

The Mary River estuary and Great Sandy Strait is a Ramsar listed wetland of international significance. Reductions in low and medium flow events will increase salinity levels within the estuarine reach and reduce the quantity of ponded water behind the Mary River Tidal Barrage and consequently the number of occasions which it overflows. The natural flushing of the river and mixing of freshwater with the sea water that creates brackish conditions will be reduced. Freshwater flows also help support marine fish production as many marine fish spawn in estuaries. This Traveston Crossing Dam proposal is likely to have significant impacts on Matters of National Environmental Significance all the way to the Great Sandy Strait Ramsar Wetlands and beyond. A decrease in freshwater flow and in nutrients due to dam construction affects the nursery areas in a number of ways, including increasing salinity, allowing predatory marine fish to invade, and reducing the available food supply.

Both the Burnett and the Mary Rivers flow out to the Great Sandy Strait, which is one of the five internationally recognised RAMSAR sites within Queensland. Studies since 1980 show that runoff from these catchments has declined and is only greater than the minimum evaporation rate for the region, in less than 10% of all instances. This period corresponds to an increase in tidal barrage and dam infrastructure, within both the Burnett & Mary Rivers. This preliminary research may be revealing the first impacts on estuarine ecosystems (Ramsar wetlands) from infrastructure related flow reductions to the Great Sandy Straits Ramsar wetland. These findings also raise serious questions as to what effect further reductions in freshwater flows will have under the Mary Water Resources Plan. All these impacts will affect Ramsar wetland species including migratory birds and have flow on impacts to endangered species beyond the 3 mile nautical limit of the *Commonwealth Marine environment*.

6. The emission of greenhouse gases associated with large dam projects

The emission of greenhouse gases (GHG) from reservoirs due to rotting vegetation and carbon inflows from the catchment is a recently identified ecosystem impact (on climate) of storage dams. Estimates suggest that the gross emissions from reservoirs may account for between 1% and 28% of the global warming potential of GHG emissions. (World Commission on Dams 2000). This is likely to have a significant adverse impact on matters of national environmental significance such as the migratory whales and turtles and these Matters of National Significance are not included in the proponent's referral.

We submit that the action be assessed by inquiry (Section 87(1)(e) of the EPBC Act 1999).

Assessment by inquiry: This will enable the Minister for Environment and Heritage to appoint a Commission to carry out inquiries, call witnesses, obtain documents and inspect places. The proponent has suggested that the statutory impact assessment process be under Queensland's State Development and Public Works Organisation Act (SDPWOA) pursuant to the bilateral agreement between the Queensland and the Commonwealth Governments in relation to environmental assessment under Section 45 of the EPBC Act signed on 13 August 2004.

Clause 9.1 of the bilateral agreement declares that an action listed in Schedule 1 (as the SDPWOA EIS process is) "does not require assessment under Part 8" of the EPBC Act. However, we have received legal advice by an EPBC Act expert that the statement "does not require" does not mean "cannot require" and therefore that the Minister still has the power to require assessment under Part 8. We request that he do that, and impose an inquiry as the level of assessment

We have no confidence in the SDPWOA process because when it was used for the approval of Paradise Dam on the Burnett River under similar rushed circumstances in 2002, it had serious shortcomings in the scientific standard and process of the environmental impact studies undertaken. It is an inappropriate process because there is a perception of bias when the proponent is a public company set up by the Queensland government that will undertake an assessment process that is run by the Queensland government

3. Description of proposed action

3.1 Action proposed by QWIPL

The referral by Queensland Water Infrastructure Pty Ltd describes the proposed action in the following terms.

- The proposed action is the construction and operation of Traveston Crossing Dam on the Mary River in South-East Queensland (SEQ), and the construction or relocation of associated infrastructure. It is proposed to construct the dam in two stages but to seek full approval for Stage 1 only at present. QWIPL acknowledges that a separate referral would be required for Stage 2 should it proceed. It is envisaged that Stage 1 of Traveston Crossing Dam will be capable of supplying at least 70,000 ML/annum of water to mainly urban and industrial users within the SEQ region. 150,000 ML/annum would likely be available at Stage 2.
- The proposed action is for the construction and operation of Stage 1 of Traveston Crossing Dam on the Mary River in SEQ and the relocation or construction of infrastructure required as a result of this action. The dam has a proposed full supply level (FSL) of EL 71.0m Australian Height Datum (AHD) for Stage 1 and EL 79.5m AHD for Stage 2. At these FSL's, the dam will provide storage capacities of approximately 153,700 megalitres (ML) and 570,000 ML respectively. At FSL the inundation area will cover approximately 3,159 hectares (ha) in Stage 1 and increase to approximately 7,302ha in Stage 2. The main channel of the Mary River will be inundated for a length of approximately 36.5 km at Stage 1 and 50.7 km at Stage 2. The Traveston Crossing Dam is considered suitable for a Roller Compacted Concrete (RCC) Dam with a wall height of approximately 59m. A fishway structure will be incorporated into the dam design.
- Construction activities are detailed in Appendix D
- Operational activities will include periodic maintenance of the dam structure, associated infrastructure and ongoing monitoring. The dam will be operated as a water storage and supply structure. The outlet works and gates will be designed to achieve conformance with the Mary River Water Resource Plan, including achievement of designated ecological outcomes and environmental flow objectives.
- The former includes items such as “to minimise changes to the hydraulic habitat requirements of species such as the Mary River Cod, Mary River Tortoise and lungfish” while the latter include low flows, medium to high flows and seasonal flow objectives. Gate operation will allow some level of flood mitigation for areas downstream, including the town of Gympie.

3.2 The inadequacies in the referral form:

3.2.1 Stage 1 referred only.

Queensland Water Infrastructure Pty Ltd has only referred Stage 1 of the proposed dam under the EPBC Act (Sections 2.1 and 2.6 of the referral):

“It is proposed to construct the dam in two stages but to seek full approval for Stage 1 only at present. QWI acknowledges that a separate referral would be required for Stage 2 should it proceed.”

“It is proposed to seek full approval for Stage 1 of the Traveston Crossing Dam and to notify the long term intention to develop Stage 2. At this stage it is not considered prudent to seek full approval for Stage 2 as the current planning horizon does not envisage construction for another 28 years.”

However QWIPL is proposing to build the dam to full height as part of Stage 1 and is now acquiring all the land for both Stages 1 and 2. This fact has been confirmed by QWIPL and Queensland Government ministers several times in the past five months. It was first admitted by the Premier Peter Beattie in a letter to landholders in July 2006:

“While the Traveston Dam wall will be constructed to its maximum height, in the first stage the water levels will be limited to an elevation of no more than 71 metres, plus a buffer that includes provision for flood inundation.”

The “staging” of the project is thus purely an exercise in semantics. The dam wall is being built to its full final height in Stage 1, and all land is being acquired. The so-called “construction” of Stage 2 simply involves the push of a button to raise the height of the flood gates. Even if one takes the view that “construction” of Stage 2 is defined by the raising of the water level from 71m RL to 79.5m RL, Mr Graeme Newton (QWIPL) and Ms Anna Bligh (Deputy Premier and Minister for Infrastructure) made it quite clear at a public meeting in Gympie on 3rd November 2006 that such water levels and greater will occur during periods of high flow and flooding. Whole communities of Federal, Imbil, Belli, Carter’s Ridge and Kandanga are being affected and land is being bought up by QWIPL for Stage 2, therefore full approval should be required for Stage 1 and Stage 2.

The referral is fundamentally flawed in that the Queensland Government has only referred Stage 1 of the proposed dam for assessment, when it is clear that the proposal must be assessed in terms of its total and ultimate impact. We request that the Environment Minister apply his authority under Section 74A of the EPBC Act to reject the referral of Stage 1 and only accept any subsequent referral which relates to the entire dam proposal (Stage 1, Stage 2, clearing for quarries and piping water out of the catchment). This full proposal is likely to have a significant impact on Matters of National Environment significance such as the Mary River Tortoise, Mary River Cod, the Australian Lungfish, Giant Barred Frog and the Grey Headed Flying Fox because all these parts of the action involve clearing through inundation and infrastructure relocation.

3.2.2 Ground water extraction and salinity implications not considered in Mary Basin WRP

“The Traveston Crossing Dam is considered suitable for a Roller Compacted Concrete (RCC) Dam with a wall height of approximately 59m” (Proponents Referral Document). The approximate stream EL is 52-55m AHD and if final wall height is EL 94m AHD, thus the above ground wall height is approximately 40m with plans to build 20m below ground level. This would mean substantial interference with ground water that the Mary Basin WRP has not accounted for and likely to have significant salinity impacts on the downstream floodplains and aquifers. This is likely to have a significant impact on Matters of National Environment significance such as the Mary River Tortoise, Mary River Cod and the Australian Lungfish by over allocating water that isn’t available and putting the catchment at risk to salinity problems. There will not be enough for adequate environmental flows. There may also be an impact on water quality from rising salinity within the dam and downstream to as far as the Great Sandy Strait Ramsar wetland.

3.2.3 Proposed Action has Over allocated the Water Resource

“150,000 ML/annum would likely be available at Stage 2”. Using the median flow statistic (the more appropriate statistic to be using, than the mean based on the type of flow distribution because most water flows during short duration events) and actual historical flow data from Dagon Pocket, the yield from this catchment is only 103,000 ML/year. The proposed action is likely to have a significant impact on Matters of National Environment significance such as the Mary River Tortoise, Mary River Cod and the Australian Lungfish by allocating water that isn’t available and not making provision for adequate environmental flows.

3.2.4 Proposed Action does not include Quarries

Details regarding the location and size of the quarry required to construct the wall and infrastructure have not been provided. The Meadvale Quarry being developed north of Traveston (within 10 km of the wall) has recently been extensively drilled and local landholders are concerned about the confirmed acid rock drainage and arsenic problems.

The proposed Quarry sits on top of fractured rock and drains into Six Mile Creek which is key habitat for the endangered *Maccullochella peelii mariensis* (Mary River Cod) and residents have concerns about expansions of this site. The quarry and associated super dump for construction and demolition waste have already undergone court action (Traveston Residents Association vs Queensland Rail). Should this quarry or another with similar acid rock drainage be used for building the dam wall, then it is likely to have a significant adverse impact on Matters of National Environmental Significance such as the *Maccullochella peelii mariensis* (Mary River Cod).

3.2.5 Green house gas emissions

The emission of greenhouse gases (GHG) from reservoirs due to rotting vegetation and carbon inflows from the catchment is a recently identified ecosystem impact (on climate) of storage dams. Estimates suggest that the gross emissions from reservoirs may account for between 1% and 28% of the global warming potential of GHG emissions. (World Commission on Dams 2000). This is likely to have a significant adverse impact on migratory whales and turtles, and these Matters of National Significance are not included in the referral.

3.2.6 Inter-basin water transfer

The cumulative impacts of inter-basin water transfers can be of special concern, as this often involves the transfer of species into new watersheds and impacts on EPBC Act listed species in other catchments. When waters of one basin are diverted into another one, changes in volume and seasonality of flow result. This referral needs to include in the action transferring water out of the catchment (land clearing for pipes/GHG's and energy used in pumping.) This is likely to have a significant adverse impact on Matters of National Environmental Significance such as the migratory whales and turtles through global warming. In addition it is likely that organisms may be introduced and significantly impact on Matters of National Significance in the receiving area.

3.2.7 Decision making process

No documentation about decision making or least cost planning studies comparing other alternatives to building this dam have been provided. Given the number of Matters of National Environmental Significance and considering the precautionary principle, there are other alternative sources of potable water such as recycled water, desalination and localized harvesting through rainwater tanks and stormwater basins.

4. EPBC Act requirements - Call for a Commission of Inquiry to be required

It is evident that the proposed action will have and a significant impact on Matters of National Environmental Significance. The EPBC Act requires that approval be obtained for any such action. In this instance there are:

- Matters of National Environmental Significance located in the area, adjacent to and downstream of the proposed action
- At all stages of the proposed action there is potential for impact on matters of national significance
- The proposed methods of reducing the impact of the proposed action are unlikely to significantly reduce the impacts
- Considering the context and intensity of the proposed action, it is likely to have significant impacts on matters of national significance

The Proponent states how the actions are to be assessed *“The project was declared to be a “significant project” under the Queensland SDPWOA by the Coordinator-General on 3 November 2006, following consideration of an Initial Advice Statement (IAS) prepared by QWI. The declaration initiates the statutory impact assessment procedure of Part 4 of this Act, which is administered by the Department of Infrastructure on behalf of the Coordinator-General.*

Under this procedure, QWI is required to prepare an Environmental Impact Statement (EIS) to address Terms of Reference (ToR) prepared by the Coordinator-General. The impact assessment process concludes when the Coordinator-General evaluates the EIS, public submissions and other relevant material and prepares a report on his findings. The Coordinator-General provides the report to the proponent, relevant government agencies and local authorities and makes the report available to the public. The statutory impact assessment process under the SDPWOA is the subject of a bilateral agreement between the Queensland and the Commonwealth Governments in relation to environmental assessment under Section 45 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) signed on 13 August 2004.”

