The Secretary
Senate Rural and Regional Affairs and Transport
Parliament House
Canberra ACT 2600
18th March 2007

Dear Sir/Madam,
Re: Inquiry into Additional Water Supplies for South East Queensland - Traveston Crossing Dam Information

The purpose of this submission is to provide information for the Senate Inquiry.
I am a landholder within stage 1 of the proposed Traveston Crossing Dam and my family have owned the farm for 30 years. I am second generation grazier and bought the property off my parents about 20 years ago and have worked 2 jobs for most of my life to do that. I grew up in the Mary Valley and strongly believe this beautiful valley and river, with its thriving farming area on prime agricultural land (Class A), its unique environment and rural community should be preserved as it is for future generations.

My working background has included 18 years of environmental management in the mining industry. My last employment position was with Western Mining as Environmental Coordinator at Mt Keith Nickel mine from 2001-2006. While working part-time with WWF 1998-2001, I canoed/walked over 300km of the Mary Catchment streams (including all of the proposed inundation area for the Traveston crossing dam and downstream to the Mary River Barrage wall), mapping the condition of the streambank vegetation, the occurrence of weeds (both terrestrial and aquatic) and Mary River Cod habitat.

I manage 2 cattle properties, a breeding block in the Kilkivan shire drought declared over a year ago (and within a 1 hour drive of the Mary Valley) and ironically my 170 acre home property is now threatened to be flooded by a dam proposal and is now drought declared also. My life has been turned upside down from day 1 of this announcement, my time being mainly spent in helping people in my community through this stressful time and helping in educating the general community of the potential likely environmental impacts. My landcare projects have been put on hold, while my 77 year old father and my sister have kindly helped to keep the home property running and weeds under control. My father has been through this stress before in 1992 when the dam was proposed but when evaluated was found to be unacceptable for social and environmental reasons. **What has changed now**?

I endorse the Save the Mary River Coordinating Group's (STMRCG) submission to the Senate Inquiry and which I collated the environmental section.

I include in my submission the following 3 documents as evidence of the potential environmental impacts and would be prepared to answer questions in front of the Senate Inquiry.

1. The Environmental Protection and Biodiversity Conservation (EPBC) Act submission from The Save the Mary River Coordinating Group to the Federal government for the project **Reference Number 2006/3150 15 November 2006** Queensland Water Infrastructure Pty Ltd (QWIPL)/Water Management and Use/Mary River/Queensland Traveston Crossing Dam that I collated on behalf of the Research Section of our Group.

2. The submission from The Save the Mary River Coordinating Group to the Coordinator General for the draft Terms of Reference for the Environmental Impact Statement for the Traveston Dam Proposal that I collated on behalf of the Research Section of our Group.

3. My personal submission to the Coordinator General for the draft Terms of Reference for the Environmental Impact Statement for the Traveston Dam Proposal.

In particular, the following five issues are summarized and four recommendations made:

- The river is overallocated already, the water resource plan is flawed and the river's water quality for dissolved oxygen and salinity is outside the Queensland guidelines for Water Quality for a large proportion of the time NOW! without building Traveston Crossing Dam or raising Borumba Dam. Submissions to the Senate Inquiry by Steve Burgess and Darren Edwards (Research Section of the Save the Mary River Coordinating Group) has shown this conclusively using the governments own modelling techniques.

  The current Mary Basin Water Resource Plan (WRP) intends to minimise the impacts of changes in flow regime through the setting of environmental flow releases. This 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.).
  Recommendation: Steve Burgess and Darren Edwards present a summary of their research to the Senate Inquiry Committee. That the Senate Inquiry ask the government to make public all documents that scientifically prove that there is 150,000ML/annum strategic reserve in this catchment.

- There has been a lack of community involvement in the decision making process and the communication process. There should have been a strategic environmental impact assessment to look at all the options for water supply in SEQ before this decision to propose this project was ever announced. No documentation about decision making or least cost planning studies comparing other alternatives to building this dam have been provided even though the Government makes statements in the media about a transparent and "nothing to hide" process.(attached is an audio of a 4QR radio interview 26th Feb 07 with Senator Barnaby Joyce, Duputy Premier Anna Bligh and Glenda Pickersgill from Save the Mary River Coordinating Group)

  Since the April 2006 announcement, there have been lots of public DNR meetings in the towns upstream of the proposed wall to gather issues and each meeting got more confusing as information kept changing including the maps. However there have been no downstream information nights. Statements that there will be no significant impact because there will be 85% flow rate at the river mouth is fundamentally flawed. The downstream communities have a right to be involved and informed ….communities around Tiaro on the Mary River Barrage and fisheries down stream to Hervey Bay are still being affected by the environmental impacts from the building and operation of the Mary River barrage after 20 years where no compensation has ever been paid for the impact.
  Recommendation: Roger Currie presents his submission on the Cost Benefit Analysis of the Traveston Dam Proposal. That the Senate Inquiry ask the government to make public all documents relating to how the decision was made that Traveston Crossing Dam, the project cost benefit analysis, the breakdown of how the $1.7 billion was arrived at and what is the cost estimates of future compensation for the social, economic and environmental impacts including downstream impacts.

- There are significant failings in the Paradise Dam on the Burnett River. It is recommended that EPBC act compliance auditing of Paradise dam is conducted, to get a clear understanding of the performance and consequences arising from the Beattie government's only other attempt to build and

operate a dam. The Paradise Dam was built by a private company with the same CEO and directors as involved with QWIPL and must be held accountable for their actions. Submissions to the Senate Inquiry by David Kreutz (Research Section of the STMRCG) has listed a number of commitments to protect matters of national significance that have not been met.
Recommendation: David Kreutz present a summary of his submission to the Senate Inquiry Committee. An EPBC act compliance auditing needs to be conducted on Paradise Dam and an independent Environmental Assessment is required for the Traveston Crossing Dam project to avoid the shortfalls of the EIS process that occurred at Paradise Dam.

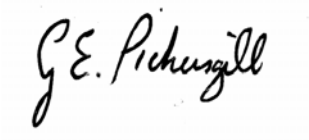
- I endorse the findings of the independent study funded by The Council of Mary River Mayors on "Review of water supply –demand options for South East Queensland". The Queensland Government has indicated that this Dam is required as part of their response to the current drought. However, the Dam would not be completed until 2011 and therefore cannot help with the current drought. In terms of future water requirements, including requirements during future droughts, the report commissioned by the Council of Mary River Mayors found that **neither the Traveston Crossing Dam, nor any other Dam is needed** (such as the proposed Wyaralong Dam west of Brisbane).

  The report recommendations are considerably cheaper than the proposed dam, are based on the same figures for population growth and water demand used by the Queensland Government and do not require that South East Queensland is placed on long term water restrictions. ***How can it be that the Queensland Government has made this decision to spend the tax dollars of Queensland on a multi-billion dollar piece of unnecessary water infrastructure to provide expensive drinking water to the residents of Brisbane?***
  Recommendation: That the Senate Inquiry ask the government to make public all documents relating to what future use is planned for the 150,000 ML/yr of water. There is evidence that given the supply-demand options being put in place now to deal with the drought, will supply enough water out to 2050. Is there a nuclear plant requiring the water being planned for the Sunshine Coast or could the water be planned for the coal industry via the "water grid".

- The announcement of the Queensland Government to increase recycling water and to improve water treatment so it is safe to return back to existing empty dams is commended but requires more education and a rating system for quality. I include and endorse in my submission, a submission from Jenifer Simpson who has developed an excellent education booklet and 3 education videos that could be used extensively across Australia for educating the public on water recycling.

I trust that all the issues which I have raised plus those raised by the Save the Mary Coordinating Group are considered by the Senate Inquiry. I request to be considered a representative for the Save the Mary River Group on matters relating to the environmental impacts should the Senate inquiry Committee require more details. Finally, if any part of this submission is unclear, or if you require further information please contact the undersigned.

Yours Sincerely,



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Wheezer the lungfish says, "Save the Mary River!"

Dam the Mary River? Save the Mary River!

Save the Mary River Coordinating Group
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Director
Referrals Section (EPBC Act)
Approvals and Wildlife Division
Department of the Environment and Heritage
GPO Box 787
CANBERRA ACT 2601
Email address: epbc.referrals@deh.gov.au

28th Nov 2006

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

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

2. Migratory species protected under international agreements

Terrestrial

a. Monarcha trivirgatus (Spectacled Monarch)
b. Monarcha melanopsis (Black faced Monarch)
c. Rhipidura rufifrons (Rufous Fantail)
d. Myagra cyanoleuca (Satin Flycatcher)

Marine

a. Megaptera novaeangliae (Humpback whales)
b. Balaenoptera acutorostrata (Dwarf minke)
c. Eubalaena australis (Southern Right Whale)
*d. Dugong dugong (*Dugongs)
*e. Caretta caretta (*Loggerhead Turtle)
f. Chelonia mydas **(**Green Turtle)
g. Dermochelys coriacea (Leatherback Turtle)
*h.Lepidochelys olivacea (*Olive Ridley)
i. Natator depressus (Flatback Turtle)
j.Tursis truncatus (Indo Pacific Bottlenose)
k. *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 endemic[1] 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 poulations 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).

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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.

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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 Dagun 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 it's 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

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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 Dagun 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 Dagun 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 Tiaro & 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. Survivoral 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 macururs* 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 asembleage 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 ieratus* (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 12.11.14. (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.

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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 (Cooloola 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 though 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 conjuction 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 peelii mariensis(* Mary River cod)

The *Maccullochella peelii mariensis* (Mary River Cod) is an endangered species (listed under the EPBC Act 1999) endemic to the Mary River system. *Maccullochella peelii 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 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). 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 likelyhood 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 s*ummarized 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 attemptiong 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 $m^3 s^{-1}$. This is well below the climatological mean value for that period which is about 12 $m^3 s^{-1}$

(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 $m^3 s^{-1}$, 15 % were larger than 122 $m^3 s^{-1}$, and 20 % were larger than 88.9 $m^3 s^{-1}$. 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 $m^{3}s^{-1}$, 15 % were larger than 87 $m^{3}s^{-1}$, and 20 % were larger than 65 $m^{3}s^{-1}$, 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 $m^{3}s^{-1}$ 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.

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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 turbined 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.

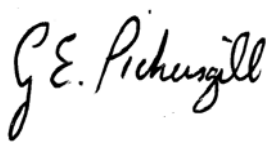
It is a significant concern to our members and the local community that so many matters of national environmental significance are likely to be significantly impacted.

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 Dagun 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 Dagun 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 Dagun 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")

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

	000b	**002b**	**N007**
IQQM scenario	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)

	000b	**002b**	**N007**
IQQM scenario	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** Pre-development	**002b** Current development	**N007** 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** Pre-development	**002b** Current development	**N007** 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 endemic[1] 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 cod[2]. 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 species[3] 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 option[4]. 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 flows[5], 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.

References

Queensland Parliament (2006). Water Resource (Mary Basin) Plan 2006. Subordinate Legislation 2006 No.192 under the Water Act 2000.

Queensland Department of Natural Resources and Water. (2006) Water for South East Queensland – A long term solution.

Brizga S. (2005). Mary Basin Draft Water Resource Plan Environmental Flow Assessment Framework and Scenario Implications. Mary Basin Technical Advisory Panel, Department of Natural Resources and Mines

Department of Natural Resources and Mines (Qld.) (2005) Hydrologic Impacts of Water Resource Management Scenarios (prepared by NR&M Water Assessment as appendix A of Mary Basin Draft Water Resource Plan Environmental Flow Assessment Framework and Scenario Implications)

Department of Land and Water Conservation (DLWC) (2004) Integrated Quantity and Quality Modelling (IQQM) Reference Manual. NSW Department of Infrastructure Planning and Natural Resources.

CSIRO(2006). River Analysis Package (RAP). Cooperative Research Centre for Catchment Hydrology. CSIRO.

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 distric. 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 Inititiative (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.

Save the Mary River Coordinating Group
Support and Information Centre, Kandanga Railway, Ph: 5488 4800
http://www.savethemaryriver.com

PROJECT MANAGER – TRAVESTON CROSSING DAM PROJECT
SEQ INFRASTRUCTURE (WATER)
THE COORDINATOR-GENERAL
PO BOX 15009
CITY EAST QLD 4002

Dear Sir,

Re: Submission on the draft Terms of Reference for the EIS - Traveston Crossing Dam proposal.

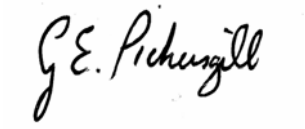
The purpose of this submission is to provide feedback on the Draft Terms of Reference (ToR) for an Environmental Impact Statement dated December 2006 regarding the proposed Traveston Crossing Dam.

The Save the Mary River Coordinating Group Inc (STMRCG) is a community based group formed two days after the Queensland Government's surprise announcement that it intended to dam the Mary River at Traveston Crossing. It has a committee comprising of landholders in the region of the dam footprint; a membership of over 200 members and demonstrated very substantial community support for its legitimacy and its actions. It has members from a wide range of professional backgrounds including expertise relevant to the issues required to be addressed in the EIS.

STMRCG requests that it be considered a stakeholder in the ongoing consultation process concerning the project and in the Resource Operations Plan that would license its operations under the Water Act 2000 should the project be approved. It also requests that this submission on the draft ToR be considered as a submission to the EIS itself.

STMRCG strongly advocates the publication of a final draft Terms of Reference for a critical review prior to the ToR being provided to QWI Pty Ltd. The community view is that having gone to the expense and taken the time to provide input into the Draft ToR process, contributors should have the opportunity to understand the Government's treatment of suggestions and in particular, explanations as to why any of the suggestions provided are not included. Similarly this should also apply for the Supplementary EIS prior to submitting to the Federal Government for consideration. You confirmation that this will be the case will be appreciated.

Finally, if any part of this submission is unclear, or if you require further information please contact the undersigned.
Yours Sincerely,



Glenda Pickersgill *on behalf of the Research Section of the Save the Mary River Coordinating Group Inc*
Ph 07 54843150 Email: pickerg@tpg.com.au

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Summary Recommendations

Stage 1/ Stage 2 split assessment: The original EPBC referral must be withdrawn and a referral of the full project – taking 150,000 ML/year out of the Mary River Catchment including:

- Traveston Crossing Dam Stages 1 and 2
  (including pipeline, distribution and water treatment),
- raising Borumba Dam and
- the northern pipeline interconnector, be re-submitted to the Federal Minister for the Environment and an independent environmental assessment is required.

The water treatment, distribution infrastructure costs and impacts must be included for all planned removal of water from the Mary River Catchment

The project and alternatives must be subject to a comparable cost/benefit analysis method and scope, and this be a multiple-criterion methodology, rather than a simple one-dimensional analysis.

The following National Action Plans and Agreements relating to catchment management and climate change must be referenced in the Terms of Reference:

- Intergovernmental Agreement on the Environment (IGAE),
- National Biodiversity and Climate Change Action Plan (NBCCAP) 2004-2007,
- National Agriculture and Climate Change Action Plan 2006-2009 and
- National Action Plan for Salinity and Water Quality

Six months is insufficient time for the completion of an appropriately documented and comprehensive EIS for a project with such a large and significant impact. If the public is to have confidence in the process and the Federal Minister is to make an appropriate assessment, then more time is required for the EIS process**.**

That Population Viability Analysis (PVA) and Population and Habitat Viability Analysis or Assessment (PHVA) are included in the analytical tools used in evaluating the risks of extinction from this project on all threatened and endangered species that occur in the Mary Catchment, Ramsar Wetlands and World Heritage areas downstream. The Environmentally Sustainable Development (ESD) Charter should be referred to in the ToR, in particular, the need to adopt the 'precautionary principle' where the environmental impact of actions is not fully known

The wider public health risks of the project must be assessed by an accepted Health Impact Assessment methodology (Department of Health 2001) as a specific and separate component of the EIS. This needs to encompass issues such as mosquito borne disease, water borne disease, blue green algal toxins, manganese and other heavy metals and the potential impact of the transfer of toxins and pathogens between catchments and include impacts on all downstream water users including the Barrages**.**

The extent of the project must include the geographic scope of project's impacts - the entire catchment of the Mary and its tributaries, the extent of coastal waters influenced by changes in freshwater flows to the Great Sandy Straits and Fraser Island, and the water distribution infrastructure and associated water bodies. In addition, the boundaries of any proposed catchment declaration under the Water Act 2000 need to be fully described.

The current Mary Basin Water Resource Plan needs to be reworked to provide adequate scientifically based environmental flows to critical downstream locations at Dagun Pocket (an important breeding ground for the Australian Lungfish and Mary River Tortoise) and at the Mary River Barrage to protect the Ramsar wetlands.
The effects of the proposal on the interaction between groundwater and surface water flow regimes in the Mary Valley must be quantified and the surface flow modelling and water allocation framework of the WRP for the catchment must be reworked to account for this.
A thorough re-examination of the hydrology of the Mary River Barrage is required to enable the fresh water flows past the barrage to be accurately measured and monitored as part of the co - operating conditions of the proposed dam and the downstream barrage.

Cumulative impacts need to be assessed in a holistic manner and not by only the incremental impacts of the project. Existing environmental, social and economic pressures within the catchment need to included, considered with the impacts from this project, and added to the existing threats to the EPBC species which also occur outside the catchment. Environmental cumulative impacts need to include impact from the series of barrages/weirs/dams of the Mary and the Burnett rivers. The TOR should require assessment of potential increase hypersalinity levels in Hervey Bay due to reduced river flow and its effect on coastline coral ecosystems. The change in salinity regimes within Hervey Bay has the capacity to affect hump back whale visitations, upon which a major proportion of Hervey Bay's tourist economy depends.

Modern internationally acceptable social impact assessment and management principles need to be detailed in the TOR. This must include a comprehensive socio-economic baseline study and the data collection methods outlined. All alternative projects need to be assessed in terms of comparative socio-economic impact. Responsibility must clearly be defined between government departments, QWI Pty Ltd and the Task Force. To address the abuse of process – land acquisition before approvals and bullying associated with that, the EIS should include an authoritative investigation as to whether the land purchase negotiations undertaken by the proponent (as a limited company) comply with the provisions of the Trade Practices Act, particularly with respect to unconscionable conduct, (sections 51ac and 51aa).
Detailed recommendations follow for each section of the ToR.

1. Overall comments on the scope and structure of the EIS

Stage 1/ Stage 2 split assessment

It is misleading to only assess the impacts of stage 1 of the project because the operation of the dam at the stage 2 supply level is a direct and foreseeable consequence of the construction of the wall being built to practically its full final height in stage 1. The crest heights of stage 1 and stage 2 are almost identical (QWIPL 2006(a)), and the spillway height is unchanged between stage 1 and stage 2. (Spillway gates that can be installed in stage 1 control changing the height from 71m in stage1 to nearly 80m in stage2). Property purchases are already being negotiated to the full extent of the stage 2 area (QWIPL 2006(b)). Arguments that stage 2 yields may not be required until a much later date are in conflict with the terms of reference used to evaluate alternative water supply options in the Mary Valley, such as a combination of smaller dams or building a very large Borumba dam. All of which have been evaluated in terms of their ability to supply 150,000 ML/year. (NRW 2006, Qld Gov. 2006). As recently as 13/02/07 the Queensland Premier was reported in the Courier Mail outlining his clear intention to proceed with Stage 2 of the proposal.

Recommendation: The original EPBC referral must be withdrawn and a referral of the full project – taking 150,000 ML/year out of the Mary River Catchment including:

- Traveston Crossing Dam Stages 1 and 2
  (including pipeline, distribution and water treatment),
- raising Borumba Dam and
- the northern pipeline interconnector,

be re-submitted to the Federal Minister for the Environment.

Independent Environmental Assessment is required.

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 via the Coordinator General should not be allowed to assess the impact of a proposal put forward by QWIPL. In effect, this is the State Government referring it's own proposal to itself for assessment, akin to allowing a person charged with a serious crime to be a juror at their own trial.

