



Save the Mary River Coordinating Group

Support and Information Centre, Kandanga Railway, Ph: 5488 4800

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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. Your 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,

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Stage 1/ Stage 2 split assessment: The original EPBC referral must be withdrawn and a referral of the full project – taking 150,000 ML/year out of the Mary River Catchment including: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

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 be 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 associated 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.

3.3 Nature 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 Dagon 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 its 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 its 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 any 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

S. Burgess and D. Edward

Save the Mary River Coordinating Group.

November 2006

Background

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

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

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

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

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

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

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

The places chosen for analysis are those downstream locations for which environmental flows are legislated for in the Water Resource (Mary Basin) Plan 2006, and the section of the river downstream of the proposed dam site (which is not protected in the WRP). The raw IQQM flow data released by the State

Government from the scenarios investigated in the draft water resource plan were analysed using IQQM (Department of Land and Water Conservation , 2004) , RAP (CSIRO, 2006) and a series of Excel spreadsheets to calculate the suite of flow statistics relevant to the WRP legislation.

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

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

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

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

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

Table 1. Summary of relevant environmental flow statistics calculated from “Hydrologic Impacts of Water Resource Management Scenarios” (also known as “Appendix A”) Dagon Pocket AMTD 204 km (Just downstream from proposed dam site)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	691,370	653,423	477,850
% of pre-development MAF		94.5	69.1
Median Annual Flow (ML)	430,714	386,530	135,802
% of pre-development MedianAF		89.7	31.5
Number of no-flow days	15	57	4031
% No-flow days	0.04	0.14	10.08
Continuous no-flow periods			
No flow periods less than 1 month	15	20	75

1 month to less than 3 months	0	0	18
3 months to less than 6 months	0	0	16
6 months to less than 12 months	0	0	2
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.60	2.39
Low Flow Exceedence			
%Days >= 10cm	95.0	87.9	87.5
%Days >= 30cm	72.5	62.4	49.0
%Days <= 1ML	0.6	0.2	10.3
ARI stats (Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	21,884	20,562	12,481
Percent of pre-development		94.0	57.0
5yr ARI (minor flood) (ML)	117,406	111,216	107,734
Percent pre-development		94.7	91.8
20yr ARI (major floods) (ML)	280,678	268,240	269,316
Percent pre-development		95.6	96.0

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

	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)

IQQM scenario	000b	002b	N007
	Pre-development	Current development	Large Reserve
Mean Annual Flow (ML)	2,569,051	2,410,543	2,242,125
% of pre-development MAF		93.8	87.3
Median Annual Flow (ML)	1,645,546	1,504,401	1,299,315
% of pre-development MedianAF		91.4	79.0
Number of no-flow days	1	2775	3599
% No-flow days	0.00	6.94	9.00
Continuous no-flow periods			
No flow periods less than 1 month	1	201	244
1 month to less than 3 months	0	23	29
3 months to less than 6 months	0	0	0
6 months to less than 12 months	0	1	1
More than 12 months	0	0	0
APFD (over full simulation period)	n/a	0.57	0.95
Low Flow Exceedence			
%Days <= 1ML	0.0	7.1	9.1
ARI stats (Annual series calculation)			
1.5yr ARI (flushing flows) (ML)	63,772	61,691	56,983
Percent of pre-development		96.7	89.4
5yr ARI (minor flood) (ML)	285,640	277,974	280,840
Percent pre-development		97.3	98.3
20yr ARI (major floods) (ML)	501,322	516,276	481,400
Percent pre-development		103.0	96.0

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

The table below summarizes:

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

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

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

Geomorphology

Barrier effects of the dam on sediment transport would be more significant for the middle and lower reaches of the Mary River.

