



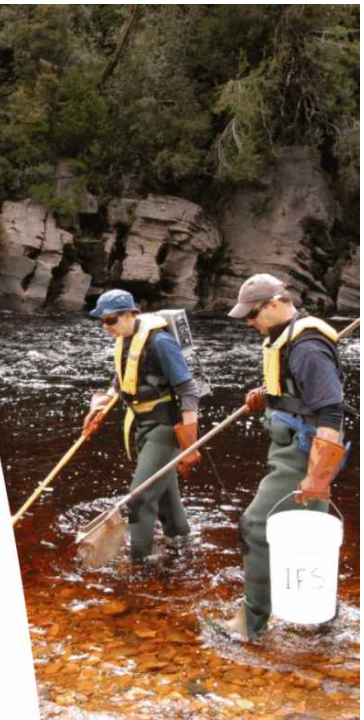
Hydro Tasmania
Consulting

**Cataract Gorge
Environmental Flow Review
Cataract Gorge Workshop
Summary Report**

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Executive Summary

Hydro Tasmania is legally required to provide a constant base flow of 0.43 cumecs through Cataract Gorge. Following a review in 2003 this environmental flow was voluntarily increased to 1.5 cumecs to reduce the risks to instream biota through the provision of additional habitat, whilst still retaining recreational values and maintaining conditions safe for swimming. At the time of implementation of the flow increase, Hydro Tasmania made a commitment to review the release after a five year trial period.

In the process of reviewing the environmental flow Hydro Tasmania has undertaken a stakeholder consultation process to assist in determining whether previously identified environmental, social and cultural values and issues are still current and if new values and issues now need to be considered. This information will help determine whether the current flow release protects these values or whether alternative releases or flow options need to be considered.

The first stage of the stakeholder consultation was a questionnaire survey in which participants were asked to identify values and issues associated with the gorge. The second stage of the process was a stakeholder workshop held on 2 September 2009 aimed at providing feedback on the questionnaire survey, obtaining more information from stakeholders and presenting potential flow scenarios to fulfil identified issues.

This report summarises the presentations and the discussions of the 2 September 2009 stakeholder workshop with an aim of capturing key issues that need to be taken into consideration when assessing an environmental flow regime for Cataract Gorge.

The presentations included an overview of studies conducted to date, preliminary stakeholder consultation and a hydrological assessment; aquatic fauna including fish species, macroinvertebrates and snails; threatened riparian plant species in the Gorge; and Hydro Tasmania operations.

The presentations were followed by further discussion on values and issues associated with the Gorge, with topics of conversation including water quality, Duck Reach Power Station, Trevallyn Dam and sedimentation, siltation in the Tamar estuary and water provisions for the Gunns Pulp Mill.

Flow thresholds to address identified issues were then discussed and evaluated to protect and maintain aquatic ecology values. Flows <3.6 cumecs were seen as suitable for flora and fauna. The need for

flushing and variable flows were identified to reduce encroachment of terrestrial vegetation and provide germination cues for riparian plants.

Flows of 0.43 cumecs were seen as not being suitable for maintaining recreational values, with flows between 1.5 and 3.6 cumecs generally more suitable for recreational purposes. Exceptions to this were: maintenance of water quality for swimming where higher flows were considered (>1.5 cumecs). However, it was acknowledged that water quality issues should be addressed at the source and not through provision of flushing flows.

Flows for tourism and cultural heritage values were similar to recreation, although flows greater than 1.5 cumecs were seen to be more important. There was also strong support for sufficient flows to allow redevelopment of Duck Reach power station, i.e. >1.5 cumecs.

Overall there was most support for baseflows of the order of 2.5 cumecs.

Following discussion of flow thresholds, a general discussion was held to identify potential flow options, to maintain values and address issues, taking into account identified flow thresholds. Key stakeholder recommendations from this discussion included:

- Enough water is required so First Basin does not appear stagnant. It was suggested that 2.5 cumecs might be sufficient.
- Provision of a variable flow that might differ during the day/night and during summer/winter i.e. base flow higher during the day in summer than over night or in winter.
- Enough increase in flow to see whitewater over the weirs (under the bridge and at edge of First Basin) which would provide improved aesthetics for visitors. This flow was estimated by stakeholders at the workshop to be between 1.5 and 2.5 cumecs.
- Installation of a mini-hydro scheme at Duck Reach and Trevallyn Dam that can work with an appropriate environmental flow (needs to be continuous).