Water treatment and distribution infrastructure costs and impacts must be included

It is not appropriate to regard the additional water treatment and distribution infrastructure associated with the project as a separate project (section 2.3.5 of the ToR). This also seems to be inconsistent with section 2.2.5 of the ToR. Neither the additional water treatment/distribution infrastructure, nor the dam project can fulfil their purpose independently of each other. The location and route of the associated water infrastructure could have significant impacts on matters of national environmental significance under the EPBC Act, and the relatively high treatment and transport costs of water from the storage would impact considerably on its economic performance in comparison with other water supply alternatives. This should also include the northern connector pipeline proposed to take 65ML/day out of the Mary River catchment by 2008 through construction of a pipeline from Lake McDonald to Ewen Mattock dam linking in with Baroon Pkt dam.

Recommendation: The water treatment, distribution infrastructure costs and impacts must be included for all planned removal of water from the Mary River Catchment.

Project and alternatives must be subject to comparable cost/benefit analysis methodology and scope

The terms of reference have a major structural flaw in not specifying a consistent and clearly defined cost/benefit analysis framework to be used in a single comparative analysis of the dam project against a range of water supply alternatives. Sections 1.3.2 and 1.4 of the ToR should be combined, and a clear and consistent list of which costs and benefits fall within the scope of the analysis should be determined and an economic methodology specified for valuing the costs and benefits used in the analysis. For example, how are the considerable evaporative losses from the dam going to be costed? Some method for valuing the environmental services provided by freshwater flow into the Great Sandy Straits RAMSAR wetlands needs to be specified, combined with an economic assessment and ecosystem benefits of the wetlands. Greenhouse gas emissions resulting from inundation and pumping water must be compared with other alternatives being investigated.

Recommendation: The project and alternatives must be subject to a comparable cost/benefit analysis method and scope and this be a multiple-criterion methodology, rather than a simple one-dimensional analysis.

National Action Plans relating to catchment management and climate change and the Intergovernmental Agreement on the Environment (IGAE) must be included.

The Mary Basin is a Priority Catchment under the National Action Plan for Salinity and Water Quality. As such, its management is expected to be subject to particular agreed standards of community consultation, and high standards of managing the risks of declining water quality. Its status as a priority catchment under this national plan specifically links its management to particular strategies outlined in the National Biodiversity and Climate Change Action Plan (NBCCAP) 2004-2007, and the National Agriculture and Climate Change Action Plan 2006-2009. None of these national agreements or the specific obligations on the State Government to incorporate climate change modelling into natural resource planning in the catchment are outlined in the ToR. The performance and impacts of the proposal and its alternatives need to be evaluated within a climate change framework for the EIS to comply with these national policies. In addition to incorporating the effects of climatic trends on streamflow, this also specifically includes evaluating changes to greenhouse gas emissions (carbon and nitrogen compounds) resulting from land use changes. The huge volume of very deep fertile alluvial soil to be inundated, in itself represents a significant carbon and nitrogen sink that is going to change from aerobic to fluctuating anaerobic conditions, which may result in significant emissions of carbon and nitrogen compounds with many times the greenhouse impact of CO2. 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).

The ToR should also address all associated energy demands for dam construction, water treatment and dam operation.

Recommendation: The following National Action Plans and Agreements relating to catchment management and climate change must be referenced in the Terms of Reference:

- Intergovernmental Agreement on the Environment (IGAE),
- National Biodiversity and Climate Change Action Plan (NBCCAP) 2004-2007,

- National Agriculture and Climate Change Action Plan 2006-2009 and
- National Action Plan for Salinity and Water Quality.

Time constraints on the EIS process unrealistic.

While there is no time limit specified in the ToR, the timeframe advertised by the State Government for the EIS does not even encompass one complete seasonal cycle. The reproductive biology of many of the long-lived listed species threatened by this proposal is poorly known, and a study period this brief could not be reasonably expected to give any reliable baseline data from which to assess the risks posed by the project to these species and essential habitats. In a Qld Government commissioned report, Brooks & Kind 2000 recommended that a decadal study of the life cycle and habitat requirements of the *Neoceratodous forsterii* in both the Burnett and Mary Rivers be carried out before further infrastructure was planned

It is also insufficient time to conduct the detailed studies required to quantify the effects of the proposal on the interaction between groundwater and surface water flow regimes in the Mary Valley required (This was not covered by the Mary Basin WRP). The Queensland Government has used the argument that the critical water shortage in South East Queensland justifies the fast tracking of this project. Critical water shortage is also used as a justification for the significant economic risks associated with the dam construction, compensation and infrastructure redevelopment. This is despite the fact that the water from the dam on the Mary River will not help the current water shortage crisis because the construction of the dam will take many years. Construction time alone ensures that there is no way in which this project can provide any public benefit in the current water supply situation. More urgent and appropriate drought measures will need to be taken and those measures will continue to work in future drought or non-drought conditions.

Recommendation: Six months is insufficient time for the completion of an appropriately documented and comprehensive EIS for a project with such a large and significant impact. If the public is to have confidence in the process and the Federal Minister is to make an appropriate assessment, then more time is required for the EIS process**.**

Methods need to be specified for analysis of risks to species and habitats listed in the EPBC legislation

There is no quantitative methodology specified for assessing the risks that the project poses to populations of threatened species and their habitats. The impact on threatened species must consider loss of habitat, connectivity and fragmentation. Population viability analysis (PVA) and Population and Habitat Viability Analysis or Assessment (PHVA) are very useful tools (indeed the only widely-used such analytical tools (Burgman, M. & Possingham, H. P. 2000 and Possingham et al. 2002) in evaluating risks, particularly to small populations and threatened species.

Population viability analysis (PVA) is a modelling tool that estimates the future size and risk of extinction for populations of organisms. It can be used to estimate the probability of a population going extinct over a given time under different scenarios. A PVA is often only one step of a PHVA. A PHVA is a tool to compile, evaluate, and synthesize data and build a framework for conservation actions. It provides an in-depth examination and synthesis of what is known of a species' life history, ecology, management, and other factors to determine courses of action to manage for viable populations. Assessments include consideration of model analysis, habitat management, captive breeding (if appropriate), genetic factors (if appropriate), life history, status, threats, geographic distribution, education and information, other conservation efforts, human demography, research, and any other component deemed necessary (Beardmore and Hatfield, http://www.birds.cornell.edu/pifcapemay/beardmore.htm):

In addition, the Environmentally Sustainable Development (ESD) Charter must be referred to in the ToR, in particular, the need to adopt the 'precautionary principle' where the environmental impact of actions is not fully known. The 'precautionary principle' suggests that the onus must be on the proponent to demonstrate to a high degree of statistical certainty that the project will NOT adversely affect the population viability of the relevant species. The National Biodiversity and Climate Change Action Plan also clearly states that the impact of climate change needs to be taken into account as part of this assessment.

Recommendation: That Population Viability Analysis (PVA) and Population and Habitat Viability Analysis or Assessment (PHVA) are included in the analytical tools used in evaluating the risks of extinction from this project on all threatened and endangered species that occur in the Mary Catchment, Ramsar Wetlands and World Heritage areas downstream. The Environmentally Sustainable Development (ESD) Charter should be referred to in the ToR, in particular, the need to adopt the 'precautionary principle' where the environmental impact of actions is not fully known

Comprehensive Health Impact Assessment must be specified

The project is likely to have significant long term cumulative public health impacts through creating a large area of shallow vegetated water around the fringes of the storage in close proximity to areas of rapidly increasing settlement and development. Mosquito-borne notifiable diseases such as Ross River Virus and Barmah Forest Virus are already present in the Mary Valley, and this vast increase in suitable habitat for the vectors poses a significant public health risk from these and other arboviruses that must be assessed.

Another area of public health risk is related to the likelihood of poor water quality in the impoundment and distribution system, and the downstream effects of low flow on water quality at the Maryborough Barrage. Algal toxins and manganese problems have already caused problems in the catchment (in Lake Borumba and in Amamoor town water supply)(Stockwell 2001) and would be greatly compounded by the likely eutrophic conditions and low oxygen levels in such a shallow, warm storage. In addition, further reduction of flushing flows at the Mary River barrage could contribute to an accumulation of manganese, arsenic, mercury and other toxic metals in the sediments behind the Mary River barrage. All these metals naturally occur in significant quantities in the barrage catchment and have been released by past mining activities. The consequences of a possible accumulation of these metals in the barrage water storage (possibly used for future town water supplies) resulting from the reduction of flushing flows by the dam proposal warrants investigation.

Recommendation: The wider public health risks of the project must be assessed by an accepted Health Impact Assessment methodology (Department of Health 2001) as a specific and separate component of the EIS. This needs to encompass issues such as mosquito borne disease, water borne disease, blue green algal toxins, manganese and other heavy metals and the potential impact of the transfer of toxins and pathogens between catchments and include impacts on all downstream water users including the Barrages**.**

Project area needs broader definition

The ToR needs to define the geographic scope of the project area and its impacts more broadly. The project area illustrated on figure 1 of the initial advice statement for the project does not provide sufficient geographic scope for the impacts of the project.

The Study area should include:

- the flooded zone of the dam
- the upstream sections of the Mary River and tributaries (likely to be affected by reduced water entitlements, land-use conditions and access),

- the downstream freshwater section of the Mary River,
- the downstream tidal/estuarine section of the Mary River,
- the Great Sandy Strait and its Ramsar wetlands and World Heritage Area (Fraser Island),
- the land to be quarried for dam wall material and transport corridors leading to the dam site
- the land that will be affected by the proposed pipeline and treatment plant to appropriate water from the Mary River Catchment to Brisbane.
- The water bodies which will receive the water from the Mary river catchment.

Specific attention must be paid to the riverbanks as far as Bell's Bridge, because of the risks posed by the predictable loss of riverbank stability. The impacts of the water distribution infrastructure associated with the dam obviously extend as far as the water is distributed.
Recommendation: Figure 1 must include the geographic scope of project's impacts - the entire catchment of the Mary and its tributaries, the extent of coastal waters influenced by changes in freshwater flows to the Great Sandy Straits and Fraser Island, and the water distribution infrastructure and associated water bodies. In addition, the boundaries of any proposed catchment declaration under the Water Act 2000 need to be fully described.

Water Resource Plan does not provide environmentally sustainable flows at crucial locations.

The EIS is to be based on a flawed Water Resource Plan with unacceptable low flow Environmental Flow Outcomes. Simply achieving the outcomes listed in the Water Resource Plan will not provide for environmentally sustainable flows at crucial locations in the river. The EIS must be based on the flows which are required to ensure the continued viability of threatened species and habitats. Efforts to minimise the impacts of changes in flow regime in this proposed action are relying 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 (Arthrington et al 2006.).

Detailed analysis of the hydrological modelling 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 Dagun Pocket, (an important breeding ground for the Australian Lungfish and Mary River Tortoise). The statistics indicate that the flow regime will be severely disturbed here, and at the river mouth, where the no-flow regime will be significantly altered from the natural state (Appendix A).

At Dagun Pocket, the modelling shows 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 would be inconsistent with the requirement for high priority regulated water for existing downstream users, including the Gympie town water supply. 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.

Recommendation: The current Mary Basin Water Resource Plan needs to be reworked to provide adequate scientifically based environmental flows to critical downstream locations at Dagun Pocket (an important breeding ground for the Australian Lungfish and Mary River Tortoise) and at the Mary River Barrage to protect the Ramsar wetlands.

Relative importance of groundwater and surface water yields not clear.

Although proposed as a surface water storage, the ToR specifically refers to water extraction from 'target aquifers' (section 3.5.2, page 50) as part of the project. The relative importance of the surface water and groundwater components of the project is not clear in the ToR or in any supporting documentation released to the public to date.

If groundwater extraction is to be a significant component of the purpose of the project, then this needs to be clearly stated in the project description and the implications of this made clear to all stakeholders during the EIS process. Groundwater extraction in the Mary Valley proper is specifically outside the scope of the Mary Basin Water Resource Plan.

A complete reworking of the surface flow modelling and water allocation framework that underlies the Water Resource Plan (WRP) for the catchment will be required, if significant new groundwater storage and extraction is made possible by design of the wall and the geological location of this project (ie using intercepted surface and ground water flows to recharge an underground storage of alluvium and fractured rock), or if the dam wall causes a significant change to the linkage between surface water and groundwater flows in the valley.
Recommendation: The effects of the proposal on the interaction between groundwater and surface water flow regimes in the Mary Valley must be quantified and the surface flow modelling and water allocation framework of the WRP for the catchment must be reworked to account for this.

Freshwater inflows into the Great Sandy Straits need to be measurable.

The EIS is to be based on a flawed Water Resource Plan with unacceptable low flow Environmental Flow Outcomes. Simply achieving the outcomes listed in the Water Resource Plan will not provide for environmentally sustainable flows at crucial locations in the river. The EIS must be based on the flows, which are required to ensure the continued viability of threatened species and habitats.

Currently there is no ongoing measurement or monitoring of fresh water flows past the Mary River Barrage into the sea. This point in the river is the critical link between the river system impacted by the dam proposal and the internationally listed estuarine ecosystems impacted by the proposal. The Mary Basin WRP does not specifically protect these flows and landholder observations at the barrage are that the barrage has rarely overflowed in the past five years (Darryl Stewart 2006 pers. comm).

A thorough re-examination of the hydrology of the Mary River Barrage is required to enable the fresh water flows past the barrage to be accurately measured and monitored as part of the co - operating conditions of the proposed dam and the downstream barrage. Since construction, there has been considerable siltation of the barrage storage and changes to the fishway and spill conditions. This combined with increases to evaporative conditions in the storage because of surface weed infestations now suggest the surface area/storage volume/water level relationships of the storage and the spillway rating curves of the barrage need to be re-calibrated and verified to enable this modelling and flow monitoring to be conducted accurately. This work should be conducted as part of the EIS, because without it, the impacts of the proposal on the listed provisions in the EPBC act cannot be accurately assessed. This should be a high priority for assessing the impacts of the proposal on the river and the regional hydrological cycle. It is essential to know how much water is left to flow to the sea.
Recommendation: A thorough re-examination of the hydrology of the Mary River Barrage is required to enable the fresh water flows past the barrage to be accurately measured and monitored as part of the co - operating conditions of the proposed dam and the downstream barrage.

Principles behind assessing cumulative impacts

Many of the impacts of the project will add to existing environmental, social and economic pressures within the catchment, and add to the existing threats to the EPBC species which also occur outside the catchment. The ToR are not clear as to how the cumulative effects of the project's impacts will be assessed, but hint that only the incremental impacts of the project may be assessed. It is clearly not appropriate to only assess the marginal impacts of the project. The analogy with the straw that broke the camel's back applies. The impact of that straw is not half a gram of extra load on the camel, the impact is the avoidable death of the camel. The way in which cumulative impacts are to be assessed needs to be clearly stated and consistently applied throughout the EIS.

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 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 and fishery 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 effectiveness 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.

Environmental cumulative impacts need to include impact from the series of barrages/weirs/dams of the Mary and the Burnett rivers. 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. 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 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 Straits Ramsar Wetlands and Fraser Is World Heritage Area.

Recommendation: Cumulative impacts need to be assessed in a holistic manner and not by only the incremental impacts of the project. Existing environmental, social and economic pressures within the catchment need to included, considered with the impacts from this project, and added to the existing threats to the EPBC species which also occur outside the catchment. Environmental cumulative impacts need to include impact from the series of barrages/weirs/dams of the Mary and the Burnett rivers. The TOR should require assessment of potential increase hypersalinity levels in Hervey Bay due to reduced river flow and its effect on coastline coral ecosystems. The change in salinity regimes within Hervey Bay has the capacity to affect hump back whale visitations, upon which a major proportion of Hervey Bay's tourist economy depends.

More detail needed on the social and cultural impact assessment

Australia is a signatory to the International Convention on Biological Diversity under which stand the Akwe: Kon Voluntary Guidelines 2004. These are guidelines for the conduct of cultural, environmental and social impact assessment 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. These guidelines are a tool for achieving a reduction in the current rate of loss of biological diversity and should be used in this environmental assessment process to develop an accurate and internationally credible estimate of the likely impact of the construction of the dam on indigenous heritage, on local communities and on biological diversity. In determining the scope of a social impact assessment, the following taken from the *Akwé: Kon* Voluntary Guidelines 2004 must be considered:

(a) Baseline studies;
(b) Economic considerations;
(c) Possible impacts on traditional systems of land tenure and other uses of natural resources;
(d) Gender considerations;
(e) Generational considerations;
(f) Health and safety aspects;
(g) Effects on social cohesion;
(h) Traditional lifestyles; and
(i) The possible impact on access to biological resources for livelihoods.

The Draft Terms of Reference for the EIS and The Community Futures Task Force do not seek to determine comprehensive baseline data of the quality needed for adequate assessment, management and evaluation of the social and cultural impacts. The social impact assessment of the proposal requires a radical change to meet the challenge of assessing and managing the depth and scale of the social impacts of such a large project. A comprehensive socio-economic baseline study needs to be conducted and the data collection methods outlined in the TOR. The Queensland Government needs to commit to implementing modern internationally acceptable social impact assessment and management principles such as those used in these four key reports on social impact assessment (International Association for Impact Assessment (2003), Scudder

1997, Vanclay 1999, World Commission on Dams 2000). The aspects covered in the 'Description of Environmental Values' do not adequately meet the requirements of a baseline demographic study.

There also needs to be a policy document that guide the organisations listed above to ensure affected people's wellbeing during the project evaluation phase and plan in the scenario that the project may not go ahead. EIS process consultation and initiatives undertaken by the Community Futures Task Force should consider the rebuilding of the impacted community for the scenario that this project does not get approved. Already there is harm done by the way this project has been managed and issues to be included (but not limited to) are:

- Property values grossly affected.
- Abuse of process – land acquisition before approvals and bullying associated with that.
- How to return land purchased by the government back to farming.
- How to conserve land purchased by the government that would be suitable for conservation or needs restoration such as riverbanks.
- Encouraging businesses back to the area.
- How to protect our endangered species and our unique valley from future dam proposals.

Secondly, the social impact assessment and management strategies must aim to ensure that the people in the affected area maintain, (as a minimum), project pre-announcement living standards Ideally, these should be improved.

The draft ToR deal with Indigenous issues, in particular the reference to progressing a native title agreement or a cultural heritage management plan with aboriginal parties. This does not adequately capture the importance of Indigenous cultural practices and understandings of the environment, or the importance of preserving the biological diversity of the Mary River area.

To address the abuse of process – land acquisition before approvals and bullying associated with that, the EIS should include an authoritative investigation as to whether the land purchase negotiations undertaken by the proponent (as a limited company) comply with the provisions of the Trade Practices Act, particularly with respect to unconscionable conduct, (sections 51ac and 51aa).
Properties are being purchased by the Proponent well in advance of the necessary approvals being obtained by the Proponent. They state that these purchases are voluntary, and that they are 'standing in the market' to acquire properties. The social impact of this has already been significant and has already had large social and economic effects on the communities of the Marry Valley. In conducting itself in these contractual negotiations, the proponent makes clear that it would have the ability to enact provisions of the lands act relating to compulsory acquisition and to place water storage easements over titles at a latter date, should the project eventually be granted approvals to proceed. Contracts reached under these conditions can in no way be regarded as 'voluntary' on behalf of the landholder, and are aggressively pursued by the proponent's agents with an aim to finalizing contracts within a limited time frame. This situation needs to be accurately recorded and analysed in the EIS and tested against the relevant sections of the Trade Practices Act relating to unconscionable conduct. A ruling made by the Australian Competition and Consumer Commission on this practice should be obtained and published as part of the EIS procedure.