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

Hydraulic habitat

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

Water quality

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

Aquatic vegetation

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

Aquatic macroinvertebrates

The effect of option R2 will be concomitant with the size of the impoundment. Option R2 would replace a large stretch of lotic habitat with the lentic environment of a large dam pondage. Very long on-stream pools are a feature of the middle reaches of the Mary River and therefore a proportion of the macroinvertebrate assemblage may be able to use vegetated edges of the dam pondage like the edges of pools – however, the extent of quality of vegetated edge habitats would depend on dam operation. Highly variable water level regimes in dams often result in edge zones that are bare or colonised by tolerant exotics such as para grass. Any stands of emergent and aquatic vegetation within the impoundment would be colonised by macroinvertebrates. However, some obligate lotic species would be lost and a large extent of deep benthic habitat within the pondage will support very few macroinvertebrates. Depending on the management of the pondage, downstream effects are likely to occur due to changes in wetted area, sediment distributions and benthic substrates.

Fish

Potentially a greater number of fish species affected than option R1 due to position of dam lower in catchment – a single large dam on the Mary River upstream of Gympie would inhibit access to a greater area of aquatic habitat than several upstream dams. Magnitude of impact depends on length of impounded stream channel (including tributaries) – likely to be more for downstream site (for a given dam height) due to wider valleys and flatter gradients than for option R1. The dam impoundment is likely to favour only a subset of the total species pool naturally present in flowing waters (e.g. bony bream and fork-tailed

catfish that are more likely to occur naturally in this part of the Mary River than at the upstream sites). Stocking of a dam in this part of the river system would open up more of the catchment to stocked species than option R1 (via free access upstream of the dam) though some downstream movement would also occur. A dam on this part of the Mary River is more likely to affect Mary River cod and lungfish than option R1, although currently degraded riparian and instream habitat conditions in this part of the river are likely to be negatively impacting on Mary cod and lungfish populations in comparison to less disturbed reaches further upstream.

Other vertebrates

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

General statement concerning the catchment

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

Impacts in the impoundment

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

Fish migration

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

EPBC species

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

Turbidity

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

Lungfish and Mary River Cod

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

Mary River Turtle

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

Conclusion

The statement that the environmental health of the Mary River will not be significantly affected by a large dam at Traveston Crossing because end of system flows will be maintained in excess of 85% of pre-development flows is simply not supported by the comprehensive scientific investigations that have already

taken place during the formulation of the Mary Basin Water Resource Plan. Even if 85% of pre-development mean annual flow volume is maintained at the river mouth, the likely environmental impacts of a markedly altered cease-to-flow regimes in the estuary, and severe changes to the flow regimes in the middle reaches of the river in critical habitats for lungfish, Mary River Turtle and other species will be severe and difficult or impossible to mitigate. Because of the incredibly variable nature of flows in the Mary River, the ability to maintain 85% MAF at the river mouth is simply a consequence of the fact that the dam will have a negligible effect on mitigating the large flood events in the Mary River.

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Appendix B: Notes on trends in streamflow in the Mary River and modelling the operation of the proposed Traveston Crossing Dam from 1997-2007

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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.