However, we submit that the proposed action should instead be assessed by an inquiry (Section 87(1)(e) of the EPBC Act 1999):

This will enable the Minister for Environment to appoint a Commission to carry out inquiries, call witnesses, obtain documents and inspect places. The reasons for this are given as follows:

4.1 Previous failure of SDPWOA EIS process to assess impacts on Matters of National Environmental Significance

The above process suggested by the Proponent was followed for the approval of Paradise Dam on the Burnett River. There were serious shortcomings in the scientific standard and process of the environmental impact studies (EIS) that were undertaken for the Paradise Dam, developed under similar rushed circumstances in 2002 (Appendix B). Since this dam was announced by the Queensland Government, that there have been many examples of conflicting and changing information and in combined with the inadequacies of the Burnett River process, we consider that the current process will not properly assess impacts of matters of national environmental significance (Appendix C).

4.2 Statements by Queensland Government which indicate forgone conclusion

Public statements issued by the Queensland government indicate a determination to build this dam under any circumstances, based on an incorrect assessment that there are no alternatives that will guarantee an adequate water supply for South East Queensland. This does not follow the principles of ecologically sustainable development, which are defined by the Act that “decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations”. Similarly, the conservation of biological diversity and ecological integrity should be fundamental considerations in decision-making. In fact, environmental baseline studies have not been carried out and Terms of Reference for the EIS have not been released to the public before this referral. This is a clear indication that these principles are not being followed.

4.3 Lack of Community Consultation

The SDPWOA process requires public comment on the EIS terms of reference and the EIS itself, however, we are concerned that appropriate levels of information to enable informed submissions will not be provided. To date, there is local community outrage at the lack of public consultation regarding this project. QWIPL and the State Government have made a mockery of the concept of “transparent process” and the Freedom of Information laws, denying public access to a wide range of relevant information, especially regarding river hydrology and environmental impacts (Appendix C). This is despite their obligations under the Intergovernmental Agreement on a National Water Initiative that was signed by the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory on 25 June 2004. Section 93 of this agreement (Community Partnerships and Adjustment) states:

“Parties agree that the outcome is to engage water users and other stakeholders in achieving the objectives of this Agreement by:

- i) improving certainty and building confidence in reform processes;*
- ii) transparency in decision making; and*
- iii) ensuring sound information is available to all sectors at key decision points.”*

The formally appointed Community Reference Panel associated with the development of the Mary Basin Water Resource Plan has advised that they were “profoundly deceived” by the State Government during the formulation of the plan and have publicly withdrawn their support for the process. Subsequent to the Community Reference Panel’s involvement, the Queensland Government made substantial changes between the draft and final Water Resource Plan to accommodate the proposed Traveston Dam without any further consultation. There is a requirement of the WRP process that within 30 days, the Community Reference Panel should have received a final assessment report and it is now over four months overdue.

The Queensland State Government has a bilateral agreement with the Federal Government under the National Action Plan for Salinity and Water Quality. The Mary River Basin is specifically identified as a priority under this agreement. The action of the Queensland Government thus far is in direct conflict with the “Statement of Intent in Signing” the National Action Plan.

*“The active involvement and participation of rural and regional communities is the cornerstone of this Plan. Through this Agreement we seek to enable communities to **take responsibility** for planning and implementing natural resource management strategies, in partnership with all levels of government, that meet their priorities for sustainable development and ongoing viability.”*

Although extensive public consultation meetings have helped in relation to the Traveston Dam proposal, very little specific technical information concerning environmental impacts have been made available,

and no specific written feedback as to the concerns raised by the public during this process has been publicly documented. This mirrors the case of the Water Resource Planning Process.

4.4 Lack of independent Environmental Assessment:

The proponent, QWIPL, and the Queensland State Government are effectively one and the same. We have been advised by QWIPL that “Queensland Water Infrastructure Pty Ltd is a Corporations Law entity wholly owned by the Government, with a single share held in trust by the Premier of Queensland”, and that five of the six Directors are Queensland Government employees.

Further, QWIPL has been granted State Government powers to progress the proposal and is therefore not an independent company. The Queensland Government must not be allowed to assess the impact of a proposal put forward by QWIPL. In effect, this would be the State Government referring its own proposal to itself for assessment, akin to allowing a person charged with a serious crime to be a juror at their own trial.

Due to the way the Queensland Government has approached all aspects of the dam proposal, the communities represented by the Mary River Council of Mayors (500,000 people from Maroochydore to Hervey Bay) have no confidence in the honesty, integrity and transparency of Queensland Government processes. An independent least cost planning study to evaluate all alternatives to building the dam is currently being sponsored by the Mary River Council of Mayors. Therefore we request that the action be assessed by an enquiry as set out in Part 8 Division 7 of the EPBC Act. If necessary, the Environment Minister has the power to suspend the bilateral agreement with the Queensland Government for this purpose.

4.5 Investigation of False and Misleading Statements

As discussed in section 3.2.1 above, we believe the statements in the QWIPL referral submission regarding staged construction to be false, or at the very least deliberately misleading. This is not a minor or trivial error – it underpins the entire basis for the referral.

However, Section 7.1 of the QWIPL referral submission contains the following signed statement:

“I, Graeme W Newton, declare that the information contained in this form is, to my knowledge, true and not misleading”.

The residents of the Mary Valley have become quite accustomed to receiving what appears to be false and misleading information from QWIPL. However we believe it is another thing altogether to do so in a Statutory Declaration to the Federal Government. We therefore request that this matter be investigated under Sections 489 (Providing false or misleading information to obtain approval or permit) and 491 (Providing false or misleading information to authorised officer etc.) of the EPBC Act.

4.6 Bilateral agreement is not legally binding:

Clause 9.1 of the bilateral agreement declares that an action listed in Schedule 1 (as is the SDPWOA EIS process) “does not require assessment under Part 8” of the EPBC Act. However, we have received legal advice from an EPBC Act expert that the statement “does not require” does not mean “cannot require” and therefore that the Minister still has the power to require assessment under Part 8. We request that he do that, and impose an inquiry as the level of assessment.

Moreover, the bilateral agreement itself is not meant to be legally binding on the parties (see section 8), and note section 20.1 which states that “under sections 57 - 64 of the Environment Protection and Biodiversity Conservation Act 1999 the Federal Environment Minister may cancel or suspend all or part of this agreement (either generally or in relation to actions in a specified class) under certain circumstances.”

4.7 Breach of bilateral agreement

Referring just Stage 1 of the dam is in breach of 2 sections of the bilateral agreement:

1) Section 10.3 states “The State of Queensland undertakes to ensure that the environmental impacts that the action has, will have, or is likely to have (other than the relevant impacts) are assessed to the greatest extent practicable” and

2) Schedule 1, Class 2 of the agreement (Assessment under Part 4 of the Queensland State Development and Public Works Organisation Act 1971 and the State Development and Public Works Organisation Regulation 1999) clause 3.1, 3.1a) "In preparing the terms of reference, the Coordinator-General must ensure that the EIS will meet the

requirement of sub-section 16(1) of the State Development Bilateral Agreement between the Australian Government and Queensland and Public Works Organisation Regulation 1999 and are designed to ensure that the EIS:(a) assesses all relevant impacts that the action has, will have or is likely to have"

Given how important this issue is, and the enormous environmental and social consequences at stake, we believe it is essential that the assessment process be open and allow for full expert and public participation.

5. Likely significant impacts on Matters of National Environmental Significance

The following are impacts of the action on the relevant matter protected under Part 3.

Likely significant impacts of the proposed action on relevant matters protected under the EPBC Act are summarized under the following five headings:

1. The impacts of altered downstream flows on aquatic ecosystems and biodiversity
2. The impacts on terrestrial ecosystems and biodiversity
3. The impacts of altering the natural flood cycle on downstream floodplains
4. The impacts on fisheries in the upstream, reservoir and downstream areas.
5. The cumulative impacts of a series of barrages/weirs/dams on the Mary river system
6. The emission of greenhouse gases associated with large dam projects.

5.1 Impacts of changes in downstream flow regimes on aquatic ecosystems and biodiversity

Flow regimes are the key driving variable for downstream aquatic ecosystems. Flood timing, duration and frequency are all critical for the survival of communities of plants and animals living downstream. Small flood events may act as biological triggers for fish and invertebrate migration: major events create and maintain habitats by scouring or transporting sediments. The natural variability of most river systems sustains complex biological communities that may be very different from those adapted to the stable flows and conditions of a regulated river. Finally, water temperature and chemistry are altered as a consequence of water storage and the altered timing of downstream flows. Algal growth may occur in the reservoir and in the channel immediately downstream from dams because of the nutrient loading of the reservoir releases.

5.1.1 Inadequate downstream environmental flows

Efforts to minimise the impacts of changes in flow regime in this proposed action have relied on measures to restore the streamflow regime through the setting of environmental flow releases. The current Mary Basin Water Resource Plan does not adequately protect the river health and is not endorsed by the Community Reference Panel. It also does not account for linkages between runoff, river water and ground water. Choosing 85% of average annual flow at the mouth of a river as an adequate figure to maintain health of a river is flawed. (Burgess and Edwards. 2006). The statistic used should be the median annual flow and the scientific basis of the number 85% has no documented empirical basis (Arthington et al 2006.).

Detailed analysis of the hydrological modelling used in the formulation of the Mary Basin Water Resource Plan shows that the critical points in the river seem to be in the reach just downstream of the dam at Dagon Pocket (an important breeding ground for the Australian Lungfish and Mary River Tortoise), where the statistics indicate that the flow regime will be severely disturbed, and the river mouth, where the no-flow regime will be significantly altered from the natural state (Appendix A).

At Dagon Pocket, the impact is a reduction of median flows to 31.5% of the pre-development state, virtual no flows for more than 10% of the time, with periods of no flows for more than 6 months continuously. This corresponds with an APFD statistic (a measure of disturbance in river flow patterns) of 2.39, which is regarded as severely disturbed. The 1.5 year ARI daily flow volumes (indicative of minor flushing flood flows) are reduced to 57% of the pre-development state. It is interesting to note that major flood flow events (20 year ARI) are only reduced by 4%.

At the river mouth, the modelling suggests that the river will cease to flow to the sea for 9% of the total time under the single large dam scenario. The APFD statistic for the river mouth is predicted to rise from 0.57 under current conditions to 0.95. Ecological processes at the river mouth are already heavily impacted on by the operation of the Mary River Barrage, and this further disruption in freshwater flow patterns could have a severe cumulative effect on estuarine processes related to water quality and limited operation of fishways.

A summary of the full analyses of likely flow impacts is included as **Appendix A** of this report.

In addition, the modelling does not try to take into account climatic change. The hydrological data used for modelling the 'simulation period' came from 1893 (apparent largest flood in history) to 1999 (largest flood in 100 years); and does not include the last 7 drought years to 2006.

Therefore the proposal for **85% MAF at the river mouth** is likely to have a significant impact on the estuary and the Ramsar listed Great Sandy Strait, World Heritage listed Fraser Island and the National Heritage Area listed Wide Bay Military Area.

5.1.2 Impacts on water quality

Analysis of water quality data collected within the dam footprint by State and Local Government and members of the community over the past 10 years shows a consistent level of non-compliance for dissolved oxygen according to the Queensland Water Quality (QWQ) Guidelines for the Mary Basin (MRCCC Water Watch 2006). Nutrient levels such as total phosphorus, chlorophyll A, oxidized nitrogen display consistent non-compliance with the guidelines, and most importantly faecal coliform levels are consistently non-compliant.

At present the electrical conductivity (surface water salinity level) of the Mary River downstream of Gympie occasionally exceeds QWQ Guidelines during low flow events at the end of winter. On the 16th and 17th October 2006 the Mary River Catchment Coordinating Committee (MRCCC) Project staff conducted its annual catchment crawl from the headwaters to the upper estuary of the Mary River. The Electrical Conductivity (EC – surface water salinity level) readings recorded were some of the highest recorded for October. Consistently higher EC levels were recorded below Gympie that did not comply with Queensland Water Quality guidelines. At seven (7) sites the highest EC values were recorded. This catchment crawl coincided with a period where the river downstream of Gympie stopped flowing as a result of no water being released from Borumba Dam. This rare event provided a snapshot of the serious changes to the salinity level of the river downstream of Gympie after only a few days of no flow. However, the Mary Basin WRP allows upwards of 6 months of no flow downstream of Gympie

In January 2006 a major fish kill occurred in the immediate reaches above the dam footprint. This event was responsible for the death of thousands of fish, including large *Maccullochella peelii mariensis* (Mary River Cod). Possible causes for these deaths were high levels of a pesticide, combined with extremely low dissolved oxygen levels and high water temperatures. This highlights the sensitivity of the Mary River Cod to water quality.

Water quality, in particular, dissolved oxygen is currently non-compliant to Queensland Water Quality guidelines. If the dam is constructed with such inherent dissolved oxygen problems, the possibility exists that the aquatic ecosystems that currently exist in the area will be pushed beyond tolerable limits and will become locally extinct.

Proliferation of blue-green algae and floating aquatic macrophytes, and stratification of impounded water can cause degraded water quality conditions (low dissolved oxygen and temperature). This may result in fishkills, a change in aquatic assemblage structure to favour those species tolerant of poor water quality, a decline in sensitive species and potentially interrupt cues for fish migrations and reproduction.

Fishkills extending for 17 km were recorded in the Paradise Dam at Mingo Creek in 2006. This is not unusual for new dams to have low dissolved oxygen levels after inundation as rotting plant matter is decomposing. This fact, combined with this proposal of a relatively very shallow dam, will result in extensive aquatic plant growth and corresponding death, decomposition and low Dissolved Oxygen levels with changing water levels.