Recommendations: Modern internationally acceptable social impact assessment and management principles need to be detailed in the TOR. This must include a comprehensive socio-economic baseline study and the data collection methods outlined. All alternative projects need to be assessed in terms of comparative socio-economic impact. Responsibility must clearly be defined between government departments, QWI Pty Ltd and the Task Force. To address the abuse of process – land acquisition before approvals and bullying associated with that, the EIS should include an authoritative investigation as to whether the land purchase negotiations undertaken by the proponent (as a limited company) comply with the provisions of the Trade Practices Act, particular with respect to unconscionable conduct, (sections 51ac and 51aa).

2. Comments on part B – specific requirements of the contents of the EIS

1.1 Project Proponent

As a corporation, the proponent is a new entity and such does not have an environmental record to present. It is more appropriate to examine the environmental record of the principal staff and directors of the corporation and the contractors employed in executing the project. An examination of the environmental, economic and social impacts of recent water infrastructure projects managed by the directors, senior staff and major contractors of the corporation is relevant to this section of the EIS. The environmental record in areas of stream management of senior staff conducting the EIS for this project should also be outlined.

A suitable case study would be a thorough appraisal of the performance of Paradise Dam. Have the mitigation strategies in the EIS for that project been successfully implemented? Have the economic benefits outlined in the EIS been realized? Has the project complied with the environmental flow outcomes and water security provisions of the Burnett Water Resource Plan? Have the measures outlined in the Environmental Management Plans for the project been properly implemented? Are the stakeholders identified in that project happy with the outcomes? Has there been successful mitigation of adverse impacts on EPBC listed species in the Burnett catchment? Did the economic outcomes meet predictions for the dam?

This comparison is directly relevant to the proponent of this project – the two projects share the same CEO, the same consulting firm conducting the EIS, the same corporation doing the hydrological planning and operating the storage as is contracted to do the hydrological planning for the current project.

1.2 Project Description

If groundwater storage and extraction is expected to form a significant part of the yield of the project, (as allowed in section 3.5.3) this should be clearly stated in the project description. See comments in section 1 of this submission.

1.3.1 Need for the Project

In addition to the policies mentioned in the 8th dot point, specific compliance with the National Action Plan for Salinity and Water Quality, the National Biodiversity and Climate Change Action Plan, the National Agriculture and Climate Change Action Plan and *Akwe: Kon* Voluntary Guidelines should be specified. See comments in section 1 of this submission.

1.3.2 Costs and Benefits of the Project & 1.4 Alternatives to the Project

See comments in section one of this submission under "Project and alternatives must be subject to comparable cost/benefit analysis methodology and scope." More detail is required on cost benefit analysis.

A full economic analysis of the project is needed including the full cost assessment and like comparison of all water resource options available to supply 150,000Ml. Specific cost analysis and clear articulation of breakdown of costs between projects needs to be undertaken for:

- Roads, bridges, sewerage infrastructure relocation at Imbil, relocation and decommissioning of electricity infrastructure, communications, railway.
- Decontaminating sites including dips, septic tanks, garages
- Property purchase.
- Plan redrafting costs (LG Planning Schemes, Regional NRM Plans, etc).
- Ongoing maintenance costs of all options including aquatic weed management, blue-green algae, vector control and destratification.
- Water treatment costs of water extracted from the dam in light of high sediment catchment with many known contaminated sites.
- Water treatment cost impacts for downstream users (Councils) in light of likely higher pollutant loads in water.
- Costs to transport the water to Brisbane.
- Compensation for effected upstream and downstream users
- Ecosystem service costs for loss of significant areas of remnant vegetation.
- Remnant vegetation offset costs for reestablishment.
- Industry costs including economic evaluation of good quality agricultural land loss, fisheries industry and associated tourism impacts down stream.
- Engineering works for necessary infrastructure (eg bridges) downstream that are affected by future bank instability associated with changes in water flows.
- Bank stabilisation works costs for downstream areas.
- Costs of managing sediment load within dam and costs for managing/reducing sediment entry into dam.
- Cost of land use change within likely controlled catchment area above dam.
- Costs of offsetting the significant greenhouse gas emissions caused by the construction and operation of the dam including greenhouse gases emitted from inundation of land.
- Future engineering works for changes to river geomorphology
- Cost to decommission dam and rehabilitation provision for that money should be set aside throughout the life of the dam (eg $/ML surcharge).

Alternatives should also consider water that could be saved by

- Leakage reduction from repairing and speeding up maintenance plans on existing pipes in SEQ.
- Replacing wet cooling with dry cooling technology for powerhouses.
- Encouraging industries generally to catch and recycling more water on site.
- Auditing large industrial users to ensure that plans are in place to achieve usage reduction targets.
- Stormwater harvesting in urban areas of SEQ be investigated for their potential to contribute to the proposed annual yield required for SEQ.

Recently the Mary Council of Mayors commissioned Cardno and University of Technology Sydney to investigate alternative water supply sources for South-east Queensland. “This Study outlines a robust strategy for meeting the supply-demand balance within the planning horizon of 2050, without needing to construct a dam at Traveston Crossing on the Mary River. This is a strategy that has significantly lower costs, reduced greenhouse gas emissions and reduced environmental and social impact. It also offers an adaptive approach to changing circumstances in terms of yield and demand. This Study also makes a series of recommendations to improve the

transparency and level of community engagement in water planning in SEQ." (Carno and University of Technology Sydney 2007)

Therefore it is recommended the final ToR includes the outcomes of this study in the alternatives section (Section 1.4) and the cost / benefit analysis (1.3.2) section. The Save the Mary River Coordinating Group requests the Coordinator General carefully considers the findings of the Mary Council of Mayors report.

1.5.2 Objectives of the EIS

The 3rd dot point would be more appropriately expressed as:

'determine to what extent environmental …..'

1.6 Public Consultation Process

This process should include an undertaking by the proponent to provide specific technical data regarding the project on request, and describe an independent method of appeal if reasonable and relevant requests for technical information are refused, or false or misleading information is issued in response to such requests. A list of the interest groups / stakeholders which have been consulted with during the EIS preparation needs to be provided. For each of the interest groups / stakeholders an outline of the amount of consultation should be included (for example, the number of meetings help with the group).

2.2.1 Barrier/Embankment Structures

The following dot points need to be included:

- Design and method of operation of spillway gates
- Engineering measures to prevent spillway blockage from floating vegetation and flood debris
- Engineering measures taken to control seepage around and under the barrier.
- an estimated total economic cost to construct the barrier/embankment (materials and labour) be provided.

2.2.2 Site Details including Inundation Area

The following dot points need to be included:

- inundation area for a range of water levels *up to the crest height*
- cross sectional stream profiles and stream flow versus depth rating curves for critical points in the river downstream of the wall as far as Bell's Bridge.

2.2.4 Construction Activities and Infrastructure

The following dot points need to be included:

- full details of any off-site quarrying activities associated with the project.
- full details of any activities taking materials off-site eg gravel, topsoil, timber, houses, sheds, powerlines,
- an estimated total economic cost with breakdown of activities and infrastructure costs (materials and labour) be provided.

2.2.5 Proposed Water Storage Operation

Dot points should include:

- measures taken to control loss of storage capacity through sedimentation
- measures and infrastructure required for de-stratification of the water body
- measures taken to prevent fouling of outlet works and blockage of spillway
- an estimated total economic cost of the operation of the water storage be provided

The last paragraph is inconsistent with statements made later in section **2.3.5**. It is recommended that all water distribution and treatment systems used to distribute water from the proposed projects needs to be part of this EIS process and the intended use defined (Urban or if industrial – what type). The EPBC Act definition of an action - indirect and offsite impacts include: 'facilitated impacts' that result from further actions (including actions by third parties) which are made possible or facilitated by the action. For example, the construction of a dam for irrigation water facilitates the use of that water by irrigators with associated impacts or in this case the water. In this case what is the water to be used for?

Likewise, the construction of basic infrastructure in a previously undeveloped area may, in certain circumstances, facilitate the urban or commercial development of that area. Consideration should be given to all adverse impacts that could reasonably be predicted to follow from the action, whether these impacts are within the control of the person proposing to take the action or not. Indirect impacts will be relevant where they are sufficiently close to the proposed action to be said to be a consequence of the action, and they can reasonably be imputed to be within the contemplation of the person proposing to take the action.

2.2.6 Rehabilitation

It is recommended that an estimated total economic cost of the rehabilitation be provided with breakdown of activities.

2.2.7 Decommissioning

It is recommended that an estimated total economic cost of decommissioning be provided.
All dams should have time-bound license periods. Re-licensing processes should provide opportunities for participatory reviews of project performance and impacts which may lead to changes in project operation, or dam decommissioning. Efficient lifespan of the dam must be predicted using sediment modelling for the catchment and this combined with decommissioning costs be considered in the economic evaluation of the dam. Cost to decommission dam and rehabilitation provision for that money should be set aside throughout the life of the dam (eg $/ML surcharge).

3 Environmental Values and Management of Impacts

As described in section 1 of this submission, there needs to be a credible formal methodology specified to quantify the risks to the EPBC listed species and communities. The burden of proof must be placed on the proponent to demonstrate that the action will NOT increase the extinction risk to these species and communities and in fact should contribute to their recovery plan if already classified as endangered.

3.1 Flooding

The major extreme event that needs to be considered is flooding, and historical intense flood patterns are largely responsible for creating the distinctive soils and landscape of the central Mary Valley in the vicinity of the impounded area. The proposed impounded area is in the depositional zone of the valley where the stream bed gradient changes from the steeper slopes of the major tributaries to the very shallow gradient of the valley floor (NRM 2005). Flood water heights upstream of the wall need to be calculated based on the ability of the spillway to regulate the intense but normally short lived flood flows in this location. As well, the full hydrodynamic impacts at the interface between the upstream inflows and the ponded backwaters of the storage need to be thoroughly investigated within the scenario of likely extreme runoff events. This must also include modeling of sediment loads and deposition within the impoundment and downstream. The effect of flooding riverbanks is likely to have large impact on riverbank

stability within the ponded area. These riverbanks consist of deep unconsolidated alluvium held together by fragile riparian vegetation. This has already been observed in the catchment as a result of the construction of the Mary River Barrage which even now after 20 years has riverbanks continuing to slump and no compensation ever made to Landholders (Stewart, D. 2007 pers. comm). The effects of this on riparian vegetation need to be assessed. Experience in the catchment suggests that it will not be possible to mitigate this impact.

The effect of the spillway in decreasing the peak intensity of downstream flood flows but increasing the duration of high flow and high water level events (QWIPL 2006) is likely to have large impacts on river bank stability for a great distance downstream. These riverbanks also consist of deep unconsolidated alluvium held together by fragile riparian vegetation. This has already been observed in the catchment as a result of the construction of Baroon Pocket dam which resulted in the destruction of riverbanks and sediment infill of the stream bed along the entire downstream catchment of Obi Obi creek (more than 30km) (Braby 2007). This excessive sediment most likely contributed to death of seagrass and impacted on fisheries, dugong and marine turtles in the Great Sandy Straits after the 1992 floods (McLeod 1996). The implications of this effect for infrastructure and downstream of Traveston Crossing requires thorough investigation for impacts on landholders, communities and ecosystems as far as the Great Sandy Straits Ramsar Wetlands. CSIRO research (De Rose et. al, 2002) has already showed that riverbank erosion can contribute upwards of 87% of end-of-valley sediments in the Mary River Catchment.

Community attitudes towards the Mary River have changed significantly over the past decade. Millions of dollars in government funding has been allocated for river restoration, which has helped landholders along the river and other interested community members set up programs to restore the Mary River catchment (Pickersgill et. al. 2007). Landholders and community groups applied for funds for the following activities: tree planting, fence construction, restricted stock watering points, hardened cattle pads (to reduce bank erosion at stock access points), pipework and pumps for reticulation, cattle troughs, riffle placement to slow stream flow, stream bed restoration and the control of woody weeds (Kelly, 1998). In 2004 the Mary River community was awarded the coveted National Rivercare Award for the implementation of the Mary River and Tributaries Rehabilitation Plan. The full economic and social costs of potential collapse of streambanks both in the proposed inundation area and downstream, longer flooding in Gympie and even loss of pasture from prolonged inundation downstream of the dam infrastructure need to be included in the assessment of the projects potential impacts

In addition, there is a risk of the spillway becoming obstructed in one of these major floods due to the large amount of surface vegetation likely to be on the storage, and the large amount of floating debris likely to be deposited into the storage by a violent flood event. The consequences of such an obstruction for people living in areas upstream of the dam wall but lower than the crest height need to be thoroughly assessed in the EIS. The EIS should include the identification and analysis of any similar dams in other parts of Australia or internationally where residents of entire townships (eg. Kandanga, Imbil and Kenilworth) are permitted to live within the catchment of a dam at elevations lower than the crest height of the dam wall.

3.1 Landslip

Apart from the floodplain itself, another defining feature of the wider landscape in the vicinity of the dam wall is landslip and heavily faulted and fractured rock. Any possible interaction of the dam project with increased landslip risks in the wider Mary Valley needs to be thoroughly investigated because of the recorded history of serious landslip events in the valley in the vicinity of the project. The hills to the west of the dam have experienced many past serious landslip

events, contributing in one case to the abandonment of the soldier settlement township of Calico Creek. Rehabilitation of these landslip areas was a significant component of Gympie and District of Landcare funded projects in the late 1990's. The ridge on the eastern abutment of the dam is heavily fractured and faulted, as is clearly shown on the geological maps of the area. The western abutment of the dam wall also adjoins a mapped fault buffer zone. The dam itself lies above an ancient subduction zone intersected by major faults as outlined in the report on the Gympie Special sheet produced as part of the Geological Survey of Queensland and more recent digital mapping. There was recorded seismic activity in the vicinity of Borumba Dam and Moy Pocket in the early 1990's (several events up to Richter 3.6) (GA Australia 2006) which coincided with at least one major landslip event on the western side of the valley on the Dagun escarpment. The compounding risks of high rainfall events, steep slopes at the valley sides, structural weaknesses and possible underlying seismic movement due to natural causes or construction activities need to be considered in tandem when assessing the landslip risk to the project and the surrounding hillslopes.

3.2.1 Land Use and Infrastucture

Description.

Must include salinity hazard mapping from the NAPSWQ. Must include mapping of bank conditions from the Mary River and Tributaries Rehabilitation Plan 2001.

Impacts and mitigation

- Impacts on Good Quality Agricultural Land (GQAL) and other land must include land use restrictions likely to apply to all land in the catchment upstream of the dam, including specifically assessing the full impacts that would occur if the catchment was listed as a Declared Catchment under the Water Act. Specifically, the full extent of the declared catchment area and a clear statement of the full development implications this has for landholders must be publicized as part of the EIS. The full economic and social costs of this declaration need to be included in the assessment of the project's impacts.
- Must specifically investigate the risk of changing groundwater levels, drainage regimes and possible soil salinity on GQAL in the vicinity of the project and at all downstream locations at risk of these effects.
- Must specifically look at impacts on downstream users relating to the removal of streamflow resources from the catchment. (The out-of catchment transfers from the yield of the storage, plus the evaporation and seepage losses incurred by the storage). IQQM modelling prepared for the Water Resource Plan showed that, without allowing for any further extraction from the catchment,, the full utilization of existing water allocations could not be supplied from the river without compromising environmental flows. (IQQM scenario CR025) Must examine costs and risks to riverbank land and infrastructure (riverbanks, fences, pumps, bridges etc) at least as far as Bell's Bridge resulting from changes to the river flow regime in areas of deep alluvial soils.

3.2.2 Topography and Geomorphology

Description

It is recommended that the fluvial geomorphology of the river (from the upper section of the impounded area to the river mouth) should be described and mapped with commentary on significant features that will be affected. This must include but not be limited to cross-sectional stream and riverbank profiles near downstream infrastructure as far as Bell's Bridge, and in the vicinity of proposed new infrastructure in and at the margins of the impounded area. An estimate should be made of river height vs. river flow rate curves at each of these locations.

Impacts and mitigation

Must specifically investigate risks of downstream bank collapse through to at least Bells Bridge.

It is recommended that all fluvial and landscape geomorphic features that will be inundated be investigated, recorded and catalogued. The potential changes to the fluvial geomorphology both upstream and downstream of the proposed dam must be investigated (including the reduction in downstream flow potentially leading to loss of riffles and pools, channel contraction, decrease in large woody debris, tributary channel incision, sedimentation during construction).

3.2.3 Geology and Soils

Description

Must identify possible rock types likely to disturbed by the project that may produce acid rock drainage (ARD), or release toxic compounds (eg arsenic) on oxidation. This has been identified as an issue at the closest quarry to the project, (the Meadvale Quarry operated by Queensland Rail at Tandur). It is also an identified issue with the potential quarry materials at Belli. Should identify toxic metal deposits in the greater Mary catchment that may accumulate in the sediment load in water storages, both at the proposed dam site and at the Mary River Barrage. For example, mercury, bismuth, cobalt, copper, arsenic and manganese have all been commercially exploited in the catchment.

Potential for salinity impacts (both up and downstream of the proposed dam site) on surface water and groundwaters that may be caused by the dam and dam wall should be analysed.
Salinity Hazard Mapping for the Mary River Catchment shows that the dam-site and immediately downstream is in the high to moderately high-risk categories. Therefore it is recommended that a specific section in the EIS investigates salinity impacts to surface waters and groundwaters as a consequence of reduced flows for surface waters, and potential blockage of groundwater flows as a consequence of the dam wall (and sub-surface infrastructure) construction.

Potential threat from seismic activity, geological faults and associate geological hazards must be investigated (including threats to townships from development failure).

Impacts and mitigation

The drainage from sites likely to produce ARD need to be investigated in terms of their effect on EPBC Act listed species and water quality guidelines. For example, Meadvale Quarry drains into the Six Mile Creek catchment and the Belli quarry site may drain into Belli Creek, both significant habitats for EPBC listed species. The sediments accumulated behind the Mary River Barrage must be tested for levels of metals which potentially pose a health risk.

3.3Nature Conservation

As mentioned in section one of this submission, there needs to be a consistent quantitative framework used to analyse the extinction risks to listed species *in their natural habitat.* The burden of proof should be on the proponent to demonstrate that the project will not increase these risks and the precautionary principle applied to this assessment.
The NBCCAP clearly states that in priority catchments under the NAPSWQ, habitat linkages should be maintained to allow populations to move in response to climate change. The specific effects of this proposal on habitat linkages and barriers to species movement both in the riparian zone and in the aquatic habitats of the river and estuary need to be clearly assessed under these agreements.

Past studies of all EPBC listed species need to be listed, reviewed and summarized. The proposed dam needs to be assessed alongside all relevant endangered species Recovery Plans. The success of artificial introductions (particularly in terms of breeding and recruitment), hatcheries and fishways must also be assessed for each species. The impact on threatened species will need to

consider loss of habitat (especially remaining breeding habitat), the present extent of the population not to mention connectivity and fragmentation.

The additional extinction risk posed to threatened species needs to be assessed in the context of the cumulative impacts of this project and other known risks to these species. For example, impacts on the genetic diversity of lungfish need to be assessed together with any reduction in diversity and population viability already brought about by the extensive infrastructure development in the Burnett river system.

This section must include an assessment of the risk of any potential flora and fauna pathogen transfer between and within water catchments, and identify mitigation and management measures

3.3.1 Sensitive Environmental Areas

The EIS needs to specifically identify crucial locations in the catchment where the proposal will have the greatest effect on matters governed by the EPBC act. These sensitive locations need to be the focus of detailed study and assessment and the focal points for any EMPs and licence conditions placed on the project by the ROP and other licensing procedures.
These locations should at least include

- the stretch of river from the dam wall to the mouth of Amamoor Creek,
- the Mary River Barrage,
- the Tinana Creek Barrage
- any areas of remnant valley floor 'scrub' vegetation or riparian rainforest (e.g. Hyne Estate Rd),
- other areas of limited habitat or vegetation critical to any of the listed species, particularly habitats or food sources described in Threatened Species Recovery Plans e.g. Coxen's Fig Parrot, Richmond Birdwing, Grey-headed Flying Fox.