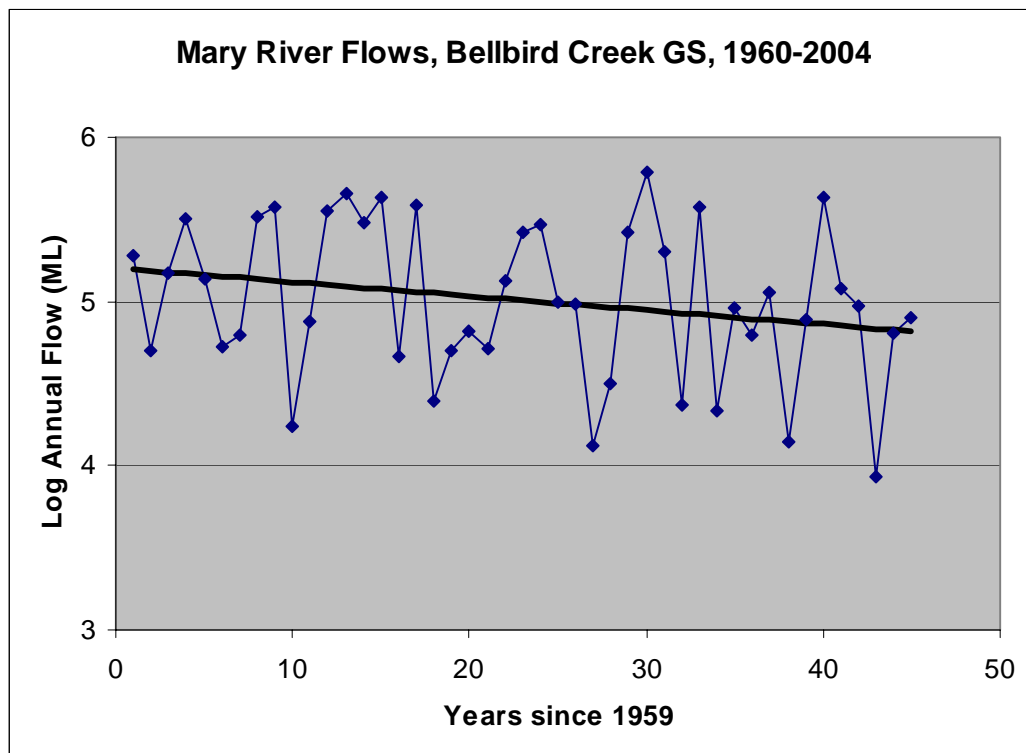


Figure 1. Trend in annual flow rate in the Mary River at the Bellbird Creek confluence.

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.