Elusor macrurus (Mary River Tortoise) belongs to the family Chelidae which is a recent phenomenon as far as turtles go, Chelids are represented in fossil deposits from the Miocene Period (18million years ago) onwards in Australia (Cann 1998). Two species within the proposed dam site, *Elseya albagula* (White Faced Snapping Turtle) and the *Elusor macrurus* (Mary River Tortoise), are part of a unique group of tortoise that are capable of cloacal breathing, making them even more vulnerable to the effects of the poor water quality within dams.

Water quality parameters recover only slowly when water is released from a dam. Oxygen levels may recover within a kilometre or two, while temperature changes may still exist 100 km downstream. (Report of the World

Commission on Dams 2000). This will have a significant impact on species downstream of the proposed dam specifically spawning grounds for *Neoceratodus fosteri* (Australian lungfish), *Maccullochella peelii mariensis* (Mary River Cod) and *Elusor macrurus* (Mary River Tortoise).

5.1.3 Impact on Downstream River Processes

The river forming processes (geomorphology) downstream of the dam will be affected and will dramatically change the shape of the lower reaches of the Mary River, due to the combined effects of reduced mean annual flow and the loss of channel forming high flows.

Loss of Riffles and Pools:

The major impact expected from the change in flows will be the loss of the riffles (shallow water rapids) and pools along the Mary River. Riffles will be lost simply due to the massive reduction in flows due to the dam. The infilling of the pools will be a result of the reduction in high flows needed to form and maintain pools in a river system (Mary Basin Technical Advisory Panel, 2005). Riffles and pools are essential habitat for the *Maccullochella peelii mariensis* (Mary River Cod) and Queensland Lungfish, with the Mary River Cod relying on deep shaded pools to breed and spawn in and the Lungfish needing riffles with aquatic plants on which to lay their eggs. Riffles also provide the river with dissolved oxygen through aeration of the water. A loss of riffles will mean a reduction in the dissolved oxygen levels directly affecting the *Maccullochella peelii mariensis* (Mary River Cod), Queensland Lungfish and Mary River tortoise. Riffles are also very important breeding areas and habitat for many species of macroinvertebrates (waterbugs), which are a very important food source for the Mary River Cod, Queensland Lungfish and Mary River Tortoise.

Channel Contraction:

The lack of high flows that will result from the proposed dam, will also result in channel contraction and bed scouring downstream of the dam. As the channel contracts and the bed deepens, vegetation will likely begin to encroach further towards the river. The Mary River Tortoise uses the sandy banks of the Mary River to lay its eggs and, as the vegetation encroaches into the contracting river channel, these important sandy banks will be lost to the Mary River tortoise, impeding reproduction.

Sedimentation During Construction:

The construction of the proposed dam will undoubtedly cause a large increase in sediment entering the Mary River. This will increase the river's turbidity downstream of the proposed dam site, and directly affect the health of the *Maccullochella peelii mariensis* (Mary River Cod), Queensland Lungfish and Mary River Tortoise, through decreased water quality, decreased native submerged aquatic plant growth and infilling of habitat pools.

Tributary Channel Incision:

It is probable that the decreased flows caused by the proposed dam will cause channel incision (or stream bed erosion) as the normal flow of the tributaries enter the lower flows of the Mary River. Channel incision of the tributaries entering the Mary River will alter the habitats of the many of the aquatic species of the Mary River and eventually result in the loss of riparian vegetation as the stream bed erosion leads to stream bank erosion.

5.1.4 Impacts on Ramsar listed Great Sandy Strait

Due to inadequate downstream flows affecting salinity, nutrient and sediment all the following impacts are likely to occur:

- areas of the wetland being destroyed or substantially modified;
- a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland;
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected;
- a substantial and measurable change in the water quality of the wetland has been measured relating to salinity since 1980 and is evidence that there is a cumulative effect of impacts from building impoundments in the Mary and the Burnett River catchments (see section 5.5 for details). This is likely to adversely impact on biodiversity and ecological integrity if this action proceeds.

These factors combine to indicate that the dam is likely to have significant impact on the ecological character of the declared Ramsar site Great Sandy Strait, and the likelihood of having a significant adverse impact on matters of national environmental significance such as the migratory birds, whales, marine turtles and the dugong .

5.1.5 Impacts on Migratory species protected under international agreements

There are five marine turtles which use the Sandy Straits/ Commonwealth Marine area which are known to either breed or inhabit this area. Some of these species are also nationally threatened species.

Caretta caretta (Loggerhead) – endangered, *Chelona mydas* (Green) – vulnerable, *Derochelys coriacea* (Leatherback) – vulnerable, *Eretmochelys imbricata* (Hawksbill)- vulnerable and *Natator depressus* (Flatback)-vulnerable.

The Marine Turtle recovery plan has identified five different habitat types that marine turtles use at different stages of their lives. These are: the natal beach, mating areas, inter-nesting habitat, feeding areas and pelagic waters. Deteriorating water quality has been identified as a main threat to turtle habitat. Due to inadequate downstream flows affecting salinity, nutrient and sediment all the following impacts are likely to occur on the migratory marine turtles:

- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- interfere with the recovery of the species.

5.1.6 Impacts of trapping sediments and nutrients behind a dam

The Report of the World Commission on Dams (2000) states “The reduction in sediment and nutrient transport in rivers downstream of dams has impacts on channel, floodplain and coastal delta morphology and causes the loss of aquatic habitat for fish and other species. Changes in river water turbidity may affect biota directly. For example, plankton production is influenced by many variables, including turbidity. If this is reduced due to impoundment, plankton development may be enhanced and may occur in new sections of a river.”

Reduction in sediment moving downstream from the dam leads to degradation of the river channel below the facility. This can lead to the elimination of beaches and backwaters that provided native fish and Tortoise habitat, and the reduction or elimination of riparian vegetation that provides nutrients and habitat for aquatic and waterfowl species.

This is likely to have a significant impact on listed threatened species as set out below:

Changes to the river flow and volume and frequency of sediment load within the river is also likely to impact on the seagrass beds within the Great Sandy Straits. Migratory marine mammals, *Dugong dugong* (dugong), *Caretta caretta* (loggerhead turtle), and *Chelonia mydas* (green turtle) which are all known to feed on these seagrass beds.

The impact of spillway flow downstream will scour the river bed and banks for many kilometres. Extensive erosion of downstream bed and banks are often recorded after dam construction due to concentrating flows from the spillway and increased water energy due to loss of sediment deposited upstream of the dam wall. This will significantly impact on habitat of all aquatic and terrestrial species down stream for an indeterminate distance. Destabilization of banks after construction of Baroon Pocket Dam in the Mary River catchment (a relatively small dam compared to this proposal) was constructed was observed for over 50km downstream (submissions by the Mary Catchment Protection Group cited in Dept of Primary Industries 1994 (DPI) – per comment John Bradley 2006).

Sediment transfer within the catchment has been modelled by Department of Natural Resources using SEDNET. This is data that could be used to predict the effective life of the dam from a sedimentation point of view.

Impounding the Mary River at Traveston Crossing will invariably result in increased degradation of coastal deltas due to reduction in sediment input. The consequence of reduced sediment also extends to long stretches of coastline where the erosive effect of waves is no longer sustained by sediment inputs from rivers and hence is likely to impact on the Great Sandy Straits and Fraser Island by:

- Modifying, altering or inhibiting landscape processes, (for example, by accelerating or increasing susceptibility to erosion on coastal beaches on the western side of Fraser Island);
- modifying or inhibiting ecological processes in a National Heritage place; reducing the diversity of or modifying the composition of plant and animal species in a National Heritage place due to greenhouse gas emissions that cause global warming.

Whales use these habitats seasonally and are found along the Australian coast for seven months of the year. Significant habitat degradation is likely due to changes to water flow regimes causing erosion or altered currents in near shore habitat. This combined with degrading water quality is likely to reduce food source, reduce occupancy and/or exclusion of individual whales from suitable habitat thus compromising reproductive success. (DEH website 2006)

5.1.7 Impacts on the *Elusor macrurus* (Mary River Tortoise):

The Mary River Tortoise lays its eggs on sandbanks during the spring period after sufficient rains and often returns to the same nesting sites. There are a limited number of breeding tortoises in the lower reaches (estimated at 100). The population size has crashed by more than 50% since the 1960s/1970s. Surveys have found few immature Tortoises. Egg predation, habitat loss and changes to the riparian zones are thought to be the main causes of decline. Since 2001 Tiara & District Landcare Group in partnership with Queensland Parks & Wildlife Service have been protecting nests in order to increase the survival of *Elusor macrurus* (Mary River Tortoise) hatchlings. This is a long-term project and will take many seasons before survey work can be undertaken to assess impacts on populations.

The proposed inundation area would have reduced oxygen levels and lower temperatures due to increased depth. If this proposed action goes ahead it will completely inundate > 80% of the Mary River Tortoise nesting banks above Traveston Crossing (per comment Craig Latta 2006). Tortoise's need riffle zones, which are shallow rocky areas that run into big pools keeping water oxygen levels high. Research on tortoise performance in cooler and hotter temperatures found that they do not adapt well to any temperature changes (pers comment Natalie Mathie 2006). Significant impacts are likely on sandbank nesting sites downstream due to loss of sediment trapped back in the dam and increased bed scouring below the dam and may affect as much as 64% of nesting bank sites and habitat. Only 6% of the nesting banks and habitat would be secure upstream of the proposed dam to Kenilworth (pers comment Marilyn Connell 2006). We urge the Minister to apply the precautionary principle, particularly as *Elusor macrurus* (Mary River tortoise) as it is only known to occur in the Mary River

The Queensland Government announced mid 2006 that it will provide an additional \$50 000 a year for the next five years for the White faced Snapping Turtle (*Elseya albagula*) turtle hatchery at the Paradise Dam on the Burnett River. The Government has announced previously that the tortoise population of the Mary River, threatened by the proposed Traveston Crossing Dam, will be sustained by a similar turtle hatchery. What has not been disclosed to the public is the failure of the Paradise Dam hatchery to produce a significant number of hatchlings. The hatchery was not functional until early in 2006 and its success at producing turtles for release is yet to be determined. It was estimated that thousands of hatchlings were expected to be released, however, the Hon. Anna Bligh announced on 19 Nov 2006 that 1 clutch had been released and expect 11 clutches to be released this year from the Paradise Dam hatchery.

Five years is insignificant time to prove whether this approach will work to conserve and rehabilitate turtle populations because of the 20-25 year generational cycle of the turtle. Survivorship of hatchlings or young turtles in the river is yet to be studied. To be successful, hatcheries must do more than release turtles into the wild. For a hatchery program to work effectively there must be suitable riverine habitat into which hatchlings are released. *Elusor macrurus* has strong nesting site fidelity and it is unknown whether they will nest in replacement man made nesting banks.

With the building of dams comes a permanent change in the tortoise's habitat through fluctuations in water levels and water flows both in the ponded area of the dam and downstream areas. The building of dam walls effectively divides the population, possibly causing a loss of diversity. Additionally, "traditional" nesting banks, correctly oxygenated water and food sources are destroyed. All the following impacts would occur:

- a long-term decrease in the size of a population;

- reduction in the area of occupancy of the species (for example nesting sites would be inundated);
- fragmentation of an existing population into two or more populations (Tortoise do not use fish ladders);
- degradation of habitat critical to the survival of a species; (loss of sand from the river system would affect downstream nesting banks);
- Disruption of the breeding cycle of a population (limited sand for nesting banks);
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; about 80% of nesting banks would be inundated above Traveston crossing:
- Introduction of disease that may cause the species to decline; eg turtle hatchery not a mitigation success at Paradise and
- Interference with the recovery of the species. (limited number of breeding pairs in the catchment. about 100 at Tiaro nesting bank)
- Reduction in population due to fatal injuries from crashing over the high dam wall during flood events

5.1.8 Impacts of aquatic weed species on endangered species in the catchment

This proposal makes for a very shallow pondage, prone to extraordinarily high seepage and evaporation losses and subject to serious water quality problems of high nutrient loads, low oxygen, toxic metal contamination, algae and weed infestation, greenhouse gas production and sedimentation. If constructed, at Stage One it will have an average depth of only approximately 6m, and at stage two an average depth of about 8m. Much of the dam would be less than 2m deep.

Aquatic weed species already in the catchment above the proposed dam wall include *Salvinia molesta* (Salvinia- a weed of National Significance ie. Top 20 weed of concern to Australia), *Eichhornia crassipes* (water hyacinth) and *Egeria densa* (Dense Waterweed). *Cabomba caroliniana* (Cabomba) (a weed of national significance) infests Lake Macdonald 25 km away and it is likely to be introduced to the proposed impoundment area and dominate native aquatic plants. Lake Macdonald contains 40% of Australia's *Cabomba caroliniana* (Cabomba) infestation, and has infested the lake in 5 years to the extent of 90 tonnes per hectare. There is currently no effective control technique, At present chemicals are used to control *Cabomba caroliniana* (Cabomba) in lakes that do not supply potable water. Physical harvesting is used in Lake Macdonald with limited success. Salivina is a major problem in the Hawkesbury River near Sydney. Recently over \$1.5 million was spent to control Salvinia in the Hawkesbury River, of which the Federal Government contributed \$650000. In 14 months over 140 000 tonnes of Salvinia was removed by 3 large harvesters, barges, trucks and other expensive heavy machinery

Salvinia molesta (Salvinia) and *Eichhornia crassipes* (Water Hyacinth) are declared noxious plants and can quickly become major pests with dense growth, reducing fish populations, limiting food sources for waterfowl, providing shelter for mosquitoes and other disease spreading organisms. Masses may build up creating walls endangering man made structures and making it dangerous to swim, canoe or boat around. Shading by these floating weeds changes the aquatic assemblage and is likely to impact significantly on the feeding of the Mary River Tortoise, Australian lungfish and the *Maccullochella peelii mariensis* (Mary River Cod). Subsequent breakdown of these plants is likely to significantly decrease dissolved oxygen levels, which could cause fish kills.