3.3.2 Potential impacts

This section needs to incorporate local climate modification caused by the storage. It is likely that the heat buffer formed by the large body of water would change the frost regime on the valley floor, and thus change the weed spectrum in the area. For example, para grass could conceivably become a problem at the margins of the storage. This weed is not currently a major problem on the valley floor but readily invades water bodies in tributaries at higher elevations. It has become established on the banks of the Mary River Barrage storage.

This section also needs to look closely at the impact of fluctuating water levels over large areas of land on weed dispersal and colonization. The fluctuating water levels in the storage will provide a mechanism for water borne dispersal of weeds over a large area of fertile deep soils. The periodic inundation will repeatedly interrupt ecological succession on the flood plain. These conditions are likely to result in rapid ecological selection for opportunistic colonizer weed species over much of the periodically flooded land in the impounded area and buffers. This would have severe economic impacts on landholders and leaseholders in this area.
As mentioned previously, riverbank collapse with associated riparian vegetation for a considerable distance downstream is a predictable consequence of the changes in river flow patterns resulting from this project. The impacts from loss of this riparian vegetation downstream must be included in the TOR. Experience in the catchment suggests that it will not be possible to mitigate this impact.

3.3.3 Terrestrial Fauna

A description of terrestrial fauna must include the impacts of habitat loss, degradation and fragmentation on the populations of a species outside of the dam footprint as well as within the footprint. Distribution within the dam footprint must be in context with overall distribution of the species. While emphasis may be placed on threatened species the EIS must recognise the importance of Common species and their role in food webs and symbiosis relationships e.g. the reliance of the vulnerable Richmond birdwing butterfly on the Brush turkey through seed spread of the host vine.

Fauna data must be obtained from sources other than fauna studies commissioned by QWI. It must search beyond the realms of Government agencies as community groups and individuals hold a great deal of information. The EIS must detail the relocation policy for wildlife from the proposed inundation area.

"Potential Impacts and Mitigation Measures"

- Cumulative effects of threats must be addressed by the EIS. The effects of vegetation loss and degradation (historical and current), weed and feral animal invasion, climate change, industry and agricultural outputs, soil degradation and erosion, disease etc from all activities within the catchment need to be included in any assessment of the effects of the Traveston dam on fauna species.
- Where disturbance or destruction of fauna habitat is to occur, offset activities must be realistic and equate to the loss. In certain circumstances replica habitats will not be able to be created and that a net decrease in population levels will occur.
- The EIS must discuss the impact of infrastructure on riparian dependant species e.g. Giant barred frog, that will not easily negotiate barriers that protrude beyond the riparian zone.
- The effect of the spillway on the survival of transient terrestrial species particularly during floods must be assessed. Many species rely on flood waters to transfer genetic material throughout the catchment, particularly between sub-catchments. Turbulence and high impact flows over the spillway are likely to reduce the success of downstream migration and thereby reduce the genetic vigour of downstream populations.
- The EIS must recognise that even though species are represented and possibly projected in areas outside the dam footprint, decreases in overall populations levels will occur as a result of the dam. It must recognise that populations outside of protected areas are important for mixing of genetic material and as recruitment sources following local catastrophic events e.g. fire, flooding, disease outbreaks.
- Future status changes to a species as a result of the dam must be considered and reported on by the EIS. It is not acceptable to consider the current status of a species but also its potential status post-dam construction. Therefore species that are currently listed as common may be downgraded to vulnerable as a consequence of the Traveston dam.

3.3.4 Aquatic Flora

The last paragraph of this section on p42 looks as if it belongs in 3.3.5

A specific section on 'Aquatic Weeds' is required given the high level of concern within the Mary River Catchment on this subject. This is due to the presence of Australia's largest Cabomba infestation (at Lake Macdonald) only 15 minutes from the proposed dam, and the current level of community concern regarding Salvinia and Hyacinth problems in the lower Mary River Catchment (which will be exacerbated by a dam being built at Traveston Crossing).

An assessment of the risk of infestation to the project area, and downstream, by these exotic species must be included. The absolutely predictable outbreak of exotic aquatic weeds in this

storage would be a major threat to the economic viability of the entire project. The storage *will* become heavily infested with some combination of water hyacinth, salvinia and dense water weed as these are already in the proposed inundation area. The risk of a Cabomba infestation should be investigated. While not recorded within the project area, Cabomba has infested an impoundment (Lake MacDonald) within 15 minutes of the project area and can be easily transported to the project area by boating craft (particularly boat trailers) and water birds. Control measures for Cabomba should also be detailed. Need to model for the projected extent of Cabomba, Salvinia, Hyacinth outbreaks within and downstream of the project area, using the Burnett River impoundments as a reference for the potential extent of likely infestations.

- Need to identify and clearly define who will be responsible for control of aquatic weeds in the project area and downstream as a consequence of Traveston Dam construction.
- Need to fully identify feasible control strategies and cost the control measures of a likely aquatic weed outbreak within the project area and downstream reaches.
- Need to note the infestations of the highly invasive Dense water weed (*Egeria densa*) currently located within the proposed impoundment area and the very high potential for this weed to rapidly invade the proposed flooded area.

The margins are likely to be colonized by bullrush and para grass. All these species currently cause problems in the catchment in the vicinity of the impoundment. In addition, reductions in the flushing flows and the low-flow regime in the river downstream of the dam, combined with a constant source of upstream re-infestation will ensure that the project will greatly increase the problems caused by these weeds for the entire length of the main stream of the river downstream of the dam.

The economic impacts of this will be enormous, setting aside the huge ecological impact on other species in the river. Economic impacts will include

- cost of ongoing (never ending) physical harvesting and control. (An indicative budget could be estimated by multiplying the annual cost of weed control in Lake McDonald by the relative surface area of the Traveston Crossing proposal)
- greatly increased evaporative losses from the storage. For example, evapotranspiration rates from a hyacinth mat can reach 2.7 times the evaporation from a free water surface.
- physical displacement of water storage capacity by the large biomass generated.
- greatly fluctuating oxygen levels in the storage contributing to water quality risks and treatment costs. In this storage, manganese oxides and algal toxins are likely to be a major problem.
- Increased structural and maintenance costs caused by continual physical obstruction of works.
- Risks of structural damage to downstream infrastructure when the weed mat is flushed downstream by floods.

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 as illustrated in the 92 floods.(McLeod 1996). Migratory marine mammals, *Dugong dugong* (dugong), *Caretta caretta* (loggerhead turtle), and *Chelonia mydas* (green turtle) are all known to feed on these seagrass beds. The seagrass also provides the nursery for the tiger prawn population, and the epiphyte growths on it support many linkage animals. Seagrass monitoring must be included in assessing catchment impacts on Ramsar Wetlands.

3.3.5 Aquatic Fauna

- A description of aquatic fauna must include the impacts of habitat loss, degradation and fragmentation on the populations of a species outside of the dam footprint as well as within the footprint. Distribution of a species within the dam footprint must be in context with overall distribution of the species.
- Recognition of the uniqueness of the Mary River system as habitat and breeding grounds for 3 locally endemic and threatened aquatic species (Mary River cod, Mary River turtle and Australian lungfish) must be emphasized.
- The Mary River cod and Mary River turtle are **only** naturally found in this river system. The EIS must convey the importance of this fact and recognise that there are no alternatives for these species.
- The Australian lungfish is only found naturally and only breeds in the Mary and Burnett Rivers. The habitat of the Burnett River has been severely compromised so that the Mary River now provides the only extensive habitat and breeding areas. The EIS must emphasise the importance of the Mary River to this species.
- The time period of the EIS is inadequate for determining the numbers and distribution of some aquatic species. Some species are only obvious during breeding periods. A full 12 month period is essential to sample aquatic fauna species.
- Fauna data must be obtained from sources other than fauna studies commissioned by QWI. It must search beyond the realms of Government agencies as community groups and individuals hold a great deal of information.

"Potential Impacts and Mitigation Measures"

- The effects of changing water levels on aquatic species must be discussed in the EIS. A shallow impoundment such as the Traveston Crossing Dam will necessarily create wide 'dead' zones around the perimeter when the water level drops. This represents a dramatic reduction in habitat area and will cause the populations levels of aquatic species to undergo huge fluctuations.
- Cumulative effects of threats must be addressed by the EIS. Threats include the effects of in-stream habitat and vegetation loss and degradation (historical and current), weed and feral animal invasion, climate change, industry and agricultural outputs, soil erosion, water quality degradation, disease etc from all activities within the catchment, need to be included in any assessment of the effects of the Traveston Crossing dam on aquatic fauna species.
- Where disturbance or destruction of fauna habitat is to occur, offset activities must be realistic and equate to the loss. It must be recognised by the EIS that in certain circumstances replica habitats will not be able to be created and that a net decrease in population levels will occur.
- The EIS must recognise that even though species are represented and possibly projected in areas outside the dam footprint, decreases in overall populations levels will occur as a result of the dam. It must recognise that populations outside of protected areas are important for mixing of genetic material and as recruitment sources following local catastrophic events e.g. pollution events, flooding, low dissolved oxygen events resulting in mass fish kill, disease outbreaks.
- Future status changes to a species as a result of the dam must be considered and reported on by the EIS. It is not acceptable to consider the current status of a species but also its

potential status post-dam construction. Therefore a species that is currently listed as common may be downgraded to vulnerable as a consequence of the Traveston dam.

- While emphasis may be placed on threatened species the EIS must recognise the importance of Common species and their role in food webs and symbiosis relationships e.g. the reliance of the Mary River cod on invertebrates and small fish for food and as waste recyclers
- Must include the impacts of the gross habitat changes that will result from the predictable outbreaks of introduced aquatic weeds both in the storage, and in all areas of the river downstream.
- Water quality, in particular, dissolved oxygen is often 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. The likely risk of fishkills of endangered species must be considered in potential impacts. Experience in other dams suggests that it will not be possible to mitigate this impact.
- 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 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. Baseline riparian vegetation condition must be assessed downstream of the proposed dam site.

3.4 Landscape Character and Visual Amenity

The landscape character and visual amenity of the Mary Valley from Traveston Crossing to Kenilworth would be utterly transformed by the project. Converting the rural landscape of a valley floor of mainly class 1 agricultural land into an area of weed infested swamp and mudflats is about the largest impact on landscape character and visual amenity that could be imagined apart from turning it into an open cut mine. This cannot be mitigated.

3.5 Water Resources and Water Quality

There are three Appendices attached, which are referred to in the comments on this section.

3.5.1 Water Resources - Hydrology

See attached report (Appendix A) *Notes on the likely impacts of the proposed Traveston Crossing dam on the environmental hydrology of the Mary River*. (Burgess & Edward 2006)

The main comments to apply to this section are

By itself, the Water Resource Plan (Mary Basin) 2006 will not provide adequate protection of environmental flows at locations in the river that are crucial for species and matters that need to

be protected by the EPBC act. The wording of the legislation does not require compliance with the environmental flow schedules listed in the legislation for nodes 2 and 3 (the only nodes in the river downstream of the proposed dam). Where the Draft WRP stated that something "must be adhered to", the Final WRP is now considerably weakened through the constant use of "to minimise the extent". This is akin to simply indicating what should happen, but "if we can't do it, we don't have to". This provides the State Government an "out clause" when downstream environmental flows cannot be met due to the operation of the proposed Traveston Crossing Dam.

- Although the legislation specifies compliance with a flow schedule for the river mouth, flows at the river mouth are not measured, making nonsense of any concept of compliance with the stated flow schedules for that node. Compliance with the WRP is clearly not sufficient to protect environmental flows downstream of the dam site.
- The crucial IQQM nodes in the IQQM model that is used for water resource planning in the catchment that need to be closely monitored to assess the hydrological impacts of the proposal are Dagun Pocket (node 190) and the Mary River Barrage (node 039). These are the points where specified Environmental Flow Objective's (EFOs) should be set to protect the environmental flow regime in the river as is the intent of the Water Act 2000. These are the points where changes to the flow regime will have the most impact on matters covered by the EPBC act. EFOs for these locations need to be specified as part of the licensing provisions and EMPS for the project.
- Currently there is no procedure for measuring flows past the Mary River Barrage into the Great Sandy Straits Ramsar Wetlands, but the barrage itself would provide an appropriate measuring instrument. It has a vertical slot fishway that passes water through a 200mm wide slot (ideal for measuring very low flows, a very narrow lower spillway at EL2.9 m (ideal for measuring low to medium flows) and the main concrete spillway at EL 3.0m (adequate for measuring high flows). Because freshwater flow past this point is the main impact the storages on the main trunk of the Mary will have on the Great Sandy Straits and the RAMSAR wetlands, it is unacceptable to not measure and monitor this flow as part of operation rules of the storages on the river.
- The flood modelling published to date has only shown predicted heights at the spillway for a number of selected events. As discussed in the previous section on floods, there may be complicated flood flow effects at the upstream margins of the storage. What is needed, as a bare minimum, to assess flood impact of the dam taking these effects into account are maps showing
    - 1% AEP flood boundaries, without the dam
    - 1%AEP flood boundary, with the dam stage 1
    - 1%AEP flood boundary, with the dam stage 2
    - 1%AEP flood boundary, with an obstructed spillway (stage one or stage 2)

  The same maps must then be produced for the PMF (1:500000 year event) and the maximum recorded flood event (1893) (double flood)

- In the IQQM modelling of catchment used to formulate the draft WRP, there was a requirement to maintain a flow of 80ML/day at the Gympie TWS node (WRP Hydrological Report - 2005). This had the effect of ensuring a sufficient water level in the stream at this point, and maintaining this would also have also assisted in maintaining water quality downstream from the Gympie sewerage outfall at Widgee Crossing. This requirement was built into the modelling used to determining the draft environmental flow schedule for Fisherman's pocket. However, because the WRP was hastily changed to allow for the operation of the dam after the public consultation period on the draft had finished (Consultation report dated August/December 2006), it is not clear that this requirement would

still be protected. Ensuring a sufficient flow to allow the operation of the Gympie TWS and to maintain sufficient flow at Widgee Crossing to dilute and flush the sewerage outfall needs to be a specific requirement of the EIS.

- Evaporation and seepage estimates assumed in the hydrological modelling of the storage and it's impacts need to incorporate information about the unique characteristics of the storage which have not been incorporated into simulation models of the project to date. Specifically, the evaporation model used in the past was based on monthly average Epan data modified by a lake surface factor calibrated for Nambour evaporation regimes, simulating evaporation from a deep, clear water body. This storage will not be a deep, clear storage. The albedo of the wet soil which will make up a significant proportion of the evaporative surface area, the shallow, warm nature of the storage and the impacts of fringing and surface vegetation on increasing evapotranspiration from the storage will require a much more sophisticated evaporation model to accurately assess the true evaporation losses from the storage.

- To date, seepage estimates have been based on nominal figures like 'a foot a year' or 'a mm per day' rather than any detailed analysis of the likely actual seepage losses from this particular storage. This is absolutely inexcusable when the *a priori* evidence based on the geology of the site is that seepage losses are likely to be considerably more than this, easily in the realm of 1m per year or more.

- There is a clear obligation under the national climate change action plans for biodiversity and agriculture to investigate the performance and impacts of the project in a climate change scenario. The Final WRP constantly uses the term "in the simulation period". The simulation period is approximately 110 years – from 1890 until 1999. A suitable, and feasible analysis would be to use the last 10 years of climate data to model the storage and it's hydrological impacts on the river, similar to the approach suggested in the Marsden Jacobs discussion paper on urban water supply planning, (Marsden & Pickering 2006). On the Mary, this period conveniently includes a major high intensity flood event (1999) and a period of drought. The results from this should be used to assess the yields, benefits and costs of the project in comparison with other water supply options, and assess the impacts on downstream flows. **The results of a preliminary analysis of this nature of the storage behaviour and local flow impacts of the proposal are included in Appendix B of this submission.**

- 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. These too can adversely impact on biological triggers for fish and invertebrate migration and spawning and must be considered in the EIS. 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. (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).

- 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) and instability of riverbanks (already discussed in section 3.1 Flooding). 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.

3.5.2 Water Resources - Hydrogeology

A major concern is the effect that the deep subterranean wall and grout curtain proposed for the project will have on groundwater flow regimes through the alluvium and shattered rock in the valley floor. This effectively produces a groundwater dam across the entire width of the valley at that point. The possible implications of this for the area downstream of the dam may be severe. Disturbing the linkage between surface water and groundwater flow in this region in this way may well completely invalidate all the surface flow modelling used to formulate the water resource plan relating to downstream flows and have significant downstream effects in the river. Additional surface water releases from the storage may be required to compensate for the loss of downstream sub surface flow. The dot points referring to target aquifers and required volumes of water from these aquifers need clarification. (As discussed in section 1 of this submission). Is groundwater extraction a significant part of the intent of the project?

3.5.3 Water Quality

No mention is made in the ToR of the Mary River's priority status under the NAPSWQ. Water quality, both in the storage and downstream will be adversely affected by the nature of the storage and it's predicted impact on low flow regimes and minor flushing events. The Queensland Water Quality Guidelines 2006 should also be used to define environmental values. In times of low flow, water quality in the river already lies outside the Queensland Water Quality Guidelines (2006) for the catchment. **There is a preliminary analysis of some water quality impacts in Appendix C of this submission.**

3.6 Air Environment

The water in the storage would be expected to act a local thermal buffer, and therefore have an effect on local climate conditions. These could possibly include reductions in frost frequency and may increase local occurrence of low cloud and fog. Fog already has safety impacts on the Bruce Highway and Gympie Aerodrome close to the dam site. The likelihood of and risks associated with local climatic impacts should be investigated.

The types and levels of anticipated greenhouse gas emissions from the storage itself should be calculated and the impacts assessed. This is an impact referred to under the National Climate Change and Agriculture Action Plan resulting from the land use change from class 1 agricultural land to swamp and mudflats. This must include baseline data for the current production of greenhouse gases in the proposed dam area and then predicting the production of greenhouse gases that would be emitted if the area were to be inundated. In addition, the

greenhouse gas emissions resulting from the pumping and treatment of the water from the storage need to be included in the assessment of the impacts of the proposal.

3.7 Waste

Locations, hours of operation, likely traffic volumes and access routes to and from the major off-site landfill sites (mega dumps) required for the disposal of construction and demolition waste generated by the project need to be clearly specified in the EIS. All impacts of this major component of the project need to be comprehensively assessed and the full impacts explained clearly to the public.

3.8 Noise and Vibration

Hours of operation, duration and intensity of noise produced must be assessed and described clearly to the public. In particular, the noise impacts of operations of a continuous nature (such as operation of concrete batching plant, gravel crushers, compactors, excavation machinery) need to be clearly outlined.

The Mary Valley is a quiet place, sound is noticeable for long distances, and month after month of continuous noise of this type would seriously impact on the quality of life to which residents are accustomed.

3.9 Transport and Access Arrangements

As part of the EIS, the feasibility and likely construction plans for all new transport corridors needs to be checked with a thorough on-the-ground assessment in co-operation with long-term local residents and Cooloola Shire officers to ensure the viability of proposals. Map-based studies and costings are insufficient. Particular attention should be paid to any interactions of new road proposals with drainage lines to avoid inadvertent flooding and erosion impacts on surrounding land.

3.10 Cultural Heritage

It is essential that the Local History Unit of the Cooloola Library be closely involved in the assessment of local cultural heritage values and assessment. They have been engaged in extensive and meticulously documented historical scholarship regarding the Mary Valley for a long time.

Because there is a history of conflicting native title claims over the Mary Valley, it is important that indigenous consultation is inclusive and involves the widest practical representation of Aboriginal interests including but not restricted to the current Native Title claimants over the Mary Valley. For example, Butchella people from the region of the river mouth and the Great Sandy Straits should be consulted concerning the impact of the proposal at the estuary end of the river.