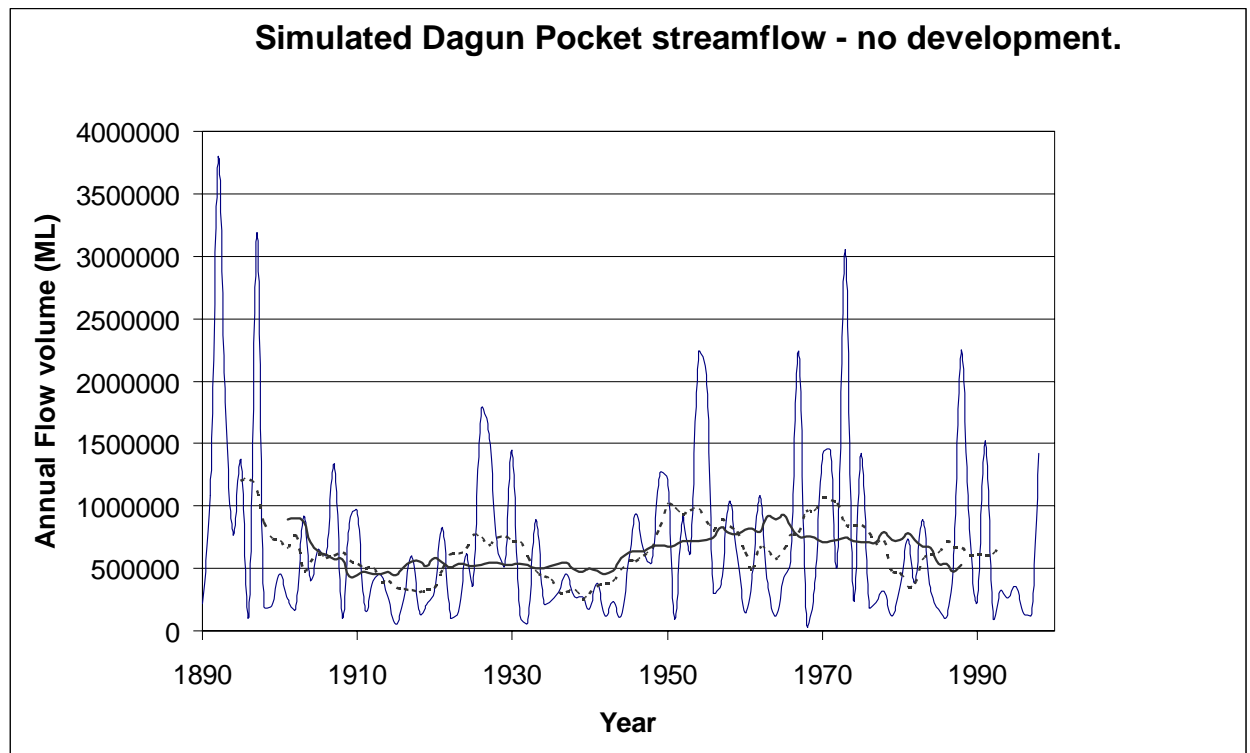


Figure 2. Simulated annual stream flow data for the 'no development' IQQM scenario at Dagon Pocket. 11 year and 22 year moving averages are shown. Derived from 'Appendix A' of the Environmental Flows and Scenario Implications Report for the Water Resource Plan (Mary Basin) 2005.

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 Dagon 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 approximate 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.

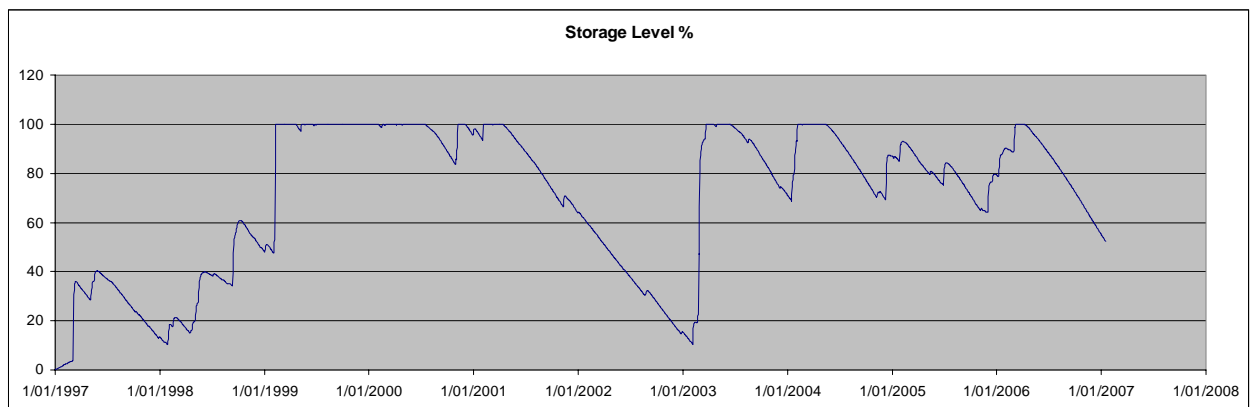


Figure 3. Storage behaviour curve for scenario S1-minimal loss.