An update on the review process will be provided before the end of the year.

The viewpoints stated in this document reflect discussions of participants at the workshop and are not the opinions of Hydro Tasmania (unless specifically stated). The values and issues raised by stakeholders through the consultation process will be taken into consideration in the ongoing environmental flow review.

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1. Background

Under the Water Act 1957, Hydro Tasmania is required to provide a constant base flow of 0.43 cumecs ($\text{m}^3 \text{s}^{-1}$) through Cataract Gorge. Following a review in 2003 this environmental flow was voluntarily increased to 1.5 cumecs. The increase to 1.5 cumecs was introduced to reduce the risks to instream biota through the provision of additional habitat, whilst still retaining recreational values and maintaining conditions safe for swimming. At the time of implementation of the flow increase, Hydro Tasmania made a commitment to review the release after a five year trial period.

In order to avoid providing an environmental flow that may not provide any benefit or result in further degradation of the lower South Esk River and Cataract Gorge, Hydro Tasmania has been reviewing the existing environmental release. Hydro Tasmania fully recognises that the aquatic environment and values associated with it are inherently complex and management options should be considered in close consultation with users. In the process of reviewing the environmental flow Hydro Tasmania is therefore undertaking a stakeholder consultation process to assist in determining whether previously identified environmental, social and cultural values and issues are still current and if new values and issues now need to be considered. This information will help determine whether the current flow release protects these values or whether alternative releases or flow options need to be considered.

The first stage of the stakeholder consultation was a questionnaire survey and the second stage of the process was a stakeholder workshop held on 2 September 2009 aimed at providing feedback on the questionnaire survey, obtaining more information from stakeholders and presenting potential flow scenarios to fulfil identified issues.

2. Purpose and Aim of Workshop

The aim of the workshop was to present participants with an overview of existing information and feedback from the questionnaire survey and provide a forum to further discuss stakeholder values, issues and flow requirements for the Gorge. The outcomes of the workshop will assist Hydro Tasmania to make a balanced decision on future flows in Cataract Gorge. It should be noted that the purpose of the workshop was to provide a forum for information exchange and not to involve decision making or voting on alternatives or flow options.

This report provides a summary of the workshop. It should be noted that the viewpoints in this report are not that of Hydro Tasmania, but rather of stakeholders in attendance at the workshop. The agenda for the workshop is shown in Appendix A and a list of attendees is shown in Appendix B.

It was expected that the workshop would:

- Provide participants with an overview of existing information;
- Inform participants of the outcome of the recent questionnaire survey completed by stakeholders;
- Identify additional sources of information including data, local knowledge, observations and insights of participants, that may assist in the review process that were not captured by the survey;
- Discuss potential flow options and the implications associated with these;
- Receive suggestions from stakeholders regarding environmental flows in Cataract Gorge.

3. Presentations

To start the workshop, an outline of the structure of the workshop and its aims were provided by the workshop facilitator, Mick Howland (Hydrosphere Consulting). This was followed by an overview of studies commissioned for the review by Hydro Tasmania and outcomes of the preliminary stakeholder questionnaire survey. Presentations on the flora and fauna of Cataract Gorge and a summary of Hydro Tasmania operations were also provided for stakeholders. All presentations are found in Appendix C. A summary of the presentations is provided below.