3.11 Social and Economic Environment

As described in section 1 of this submission, modern internationally acceptable social impact assessment and management principles need to be detailed in the TOR.

Five specific areas that require addressing in the TOR and outcomes include:

1. Planning
    - Provide evidence of planning for social impact prior to proposal.
    - Methods to be used in the baseline demographic and socio-cultural studies
    - Strategy for assessing and compensating downstream social impacts right down to the fisheries/tourism at Hervey Bay.
    - Strategy for assessing and compensating for the second order impacts

- A strategy to assess and compensate for impacts based on the quality of life (social wellbeing) of people and not their standard of living
- An effective relocation strategy that is evaluated by ensuring that the resettler's next generation benefits from the relocation (do the resettler's children incur a loss socially and economically because of the dam?)
- A strategy to compensate the community should the dam proposal not go ahead.

2. Process of Social Impact Assessment and Management
    - Be as open and transparent as possible. The initial announcement of a project was an announcement to proceed with the project rather than an announcement of a proposal for public debate. So far the government has revealed it has only used one document in its analysis of the decision to dam the Mary River. This report is the GHD report of suitable dam sites that allows a comparison of various water yields. It does not include financial cost benefit analyses let alone comparative economic, environmental or social analyses. Waiting nine months after the announcement is in no way an open or transparent process.
    - Realise the importance of true public participation and the consequences that might arise from a lack of participation
    - Ensure the adequacy of time and resources for a thorough social impact assessment. Six months is seen as insufficient time to collect adequate data.
    - Include consideration to the gendered nature of impacts
    - Include consideration to the social impacts caused through loss of biophysical aspects (loss of place)
    - Include consideration to the existence of spiritual worldviews and the potential existence of sacred places.

3. Removal of people and resettlement
    - A resettlement package that does more than restores living standards to compensate re-settlers for the negative health impacts and the socio-cultural trauma that the majority is suffering.
    - An independent mediator should the Government renege on agreements
    - Avoid relocation if at all possible – full evaluation of all the alternatives to this dam proposal for water.

4. Future Economic development and community formation
    - Develop mechanisms for capacity development and use project planning as an opportunity to foster civil society.

5. Evaluation Strategies

Strategies that ensure that people are not made worse off.

- Use appropriately qualified social scientists to conduct social impact assessment as necessary depending on the issues.
- Ensure that there is ‘arms length’ independence between the proponent and the Social Impact Assessment.
- Timeframe for impact assessment processes and integrate evaluation of the strategy within project design processes.

Part of the social impact assessment must also include an accurate measurement and reporting of

- Total costs of all government-funded counselling and support services (including the entire diversion of government expenditure to the community futures task force and associated

projects, lifeline services, Kandanga One Stop Shop, Langmont Advantage) that have been incurred in relation to the project.

- A serious measurement of the total amount of volunteer hours taken from and personal expenses incurred by the community at large in providing community support services and participating in the community consultation and negotiation processes involved with the project.
- An estimate of the costs of private medical, personal counselling, legal and financial services purchased by the community as a consequence of the project.

The Mary River Catchment have a number of outstanding environment restoration groups including Gympie and District Landcare, Tiaro Landcare, Noosa Landcare, Barung Landcare and Mary River Catchment Coordinating Committee. All have achieved national recognition and awards. These groups rely very heavily on community motivation and involvement. The effect of this proposal on ongoing goodwill and participation in these programs needs to be evaluated under social impacts.

3.12 Hazard and Risk

A network analysis of the proposed new transport, power and communication networks must be conducted to design robust networks that will still continue to function in the event of failure of any particular link in an emergency. For example, in the event of a flood event to 80m EL at the spillway in stage one, how many properties in the wider area would be isolated from emergency services? Is there a change in the proposed road network that could reduce this impact?

In particular the Dam Safety risk assessment applied to the structure must not only look at downstream impacts in the event of wall failure or overtopping, but must explicitly examine the risks of a spillway blockage during a major flood event on upstream residents. It seems highly irregular to allow townships to remain inhabited upstream of a dam at heights lower than the crest height of the wall.

As mentioned in part one of this submission, the long term public health risks likely to be associated with this project warrant a separate Health Impact Assessment section in the EIS.

3.13 Cumulative Impacts

See comment in section one of this submission - "**Principles behind assessing cumulative impacts"**

Currently there is no requirement to meet **<u>any</u>** environmental flow requirements over the Mary River Barrage or Tinana creek Barrage. Freshwater flows at these points are critical for freshwater/saline interface ecosystems yet this has been ignored in the allocation of water within the Mary Catchment water resource plan.

The current operation of the water storage and distribution system on the Burnett River, including yield, operating strategy, supply reliability, allocation and use of water supplies is also required to assess the cumulative impacts of environmental flow on the downstream Great Sandy Strait Ramsar Wetlands and Fraser Is World Heritage areas.

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.). In addition it is likely that

organisms may be introduced and significantly impact on Matters of National Significance in the receiving area.

4 Environmental Management Plans

The EIS should contain a demonstrated program of implementation of mitigation measures with consequences for non-implementation and fully documented performance criteria. It is evident that such a program was not put in place for the Paradise Dam and many of the proposed mitigation measures either do not work or have not been implemented.

Any monitoring benchmarks proposed in Environmental Management Plans need to relate to physical measurements and observations that can be conducted by any independent body. It is not appropriate, for example, to have river flow criteria that can only be assessed in terms of a particular computer simulation analysis that can only be conducted by the proponent/operator or their agents. Considerable thought should go into formulating useful criteria that can be independently assessed and verified.

An example might be – "maintain inter-pool connectivity in the reach from Traveston Crossing to the junction with Amamoor Creek at all times", rather than "modelled flows at node 190 should meet the targets outlined in schedule 3"

The Environmental management plans should be to ISO14001 standard and be accredited to ensure better enforcement mechanisms.

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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

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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 Dagun 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 Dagun 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 Dagun 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")

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

	000b	**002b**	**N007**
IQQM scenario	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)

	000b	**002b**	**N007**
IQQM scenario	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)

	000b	**002b**	**N007**
IQQM scenario	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)

	000b	**002b**	**N007**
IQQM scenario	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 endemic[1] 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 cod[2]. 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 species[3] 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 option[4]. 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 flows[5], 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: Notes on trends in streamflow in the Mary River and modelling the operation of the proposed Traveston Crossing Dam from 1997-2007

S. Burgess
Save the Mary River Coordinating Group
February 2007

There is good evidence that streamflows in the Mary River have been declining over the last 40 years. This is in line with most of the current thought about cyclic climate variability and climate change in S.E. Qld. Figure 1 shows recorded streamflow in the Mary River at a point in the upper catchment that has not experienced any major upstream infrastructure development during the period of record. (It is possible that overland flows may have been reduced because of land use or groundcover changes). However, streamflow is the actual resource that is harvested by dams, and these data indicate that annual flows in the river at that location have reduced from an expected value of around 157 GL/annum to an expected value of 66 GL/annum since 1960.

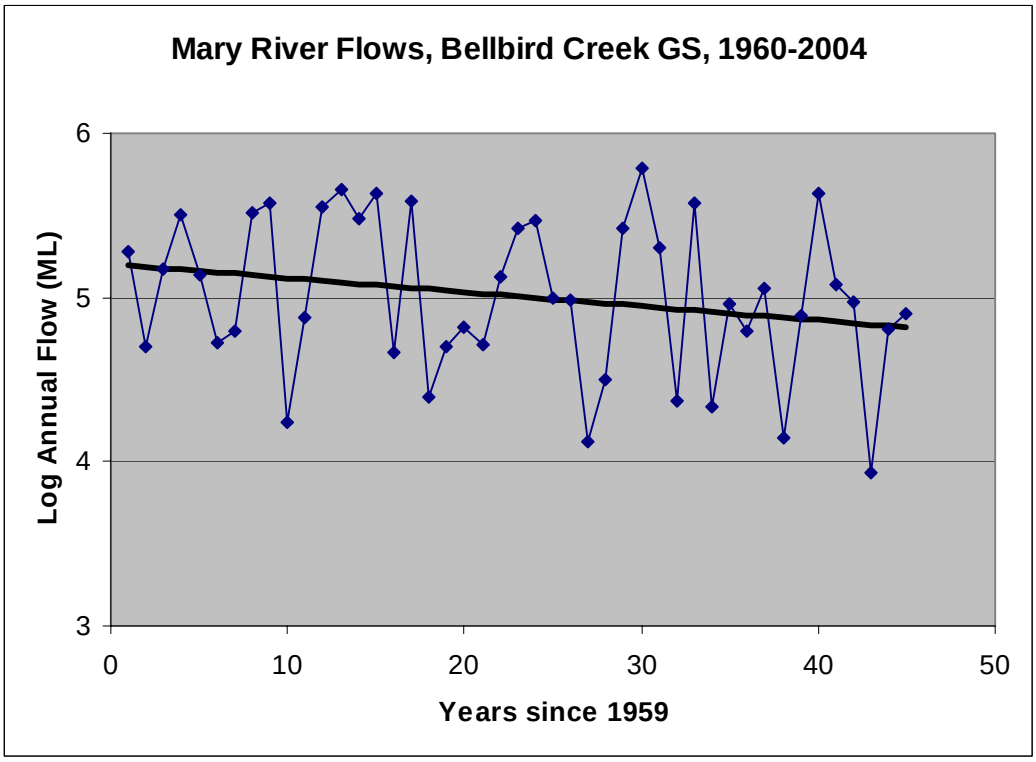

Figure 1. Trend in annual flow rate in the Mary River at the Bellbird Creek confluence.

The IQQM (DLWC 2004)modelling used to formulate the draft Water Resource Plan for the Mary Basin (DNR 2005) offers an opportunity to simulate the natural flows that would have existed in the river at the proposed damsite, in a non-developed 'natural' state over the simulation period of 1890 to 1999. These results are shown in figure 2. A striking feature is the large variability in flows. There does seem to be evidence of a cyclical pattern in the flows. An attempt to illustrate this is shown on the graph by also showing 11 year and 22 year moving averages. It seems that annual streamflows at the damsite would have been very high at the

end of the 19th century, generally low during the first half of the twentieth century, high during the mid to late 20th century and the pattern suggests that low streamflows may generally be expected for the late 20th century/early 21st century.

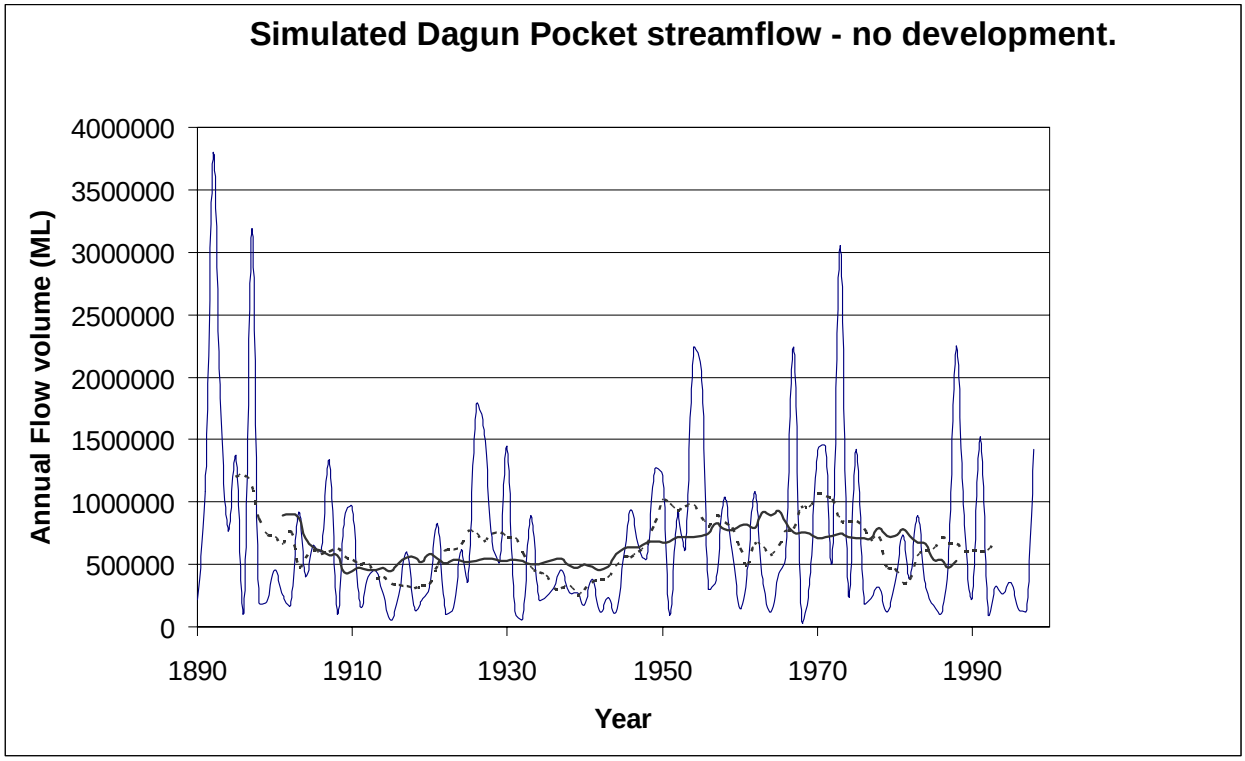

Figure 2. Simulated annual stream flow data for the 'no development' IQQM scenario at Dagun Pocket. 11 year and 22 year moving averages are shown. Derived from 'Appendix A' of the Environmental Flows and Scenario Implications Report for the Water Resource Plan (Mary Basin) 2005.

In their discussion paper on urban water planning commissioned by the Federal Government in 2006, Marsden and Pickering suggested that in light of the likely effects of climate change and variability on stream flows it is prudent to base water resource planning on the most recent available climate data. They observed the similar cyclical pattern in the modelled inflows to Wivenhoe dam over the same period. One question that has been asked of the State Government by Mary Valley residents since the dam proposal was announced, is 'If the dam was built 10 years ago, what would it be like now?". To date, all modelling of the performance of the project has been based only on the climate record from 1890 to 1999, including both very wet cycles, but only including one extended dry period, and explicitly excluding the current and most relevant dry spell.

To attempt to get a feel for the performance and impacts of the project under recent conditions, the Save the Mary River Coordinating Group has developed a daily time step model based as closely as possible on the modelling assumptions used in the published IQQM simulations of the dam proposal released to date. An approximate daily inflow hydrograph was generated for the dam site based on NRW and Sunwater streamflow records from the Dagun Pocket and nearby gauging stations. This enables us to evaluate various scenarios for operating the dam and examine the likely impacts of assumptions made about the operation of

the dam. These analyses are only approroximate and need to be repeated with the full level of detailed information available to the proponent and the State Government. However, considerable consultation has occurred in order to ensure that the model is close enough to draw some valid conclusions and to get a feel for the relative magnitudes of assumptions and their impacts. In addition, some water quality analysis has been incorporated into the model, to investigate issues associated with the National Action Plan for Salinity and Water Quality.

An analysis of this crucial time period from 1999 to 2007 has not yet been conducted by the State Government, partly due to the large effort involved in setting the entire catchment model up for a new simulation period. The approach used here is meant to short cut this delay, and should be repeated as part of the EIS if the full simulation cannot be conducted and analysed in time. The inflow hydrograph generated from actual streamflow records should be at least as accurate as a hydrograph simulated from climate data. However, care is needed to interpret the results, because of complications with accounting for linkages with Borumba dam and downstream allocations. Three scenarios are presented and discussed here:

"S1 minimal loss".
This scenario represents a dam of stage 1 capacity, shape, and target yield, operated under the same evaporation, seepage and downstream flow release rules as used in "Water for SE Qld- a long term solution". These assumptions are very conservative, and in local eyes are likely to underestimate the actual seepage and evaporative losses in the storage. Evaporative losses are based on Nambour monthly Epan figures adjusted to simulate evaporation from a deep clear water surface. Seepage is estimated at 'a foot per year'. To account for Borumba releases, it is assumed that all releases from Borumba that would have passed Dagun Pocket are captured by the storage and are available to be incorporated into the yield. This effectively gives the dam the best chance of success, because it does not need to supply any downstream allocations on top of the environmental flow release rules assumed. The environmental flow release rules are also very conservative – all flows up to 100 ML/day are passed through the storage, and one flushing flow of between 10,000 and 20,000 ML/day (if it occurs) is allowed to pass through once per water year.

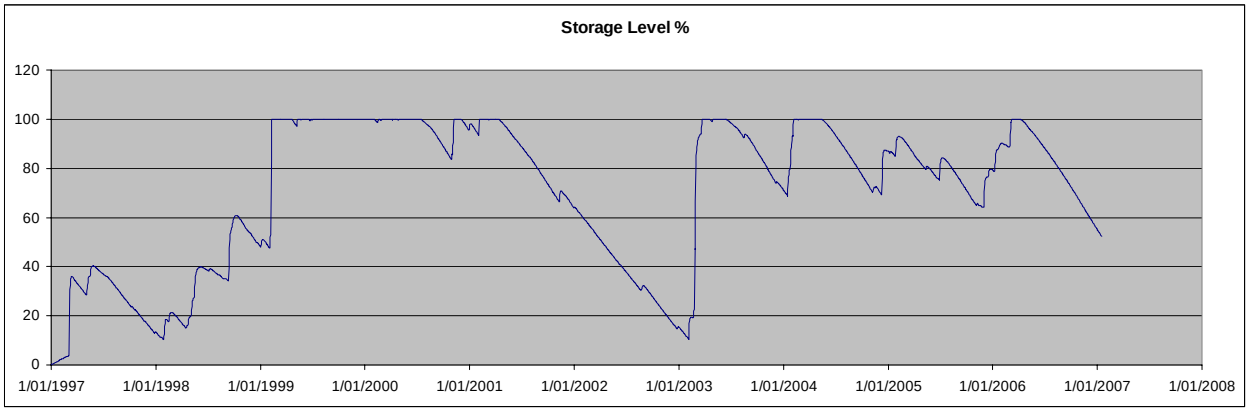

Figure 3. Storage behaviour curve for scenario S1-minimal loss.

Even with these generous assumptions, and not having to provide any water at all for downstream users, the dam operates at the margin of failure and has severe impacts on downstream flows, reducing median daily flows a further 35% below the existing (already drought affected) flow regime.

"S1 – WRP"
This scenario is based on the environmental flow release rules used to formulate the WRP, - all flows up to 250 ML/day are passed through the storage, and flushing flows between 15,000 and 25,000 ML/day are allowed to pass through. Evaporation losses are more in line with local

expectations, based on being a warm shallow storage, with surface weed cover and fringing vegetation and mudflats – assumed to be 1.5 times the evaporation from a clear deep water surface. (Still conservative). Seepage losses are also more in line with local expectations at "a metre per year". All Borumba releases destined for downstream users are still accounted for as part of the yield of the storage

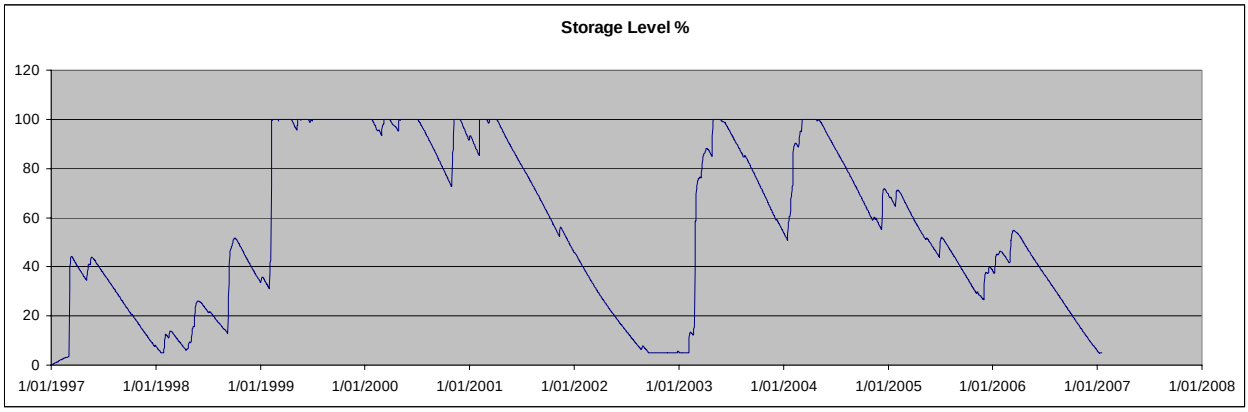

Figure 4. Storage behaviour curve for scenario S1-WRP.