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

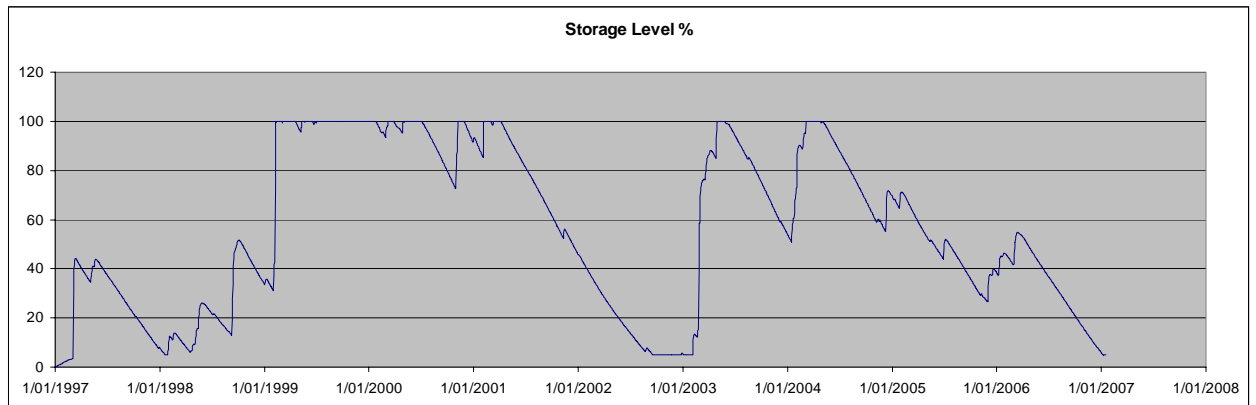


Figure 4. Storage behaviour curve for scenario S1-WRP.

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)

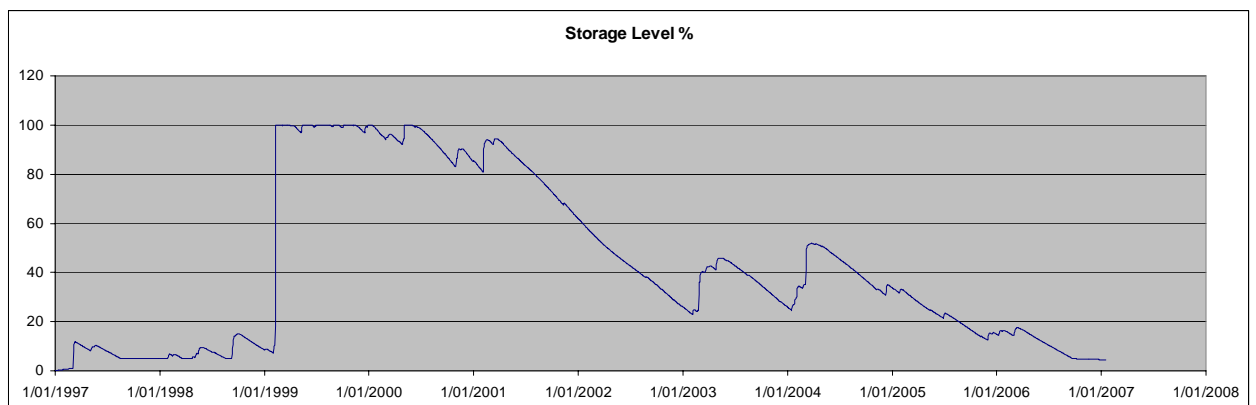


Figure 5. Storage behaviour curve for scenario S2-WRP.

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 Dagon Pocket %	30	33	55
Reduction in median daily flow volume at Dagon 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)