Historically there have been blue-green algal blooms in Borumba Dam, upstream of this proposal. Risk of developing blue-green algal blooms will be high in this shallow dam proposal. It, too is likely to significantly impact on water quality and have similar consequences.

In Australia, the elimination of high discharges to flush systems has allowed the extensive development of the aquatic weeds *Eichhornia crassipes* (Water Hyacinth) and Water Fern (*Salvinia molesta*).²² Both these species occur throughout the catchment and in places completely cover the river. At the Mary River Barrage at Tiaro, Water Hyacinth stretches over a kilometre back upstream and the local shire Council is attempting to control it physically. Aquatic water plants are known to accumulate heavy metals and particularly in the Mary catchment, Anecdotal evidence is that the Mary River catchment is geologically similar to the area around the Pine River Dam close to Brisbane where high manganese can be a serious problem. This is another example of impacts associated with declining water quality.

5.2 The impacts on terrestrial ecosystems and biodiversity

5.2.1 Direct loss of species

The construction of a storage dam and subsequent inundation of the reservoir area effectively kills terrestrial plants, displaces animals and changes a riverine system to an impoundment of still water. As many species prefer valley bottoms, this proposed action will eliminate unique wildlife habitats and will affect populations of endangered species identified within the proponents referral.

Loss of biodiversity will impact on all species especially the identified classified species under the EPBC Act.. The riparian vegetation along the streams are wild life corridors connecting remnant vegetation (main channel of the Mary River will be inundated for a length of approximately 36.5 km at Stage 1 and 50.7 km at Stage 2.) To remove this important ecological component from the landscape over such a vast area will lead to isolation of many species and lead to biodiversity decline in the whole region. Terrestrial migratory species such as *Monarcha melanopsis* (Black-faced Monarch), *Monarcha trivirgatus* (Spectacled Monarch), *Myagra cyanoleuca* (Satin Flycatcher), *Rhipidura rufifrons* (Rufous Fantail) are all known to require damp gullies in rainforest for breeding (Pizzey 1988). The main channel of the Mary River and Yabba, Amamoor and Kandanga Creeks are recognised as significant riparian corridors (Cooloola Shire Council, 1995).

The proposed action of this magnitude could cause a native species or ecological community to become eligible for listing as Endangered or Vulnerable under State and/or Federal Legislation or cause an already listed threatened species or threatened ecological community to be damaged

The inundation area will cover approximately 3,159 hectares (ha) in Stage 1 and increase to approximately 7,302ha in Stage 2. This includes approximately 335 ha of remnant vegetation being affected by Stage 1 of the project, with 734 ha affected in Stage 2. State declared Endangered Regional Ecosystems comprise 242 ha of the remnant vegetation lost in Stage 1. Wildlife in the area will either be drowned or need to move into surrounding higher ground habitat that either may not meet their requirements or is already occupied by other individuals or species

Under the EPBC Act, nine vulnerable and nine endangered fauna species are known or potentially occurring within the project area. Full species list including the species listed under the NCA are given in the Proponents referral documents. Specific impacts on threatened species are discussed below:

5.2.1.1 Impacts on *Mixophyes iteratus* (Giant Barred Frog) Endangered:

The majority of known populations of *Mixophyes iteratus* in the Mary River catchment are known from lowland tributaries of the Mary River within the dam footprint comprising the lower altitudinal limit of their range – the dam proposal will destroy this strong-hold. This strong-hold is also the northern limit of the core Giant-barred Frog population in Australia. Here they inhabit stretches of creek that are characterised by slow pools and stable creek banks with under-cuts for egg laying. Healthy riparian vegetation is essential for providing leaf litter, bank stability and detritus for tadpoles. Canopy closure is normally a feature of this frog's habitat as it provides cool temperatures, cover and abundant leaf-litter.

Significant populations have been recorded in recent years at Belli, Blackfellow, Happy Jack and Coonoongibber Creeks within the Traveston Crossing Dam footprint. These records contribute significantly to the core lowland populations of *Mixophyes iteratus* and constitute the lower limit of the frog's altitudinal range and also the North-easterly limit of its range (one record is known from the Burrum River catchment above Lenthalls Dam about 150 km to the north; its connectivity with southern populations is unknown but unlikely).

Other tributaries within the inundation area are currently being surveyed. Some of these; Kandanga and Yabba Creeks, are expected to contain populations of *Mixophyes iteratus*.

Construction of Traveston Crossing Dam will likely have significant impacts on the habitat and populations of *Mixophyes iteratus* by:

- Decreasing breeding areas
- Decreasing habitat areas for occupancy
- Decreasing population levels and
- Isolating the population leading to reduced genetic integrity and possible genetic depression

A Recovery Plan has been developed for the Stream frogs of SE Queensland (Hines et al, 2002). Recovery of *Mixophyes iteratus* is addressed in section 4.4 of the plan and reads as follows:

‘Manage populations of the Giant Barred-Frog on private land

The vast majority of known populations of the Giant barred-frog in South-east Queensland occur along narrow remnant riparian vegetation on private lands. Long-term conservation of the Giant barred-frog in Queensland is dependant upon the maintenance of water quality and flow regimes, and on the protection and enhancement of riparian vegetation on these lands’

Inundation of riparian vegetation equates to land clearing which is a key threatening process and is contrary to the recovery actions in the Recovery Plan (Hinds et al 2002)

5.2.1.2 Impacts on the *Maccullochella peelii mariensis* (Mary River Cod) Endangered

(Detailed under 5.4.1.1)

5.2.1.3 Threatened plants listed under the EPBC Act

A search of the databases over the Stage 1 and 2 areas identified 16 vulnerable species listed as potentially occurring in the area. Three species listed as Vulnerable under the EPBC Act, (*viz.*, *Xanthostemon oppositifolius*, *Fontainea rostrata* and *Macadamia ternifolia*) occur as part of the endangered Regional Ecosystem 12.3.1 and this is the predominant regional ecosystem present in both Stage 1 and 2 areas. Therefore, there is a high likelihood that these species may occur within the inundation area. About 20% of the remnant endangered regional ecosystem where these threatened species occur will be inundated. The proposed wall will :

- lead to a long-term decrease in the size of a population by inundation.
- reduce the area of occupancy of the species through land clearing (inundation);
- fragment an existing population into two or more populations due to the size of impact;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline About 20% of the remaining remnant state endangered ecosystem 12.3.1 where these occur will be irreversibly lost and
- interfere with the recovery of the species

5.2.1.4 Impacts on *Pteropus poliocephalus* (Grey Headed Flying Fox) -vulnerable:

Several maternal colonies of *Pteropus poliocephalus* (Grey Headed Flying Fox) occur in the vicinity of the proposed dam and feed within a 50km radius which includes the proposed inundation area of the dam. High protein food (36-48%) is critical for feeding young during Oct-Dec period and forages within the endangered Regional Ecosystem 12.3.1, and of concern Regional Ecosystems 12.3.11 and 12.1.1.14. (per comment Dr Les Hall 2006) All the following significant impacts are likely to occur:

- lead to a long-term decrease in the size of a population by loss of critical food source;
- reduce the area of occupancy of the species through land clearing (inundation);
- fragment an existing population into two or more populations due to the size of impact;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population due to insufficient food for the young ;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. About 20% of the remaining remnant state endangered ecosystem 12.3.1 where a significant amount of food source is planned to be inundated by the proposed dam.
- interfere with the recovery of the species.

5.2.1.5 Impacts on Migratory Birds

Terrestrial migratory species such as *Monarcha melanopsis* (Black-faced Monarch), *Monarcha trivirgatus* (Spectacled Monarch), *Myagra cyanoleuca* (Satin Flycatcher), *Rhipidura rufifrons* (Rufous Fantail) are all known to require damp gullies in rainforest for breeding (Pizzey 1988). The main channel of the Mary River and Yabba, Amamoor and Kandanga Creeks are recognised as significant riparian corridors (Cooloolo Shire Council, 1995). Inundation of riparian corridors is likely to significantly impact on these migratory species which rely on forest

vegetation to provide protection and food along their migratory path. The inundation of this state endangered riparian rainforest 12.3.1 will clear about 20% of the remaining remnant in this area. It is likely that significant impact on riparian vegetation will occur downstream of the proposed dam through bank erosion, groundwater depletion or salinity.

- lead to a long-term decrease in the size of a population through loss of habitat and migration corridor protection.
- reduce the area of occupancy of the species through loss of habitat;
- fragment an existing population into two or more populations – a large water body would likely present a barrier to migration.
- adversely affect habitat critical to the survival of a species – migratory species particularly these small birds need habitat protection;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; and
- interfere with the recovery of the species

5.2.1.6 Invasion of pest species of endangered flora and fauna

By conversion of riverine, floodplain and upslope habitats to dam pondage habitat within the impounded area, there is significant potential for alien species of plants and fish (e.g. mosquitofish, mosquitoes, cane toads, cabomba, carp and tilapia) to establish in impoundments, posing threats to native endangered species such as the Mary River tortoise, Mary River Cod and Australian Lungfish through competition for resources.

5.2.1.7 Impacts on the *Dasyurus maculatus* (Spotted tail Quoll):

There is anecdotal evidence of a population of *Dasyurus maculatus* (Spotted-tail Quoll) within or adjacent to the proposed inundation area. Recent experiences in the Northern Territory show that when cane toads arrive in an area, they quickly send predator populations spiraling to extinction. Quolls, goannas and other predators try to eat toads and die from their poison. Researchers have studied what happens to *Dasyurus maculatus* (Spotted-tail Quoll) when cane toads first arrive and have found that most die, and local populations become extinct. A shallow dam as proposed will have favourable conditions for cane toads to proliferate and it is likely the following significant impacts will occur:

- lead to a long-term decrease in the size of a population through poisoning;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations – unclear of extent of population.
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; and
- interfere with the recovery of the species

5.3 Impacts of altering the groundwater flow and natural flood cycle on downstream floodplains

This proposed action will interrupt the groundwater flow in the middle of the Mary River catchment. This will likely have significant impacts on groundwater quality particularly salinity. This combined with the reduction in downstream annual flooding is likely to affect the natural productivity of riparian areas, floodplains and deltas. The characteristics of riparian plant communities are controlled by the dynamic interaction of groundwater flows, flooding, and sedimentation. Many riparian species depend on shallow floodplain aquifers that are recharged during regular flood events. Dams can have significant and complex impacts on downstream riparian plant communities. High discharges can retard the encroachment of true terrestrial species, but many riparian plants have evolved with and become adapted to the natural flood regime. Typically, riparian forest tree species are dependent on river flows and a shallow aquifer, and the community and population structure of riparian forests is related to the spatial and temporal patterns of flooding at a site. Many riverine fish that have evolved to take advantage of the seasonal floods and use the inundated areas for spawning and feeding.

Loss of this connection is likely to lead to a rapid decline in productivity of the local fishery and to extinction of some species. Additionally, dewatering of stream channels immediately downstream from dams can be a serious problem. The direct loss of annual silt and nutrient replenishment as a consequence of upstream impoundment is thought to have contributed to the gradual loss of fertility of formerly productive floodplain soils as used in agriculture and flood-recession agriculture. Associated dramatic reductions in bird and plant species are also known in conjunction with loss in

fertility. A well cited example of this is on the Murray floodplain, Australia, where it is shown that periodic flooding is essential for seed germination, and headwater impoundment has curtailed regeneration.³⁰

Conversely, artificial pulses generated by dam releases at the wrong time – in ecological terms – are recognised as a cause of woodland destruction. Finally, recharge of groundwater in floodplain areas is severely diminished once floods are eliminated. This lack of groundwater will impact on the EPBC listed threatened species by loss of the trees along the banks of the river and floodplain, the source of large woody debris that is important for providing snag habitat for the Mary River Cod and basking logs for the Mary River Tortoise. The control of floodwaters by large dams, which usually reduces flow during natural flood periods and increases flow during dry periods, leads to a discontinuity in the river floodplains, freshwater lakes and coastal and estuarine environments.

In summary, the changed hydrological regime of rivers has been reported to cause adverse affects on floodplains, agriculture, fisheries, pasture and woodlands and this constitutes the organising element of the community livelihood and culture that is typical of the Mary River Valley.

5.4. Impacts on fisheries in the upstream, reservoir and downstream areas

5.4.1 Impacts of blocking migration of aquatic organisms

As a physical barrier the dam disrupts the movement of species leading to changes in upstream and downstream species composition and even species loss. River-dwelling species have several migratory patterns. This is demonstrated by the diversity in fish – with some species where the adults migrate up rivers to spawn and the young descend, while the reverse occurs with other fish such as eels. Many other freshwater fish move up rivers or their tributaries to spawn and dams block these migrations to varying degrees.

Migratory fish require different environments for the main phases of their life cycle: reproduction, production of juveniles, growth, and sexual maturation. As a physical barrier the dam disrupts the movement of species leading to changes in upstream and downstream species composition and even species loss. Even when fishways have been installed successfully, migrations can be delayed by the absence of navigational cues, such as strong currents or changes in temperature. This can cause stress on the energy reserves of the fish, as some fish do not feed during migration. Recent research in Australia, the United States, and Japan has shown that fish passes need to be modified to meet the needs of each species and the particular situation at each dam.