With more realistic assumptions, but still not leaving any water for downstream users on top of the environmental flow releases, it is fairly clear that the dam would have experienced a convincing yield failure in late 2002 and in early 2007.

"S2 – WRP"

This scenario is also based on the environmental flow release rules used to formulate the WRP, and the same evaporation and seepage rules used in S1-WRP. All Borumba releases destined for downstream users are still accounted for as part of the yield of the storage. This looks at how the larger Stage 2 storage (530GL) would fare with trying to supply a yield of 110GL/year. (Note that this is not the 150GL allowed for in the WRP)

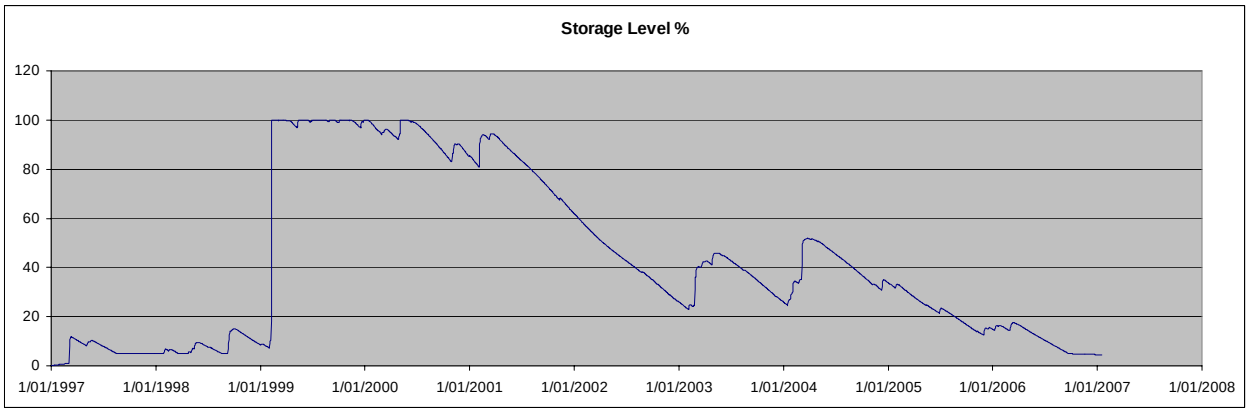

Figure 5. Storage behaviour curve for scenario S2-WRP.

It appears that even the larger stage 2 dam, with a moderate target yield of 110GL would have also experienced a convincing yield failure by the end of 2006.

Comparison.

Table 6 shows a comparison of some of the losses from the storage and the effects on flows immediately downstream. These serve to give a ball-park feel for relative efficiency of the storage and its impact on water resources in the catchment.

Scenario	S1 minimal loss	S1 WRP	S2 WRP
Mean annual yield (GL)	68.7	66.2	98.8
Mean operating depth (m)	4.47	4.0	5.3
Evaporative losses (GL)	20.6	26.6	54.2
Seepage losses (GL)	6.9	19.1	38.5
Reduction in mean annual flow volume at Dagun Pocket %	30	33	55
Reduction in median daily flow volume at Dagun Pocket %	35	7	5

Table 6. A comparison between the scenarios investigated for the modelling period 1997-2007

It is interesting to note that the environmental flow release rules assumed in the WRP resulted in much less impact on the median daily flow than the release rules used in later documents. It is important to stress that the last two rows refer to the additional impact over and above the current flow regime in the river, not relative to the 'no development' scenario as used in the WRP environmental flow schedules.

Conclusion

This preliminary analysis reinforces the commonsense conclusion that accurate assessment of likely evaporation and seepage losses is critical to evaluating the economic and environmental viability of the project. Under recent climatic conditions, it is unlikely that the project will be able to provide the anticipated yields, allow sufficient water for downstream users, and allow for maintenance of a satisfactory environmental flow regime. It is essential that this analysis be properly repeated and openly reported, and the estimates assumed for evaporation, seepage and environmental flow release subject to a meticulous independent peer review during the EIS.

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Appendix C: Notes on the likely impacts of the Traveston Crossing Dam Proposal on salinity and water quality in the Mary River.

S. Burgess
Save the Mary River Coordinating Group
February 2007

There is some evidence that the base flow in the Mary River downstream from the proposed Traveston Crossing dam site is saline, which could indicate a saline groundwater table. If this is so, the effect of ponding a large area of water and blocking the natural groundwater flows with the dam wall in this area would have unpredictable consequences, possibly causing this saline groundwater to appear near the surface in nearby areas of the valley. The effect of this on the surrounding countryside, if this occurs, will be devastating. The area of the valley in the vicinity of the dam has already been mapped as a high salinity risk as part of the National Action Plan on Salinity and Water Quality. This map can be viewed at www.nrw.qld.gov.au/salinity/pdf/burnettmary_map.pdf.

In times of low flow, salinity (EC) levels in the river downstream of the dam already exceed the Queensland Water Quality Guidelines for the Mary River (2006). Figure 1 shows EC levels recorded by the MRCCC while travelling down the river during the annual catchment crawl in October 2006, indicating where this occurs. (from Wedlock 2006)

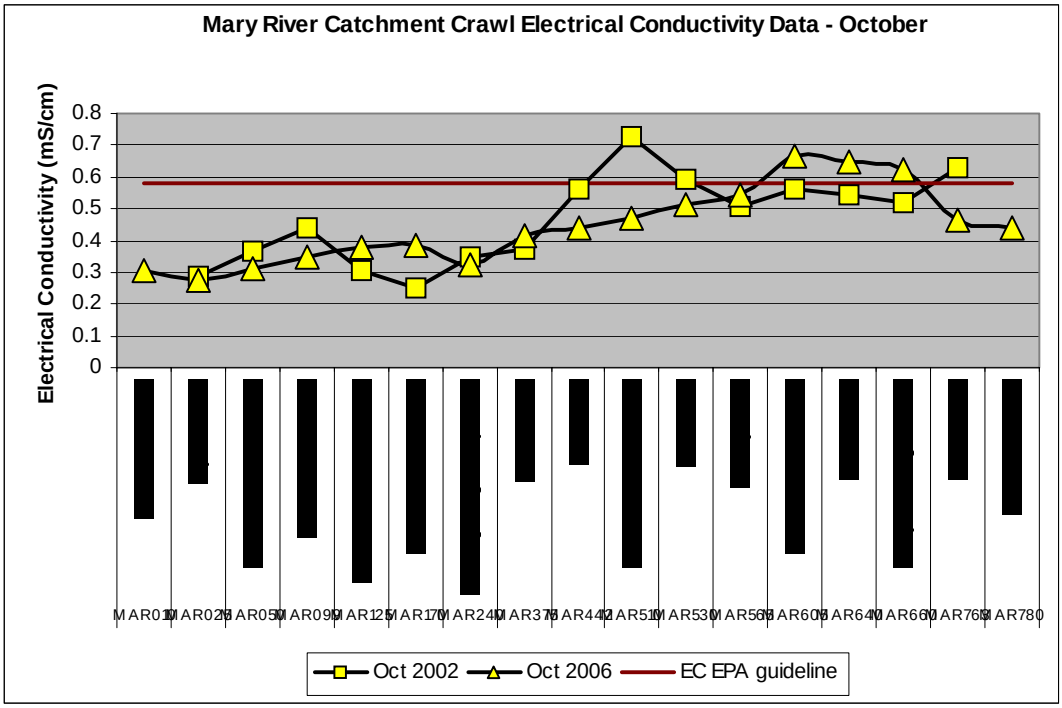

Figure 1: Electrical conductivity levels recorded during the 2006 & 2002 Catchment Crawls

At a given point in the river, there is a strong negative correlation between EC levels and flow, as shown in figure 2 for the stream gauging station at Fisherman's Pocket. It is particularly clear if you investigate a particular flow sequence (to remove compounding long term time trends), as illustrated in figure 3.

The 80 percentile figure for Southern Coastal Streams from Appendix G of the Queensland Water Quality Guidelines is 572 μS/cm. Figure 2 also shows that when flows are low, EC levels already reliably exceed this figure.

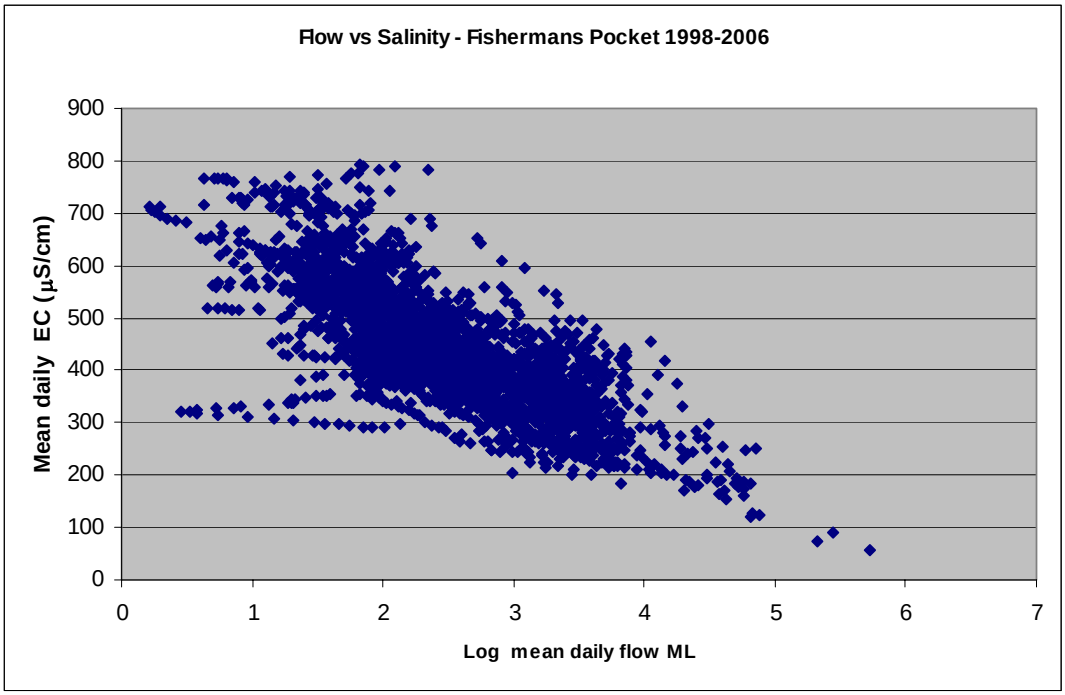

Figure 2. The overall correlation between reduced flow and increasing salinity at Fisherman's Pocket. Note the large number of EC readings above 572µS/cm.

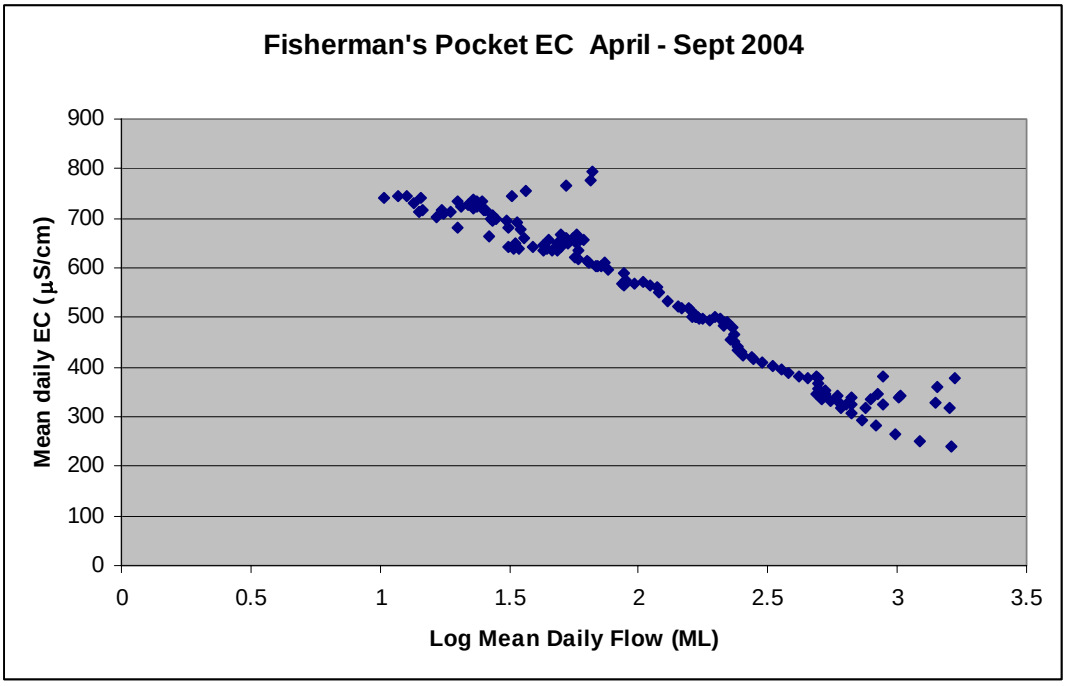

Figure 3. Correlation between reduced flow and increasing salinity during a typical seasonal decreasing flow sequence.

EC levels may also be showing a generally increasing long term trend with time, as shown in figure 4.

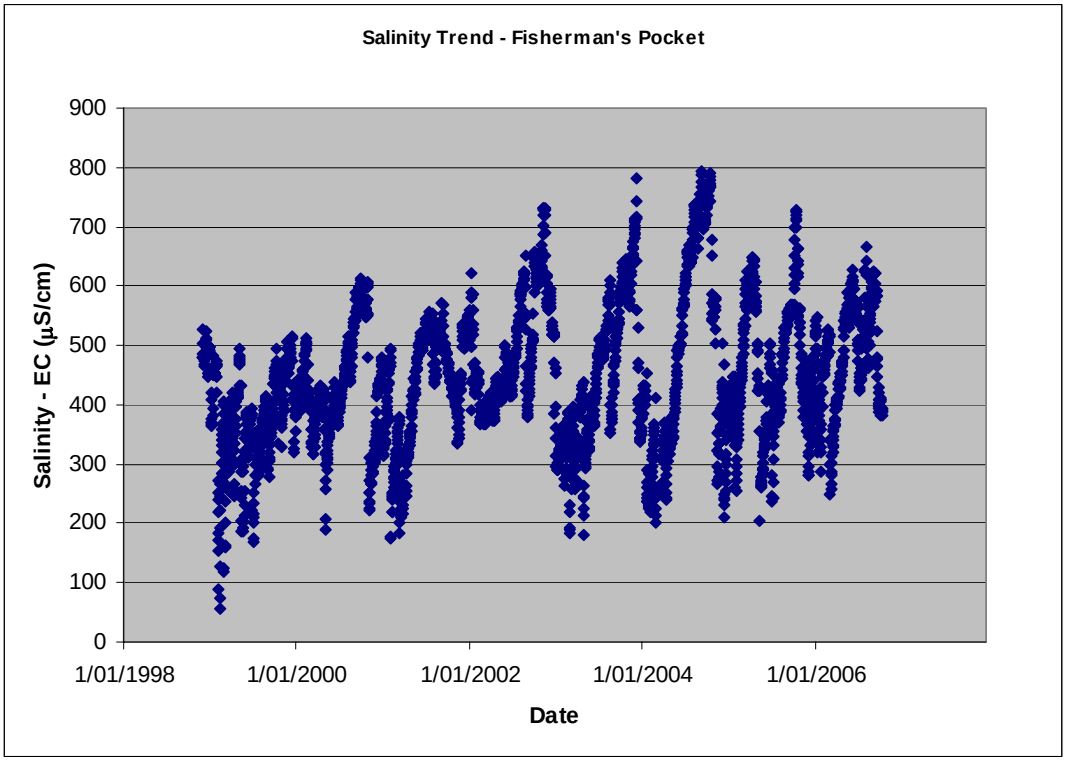

Figure 4. Time trend in salinity levels at Fisherman's Pocket.

The impact of the dam proposal of reducing river flows downstream of the dam site, particularly with respect to the low and medium flow regime, can do nothing but exacerbate and accelerate these trends and effects. For these reasons alone, It is not likely that the operators of the dam will be able to comply with the provisions of the Queensland water quality guidelines or the intent of the National Action Plan for Salinity and Water Quality and also provide the expected yields from the storage.

In addition to the effects on water quality resulting from reduced downstream flow, the dam itself would play a direct role in concentrating contaminants. A rudimentary water quality model was incorporated into the daily time step model described in Burgess 2007 used to investigate the storage and yield behaviour of the dam. This calculates the effect of evaporation and seepage from the storage on concentrating substances that come into the storage in the dam inflow. Figure 5 shows the effect of a stage one-sized storage (S1 minimal loss scenario) on concentrating pollutants in the storage over the 1997 to 2007 simulation period. Concentrations in the storage are increased to nearly 50% above the concentration in the inflow at times within this short 10 year period. This has major implications for water quality in the storage and in the downstream flows from the dam.

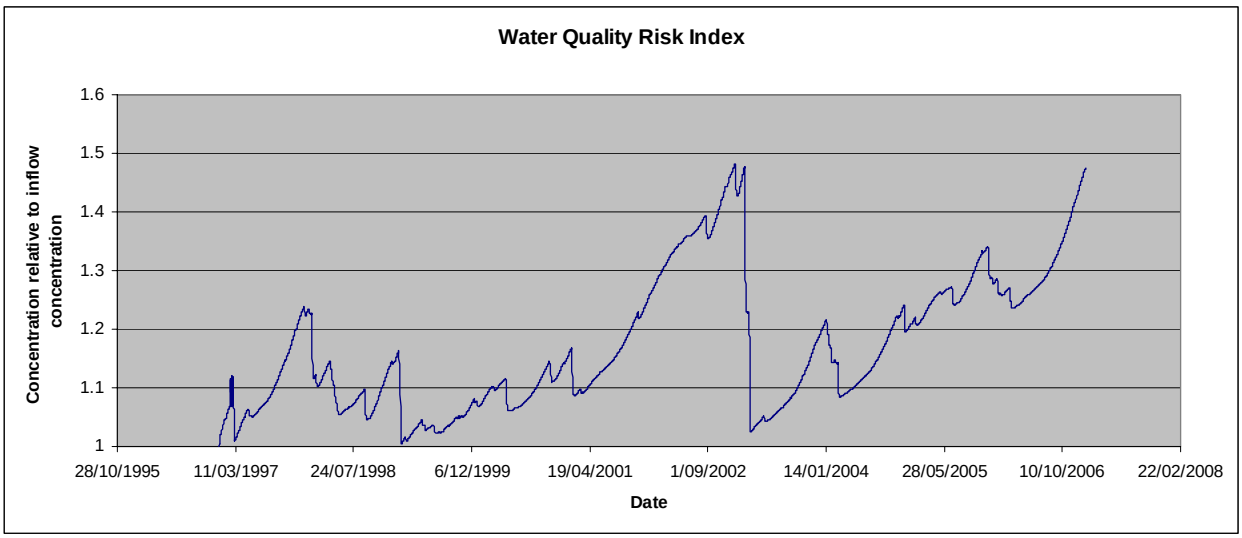

Figure 5. Modelled increase in outflow concentration from the storage, Traveston Crossing Stage 1.