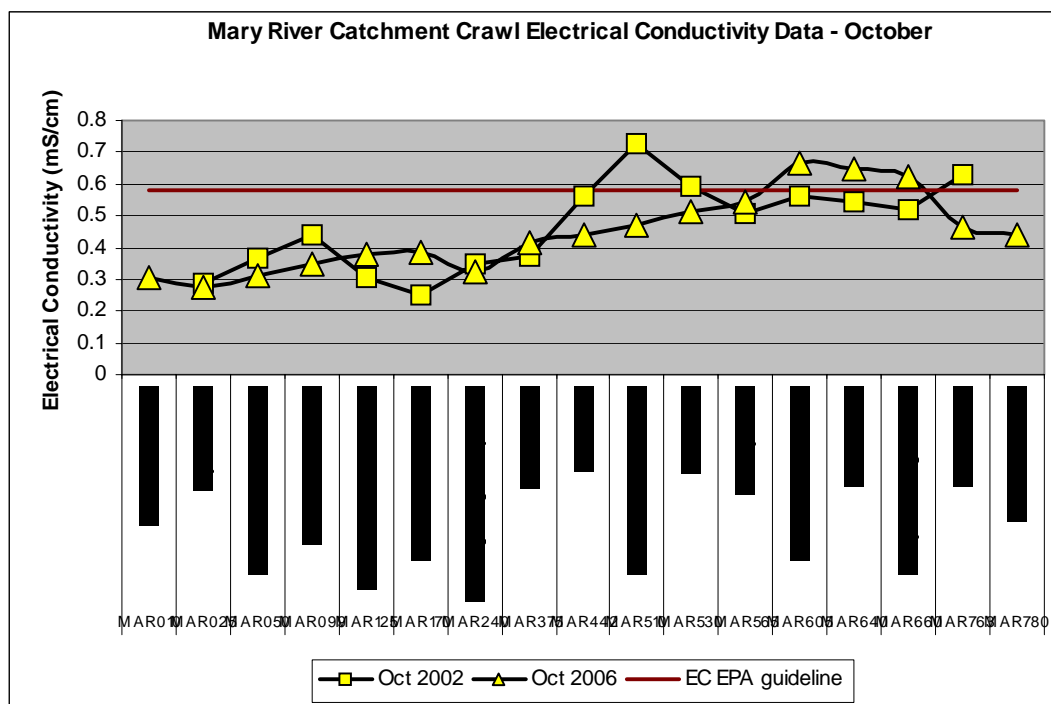


Figure 1: Electrical conductivity levels recorded during the 2006 & 2002 Catchment Crawls

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 $\mu\text{S}/\text{cm}$. Figure 2 also shows that when flows are low, EC levels already reliably exceed this figure.

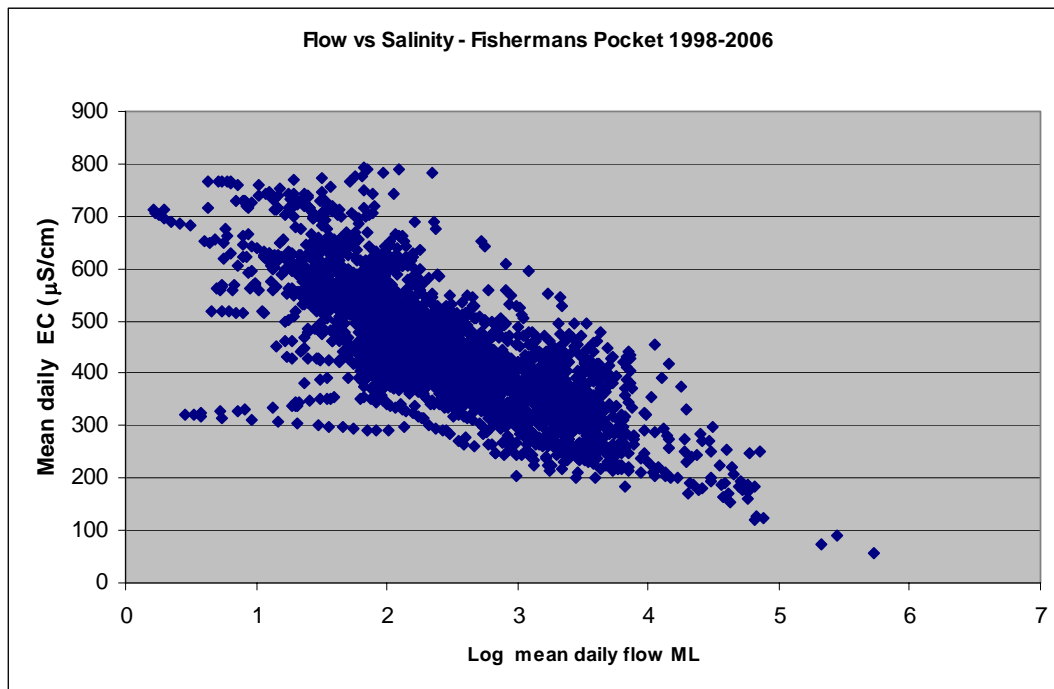


Figure 2. The overall correlation between reduced flow and increasing salinity at Fisherman's Pocket. Note the large number of EC readings above 572 $\mu\text{S/cm}$.