5.4.1.1 Impacts on *Maccullochella peellii mariensis* (Mary River cod)

The *Maccullochella peellii mariensis* (Mary River Cod) is an endangered species (listed under the EPBC Act 1999) endemic to the Mary River system. *Maccullochella peellii mariensis* (Mary River Cod) is at the top of the food chain of the Mary River system. Any adverse impacts on fisheries directly affect the recovery plan of this species (Simpson & Jackson, 1996, The Mary River Cod Research and Recovery Plan).

The proposed dam wall could severely impact on the seasonal movements and breeding requirements of the Mary River Cod. Radio tracking studies have shown that the Mary River cod migrate long distances along waterways, especially during spawning times (Simpson, 1994). There is no evidence of the Mary River cod utilising a fishway in its natural habitat.

Although the Mary River Cod can survive in dams there is no research evidence showing that they are capable of breeding within dams (hatchery ponds can not be considered as dams due to their artificially controlled food supply). The Mary River Cod relies on deep, cool, shaded pools containing large woody debris (snags) for it to successfully breed (Simpson, 1998). The Traveston Crossing dam will flood several of these known habitats on the Mary River and is unlikely to provide any similar habitat once completed, especially considering the large water level fluctuations associated with operating impoundments that would eliminate the establishment of stable riparian vegetation (Mary Basin Technical Advisory Panel, 2005). Similarly downstream of the dam the expected effects of sedimentation during construction, reduced flows, channel contraction, decrease in large woody debris will all have a detrimental affect on the habitat requirements of the Mary River Cod.

Dissolved oxygen depletion within the impoundment area due to the processes of stratification (deeper, cooler waters, with little dissolved oxygen turning over when surface waters heat up) and excessive algal and aquatic weed growth will also effect any surviving Mary River Cod populations within the impounded area.

If water releases from the proposed dam are not managed correctly and multi-levelled releases are not incorporated into dam operations there will be impacts on the Mary River Cod through thermal pollution and decreased dissolved oxygen levels. Water is often released from the bottom of a dam, where the water has a much lower temperature, and lower dissolved oxygen levels. Many studies have shown that cold water releases can be detrimental to many aquatic species spawning and life cycles (such as the Mary River Cod and Queensland Lungfish) and disrupt the availability of food throughout the food chain.

The Mary River cod may also be threatened by a large reduction in food sources due to the effects of releasing water from the impoundment during normally low flow periods, causing flushing of the natural epiphytic algae and phytoplankton that are an essential component of the food chain and important for juvenile Mary River Cod (Kennard, 2003). Downstream of the dam changes in stream flow processes may result in the loss of riffles that are very important breeding areas and habitat for many species of macroinvertebrates, a very important food source for the Mary River Cod.

It is well documented that an impounded dam environment is far more suited to many exotic fish species, such as Carp and Talapia . The Mary River is one of the few remaining rivers in South East Queensland without an infestation of large exotic fish. If exotic fish species entered the proposed dam, they could be expected to proliferate in a short period of time and outcompete any remaining native fish species, such as the Mary River Cod.

The proposed action will:

- fragment an existing population into two or more populations (no evidence of *Maccullochella peelii mariensis* (Mary river cod) using fishways)
- adversely affect habitat critical to the survival of a species; (environmental flows in the Mary WRP insufficient to mitigate the affects on aquatic species abundance, biodiversity and loss of riparian habitat.)
- disrupt the breeding cycle of a population; (Temperatures in spring are critical triggers for spawning. Water temperatures will be significantly changed below the dam and in the dam itself) and
- interfere with the recovery of the species (gene pool segregation)

5.4.1.2 Impacts on the *Neoceratodus fosteri* (Australian Lungfish)

(see section 5.5.1)

5.4.1.3 Impacts on the Mary River Tortoise

Tracking studies have shown that Mary River Tortoise females may swim many kilometres to find their suitable traditional nesting banks. Tortoise do not use fishways and have been found stranded on dam walls. (More details on impacts in Section 5.1.7)

5.4.2 Failure in mitigations to fish passage:

Efforts to mitigate the impacts on fauna have met with little success in other dams especially the most recent Paradise Dam built on the Burnett River. Evidence from the “state of the art” fishways on the Burnett has demonstrated that this measure is not enough to reduce the level of impact below the “significant impact” threshold. The Queensland Government has just funded a further 10 year monitoring project to evaluate the existing structures on the Burnett River after recent publications on monitoring have shown significant impacts on turtle population ecology and demography and *Neoceratodus fosteri* (Australian lungfish) .(Brooks and Kind 2002, papers prepared under the Burnett stage1 Program of Actions but not released to the public)

5.5 The cumulative impacts of a series of barrages/weirs/dams and inter-basin water transfer.

Although seldom analysed, cumulative impacts occur when several dams are built on a single river and water is transferred between catchments. They affect both the physical (first-order) variables, such as flow regime and water quality, and the productivity and species composition of different rivers. The problems may be magnified as more

large dams are added to a river system, resulting in an increased and cumulative loss of natural resources, habitat quality, environmental sustainability and ecosystem integrity. New biota from the source basin may invade the recipient basin and compete with the native species

The cumulative impacts of inter-basin water transfers can be of special concern, as this often involves the transfer of species into new watersheds. When waters of one basin are diverted into another one, changes in volume and seasonality of flow result.

The construction of Traveston Crossing Dam will result in the Moreton WRP receiving an extra 150 000 megalitres per year through the water grid. A comparative analysis between the draft Moreton WRP and the Mary WRP shows the vast difference in flow deviation (alteration) in low, medium and high flow events between the draft Moreton WRP and the Final Mary WRP sub-ordinate legislation. Interestingly in the “Special Ecological Outcomes” section (page 12) of the draft Moreton WRP sub-ordinate legislation it states “Moreton Bay / Pumicestone Channel – to minimise changes to the delivery of freshwater, natural sediments, nutrients and organic matter”. However in the “Ecological outcomes for particular parts of the plan area” in the Final Mary WRP subordinate legislation (page 10) there is no recognition of the special requirements of the Great Sandy Strait to maintain its international significance through Ramsar listing and minimise the likelihood of impacts on the Matters of National Significance

Comparing the environmental flows in the water resource plans, it is highly likely that there will be irreversible impact to the threatened species of the Mary River catchment at the expense of protecting the Moreton catchment estuary areas.. The 1 in 20 year floods at the Bremer River mouth will cut by 4%. – thus allowing 96% of 1 in 20 year floods to reach the Bremer River mouth. The 1 in 20 year floods at the Mary River mouth will be cut by 31% - thus only allowing 69% of 1 in 20 year floods to reach the mouth.

5.5.1 Impacts on the *Neoceratodus fosteri* (Australian lungfish) - Vulnerable

The *Neoceratodus fosteri* (Australian lungfish) is a much older species than any of the other living lobe-finned fish. It was alive as it is today during the Cretaceous, along with the now extinct dinosaurs. *Neoceratodus fosteri* (Australian Lungfish) have an absolute requirement for shallow, slow-flowing, densely-vegetated riffles as spawning and nursery habitat. These environmental features are characteristic of both the Burnett and the Mary Rivers where it only occurs naturally but it is exactly these features that are lost entirely by permanent flooding resulting from the construction of dam walls. The main channel of the Mary River will be inundated for a length of approximately 36.5 km at Stage 1 and 50.7 km at Stage 2. This section of the river is critically important for the spawning due to its pool/riffle habitat and aquatic plants to which the eggs are adhered. It represents **~ 50% of the suitable breeding habitat left** for this species which only occurs in the Mary and Burnett Rivers (Info source Prof Jean Joss 2006).

Reduced flows downstream of the dam wall will also result in destruction of spawning and nursery sites as has occurred with impoundments recently constructed on the Burnett River. QDPI report by Brooks and Kind (2002) points out that increased pressure for spawning on a very reduced number of spawning sites leads to a very much decreased success of recruitment to the population.

There is to date no scientifically researched data forthcoming from the State Government substantiating the effective application of the Paradise Dam fishway, in mitigating lungfish passage. Further there is also no data available which shows that the agreed mitigation measures for both lungfish and *Elseya* sp, under the Bilateral assessment process for Paradise Dam have been effective. To date no spawning habitat has been created for these species within the impoundments for both Paradise Dam or the Ned Churchward Weir (QEPA : “ Final Report : Operation of the Ned Churchward Wier between 1998-2005).

This is clear evidence that the State Government has a questionable past environmental record for successful and demonstrated application of environmental duty of care for species which are Matters of National Environmental Significance, and have been identified as requiring effective mitigation under the bilateral assessment process.

A fishway only addresses one of the provisions of the Act for *Neoceratodus fosteri* (Australian lungfish), ie. the impediment to natural migration caused by construction of the dam wall. The other requirement of the Act is that no significant impact is made on *Neoceratodus fosteri* (Australian lungfish) spawning and nursery habitat areas.

Although lungfish populations survive in impoundments, there is no evidence to support that they breed successfully in them. Lungfish populations in impoundments outside the Burnett and Mary catchments (e.g. Lake Samsonvale, Lake Wivenhoe and Enoggera Reservoir) are frequently used as examples of successful lungfish breeding in impounded waters. However Brooks and Kind (2002) found after closer examination of the available evidence, that these claims may be misleading. Lungfish populations in these areas are poorly documented and have never been subject to rigorous survey.

With the exception of Enoggera Reservoir, lungfish records from these impoundments have invariably been mature adults. While limited periodic recruitment of lungfish was previously evident in Enoggera Reservoir, there has been no evidence of spawning or recruitment since the control of water hyacinth commenced in 1974 (Kemp 1986). Water hyacinth is a declared pest plant and, therefore, is not suitable as an alternative spawning medium for lungfish in the Burnett or Mary Rivers. In addition, while successful lungfish recruitment has been recorded in the Brisbane River downstream of Wivenhoe Dam, there are currently no confirmed records of juvenile lungfish collected from within the impoundment. Relocation of a species to another catchment system are not used as a mitigation solution or recovery plan due to intrinsic problems that can arise from a limited gene pool base and risk of problems associated with introducing a new species.

If this proposed action goes ahead it, combined with recent spawning habitat losses on the Burnett River, will completely extinguish **>80% of the lung fish's natural spawning and nursery sites** and following a lineage of 400 million years. There is no other lungfish living in the world today that can replace the Queensland lungfish in scientific significance (Info source – Prof Jean Joss 2006)

In addition, poor water quality especially low DO levels will put the surviving population in the inundation area at risk of being involved in a major fishkill event and affect it's food supply that includes frogs, tadpoles, small fishes, snails, shrimp, earthworms and plant material.

All of the following impacts will occur:

- Reduced recruitment to critical levels (raising 'vulnerable' status on EPBC Act to critically endangered)
- which will lead to a long-term decrease in the size of the population,
- reduce the area of occupancy of the species,
- fragment an existing population into two or more populations,
- adversely affect habitat critical to the survival of a species,
- disrupt the breeding cycle of a population,
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline and
- prevent the recovery of the species.

5.5.1.1 Additional importance of this fish is to our CULTURAL HERITAGE: The following extract is summarized by *Eve Mumewa Doreen Fesl, OAM, CM, PhD (nee Evelyn Serico), Gubbi Gubbi Elder:*

*"The Australian lungfish is a sacred (totemic) fish of the Gubbi Gubbi people. We never killed or ate the fish, and saw it as important to protect it. We call it "Dala" and for reasons associated with its important place in our culture, we were often referred to by other Aboriginal groups, as "the Dala" people.¹ Our traditional land encompasses the Mary River basin and its catchments. The Mary Cod is an important economic fish, but the Dala (Lung Fish) are **not to be killed but protected from harm.**"*

Australia is a signatory of the international Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments Regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities were developed pursuant to task 9 of the programme of work on Article 8(j) and related provisions adopted by the Conference of the Parties of the Convention on Biological Diversity at its fifth meeting, in May 2000.

¹ Earlier Europeans in attempting to record our cultures often got mixed up and thought the name "Gubbi Gubbi" and "Dala" referred to two different peoples, but this was not so.

5.5.2 Impacts on the ecological character of the Great Sandy Strait Ramsar Wetland

5.5.2.1 Cumulative impacts within the Mary catchment

The condition of the estuarine reach of the Mary River system has already been compromised by the Mary River Tidal Barrage and the Tinana Creek Tidal Barrage. The Mary River Tidal barrage isolated a 30km tidal reach of the River. Reductions in low and medium flow events will increase salinity levels within the estuarine reach and reduce the quantity of ponded water behind the Mary River Tidal Barrage and consequently the number of occasions which it overflows. The natural flushing of the river and mixing of freshwater with the sea water that creates brackish conditions will be reduced. No consideration was made for the impacts of climate change. It is unknown what impacts the combination of climate change and the proposed Traveston Crossing Dam will have on the size and frequency of major flood events which are essential for the maintenance of the western side of Fraser Island (World Heritage Area) and the Great Sandy Straits.

Freshwater flows also help support marine fish production as many marine fish spawn in estuaries or deltas. A decrease in freshwater flow and in nutrients due to dam construction affects the nursery areas in a number of ways, including increasing salinity, allowing predatory marine fish to invade, and reducing the available food supply. All these impacts will affect Ramsar wetland species including migratory birds and have flow on impacts to endangered species beyond the 3 nautical limit of the *Commonwealth Marine environment*.