To sum up, in times of low flow the Mary River already fails to comply with water quality guidelines, and compelling evidence suggests that the construction of the proposed dam can do nothing but greatly increase the risk of major salinity impacts on the surrounding countryside, and greatly reduce water quality in the river and the storage itself. This is directly opposed to the objectives of the National Action Plan for Salinity and Water Quality and in a properly conducted cost/benefit analysis would contribute overwhelming to the risks and costs of the project. It is highly unlikely that the proposal could produce the expected yields and also comply with the water quality requirements of the catchment.

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Burgess, S. 2007 Notes on climatic trends in streamflow data from the Mary River and the implications for the operation and local hydrological impacts of the proposed Traveston Crossing Dam. Save the Mary River Co-ordinating Group.

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PROJECT MANAGER – TRAVESTON CROSSING DAM PROJECT
SEQ INFRASTRUCTURE (WATER)
THE COORDINATOR-GENERAL
PO BOX 15009
CITY EAST QLD 4002
18th February 2007

Dear Sir,

Re: Submission on the draft Terms of Reference for the EIS - Traveston Crossing Dam proposal.

The purpose of this submission is to provide feedback on the Draft Terms of Reference (ToR) for an Environmental Impact Statement dated December 2006 regarding the proposed Traveston Crossing Dam.

I am a landholder within stage 1 of the proposed Traveston Crossing Dam and my family have owned the farm for 30 years. I am second generation grazier and bought the property off my parents about 20 years ago. My working background has included 18 years of environmental management in the mining industry. While working part-time with WWF 1998-2001, I canoed/walked over 300km of the Mary Catchment streams (including all of the proposed inundation area and downstream to the Mary River Barrage wall), mapping the condition of the streambank vegetation, the occurrence of weeds and Mary River Cod habitat.

I endorse the Save the Mary River Coordinating Group's (STMRCG) submission.

I have limited my submission to streambank stability issues and restoration, but I request that these issues and those submitted by STMRCG are included in the Terms of Reference.

I have experienced a number of large floods in this area as I have lived in the valley most of my 46 years. After the 1992 floods, our property suffered particularly bad streambank erosion on the Mary River below Kandanga Creek junction (Photo 1). This type of bank slippages, slip circle bank failures, and undercut banks were extensive in the catchment and particularly bad when the banks became saturated. It was after this flood that we as a family decided to fence off the riverbanks and restore the banks back to riparian rainforest vegetation. Our story of what can be achieved inexpensively in 14 years is told in the Codline # 15 (Appendix A).

Our own money and labour achieved this – no government funding was ever applied for. We funded the off stream watering points, the electric fencing, collected the native seed, grew the native plants in the farm shade house, planted out and direct seeded, and the ongoing and never ending controlling of weeds. Photo 2 shows that same area and its restoration in 2001. Photo 3 shows these fenced off riverbanks extending for over a kilometer downstream from the junction with Kandanga Ck. Photo 4 shows how grazing pressure limits the recovery of streambank vegetation on my neighbours property on the opposite side of the river. Finally, Photo 5 shows what a fantastic result can be achieved from bare eroding banks in 14 years when nature is helped to recover in the Mary Catchment.

Photo 1: Badly eroded Mary River Banks after the 1992 flood

Photo 2: Riverbanks in 2001 (9 years later - and a big flood in 1999) recovering after fencing off and some enhancement planting/seeding

Photo 3: Riverbanks fenced off for 14 years along the Mary River– over a kilometer of well vegetated, stable riverbank downstream of the junction of Kandanga Ck and the Mary River.

Photo 4: Riverbanks unfenced on the opposite side of the river.

Photo 5: From bare eroding banks to this scene in 14 years – helping nature recover in the Mary River catchment

My concerns and recommendations include:

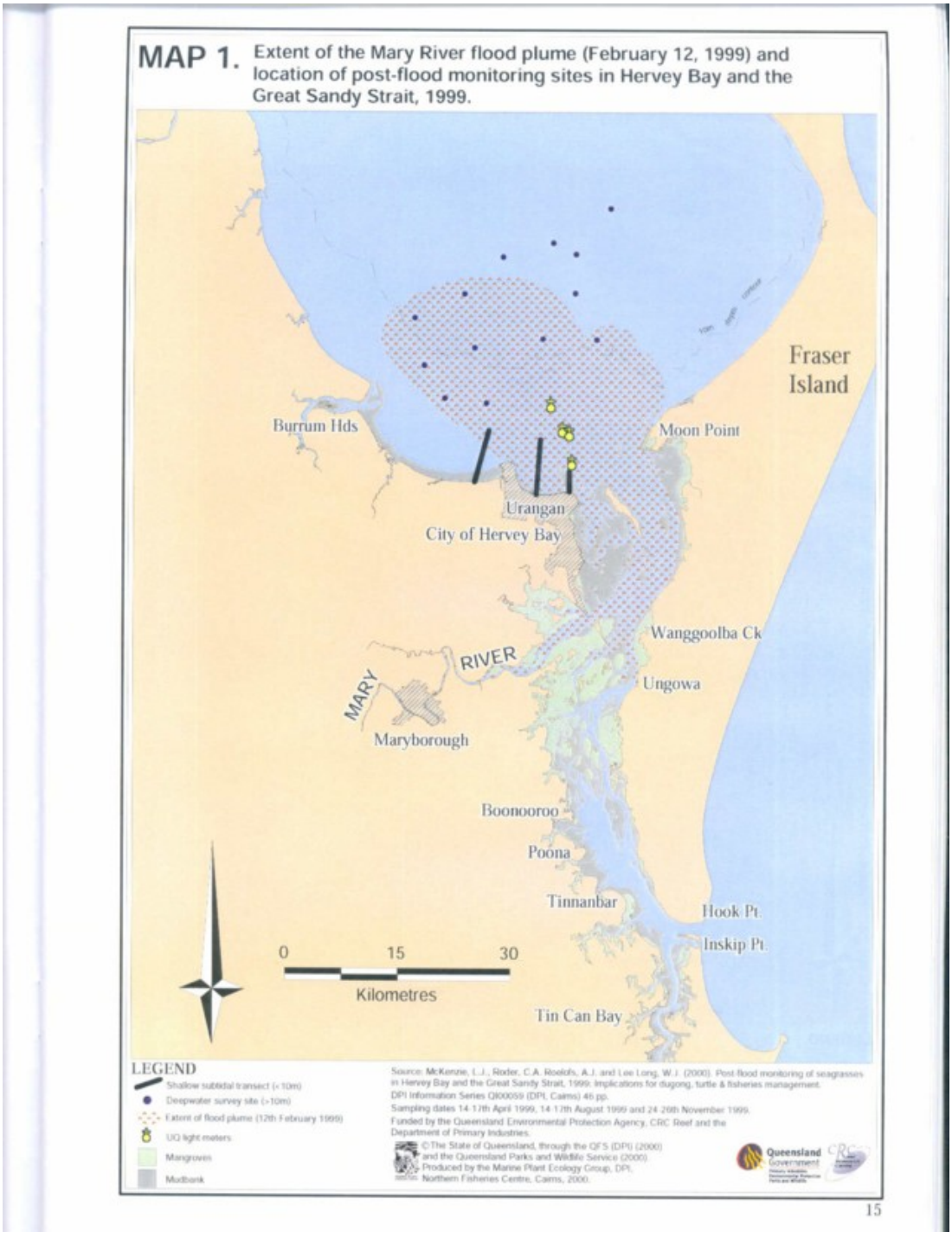
- that this hard work over many years will be inundated and lost if the Traveston Crossing Dam proposal goes ahead. There is no amount of money that will compensation for that loss.

- that any streambanks that become inundated and the water level flucuates up and down, will result in enormous collapse of streambanks (with or without vegetation) ongoing supplying sediment into the impoundment. Its been 20 years since the Mary River Barrage has been built and this stability of banks is still happening and no compensation to landholders has ever been paid. The effects of this on riparian vegetation need to be assessed. Experience in the catchment suggests that it will not be possible to mitigate this impact.

  Recommendation: An assessment of the impact on the banks of the Mary River upstream of the tidal Mary River barrage be included as part of the EIS process. A conditions assessment of all streambanks within the proposed inundation area, assessment of risk of slumping and accurate mapping of channel width to allow for future compensation for landholders, must be conducted as part of the EIS.

- the effect of the spillway in decreasing the peak intensity of downstream flood flows but increasing the duration of high flow and high water level events (QWIPL 2006) is likely to have large impacts on river bank stability for a great distance downstream. These riverbanks also consist of deep unconsolidated alluvium held together by fragile riparian vegetation. This has already been observed in the catchment as a result of the construction of Baroon Pocket dam which resulted in the destruction of riverbanks and sediment infill of the stream bed

along the entire downstream catchment of Obi Obi creek (more than 30km) (Braby 2007). This excessive sediment most likely contributed to death of seagrass and impacted on fisheries, dugong and marine turtles in the Great Sandy Straits after the 1992 floods (McLeod 1996). The extent of the Mary River flood plume of the smaller flood of 1999 flood (Feb 12th 1999) is illustrated in Map 1 (McKenzine et.al.2000). CSIRO research (De Rose et. al, 2002) has already showed that riverbank erosion can contribute upwards of 87% of end-of-valley sediments in the Mary River Catchment.



Recommendation: The implications of this effect for infrastructure and downstream of Traveston Crossing requires thorough investigation for impacts on landholders, communities and ecosystems as far as the Great Sandy Straits Ramsar Wetlands. A conditions assessment of all streambanks downstream, assessment of risk of slumping and accurate mapping of channel width to allow for future compensation for landholders must be conducted as part of the EIS.

- Community attitudes towards the Mary River have changed significantly over the past decade. Millions of dollars in government funding has been allocated for river restoration, which has helped landholders along the river and other interested community members set up programs to restore the Mary River catchment (Appendix B-Pickersgill et. al. 2007). Landholders and community groups applied for funds for the following activities: tree planting, fence construction, restricted stock watering points, hardened cattle pads (to reduce bank erosion at stock access points), pipework and pumps for reticulation, cattle troughs, riffle placement to slow stream flow, stream bed restoration and the control of woody weeds (Kelly, 1998). In 2004 the Mary River community was awarded the coveted National Rivercare Award for the implementation of the Mary River and Tributaries Rehabilitation Plan.
  Recommendation: The full economic, environmental and social costs of potential collapse of streambanks both in the proposed inundation area and downstream, longer flooding in Gympie, excessive sediment flowing out into the Great Sandy Straits Ramsar Wetlands and even loss of pasture from prolonged inundation downstream of the dam infrastructure need to be included in the assessment of the project's potential impacts in the EIS.

- There needs to be a policy that guides the QWIPL, Queensland Government and Futures Task Force to ensure affected people's wellbeing during the project evaluation phase and plan in the scenario that the project may not go ahead. The EIS process consultation and initiatives undertaken by the Community Futures Task Force must consider the rebuilding of the impacted community for the scenario that this project does not get approved. Already there is harm done by the way this project has been managed and issues to be included (but not limited to) are:
  - Property values grossly affected.
  - Abuse of process – land acquisition before approvals and bullying associated with that.
  - How to return land purchased by the government back to farming.
  - How to conserve land purchased by the government that would be suitable for conservation or needs restoration such as riverbanks.
  - Encouraging businesses back to the area.
  - How to protect our endangered species and our unique valley from future dam proposals

Recommendation: One of the possible outcomes of the EIS is that the application for development be refused, either by the Coordinator-General or subsequently by federal government intervention. In that event, the Coordinator-General could consider recommending that those properties already purchased by the State Government, be included in protected areas, consistent with the National Strategy on Conservation of Australia's Biological Diversity. (http://www.deh.gov.au/biodiversity/publications/strategy/goal.html, excerpt here below)

"Actions

1.5.1 Incentives for conservation

Ensure that adequate, efficient and cost effective incentives exist to conserve biological diversity. These would include the use of appropriate market instruments

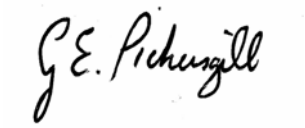
> and appropriate economic adjustments for owners and managers, such as fair adjustment measures for those whose property rights are affected when areas of significance to biological diversity are protected. Priority should be given to:
> a. ***areas important for migratory species, threatened indigenous species, remnant vegetation, wetlands and corridors between protected areas*** (my italics); …

In particular, streambanks (which are corridors) be fenced off, off stream watering points installed and funds made available for fencing, revegetating and weed control as part of the compensation for the social harm that has been done to this Mary Valley Community already.

I trust that all the issues which I have raised plus those raised by Save the Mary Coordinating Group are included in the Terms of Reference
I request to be considered a stakeholder in the ongoing consultation process concerning the project and in the Resource Operations Plan that would license its operations under the Water Act 2000 should the project be approved. I also request that this submission on the draft ToR be considered as a submission to the EIS itself.

Finally, if any part of this submission is unclear, or if you require further information please contact the undersigned.

Yours Sincerely,



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Appendix A
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http://www.wb2020.qld.gov.au/icm/mrccc/default.htm

The **COD** *Line*

Riverbank restoration work –

Experience and threats to success after 14 years

Glenda Pickersgill
Landholder, Kandanga

Here are a few tips and benefits from my 14 years of experience fencing my stock off river banks and watching the vegetation along the banks regenerate naturally, with a little help.

Firstly the fencing bit

Fencing often involves fencing off the top bank and working with your neighbour to stop their stock coming across the stream from the bottom. You also need to provide **alternative access** to water for your stock, by setting up a number of troughs.

We found **electric fencing** is more economical and easy to fix after floods than permanent barbed wire fencing. Painted wooden garden stakes often last out 10+ years, are cheap and don't short out when the insulators age, the way steel posts do. Make your own insulators from garden hose or poly pipe. Easier still if there are some remnant trees along the banks, as screwing an insulator into the trunk is by far the quickest and cheapest way to set up an electric fence. Tie wire will often do if you only have a few kilometres to fence off and energize.

Next, revegetation …

In no major rush, we watched the **succession of vegetation** occurring on the ungrazed banks and looked for opportunities to enhance-plant only the species not naturally recolonising. Firstly, at the toe of the banks near the water's edge, bottle brushes (*Callistemon viminalis*) began to establish from seed. In a few years the she-oaks (*Casuarina cunninghamii*) further up the bank quickly began to shade out the grasses and give protection from frost, allowing other species to become established either by planting or naturally from seed brought in by birds or flying foxes, or floated down with floods.

It is a common sight to see these she-oaks and bottle brushes begin the **succession phase of recovery** in many areas throughout the catchment where stock have not been able to graze and sufficient native seed is being brought into the area by natural elements. She-oak and bottle brush seed are also very easy to collect and germinate in trays or direct sow.

From bare eroding banks to this scene in 14 years – helping nature recover in the Mary River catchment.

To assist in getting more plant diversity and bank stability, we **planted** weeping lillypilly (*Waterhousia floribunda*) seedlings along the lower section of the bank anywhere from 3 to 8 metres from the water's edge. These are amazingly easy to dig up from sandy bars within the tributary creek systems where they germinate in mass numbers and, after a few months in a shade house, are ready to plant out. *Lomandra longifolia* (matrush), a native sedge, is another common bank stabilizer, often recovering in areas not grazed. It can also be easily germinated and grown in pots from seed or direct-seeded.

The black bean tree is another tree species that has demonstrated incredible stability on the steepest of banks along the Mary River and its tributaries. It also is simple to establish by **burying the bean seed** about 3 cm deep.

A few afternoons of wandering along the banks yields an amazing number of plants that establish under the she-oak canopy. With a tree canopy starting to emerge, the sound of birds has become more obvious, and with the birds have come a wide range of other riparian rainforest species which we are fortunate to have close by along Kandanga creek.

The birds have also brought in some **weed species**, notably Chinese elm, camphor laurel and wild tobacco bush. Over time we've found that the tobacco bush is actually beneficial, dying out over a ten year period after providing a food supply for pigeons which, in turn, bring in sandpaper fig seeds. The Chinese elm and camphor laurel serve in the first few years as bird perches and help with canopy closure, but in time these weeds will require selectively poisoning when they reach the age of seeding. Castor oil plant is another weed that is useful as a bird perch but then requires poisoning before it seeds; this weed is increasing in the catchment. Ongoing is the control of vines such as cat's claw creeper, Madeira vine, Brazilian nightshade, balloon vine, moth vine and Dutchman's pipe. This requires a control program of twice yearly wandering along the track that's been brushed along the length of the stream banks.

And the benefits….

The increase in canopy cover and leaf litter means more habitats suitable for fauna. We now commonly see a wide variety of birds (including bush turkeys), bandicoot or echidna diggings, and snakes visiting the area. In the water there

… *continued on Page 4*

Riverbank restoration work

... continued from page 3

are plenty of lungfish, turtles, jewfish nests, platypus and even the occasional Mary River cod to be seen.

So how does this succession revegetation **handle the big floods** … the last being in 1999? The she-oaks often get damaged the most but often recover, or a gap is created in the canopy for other riparian rainforest plants to become established. The banks are more stable thanks to the deeper rooted plants and the biodiversity and aesthetics are improving each year.

The cattle are **drinking cleaner water** from the troughs than they were from the river, and drinking more frequently. There is less risk of cattle polluting the river through urine/manure, bogging or dying in the water.

Biggest time user?

The **weeds** are, without a doubt. Particularly this year, the focus is on the Chinese elm and camphor laurel.

However another threat to our river bank restoration project and my time has dropped on us like a bomb shell!.

The announcement of the proposed **Traveston Crossing Dam** has put a dark cloud over the future of a large number of restoration works in the catchment that we as landholders have devoted our time and energy to protecting.

My property is just one kilometre upstream of the proposed dam wall, and my whole property would be innundated.

Personally, it has been a challenge to remain motivated through the past six months of uncertainty and it will only be by standing united that we can win this fight to stop the dam proposal. The river and its tributaries should be preserved for future generations in our community, not drowned in a quick, poorly planned grab for political power when there are more economically, socially and environmentally better alternatives such as harvesting and recycling water in the catchment that needs it.

More information about alternatives to building new dams can be found at the ***www.savethemaryriver.com*** *website.*

Appendix B: Paper submitted to Australian 5th Stream Management Conference

[1]Australian rivers: making a difference. (What have been the outcomes of restoration investments?)

Dam Threat to a Decade of Restoration of the Mary River, Qld.

Glenda Pickersgill[1], Steve Burgess[2] and Brad Wedlock[3]

[1] Save the Mary River Coordinating Group. www.savethemaryriver.com
[2] Gympie and District Landcare Group. www.gympielandcare.org.au
[3] Mary River Catchment Coordinating Committee. www.wb2020.qld.gov.au/icm/**mrccc**/main.htm

Keywords
Traveston Crossing, endangered species, Ramsar wetlands

Abstract
The banks of the Mary River and its tributaries were once covered with rainforest species that protected the banks from erosion during floods. However these streams have generally become wider and shallower as a result of clearing, with many banks actively eroding, destroying valuable ecosystems and river flats in the process. The Mary Catchment has been identified in studies as an aquatic biodiversity hotspot and contains a number of endemic endangered species.

Over the past decade, millions of dollars in government funding for river restoration has helped landholders and other interested community members to establish programs for restoration of the Mary River catchment. In 2004, the Mary River community was awarded the coveted National Rivercare Award. Now legislative and policy changes empowering the State Government and water corporations to capture, store and transfer large quantities of water out of the catchment into the proposed South East Queensland water grid, place these successful restoration activities and the community that has participated since 1995 at risk.
This paper describes restoration works conducted in the Mary Catchment, and outlines the present and future impacts of the Traveston Crossing Dam proposal on the catchment, the restoration projects and communities.

Introduction
South East Queensland is one of the fastest growing areas in Australia. Predicted growth is more than 1 million will settle in SEQ by 2026 bringing the total population to 3.7 million people (Queensland Government 2006a). The Mary River Catchment has significant ecological conservation values. It is situated in a biogeographical transition zone between tropical and temperate environments, and supports many plant and animal species of high conservation significance. Species endemic to the catchment are the Mary River Cod and Mary River Tortoise (both listed as endangered under the EPBC Act and have restricted geographical ranges). Other endangered species include the Australian Lungfish and Grey-headed Flying Fox(listed as vulnerable under the EPBC Act), and the northern limit of the Giant Barred frog (listed as endangered under the EPBC Act). The Mary River is the best and last 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.