3.1 Overview of Studies and Outcomes of Stakeholder Questionnaire Survey by Eleni Taylor-Wood (Hydro Tasmania Consulting)

The presentation provided an overview of studies conducted to date, preliminary stakeholder consultation and a hydrological assessment. The main values associated with the Gorge (as identified through a review of the literature and stakeholder consultation) and the issues associated with the key values were presented. Key values and associated issues are listed below:

- **Aquatic environment, e.g. threatened species:** Extended low flows result in loss of habitat for threatened species; reduced flushing and medium flow events allowing encroachment of terrestrial vegetation; poor water quality resulting in a decline in biological condition;
- **Recreational and social values, e.g. kayaking, swimming, passive recreation and visual amenity:** Poor water quality and algal blooms reduce visual amenity and make conditions unsuitable for swimming. Low flows have a detrimental impact on visual amenity and passive recreation. Extended low flows reduce habitat for fish and impact the quality of recreational fishing. Flushing and/or medium flow releases required for kayaking events;
- **Tourism:** Low flows impact upon the aesthetics and visual amenity which are important aspects of the Gorge's appeal;
- **Cultural and heritage values:** impacts associated with redevelopment of Duck Reach; loss of spiritual and cultural values (indigenous and non-indigenous) associated with the Gorge;
- **Hydropower value of water:** increase in environmental flow reduces the amount available for generating electricity at Trevallyn Power Station.

Outcomes of Stakeholder Consultation

Hydro Tasmania sent out a questionnaire to key stakeholders and community members responding to a public notice in the Examiner. Key outcomes of the responses included:

- A total of 32 responses to the questionnaire were received and showed a very strong interest in the impacts of the flow regime on environmental, social, cultural and recreational values associated with Cataract Gorge.
- All respondents to the survey expressed concerns about current low flows and would like it increased; motivating reasons being perceived decline in water quality and increase in occurrence of algal blooms, effects of low flows on threatened species and visual impacts on aesthetic quality and tourism.
- The majority of values were highlighted as being important in all areas of the Gorge and all values were ranked as being 'very important' by stakeholders.

Hydrology

A hydrological assessment comparing potential future flow release scenarios with natural and current flows was presented. Flow duration curves constructed on logarithmic scale were presented plotting flow against per cent of time that a particular flow was exceeded. Figure 1 shows a flow duration curve for the reach downstream of Deadmans Hollow during the summer months. 'Natural' flow and different modelled Trevallyn flow release options (0.43, 1.0, 1.5, 3.0 and 10 cumecs) are shown. High flows were considered those that which occurred under natural conditions less than 33% of the time, medium flows 33-67% and low flows >67%.

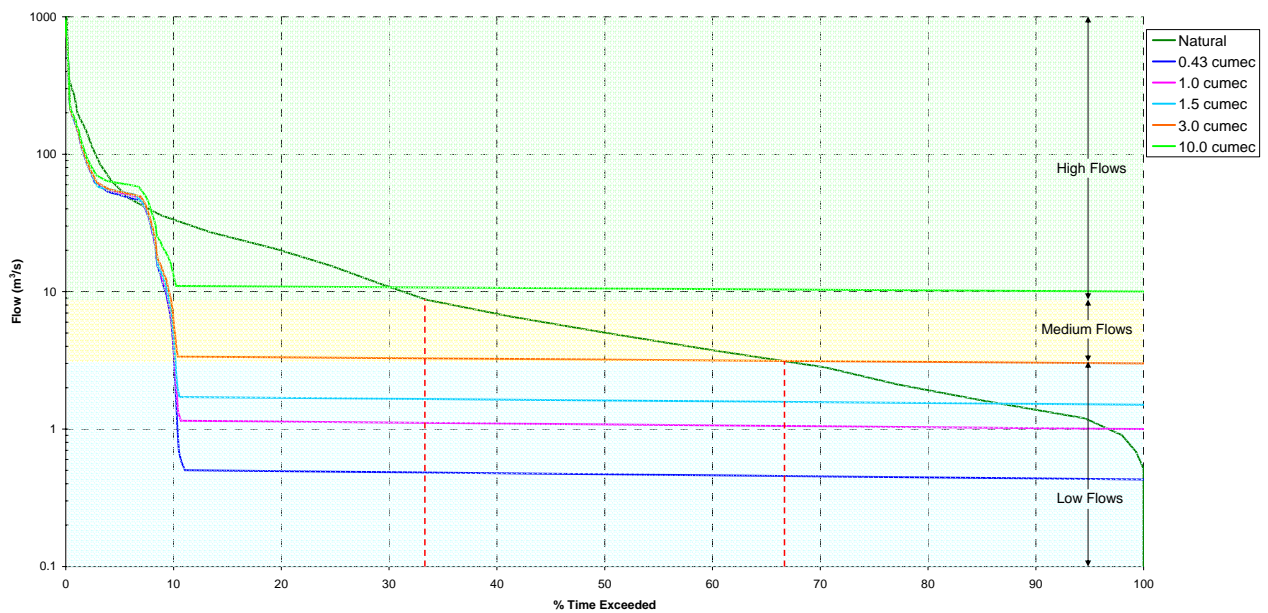
Generally, flows have been reduced in the gorge after the building of the dam. According to the model, under natural conditions the median annual river flow was approximately 15 cumecs and had a flow of at least 5 cumecs for 50% of the time during the summer. A pre-dam median flow of 50 cumecs was previously reported in Hydro Tasmania's Environmental Review of the South Esk-Great Lake Catchment in 1999. Current modelling has been compared with the earlier modelling and results indicated that the modelling in 1999 over-estimated natural flows as it is based on flow data from one site. The current modelling is considered to be more accurate as it is based on flow data from more than one site. However, as the data is based on flow data from 2001-2009, the magnitude of natural flows modelled over this period is reduced due to the drought. This means the flows are slightly underestimated compared with the long term average.