Prior to the construction of the Mary River Tidal Barrage, the river supported a thriving Fish Board in Maryborough. The Board had one of the highest product turnover in Queensland (Maryborough Fish Board, 1980). Fisheries production dropped levels and the Board became unviable after the construction of the Mary River Barrage in 1979. The combination of the existing Tidal Barrage and a new barrier to fish passage on the main channel of the Mary River if this dam goes ahead, will further deplete fish populations in the Great Sandy Straits. As well as impacting the Ramsar wetlands, this will have a social impact on the communities downstream who rely on this area for income from Tourism related activities.

While a fishway structure will be incorporated into the dam design, evidence from the “state of the art” fishway on the Burnett has demonstrated that this measure is not enough to reduce the level of impact below the “significant impact” threshold. Low flows in the river will also impact on the efficiencies of the fishway and the salinity levels at the Mary River Barrage and thus impact on fisheries through the Ramsar wetlands and Great Sandy Straits.

5.5.2.2 Cumulative impacts from Mary and Burnett catchments

Ribbe (2006) in a study on hyper salinity in Hervey Bay, has revealed that a contributing factor is the lack of freshwater flows from both the Burnett and Mary rivers.

“Both rainfall and river runoff in the Hervey Bay region of subtropical Queensland are at a minimum during the winter/early spring period often approaching zero. The mean monthly average freshwater discharge via the Mary/Burnett rivers into Hervey Bay for the July to September 2004 period, i.e. the period prior the September survey, was very low and estimated to be less than $5 \text{ m}^3 \text{ s}^{-1}$. This is well below the climatological mean value for that period which is about $12 \text{ m}^3 \text{ s}^{-1}$.

(Data not shown, but is available from the Queensland Department of Mines and Natural Resource. No data for the Burrum River is available, but since the Burrum River catchment is significantly smaller than that of the other two, the contribution would be very minimal). Based upon the simple evaporation-runoff balance, an inverse circulation within Hervey Bay is clearly most likely during this low rainfall, runoff period.)

Furthermore, the balance between evaporation and runoff indicates that the inverse circulation may not be restricted to the low rainfall, runoff winter/early spring months, but may persist throughout the year. Taking into account the historical record of mean monthly freshwater discharges from the Mary/Burnett Rivers for the period January 1950 to December 2004, only 10 % of all discharges were larger than $201 \text{ m}^3 \text{ s}^{-1}$, 15 % were larger than $122 \text{ m}^3 \text{ s}^{-1}$, and 20 % were larger than $88.9 \text{ m}^3 \text{ s}^{-1}$. Over the same period, rainfall trends in parts of eastern Australia were negative. Southeast coastal Queensland was and still is characterised by a ‘drying’ trend (Manins et al. 2001). This contributes to a decline in freshwater discharges over the same period. For example, during the period January

1980 to December 2004, only 10 % of all monthly mean discharges were larger than $122 \text{ m}^3 \text{ s}^{-1}$, 15 % were larger than $87 \text{ m}^3 \text{ s}^{-1}$, and 20 % were larger than $65 \text{ m}^3 \text{ s}^{-1}$, which is a significant reduction if compared to the period 1950 to 2004. Flows above the 10 % cut-off were due to single climatic events that reflect in high monthly mean values, of which the year 1999 major flooding one is an example (Campbell and McKenzie, 2004). In particular, for the period 1980-2004, freshwater discharges were mostly well below the minimum evaporation rate of $E = 139 \text{ m}^3 \text{ s}^{-1}$ in June which in turn would lead to **persistent hypersaline conditions throughout most of the period.**

“This follows from an analysis of the historical runoff - evaporation budget. In particular, **since 1980 runoff declined and was only larger than the minimum evaporation rate for the region in less than 10 % of all instances.**”, (Ribbe 2006, pp 13) .

This period corresponds to an increase in tidal barrage and dam infrastructure, within both the Burnett and Mary Rivers This preliminary research may be revealing the first impacts on estuarine ecosystems (Ramsar wetlands) from infrastructure related flow reductions to the Great Sandy Straits Ramsar wetlands. These findings also raise serious questions as to what effect **further reductions in freshwater flows**, under the Mary Water Resources Plan and the Traveston Crossing Dam proposal , will have on Matters of National Environmental Significance within the Great Sandy Strait.

5.6 The emission of greenhouse gases (GHG) associated with large dam projects

The World Commission on Dams has found that dams are a significant contributor to climate change. This has a direct impact on matters of national significance listed in the referral...*“the world heritage values of a world heritage site, the ecological character of a Ramsar wetland, listed threatened species or listed threatened ecological community and migratory species”*

It has been found that decomposing vegetation in the dams emit carbon dioxide and methane, a green house gas that is 20 times more potent than carbon dioxide. As awareness to climate change is increasing in Australia, estimates of green house gas emissions from dams should be included in the terms of reference for the EIS as well as the emissions resulting from pumping the water out of the catchment. . Calculations of the contribution of new reservoirs to climate change must include an assessment of the natural pre-dam emission or sink in order to determine the net impact of the dam. (World Commission on Dams 2000)

Current understanding of emissions suggests that shallow, warm tropical dams are more likely to be major GHG emitters. An estimate by the Report on World Commission of Dams suggests that the gross emissions from reservoirs may account for between 1% and 28% of the global warming potential of GHG emissions.

- Methane emissions occur due to bacteria that decompose organic matter in oxygen-poor water. The bottom layer of water in tropical reservoirs tends to be seriously depleted of oxygen. Some methane bubbles are oxidized to carbon dioxide as they rise to the reservoir surface – thus shallow tropical reservoirs where bubbles have less time to become oxidized tend to have the highest methane emissions.
- Emissions per unit of area flooded are much higher from tropical reservoirs than from those in boreal zones, which are in turn generally higher than those in temperate zones.
- Reservoirs emit greenhouse gases over their lifetime. There is an initial high pulse of emissions in the first few years after reservoir filling because of the huge amounts of carbon in the biomass and soils in the area flooded. Emissions generally appear to decline over subsequent decades. The actual rate of decline varies widely between individual reservoirs and climate zones. Some reservoirs fail to show any clear decline, and researchers have sometimes recorded increased emissions over time when sampling the same reservoir several years apart.
- Emission levels vary widely between reservoirs depending upon such factors as the area and type of ecosystems flooded, reservoir depth and shape, the local climate, the duration of winter ice-cover, the area of the reservoir covered in aquatic plants, water quality (especially pH and nutrient content), the way in which the dam is operated, and the ecological, physical and socio-economic characteristics of the dammed river basin. Among the factors influencing degassing emissions are the concentrations of methane at different reservoir depths, the depth of turbine and spillway intakes, and the type of spillway design.

- Surface emissions vary widely among different parts of the same reservoir (largely due to changes in depth, exposure to wind and sun, and growth of aquatic plants), and from year to year, season to season, and between night and day. This greatly complicates efforts to develop reliable whole-reservoir estimates from a limited set of samples measured at specific points in the reservoir during specific time periods. Confidence in the measurements themselves is also hampered by the different results obtained through different measuring equipment and techniques, and disagreements over which measuring methods are most appropriate. Factors affecting degassing emission volumes include variations in the volume of water discharged, and the proportion of turbinated water versus that which is spilled.
- Calculation of the warming impact of reservoirs should be based upon net emissions. This requires adjusting measurements of gross emissions at the reservoir surface and dam outlets to allow for whatever sinks and sources of greenhouse gases existed in the reservoir zone before submergence, the uptake of carbon through reservoir photosynthesis, and the impact of the reservoir upon the pre-dam flows of carbon throughout the wider watershed.

5.6.1 Climate and oceanographic change impacts on protected Migratory Whales

Most of the world's leading scientists agree that global warming caused by human activity is occurring. The exact implications of these changes are unknown, but it is predicted that there will be reduced productivity of Southern Ocean ecosystems and unpredictable weather events caused by increasing ocean water temperatures, changing ocean currents, rising sea levels and reductions in sea ice. The potential impacts of climate and oceanographic change on migratory whales are twofold:

1. Habitat availability

Whale migration, feeding, and calving site selection may be influenced by factors such as ocean currents and water temperature. Any changes in these factors could affect whale population recovery by rendering currently used habitat areas unsuitable.

2. Food availability

Changes to climate and oceanographic processes may also lead to decreased productivity and different patterns of prey distribution and availability. Such changes would certainly affect dependant predators such as migratory whales. (Source: DEH website 2006)

All of the following impacts are likely to occur on these Matters of National Environmental significance as a result of higher ocean temperatures:

- substantially modify (including by fragmenting, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

To date, no experience exists with minimising, mitigating, or compensating these impacts. Pre-inundation removal of vegetation is one alternative, but the net effects of such an activity are not well understood. The outcome of global negotiations on climate change may bear on future penalties and incentives for net GHG emissions from dams.

The proposed action should be declared to be a controlled action because it meets the following criteria as outlined in the Significant Impact Guidelines May 2006 in relation to actions that may have a significant impact on the following matters of National Environmental Significance:

6. Conclusion

It is our understanding that according to Section 87 of the EPBC Act 1999 the Environment Minister has the power to decide whether the proposed action is a controlled action and as such is subject to assessment and approval under the EPBC Act.

The Proponent has suggested that the statutory impact assessment process be under the SDPWOA, the subject of a bilateral agreement between the Queensland and the Commonwealth Governments in relation to environmental assessment under Section 45 of the *Environment Protection and Biodiversity Conservation Act 1999*(EPBC Act) signed on 13 August 2004.

The process undertaken to date by the Queensland Government and the Proponent gives us no confidence in the ability of the proponent to undertake an independent environmental assessment. Furthermore, the proponent and the Queensland State Government are effectively one and the same. QWIPL has advised us that has only one \$1 shareholder (a State Government employee – the Premier of Queensland Peter Beattie) and five of the six Directors are Queensland Government employees. Further, QWIPL has been granted State Government powers to progress the proposal and is therefore not an independent company.

Public statements made by the Queensland government indicate a determination to build these dams under any circumstances. This does not follow the principles of ecologically sustainable development, which are defined by the Act to be “decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations”.

Similarly the conservation of biological diversity and ecological integrity for the whole catchment should be a fundamental consideration in decision-making. This is not being followed. The environmental baseline studies have not been carried out and to date the Terms of Reference for the EIS have not been released to the public.

The same process suggested by the Proponent was followed for the approval of Paradise Dam on the Burnett River under similar rushed circumstances in 2002. There were **serious shortcomings** in the scientific standard and process of the environmental impact studies undertaken for the Burnett River Dam.

Comparing the water resource plans, it is unfair that the Moreton catchment, which has far more water, is planning to take from another catchment, the Mary catchment. Catching stormwater more efficiently, reducing wastage and recycling water for indirect potable reuse would be a more equitable solution.

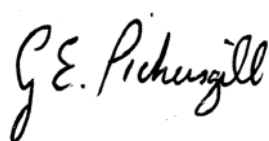
It is a significant concern to our members and the local community that so many matters of national environmental significance are likely to be significantly impacted.

We submit that the actions be assessed by an Inquiry (section 87(1)(e) of the EPBC Act 1999) This will enable the Minister for Environment to appoint a Commission to carry out inquiries, call witnesses, obtain documents and inspect places.

We request the opportunity to provide comments on any further information that is provided to the Minister under s76 of the Act.

If you wish to discuss any of the issues raised in this submission, please contact me on 07 54843150 or mb 0411443589 or email: pickerg@tpg.com.au

Yours sincerely



Glenda Pickersgill *On behalf of the Research Section of the Save the Mary River Coordinating Group*

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APPENDIX A: Notes on the likely impacts of the proposed Traveston Crossing dam on the environmental hydrology of the Mary River

S. Burgess and D. Edward

Save the Mary River Coordinating Group.

November 2006

Background

In spite of many frequent and formal requests to date (26/11/06), the Queensland State Government has consistently refused to release any comprehensive scientific data regarding the predicted hydrological effects of the current Traveston Crossing Dam proposal on flow regimes and flood impacts on the Mary River. This information is critical in determining the likely impact of the proposal on matters covered by the EPBC Act and the EIS process under Queensland legislation.

After 5 months of protracted negotiations, the Queensland Government released the IQQM flow modelling that was used in the preparation of the Environmental Flow Assessment Framework and Scenario Implications report prepared for the draft Water Resource Plan for the Mary Basin (Brizga 2005). Although not based specifically on a model of the current dam proposal, it is the only published data available to investigate the likely impacts of a large dam on the Mary River upstream of Gympie.

An analysis of the IQQM modelling data made available shows that the simulations used for the preparation of the State Government Technical Advisory Panel report were based on a single large dam between Dagon Pocket and Moy Pocket that removed an average of approximately 130,000 ML/year of total flow from the Mary River (accounting for yield, evaporation, seepage and any other losses) above the full utilization of current water entitlements. The dam modelled in that study also had a system of downstream releases that passed all flows up to 250ML/day, and passed all flushing flows between 15,000 and 25,000 ML/day.

More recent information from the Queensland State Government shows a clear intent to harvest up to 150,000 ML/year in addition to existing entitlements, not accounting for the extra losses to the river flows caused by evaporation and seepage from the proposed dam(s). These losses would conservatively be in excess of 70,000 ML/year. To obtain the yields stated in the report 'Water for South East Qld - a long-term solution', the State Government used a dam model that only released up to 100ML day in the low flow regimes, and only passed one flushing flow between 10,000 and 20,000ML/day per water year.