[1] Draft paper submitted to the Australian 5th Stream Management Conference in Albury 22nd-25th May 2007

The waters of the Mary River feed into Hervey Bay and the Great Sandy Strait Ramsar Wetlands, which are of international significance. The region's wealth is tied up in hard-to-measure intangibles such as flood pulses and the fertile silts suspended in its waters. The wetlands may stay virtually dry for several years, before being replenished by violent floods. Wildlife in the region is similarly transitory, with migrating birds, fish and mammals particularly the dugong coming and going.

The last decade has seen enormous changes in policy intended to protect Australian catchments and encourage community involvement in river conservation and restoration work. This paper details the evolution of these changes in the Mary River Catchment, examples of resultant on-ground works and how recent water planning place this community work and good will at risk.

A decade of River Restoration

Like most major catchments in the last 10 years, the Mary River has been the recipient of Government river restoration programs due to community concerns. In 1993 the State Government selected the Mary Catchment to pilot the "Integrated Catchment Management" (ICM) program. Through this ICM program the Mary River Catchment Coordinating Committee was formed as a forum for community catchment management action.

In 1995 the *Voluntary Riverbank Restoration Grants Scheme* was established - the first action-based projects for the Mary River Catchment. Through this scheme, landholders applied for funds for the following activities: tree planting, fence construction, restricted stock watering points, hardened cattle pads (to reduce bank erosion at stock access points), pipework and pumps for reticulation, cattle troughs, riffle placement to slow stream flow, stream bed restoration and the control of woody weeds (Kelly, 1998). Some reported benefits in its first year of operation was the estimated 3 million new seedlings emerging in trial plots in the riparian zone. By the end of the program in 1999, stock access had been limited by 300 km of fencing, with 150 new offstream watering points established and over 100 000 native seedlings planted. A reduction in the amount of fecal contamination and nutrients from cattle in the riparian zone was estimated to be the equivalent of a sewage treatment plant servicing 50 000 people (Kelly, 1998). Over 300 properties have been involved in the program.

The Mary Catchment was a focus of Land & Water Australia (then LWRRDC) through the River Landscapes Project from 1997 to 1999. During this time demonstration sites and community action programs were established. In 2000 the National Rivercare Program funded *Implementation of the Mary River & Tributaries Rehabilitation Plan* commenced. This was the first river rehabilitation plan in Queensland that followed the new Australian River Restoration Manual guidelines.

This on-going project involves grants and demonstration sites that provide incentives for, and information on, the restoration of the waterways of the Mary River Catchment. The plan prioritizes rehabilitation efforts based on conservation significance, targeting improvements to the habitat of endangered species as well as riparian vegetation communities of conservation and strategic significance. In 2004 the project won the coveted National Rivercare Award and this successful project continues today with over 400 properties engaged.

At the same time Landcare Groups across the Mary Catchment also addressed the loss of riparian areas within their respective Landcare districts. The Mary Catchment has been identified as a catchment requiring investment under the "National Action Plan for Salinity and Water Quality" due mainly to the high levels of phosphorus and salt levels experienced across the catchment. Salinity hazard mapping prepared by the Queensland Government (2003) shows significant parcels of the catchment are at high risk of developing salinity problems in the future.

Landholder and community experiences of river restoration

Case Study 1: Helping nature recover over 14 years at 1865 Mary Valley Rd, Kandanga (Pickersgill 2006)

CSIRO research (De Rose et. al, 2002) showed that riverbank erosion can contribute upwards of 87% of end-of-valley sediments in the Mary River Catchment. After the 1992 flood, a number of actively eroding banks were present on the property, putting at risk valuable river flats and in-stream habitat for the vulnerable Australian Lungfish. The worst site was on an outside meander of the river downstream of the confluence of Kandanga Creek where a sheer cliff face of –5 -6 metres in height remained. The objective of the revegetation was to re-establish a riparian rainforest cheaply through excluding stock, encouraging natural regeneration, direct seeding, planting and weeding where necessary. Riparian rainforest fringes the nearby Kandanga Creek and forms part of an endangered regional ecosystem found only along the tributaries of the Mary River. This has been found to be an invaluable seed source for ecological succession on riverbanks of the central Mary River where very little soil seed-bank currently exists. Protecting the area from grazing was essential to success. Electric fencing is more economical and easy to fix after floods than permanent barbwire fencing.

A succession of vegetation occurred on the ungrazed banks and those species not naturally recolonizing were planted. At the toe of the banks, near the water's edge, bottlebrushes (*Callistemon viminalis*) began to establish from seed deposited on freshly eroded bank. Within a few years, further up the bank the she-oaks (*Casuarina cunninghamii*) quickly began to shade out the grasses and give protection from frost, allowing other species to be established, either by planting or naturally from seed brought in from birds, flying foxes or floated down with floods. This has been observed in many areas throughout the catchment, where stock has been unable to access. (This succession process has also been recorded in the Manning River Catchment (Stockard et. al.1998)).

The weeds are the biggest problem with the focus on Chinese Elm and Camphor Laurel. However another threat to our river bank restoration project looms - the announcement of the proposed Traveston Crossing Dam. This dam proposal has put a dark cloud over the future of many restoration works in the catchment.

Case Study 2 – Annual community tree planting days – Gympie City riverbank

For 10 years the public has participated in Mary River tree-planting days leading to the extensive rehabilitation of the riverbanks of the Gympie city reaches. This is part of a planned restoration of the river coordinated by Gympie & District Landcare Group. This project has played an important role in raising community awareness.

Many in the community are proud to be part of this project, which involves stabilizing banks, forming walkways and river access points, controlling urban storm water drainage inflows and control of pest species such as Chinese Elm and Camphor Laurel. This river reach is now much more resilient to the erosive effects of periodic flooding, and is a popular spot to observe the Australian Lungfish. The project has transformed a previously unpleasant semi-urban industrial scene into a popular riverside walk featuring native local riparian vegetation.

Community involvement in water management and planning

In the late 1990's the Department of Natural Resources introduced the Water Resource Planning (WRP) concept based on social and economic data as well as environmental and hydrological analyses of entire catchments. The aim of the process was to determine total catchment water

resources, existing entitlements, environmental flow requirements and whether further allocations are possible.

On May 2002, the Minister announced the preparation of a draft WRP for the Mary Basin. The draft plan was developed by November 2005 following extensive community consultation initially through the formation of Sector Representative Groups and then selection of a Community Reference Panel and technical assessments of the associated issues including social, economic and environmental factors. The process was extremely well received by the community and the Mary Basin process was showcased by the State Government as an example of effective public involvement in Government planning (Queensland Government, 2003). The draft Mary Basin WRP was released for public comment on 18th November 2005, and closed for comment in February 2006.

The Traveston Crossing Dam Proposal

Soon afterward, in April 2006, the Premier announced the Traveston Crossing Dam proposal - potentially one of Queenslands largest, shallowest dams - to be constructed on the main stream of the Mary River, in the middle of the catchment floodplain, for the purpose of supplementing Brisbane's water supply. No mention of the Traveston Crossing Dam proposal was made throughout the public consultation process, or in any of the reports prepared for the draft WRP or in the draft WRP itself (the dam-site had been appraised in 1977 and 1991 but ruled out both times (QDPI (1993)). Department of Natural Resources, Mines & Water official documentation made no mention of the dam. All public documents concerning future water infrastructure in the Mary Valley referred to a small regulating weir at Coles Crossing and raising Borumba Dam, as discussed during the WRP process (NRW 2006).

Before the draft WRP became legislation, the Community Reference Panel for the Mary Basin WRP formally wrote to the Minister unanimously withdrawing their support for the WRP, stating that they had been 'profoundly deceived' by the process (J. Buchanan, R. Fredman pers. comm 2006). Petitions against the proposal from more than 20 000 citizens were tabled in State Parliament (Hansard 2006, 3 petitions). The good will that had been building up over the past decade towards an effective community partnership with government and industry in managing water resources and looking after the river evaporated within weeks.

When the WRP was passed by State Cabinet and became legislation in July 2006, the final WRP had been significantly changed from the draft (Queensland Parliament 2006, MRCCC 2006). Environmental flow objectives (downstream of the proposed dam site) had been altered to allow the construction and operation of the dam. There was no public consultation concerning these changes to the draft legislation (NRW 2006).

The final WRP provides little or no protection of environmental flow in the river at crucial locations downstream of the dam site. For example State Government IQQM modelling of environmental flows shows that median flows in crucial stretches of the river will be reduced by 70% (NRW 2005, Burgess & Edward 2006). No account is made for interactions between surface and ground water flows in the Mary Valley.

Overall likely impacts of the Dam Proposal

The dam site is in a depositional region of the floodplain of the Mary River, on very flat land with very deep, fertile, well-drained soils. The majority of the proposed ponded area is class 1 agricultural land (QWI 2006). This makes for a very shallow storage, prone to extraordinarily high annual seepage and evaporation losses and subject to serious water quality problems of salinity, high nutrient loads, low oxygen, toxic metal contamination, algae and weed infestation,

greenhouse gas production and sedimentation. If constructed, Traveston Crossing Dam at stage 1 will have an average depth of only approximately 5 metres and at stage two, an average depth of about 8 metres. Much of the dam would be less than 2 metres deep. (Calculated from published volume/surface area figures – QWI 2006)

The construction of a dam at Traveston Crossing is likely to have significant impacts on the following relevant matters protected under the EPBC Act including: downstream flows reduced by barrages/weirs/dams will affect aquatic and terrestrial ecosystems and biodiversity; the altered natural flood cycle will affect downstream floodplains; fisheries in the upstream, reservoir and downstream areas; and the emission of greenhouse gases associated with large dam projects will increase global warming (Save the Mary River Coordinating Group 2006). The main channel of the Mary River will be inundated for approximately 36.5 km at Stage 1 and 50.7 km at Stage 2 and have been a focus for river restoration works. The proposed dam would inundate 500 ha of endangered riparian rainforest 'protected' by the Queensland Vegetation Management Act.

Examples of likely impacts on iconic listed species and crucial processes of the Mary River
The proposal to dam the Mary River at Traveston Crossing combined with recent spawning habitat losses on the Burnett River will completely extinguish more than 80% of the natural spawning and nursery sites for the Australian Lungfish(*Neocerratodus fosteri*). There is no other lungfish living in the world today that can replace the Lungfish in scientific significance. No scientific data has been forthcoming from the State Government which can substantiate the effective use of the Paradise Dam fishway by Lungfish.

The proposed dam wall could severely impact on the seasonal movements and breeding requirements of the Mary River cod(*Maccullochella peelii mariensis*). Radio tracking studies (Simpson, 1994) show that the Mary River cod migrate long distances along waterways, especially during spawning times and there is no evidence of the Mary River cod using a fishway in its natural habitat. There is no research showing they are capable of breeding in dams.

If this proposed action were to go ahead it will inundate 80% of the Mary River tortoise (*Elusor macrurus*) nesting banks upstream of the proposed Traveston Crossing Dam wall and its associated riffle/pool habitat (Latta 2006 per comms). Downstream there will likely be significant impacts on all the Mary River Tortoise nesting sites due to loss of sediment. There is no evidence of the Mary River Tortoise utilising a fish-way in its natural habitat and significant deaths of similar species in negotiating weirs have been documented on the nearby Burnett River. (Queensland Government EPA 2004)

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. Flood plumes used to reach as far as Lady Elliot Island, once the most productive scallop grounds in Queensland (J.McLeod pers comm 2006). The Burnett River now contributes little to marine productivity (particularly the important prawn productivity in the Swains Reef) with few flood plumes ever reaching the sea due to the impact of more then 30 major impoundments. An overall decline in natural stream flow in the Mary River has been recorded since the 1960s. This period corresponds to an increase in dam infrastructure. These findings raise serious questions on further reductions in freshwater flows due to Traveston Crossing Dam. Reductions in low and medium flow events will increase salinity levels within the estuarine reach and reduce the frequency and quantity of freshwater overflows over the Mary River barrage. The natural flushing of the river and mixing of freshwater with the seawater to create appropriate salinity gradients in the estuary helps support marine fish production. The commercial fishing and tourism industries (valued at over $100 million/year) of the Great Sandy Strait are threatened by reduced river flows.

Effect on Community and Landholder Attitudes Towards River Restoration and Management.
Within two days of the Queensland Government's announcement of the dam proposal, the Save the Mary River Coordinating Group was formed. This group, which has developed substantial community support, has done much to educate the local and wider community regarding water management and potential impacts of the proposed dam. Main objections to the proposal include: the large-scale dislocation of residents (upwards of 3000 people will be forced to relocate though inundation alone), communities, businesses and infrastructure; the substantial damage to the environment both upstream and downstream of the dam wall; the completely unsatisfactory process of community involvement, consultation and negotiation; and the lack of published comparisons of environmental, economic and social costs of alternatives.

Unfortunately, the announcement to build a dam has already had a significant social impact. Residents have struggled with loss of motivation and depression due to the uncertainty, deliberate misinformation, and the unsatisfactory process. Businesses have been badly affected, and the impetus for on-ground work on river restoration and sustainable land management has been lost. The government is aggressively purchasing land for both stage 1 and stage 2 of the project, even though only stage1 has been referred to the Commonwealth Government for approval (under the EPBC Act) and preparation of an Environmental Impact Statement for the project has just begun. The State Government is unlikely to pursue active land and riparian management of these properties in the same spirit as the landholders who championed river restoration.

Conclusion
Community attitudes towards the Mary River have changed significant over the past decade. Millions of dollars in government funding has been allocated for river restoration, which has helped landholders along the river and other interested community members set up programs to restore the Mary River catchment. In 2004 the Mary River community was awarded the coveted National Rivercare Award for the implementation of the Mary River and Tributaries Rehabilitation Plan.

Before the Traveston Crossing Dam proposal was announced, community and landholder participation in caring for the river had been exemplary. Productive partnerships between government, landholders, industry groups and the wider community were in place. However, since the proposal was announced in April 2006, residents and business owners within the affected area have been severely impacted and the impetus for work on river restoration and sustainable land management has been lost.

Mary River communities have worked hard to restore the Mary River catchment and protect the region's unique ecosystems, and they remain committed to saving the Mary River from a repeat of the disastrous mistakes made in other catchments in the region. Will the Federal Government listen to these communities and act to prevent the destruction of the river's fragile ecosystems and endangered species?

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Submission To The Senate Inquiry Into The Traveston Dam and Future Water Supplies for Southeast Queensland from:

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The need for change

We do not use our water sustainably – we are using it at a faster rate than supplies are being replenished. We need to change our current urban water "cycle" which is a straight line from dam to disposal with a shortage of water at one end and waste at the other. We can no longer afford to use our water once and then throw it 'away' to pollute our waterways.The Government has consistently resisted recognizing the potential of using recycled water to supplement our water supplies. It has promoted the use of recycled water for industrial uses and dual reticulation, but this uses only a small fraction of the water that is available for recycling. It is only when large-scale projects (such as replenishing our storages) are implemented that significant increases in the quantity of water recycled can be achieved.

It is becoming increasingly apparent that we can no longer rely on dams – they are letting us down – yet politicians from both sides of politics are advocating more dams, regardless of climate change predictions that they will become even more unreliable in the future. Perhaps our politicians are unaware that *"the definition of insanity is doing the same thing over and over and expecting different results" (Benjamin Franklin).*

This submission advocates optimising the use of recycled water. This would provide a sustainable, reliable supply of water that has minimal dependence on rainfall and runoff. It compares favourably to new dam infrastructure in all respects. Recycling would enable us to benefit more from the capital that has been invested in the water that is already available to us. However, in order to achieve this, a proactive community education program on water quality and treatment will be needed.

Benefits to the Environment

Recycling minimises the amount of effluent discharged to waterways. The Healthy Waterways Partnership estimates that, unless there is 100% recycling, the condition of SE Queensland waterways will continue to deteriorate.

Recycling generates less greenhouse gases than pumping water from a dam that is a considerable distance from where its water is needed. Methane produced from rotting vegetation in the dam adds considerably to the greenhouse gas problems, particularly as methane has much more impact on global warming than carbon dioxide.

Cost

The cost of recycling compares favourably to both the proposed dam infrastructure and also to desalination. See Review of Water Supply – Demand Options for South East Queensland (Institute of Sustainable Futures & Cardno, 2007), pages 56 and 57.

Quantity

The amount of water available for recycling is considerable. Half of the water we use arrives at a sewage treatment plant. In SE Queensland we use 480,000 ML of water each year so about 240,000 ML of water are potentially available for recycling. The Review of Water Supply – Demand Options for South East Queensland lists some of the options for recycling. Further opportunities could be found if needed.

Technology

The technology to safely and reliably reclaim water is available and well proven. Water has been recycled for many decades where towns upstream discharge their effluent that becomes part of the water source for the towns downstream. This type of recycling relies on *"dilution being the solution to pollution*" and

sophisticated water treatment plants. Modern technology that includes reclamation of water using membranes and advanced oxidation enables us to ensure an even safer product.

Social Aspects

Fear of the lack of community acceptance is the main factor that inhibits politicians from recommending recycling. Lack of knowledge in the community has made it easy for politically motivated fear campaigns to prevent recycling projects from being implemented.

Governments, at all levels and all political persuasions, and water utilities have been well aware of this lack of community knowledge but have done nothing (and continue to do very little) to recognise and address the problem.

With the proposed recycling via the Western Corridor there is increasing confusion in the community about water recycling and several examples of uncertainty and misunderstanding have come to our attention. For example:

> **Water for Road Construction Dust Suppression**
> It has been reported that there is an impression that **all** recycled water is of the same quality as purified recycled water so that it is safe to use it for dust suppression without precautions. This is not the case, and failure to have adequate Occupational Health and Safety measures in place for its use could result in serious health problems. This misperception is a cause for concern.
>
> **Dual Reticulation**
> Educational material for dual reticulation explains that the water provided has to be used carefully. It comes in purple pipes to distinguish it from potable water, should only be used outdoors and for toilet flushing, children should not be allowed to play in it and backflow is to be avoided. Fire fighters have concerns about its use. We are given the impression that recycled water is not safe but no attempt is being made to explain to the community that its quality should be distinguished from the quality of water that will be recycled to Wivenhoe Dam.
>
> **"Unplanned" and "Planned" Indirect Potable Reuse**
> Some do not consider water to be recycled if it is "unplanned". It would be less confusing if, instead of the distinction between "unplanned" and "planned" reuse, we could be helped to understand how these processes differ. In "unplanned" reuse dilution and the water treatment plant are the most important factors, whereas when the reuse is "planned" the focus is on the water reclamation plant that incorporates sophisticated, efficient technology.

The ambivalent messages that the community is receiving about the quality of recycled water not only inhibits its use as a water supply source but also has the potential to have serious impacts on community health.

A Comprehensive Community Education Program

In order to ensure that recycled water can be used to supplement our water supply sources we need to establish community trust in water utilities. Education and knowledge of water are important in establishing this trust. A community education program is urgently needed. This will require that we use positive, accurate terminology that avoids stigmatizing the product to provide knowledge and understanding of water quality and treatment.

We need to know what we put into water, how we take it out again and how we know that it has been taken out. We should discuss the quality of water and what it can be safely used for rather than where it has been and the treatment it has received. *(Water should not be judged by its history but by its quality – Dr Lucas van Vuuren).* We should make reuse “normal” and acknowledge where and how it already happens.

We should, however, also bear in mind that the reason why politicians are apprehensive about water recycling and continue to advocate new dams is because "*It is difficult to get a man to understand something when his salary [or political aspiration] depends upon his not understanding it.” (Upton Sinclair)*