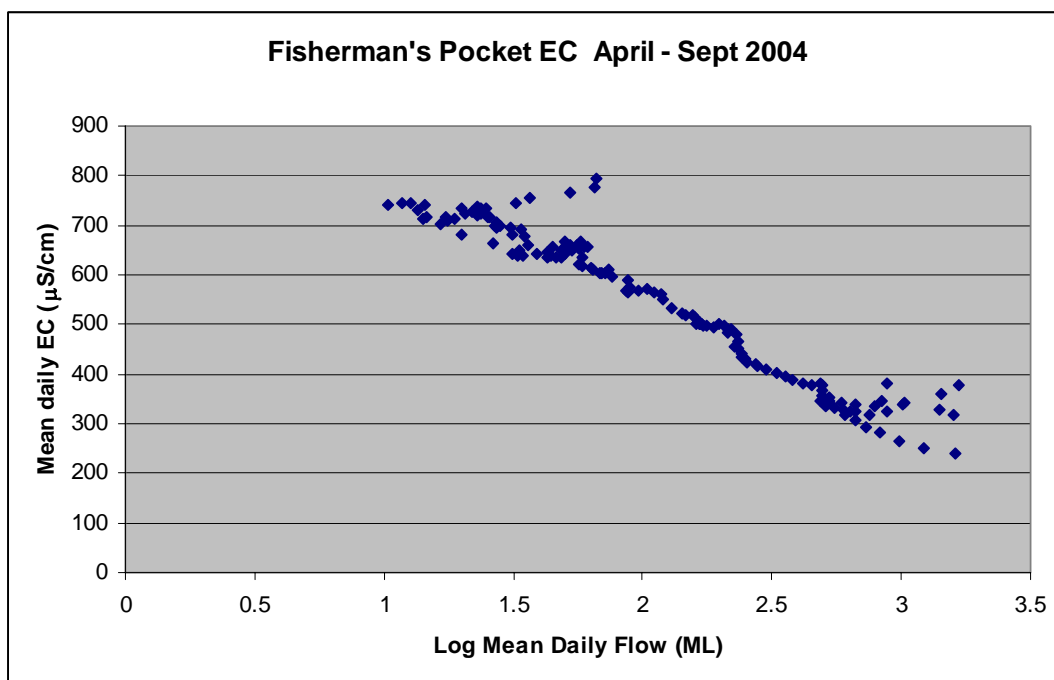


Figure 3. Correlation between reduced flow and increasing salinity during a typical seasonal decreasing flow sequence.