The conclusion is that the likely environmental flow impacts of the State Government's more recent plans for the Traveston Crossing dam will be even greater than those on which the Technical Advisory Panel's assessments for the WRP were based. This means that the TAP's assessments in the studies undertaken for draft water resource plan are likely to underestimate the environmental impact of the current dam proposal, and therefore could be validly interpreted in the current context as an indicator of the minimum level of impact that the current proposal is likely to have.

This conclusion also concurs with the significant re-write of the environmental flow schedules that occurred between the draft and final versions of the WRP legislation. This re-write allowed much greater adverse impacts on the river within the scope of the environmental flow schedules in the WRP following the political announcement of the Traveston Crossing Dam proposal. The reasons for this rewrite should be contained in the consultation report required under the WRP process. To this date, the consultation report on the legislation, (which should have been released by August) has not been released to the public.

Summary of likely flow impacts at selected points in the Mary River system, based on IQQM modelling of dam options.

The places chosen for analysis are those downstream locations for which environmental flows are legislated for in the Water Resource (Mary Basin) Plan 2006, and the section of the river downstream of the proposed dam site (which is not protected in the WRP). The raw IQQM flow data released by the State Government from the scenarios investigated in the draft water resource plan were analysed using IQQM (Department of Land and Water Conservation, 2004), RAP (CSIRO, 2006) and a series of Excel spreadsheets to calculate the suite of flow statistics relevant to the WRP legislation.

It should be noted that actual end-of-system flows at the river mouth are not measured and cannot be directly monitored or calibrated against real data: they are only produced as calculations via the IQQM model of the catchment. A crucial point is that although the predicted mean annual flow at the river mouth will be maintained at 87% of pre-development flow, this in no way implies that flows at the river mouth will be essentially unaffected. It only means that the dam will not influence the extraordinary large flood flows for which the Mary is infamous. The statistics show that effect of the dam on the low and no-flow regimes at the river mouth are likely to be significant, particular in regards to crucial environmental processes (such as the successful operation of fishways and water quality) from the Mary River Barrage to the estuary.

Table One shows a summary of some of the relevant flow characteristics. The critical points in the river seem to be in the reach just downstream of the dam at Dagon Pocket (an important lungfish and Mary River turtle breeding area), where the statistics indicate that the flow regime will be severely disturbed, and the river mouth, where the no-flow regime will be significantly altered from the natural state.

At Dagon Pocket, the impact is a reduction of median flows to 31.5% of the pre-development state, virtual no flows for more than 10% of the time, with periods of no flows for more than 6 months continuously. This corresponds with an APFD statistic (a measure of disturbance in river flow patterns) of 2.39, which is regarded as severely disturbed. The 1.5 year ARI daily flow volumes (indicative of minor flushing flood flows) are reduced to 57% of the pre-development state. It is interesting to note that major flood flow events (20 year ARI) are only reduced by 4%.

At the river mouth, the modelling suggests that the river will cease to flow to the sea for 9% of the total time under the single large dam scenario. The APFD statistic for the river mouth is predicted to rise from 0.57 under current conditions to 0.95. Ecological processes at the river mouth are already heavily impacted by the operation of the Mary River Barrage, and this further disruption in freshwater flow patterns could have a severe cumulative effect on estuarine processes related to water quality and limited operation of fishways.

The statistics unequivocally demonstrate that statements to the effect that the environmental flows in the river will not be significantly affected by the dam simply because end-of-system flows are maintained at above 85% mean annual flow are grossly misleading. The full analysis of the State Government's own flow statistics indicate that the environmental values of the river are likely to be profoundly disturbed by the proposal, particularly by the impacts on the minor flushing flows in the river. It is far from certain that this problem could be overcome by fine-tuning the operating procedures of the dam without compromising the prudent yield of the storage.

Table 1. Summary of relevant environmental flow statistics calculated from “Hydrologic Impacts of Water Resource Management Scenarios” (also known as “Appendix A”)

Dagon Pocket AMTD 204 km (Just downstream from proposed dam site)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	691,370	653,423	477,850
% of pre-development MAF		94.5	69.1
Median Annual Flow (ML)	430,714	386,530	135,802
% of pre-development MedianAF		89.7	31.5
Number of no-flow days	15	57	4031
% No-flow days	0.04	0.14	10.08
Continuous no-flow periods			
No flow periods less than 1 month	15	20	75
1 month to less than 3 months	0	0	18
3 months to less than 6 months	0	0	16
6 months to less than 12 months	0	0	2
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.60	2.39
Low Flow Exceedence			
%Days >= 10cm	95.0	87.9	87.5
%Days >= 30cm	72.5	62.4	49.0
%Days <= 1ML	0.6	0.2	10.3
ARI stats (Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	21,884	20,562	12,481
Percent of pre-development		94.0	57.0
5yr ARI (minor flood) (ML)	117,406	111,216	107,734
Percent pre-development		94.7	91.8
20yr ARI (major floods) (ML)	280,678	268,240	269,316
Percent pre-development		95.6	96.0

Fisherman's Pocket AMTD 170 km (just downstream from Gympie)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	1,025,901	924,906	765,525
% of pre-development MAF		90.2	74.6

Median Annual Flow (ML)	700,516	584,821	356,589
% of pre-development MedianAF		83.5	50.9
Number of no-flow days	41	6696	1808
% No-flow days	0.10	16.74	4.52
Continuous no-flow periods			
No flow periods less than 1 month	28	149	158
1 month to less than 3 months	0	54	12
3 months to less than 6 months	0	15	2
6 months to less than 12 months	0	2	0
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.85	1.88
Low Flow Exceedence			
%Days >= 10cm	85.1	68.1	58.4
%Days >= 30cm	55.4	41.7	34.9
%Days <= 1ML	0.3	16.8	4.8
ARI stats(Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	34,817	32,374	24,721
Percent of pre-development		93.0	71.0
5yr ARI (minor flood) (ML)	156,834	147,874	136,918
Percent pre-development		94.3	87.3
20yr ARI (major floods) (ML)	339,260	320,280	331,660
Percent pre-development		94.4	97.8

Home Park AMTD 91 km (Lower Mary Valley)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	1,800,148	1,675,628	1,520,754
% of pre-development MAF		93.1	84.5
Median Annual Flow (ML)	1,189,136	1,084,109	865,363
% of pre-development MedianAF		91.2	72.8
Number of no-flow days	14	5071	1550
% No-flow days	0.04	12.68	3.88
Continuous no-flow periods			
No flow periods less than 1 month	13	147	123
1 month to less than 3 months	0	41	9
3 months to less than 6 months	0	10	4
6 months to less than 12 months	0	2	0
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.65	1.19
Low Flow Exceedence			
%Days >= 10cm	97.8	83.3	81.3
%Days >= 30cm	80.5	63.7	58.6
%Days <= 1ML	0.1	12.8	4.6
ARI stats (Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	48,469	44,501	37,566
Percent of pre-development		91.8	77.5
5yr ARI (minor flood) (ML)	230,388	223,724	217,046
Percent pre-development		97.1	94.2
20yr ARI (major floods) (ML)	449,054	440,062	430,264
Percent pre-development		98.0	95.8

Estuary AMTD 0 (End of system)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	2,569,051	2,410,543	2,242,125
% of pre-development MAF		93.8	87.3
Median Annual Flow (ML)	1,645,546	1,504,401	1,299,315

% of pre-development MedianAF		91.4	79.0
Number of no-flow days	1	2775	3599
% No-flow days	0.00	6.94	9.00
Continuous no-flow periods			
No flow periods less than 1 month	1	201	244
1 month to less than 3 months	0	23	29
3 months to less than 6 months	0	0	0
6 months to less than 12 months	0	1	1
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.57	0.95
Low Flow Exceedence			
%Days <= 1ML	0.0	7.1	9.1
ARI stats (Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	63,772	61,691	56,983
Percent of pre-development		96.7	89.4
5yr ARI (minor flood) (ML)	285,640	277,974	280,840
Percent pre-development		97.3	98.3
20yr ARI (major floods) (ML)	501,322	516,276	481,400
Percent pre-development		103.0	96.0

Summary of likely environmental impacts identified by the Technical Advisory Panel, based on the predicted flow regimes from “Appendix A”

The table below summarizes:

- extracts quoted directly from Table 5.5 of the Environmental Flow Assessment Framework and Scenario Implications report prepared for the Mary Basin Water Resource Plan, relating to a large single storage on the Mary River.
- extracts from the TAP’s assessments of the Traveston Dam proposal attached to the State Government report ‘Water for South East Queensland – a long term solution’ produced in July 2006.

Extracts from both reports are in the context of comparing the Traveston Crossing proposal with a proposal for a combination of smaller dams in the catchment, but are quoted here verbatim in reference to the effect of the Traveston proposal.

Table 2. Summary of likely environmental impacts related to flow regime changes identified by the Technical Advisory Panel.

Geomorphology

Barrier effects of the dam on sediment transport would be more significant for the middle and lower reaches of the Mary River. The alluvial nature of the river channel means that this option is likely to be associated with elevated risk of clearwater erosion impacts downstream of the dam. Elevated risk of accelerated bank erosion, due to sandy erodible riverbank materials. Soils within the impoundment and along its shoreline would need to be assessed to determine erosion risks within the dam pondage –experience with erosion in the Mary Barrage pondage suggests elevated risk of accelerated erosion in the upper section of the pondage, where the river banks are affected by standing ponded water and fluctuating water levels resulting from dam operation (the river banks would generally be submerged in the lower part of the pondage). Possible infill of pools downstream of dam due to reductions in high flows. Rivers with sandy load tend to show more rapid dramatic response to flow regime change than rivers with bedrock channels or gravel bedload.

Hydraulic habitat

Broad valley forms mean that the pondage area is likely to be wider than for option R1 with more extensive loss of terrestrial habitat and aquatic habitat on the main stream and tributaries than for the same volume of storage with option R1. Very long on-stream pools are a distinctive feature of the middle and lower freshwater reaches of the Mary River – the extent of this habitat type would be significantly reduced in this option. There would be reduced large woody material inputs to downstream reaches, which may be ecologically significant as there is already limited large woody material in the Mary River and degradation of bank vegetation in many areas has reduced local sources.

Water quality

Existing water quality in this part of the Mary River suggests a significant possibility of blue–green algal blooms. Stratification would also be an issue.

Aquatic vegetation

High risk of infestation of dam pondage by aquatic vegetation. Sandy substrates are favourable for hydrilla and vallisneria. There is risk of rampant growth of exotic aquatic weeds such as cabomba, egeria, and water hyacinth (sourced from the upstream catchment, including infested farm dams) Potential fringing macrophytes depending on dam operation & slopes (especially in upstream parts of the pondage).

Aquatic macroinvertebrates

The effect of option R2 will be concomitant with the size of the impoundment. Option R2 would replace a large stretch of lotic habitat with the lentic environment of a large dam pondage. Very long on-stream pools are a feature of the middle reaches of the Mary River and therefore a proportion of the macroinvertebrate assemblage may be able to use vegetated edges of the dam pondage like the edges of pools – however, the extent of quality of vegetated edge habitats would depend on dam operation. Highly variable water level regimes in dams often result in edge zones that are bare or colonised by tolerant exotics such as para grass. Any stands of emergent and aquatic vegetation within the impoundment would be colonised by

macroinvertebrates. However, some obligate lotic species would be lost and a large extent of deep benthic habitat within the pondage will support very few macroinvertebrates. Depending on the management of the pondage, downstream effects are likely to occur due to changes in wetted area, sediment distributions and benthic substrates.

Fish

Potentially a greater number of fish species affected than option R1 due to position of dam lower in catchment – a single large dam on the Mary River upstream of Gympie would inhibit access to a greater area of aquatic habitat than several upstream dams. Magnitude of impact depends on length of impounded stream channel (including tributaries) – likely to be more for downstream site (for a given dam height) due to wider valleys and flatter gradients than for option R1. The dam impoundment is likely to favour only a subset of the total species pool naturally present in flowing waters (e.g. bony bream and fork-tailed catfish that are more likely to occur naturally in this part of the Mary River than at the upstream sites). Stocking of a dam in this part of the river system would open up more of the catchment to stocked species than option R1 (via free access upstream of the dam) though some downstream movement would also occur. A dam on this part of the Mary River is more likely to affect Mary River cod and lungfish than option R1, although currently degraded riparian and instream habitat conditions in this part of the river are likely to be negatively impacting on Mary cod and lungfish populations in comparison to less disturbed reaches further upstream.

Other vertebrates

More significant implications for Mary River turtle via habitat changes downstream (especially vegetation encroachment onto sand bars) and effects arising from the dam pondage (including loss of sand bars by inundation and possibly increased predation by large-bodied predatory fish that are favoured by impoundments including indigenous species such as fork-tailed catfish and stocked species). Dam development may lead to increased spread of cane toad.

General statement concerning the catchment

The Mary River catchment has significant ecological conservation values, as it is situated in a biogeographical transition zone between tropical and temperate environments, and supports a large number of plant and animal species of high conservation significance including species that are endemic¹ to the catchment (Mary River cod, Mary River turtle – both listed as endangered under EPBC; the significance of the Mary River turtle has also been recognised internationally by IUCN) or have restricted geographical ranges (e.g. lungfish [listed as vulnerable under EPBC] and a number of endangered frog species). The Mary River is the best remaining option for restoration and protection of the lungfish and Mary River cod². It is the only river where the endemic Mary River turtle can be restored and protected. It is also the only large river in South-East Queensland without a major mainstream dam.

Impacts in the impoundment

The construction of new dams in both options would lead to significant geomorphological, ecological and water quality changes in the dam pondage areas resulting from conversion of river, floodplain and upslope habitats to dam impoundments (as noted in the introduction above). All of the dams under consideration would flood regional ecosystems of conservation significance.

Fish migration

Traveston Dam would pose a greater impediment to the movement of migratory fish species³ as it is situated lower in the catchment and commands a greater proportion of the total catchment area than the Four Dams (Traveston Dam commands a catchment area of 2,110 km², compared with a total of 1,064 km² for the Four Dams)

EPBC species

Traveston Dam would not affect upper catchment ecosystems, except as a result of major reductions in connectivity with downstream areas (and hence, opportunities for biota to access upstream habitats), but would have greater impacts on the middle and lower Mary River than the Four Dams option⁴. Like the Four Dams option, the Traveston Dam option would affect species of conservation significance, including the Mary River cod, lungfish, Mary River turtle and endangered frogs.

Turbidity

There is a significant risk that water released/spilled from Traveston Dam would be turbid (due to the “averaging” effects of the dam pondage on turbidity resulting from the storage of turbid flood flows⁵, as well as potential sources of fine suspended and colloidal material in the dam resulting from the dispersal of sodic soils and (wind or boat driven) wave-induced turbulence) – further investigations would be required to quantify this risk, particularly expert soils assessment in the pondage area.

Lungfish and Mary River Cod

Both options (Traveston Crossing and Four Dams) would lead to reductions in natural habitat and spawning grounds for Mary River cod and lungfish.

Mary River Turtle

Both options (Traveston Crossing and Four Dams) would have negative implications for the Mary River turtle based on existing knowledge of its distribution, habitat and breeding requirements, but the risks to this species could potentially be greater with Traveston Dam than the Four Dams. If the waters spilled/released from Traveston Dam become highly turbid, ecological changes associated with downstream effects of the dam (including loss of unvegetated sand bar habitat resulting from mud deposition and vegetation colonisation, as well as changes in aquatic habitat and food resources) could potentially contribute to the demise of natural populations of this species

Conclusion

The statement that the environmental health of the Mary River will not be significantly affected by a large dam at Traveston Crossing because end of system flows will be maintained in excess of 85% of pre-development flows is simply not supported by the comprehensive scientific investigations that have already taken place during the formulation of the Mary Basin Water Resource Plan. Even if 85% of pre-development mean annual flow volume is maintained at the river mouth, the likely environmental impacts of a markedly altered cease-to-flow regimes in the estuary, and severe changes to the flow regimes in the middle reaches of the river in critical habitats for lungfish, Mary River Turtle and other species will be severe and difficult or impossible to mitigate. Because of the incredibly variable nature of flows in the Mary River, the ability to maintain 85% MAF at the river mouth is simply a consequence of the fact that the dam will have a negligible effect on mitigating the large flood events in the Mary River.

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APPENDIX B : Failure to meet Environmental Impact Assessment process at Paradise Dam

Concerns regarding the assessment process used for Paradise Dam by the State Government: (PDF)
http://www.publish.csiro.au/?act=view_file&file_id=EC122p18.pdf

1. The Environmental Impact Assessment (EIA) process did not achieve its potential as there were not specific Terms of Reference for the project. The Terms of Reference set out generically in the Bundaberg 2000+ project were not sufficiently specific for this major project.
2. The integrity of a process of EIA was diminished as a public decision-making tool when the government commitment to the project was announced before the EIA had commenced.

The process did not give adequate consideration to a sufficient range of alternatives to the dam for meeting water resource needs. It failed to include those identified by other water planning and assessment initiatives in the district. The Least Cost Planning Study commissioned by QLD Government EPA “Using these costed options a Hybrid Option has been developed, which achieves the requirements of the Paradise Dam but with significant additional financial, social and environmental benefits” page v Executive Summary “Burnett Region Least Cost Planning Study” UTS Institute for Sustainable Futures, March 2002

3. The integrity of other planning, especially in this case the Water Resource Planning process, is not maintained when it can be replaced by special project legislation affecting the core area of the Plan.(Details)
4. The public was not informed at any time that the EIA results would be used to amend the Water Resource Plan.
5. The new published framework for assessing the economic viability and ecological sustainability of new water infrastructure was not used in the assessment of Paradise Dam eg (“A Critique of the Economic Viability of the Burnett River Dam Development: Predicted Levels of Future Water Demand According to the Irrigators Ability to Pay for COAG Compliant Water” Dr. John Ward June 2004)
6. The integrity of the EIA process was diminished by the release of new reports and the undertaking of hydrological modelling after the completion of the EIA.(List new reports and details from modelling that were important)
7. The assessment and its evaluation were not independent. The proponent of the project was also the primary evaluation group. There is a potential conflict of interest between the Dept State Development and the proponent given that the Minister was the primary shareholder of Burnett Water.

8. Extensive research and consultation undertaken as part of the WRP process was ignored in the case of Paradise Dam and similarly is being ignored with the Mary River. Major water resource developments should not be conducted in this way(List references)
9. The process did not meet Principle 6 of the COAG agreement which states - "*Further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained.*" (Section 4.2 "A Critique of the Economic Viability of the Burnett River Dam Development: Predicted Levels of Future Water Demand According to the Irrigators Ability to Pay for COAG Compliant Water" Dr. John Ward June 2003)
10. All research documents were not released for public comment or considered in the EIA process. Documents included
 - "Ecology and demography of the Queensland lungfish (*Neoceratodus forsteri*) in the Burnett River, Queensland" S.G. Brooks & P.K. Kind Final Report QDPI may 2002.
11. Insufficient time for considering review of the technical information in the IA and related supporting studies. (The period (20 days) for the public to research and respond to the IA documents was inadequate. The period (14 days) for the government agencies to research and respond to the EIA documents was inadequate)
12. All the studies known to be prepared for this, and related projects, were not finalised satisfactorily and accessed in the EIA. (List documents)
13. Process did not follow open, facilitative procedures: It was not transparent and readily accessible, with a traceable record of assessment decisions and timely opportunities for public involvement and input at key stages.(Give examples)
14. Lack of rigorous follow-up and feedback on explicit measures for checking on compliance with conditions, monitoring effects, managing impacts, and auditing and evaluative performance. In the DNR Annual Report 2004/2006 Burnett River Catchment:

Section 4.3 ROP/IROL Monitoring

The IROL requires SunWater to monitor and report tailwater and headwater quality data at the majority of its storages, including dissolved oxygen, conductivity, pH, temperature, nutrients and blue green algae. During the reporting period there were periods when frequency of monitoring for blue-green algae were not implemented as required by the Blue Green Monitoring Manual. This was reported in SunWater's Annual Report as an oversight.

Section 4.3.1

"Monitoring data transfer and annual reporting from SunWater were completely satisfactory. The appropriate parameters were monitored and reported within reasonable limits. However, the reporting of water movement for the reporting year was in an unsuitable format for NR&M to assess.
15. The Burnett river dam was named by the World Wildlife Fund as one of the 10 worst dams constructed in the last five years. The dam is cited for the lack of transparency in the assessment process, its economic viability and the major threat it poses to Queensland lungfish. "To Dam or Not To Dam: Five years on from The World Commission on Dams" 2006

APPENDIX C : Concerns regarding the Traveston Crossing Dam proposal process:

1. Numerous reports and documents have been withheld from the community, although some of these reports are still advertised as being freely available on the Queensland Department of Natural Resources, Mines and Water website. Unexplainable delays in getting hydrological modeling data for the draft Mary Basin Water Resource Plan (WRP) Appendix A. Although we did receive the WRP Appendix A in November after 5 months of requesting, we have also asked for and still don't have modeling results for the current Traveston Crossing Dam proposal.
2. Fishkill database removed from EPA website and censored report made available to public relating to a Mingo Crossing fish kill (May 2006) which extended for 17-20km in the Paradise Dam.
3. Dam wall drilling and design suppressed. We haven't been provided with the summary reports for the initial geological drilling, or any reports for subsequent/more recent drilling, or any of the seismology reports. All despite numerous requests, and promises from Government and QWIPL representatives (eg Peter Beattie in July Gympie meeting, Scott Smith at Kandanga August meeting, Anna Bligh at Gympie November meeting).
4. We had to apply under the *Freedom of Information Act* 1992 (Qld) for access to the following documents with limited success:
 - All documents relating to the functioning of the fish ladder on Paradise Dam on the Burnett River, including but not limited to documents addressing:
 - the mechanical operation of the fish ladder;
 - the species and numbers of fish recorded to have successfully negotiated the fish ladder both upstream and downstream of the dam wall; and
 - assessments of the effectiveness of the fish ladder;
 - All documents relating to assessment of the effectiveness of the fish ladder on Walla Weir; and
 - All documents relating to the implementation of the Lungfish Flow Strategy.
5. Incorrect statements from Premier Peter Beattie regarding:
 - Performance of fish ladder at Paradise Dam.
 - Performance of hatchery at Paradise Dam .
6. Inadequate costing and management of aquatic weeds in Paradise Dam (Reference Press Release “Volunteers left to clean up Burnett Catchment”)
7. Unfair confusion about volunteer land resumption before project approval. The yield and capacity of the Traveston Dam, and consequently the inundation area, has changed on many occasions during the last 6 months leading to a high degree of uncertainty within the community.
8. Not in compliance with IGA National Water Initiative (Turnbull) for transparency and community consultation.
9. Impacts under EPBC Act cannot be mitigated. Evidence being withheld in Burnett Stage 1 Program of Actions reports not released to the public. Anna Bligh has made a press release regarding the reports are almost finished??.
10. TAP reports for WRP and “A long term solution” discounts hydrological impacts on RAMSAR and world heritage listed areas:
11. Mary Water Resource Plan treated differently to Moreton Water Resource Plan.
12. Current concerns regarding the Mary Basin Water Resource Planning process. Delegates of the MRCCC have been closely involved in the Community Reference Panel (CRP) for the Mary Basin Water Resource Plan (WRP). The formally appointed Community Reference Panel members have advised that they were ‘profoundly deceived’ by the State Government during the formulation of the plan and have publicly withdrawn their support for the process. Subsequent to the CRP involvement, the Queensland Government made significant changes to the WRP between the release of the Draft Plan in November 2005, and when the Final Plan was endorsed by Cabinet in June 2006 to accommodate the Traveston Dam. There report relating to explanation of these changes is months overdue (should be 30 days).

13. Sediment transfer within the catchment has been modelled by Department of Natural Resources using SEDNET. This is data that could be used to predict the effective life of the dam from a sedimentation point of view but there was no willingness to discuss this with the Community.
14. Numerous community consultations with very little feedback on issues raised.

Appendix D: Detailed Construction Activities

The following list was been extracted from the referral document supplied by the Proponent. Activities to be undertaken as part of the construction of the dam include:

Spillway on right abutment

- Excavate rock for spillway
- Concrete works for spillway crest
- Concrete works for spillway gates
- Supply and install spillway gates

Alluvial flats

- Excavate alluvium
- Foundation grouting and surface preparation
- Construct RCC or earth embankment

OR

- Minimal alluvial excavation
- Foundation strengthening including construction of cut off wall
- Construction of earth embankment on alluvium

Left abutment

- Excavate foundation
- Foundation grouting and surface preparation
- Construction of earth embankment

Temporary works

- River diversion during construction through partially completed spillway excavation including provision for temporary fish transfer
- Earth coffer dams upstream and downstream

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

Existing or potential quarries and pits could supply the required quantities of clay, filter sand, concrete aggregate and material for rip rap. Rockfill for the embankment will require the development of a new quarry. A potential site for this is being investigated near the site of the proposed dam wall. Access roads to the dam will be constructed to facilitate construction and be maintained as permanent dam access.

It is anticipated that the services and infrastructure listed below will be affected by Stage 1 of the inundation and that some of these will need to be replaced or reconfigured (see **Figure 2**). It should be noted that relocation may be to the Stage 2 planning levels as it would be inefficient in some circumstances to relocate twice; the Bruce Highway is one such example.

- Noosa Shire water supply intake. The Shire currently draws water from the Mary River catchment near Coles Crossing and the current abstraction point will be inundated;
- an extensive network of powerlines including 1 kilovolt (kV), 11 kV and 33 kV. The 33 kV powerlines connect areas surrounding the study area;
- Telecommunication infrastructure;
- Sections of the Bruce Highway, Gympie-Brooloo Road, Kenilworth-Skyring Creek Road and many roads joining these in the project area. The length of the Bruce Highway impacted by Stage 1 is approximately 4.5km. The length of new road required to replace it (beyond Stage 2 inundation) will be approximately 10km. The total length of local roads impacted by Stage 1 is approximately 40km. Many of these roads will be replaced along with new access to properties.
- Local government infrastructure;
- Federal Community Hall may be effected by relocation of the Bruce Highway;
- Small parts of the town of Kandanga, will experience increased flooding; and
- Private infrastructure such as houses (76), pumps and sheds.

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

- Kandanga has a range of buildings and services typical of small country towns. Initial

- planning for Stage 2 indicates that there may be considerable inundation of lower lying parts of Kandanga, including the cemetery, but no inundation of Imbil. Two buildings of cultural heritage significance; Federal State School's lower playing fields and Federal Memorial Hall are within the Stage 2 inundation area.
- The Valley Rattler is a restored World War II steam train that runs between Gympie and Imbil. A section of the railway line passes through the Stage 2 area of inundation;
- At Stage 2 the length of local road impacted rises to approximately 75km; and
A more significant degree of impact on power infrastructure would also be expected.