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

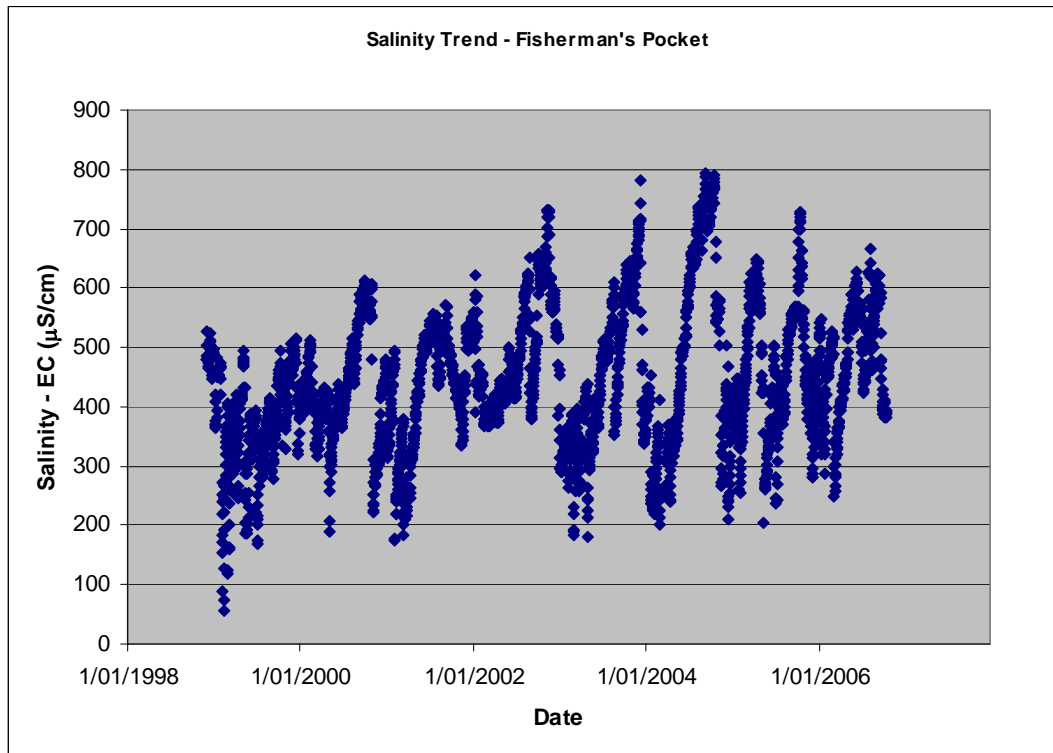


Figure 4. Time trend in salinity levels at Fisherman's Pocket.

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.

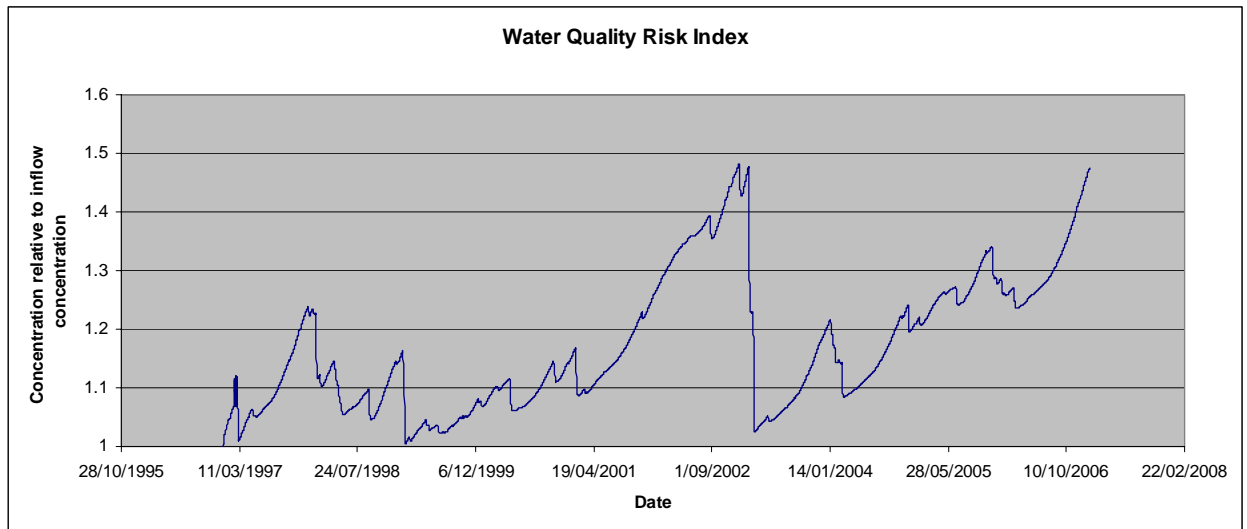


Figure 5. Modelled increase in outflow concentration from the storage, Traveston Crossing Stage 1.

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 overwhelmingly 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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