Post-dam, however, median annual flows are now 1.5 cumecs. Flows of 50 cumecs are currently exceeded for only 10% of the time, compared with flows of 90 cumecs exceeded 10 % of the time

under natural conditions. The flat shape of the duration curves for current and proposed flow regimes are indicative of the regulated constant base flows released through Trevallyn Dam. The incidence of very high flows during winter is reasonably similar with the dam in place as to what might have occurred naturally. However, Trevallyn Dam does reduce the size and frequency of flows in Cataract Gorge, especially during summer months.

The modelled data shows that with an environmental flow of 1.5 cumecs the natural flow would have been higher more than 85% of the time and less for 15 % of the time. With an environmental flow of 3 cumecs the natural flow would have been higher about two thirds of the time and lower for about a third of the time.

Figure 1
Example of a summer flow duration curve for the site downstream of Deadmans Hollow
(based on hourly flow data for 2001-2009)



3.2 Fauna in Cataract Gorge by Mick Howland (Hydrosphere Consulting) on behalf of Dr Peter Davies (Freshwater Systems)

The presentation covered the information known about fauna in Cataract Gorge.

- Aquatic fauna recorded in the Gorge included; platypus, water rat (orange bellied otter) and seals; native fish included eels and lampreys, whitebait, galaxiids, sandy, grayling and blackfish. Alien fish were reported to include brown trout, atlantic salmon, redfin perch and tench.

- Macroinvertebrates in the South Esk River are known to be of poorer quality than the North Esk River with fewer expected families, low abundance and less diversity of insects. The poorest condition was downstream Dalrymple Creek due to nutrient enrichment
- A further study was conducted in 2004-05 that included macroinvertebrate sampling but this lacked temporal and spatial replication that made reporting trends from the biological assessment difficult. Using the AUSRIVAS methodology did not allow for the analysis between macroinvertebrate assemblages and flow and the restricted number of sites sampled meant a large proportion of the Gorge was uncharacterised. Results on macroinvertebrates were within the same range, but at the lower end, as for other hydro dams.

Note: Whilst not included in the presentation, it should be noted that studies on the distribution and abundance of the threatened Cataract Gorge snail, *Beddomeia launcestonensis* conducted in 2001 and 2009 indicated that the snail population has not declined in the Gorge.

3.3 Flora in Cataract Gorge by Dr Phil Barker (North Barker Ecosystem Services)

A riparian plant species survey in the Gorge has been planned but high flows in recent weeks has delayed this work. Information was presented concerning existing information on threatened riparian plant species in the Gorge and theoretical knowledge on the effect regulation has on vegetation. Key points covered were:

- Plant habitat found in Cataract Gorge include river bed, aquatic margin, riparian shrubs, floodplain scrubs and woodlands which are now modified by reduced flows. The source of sediment (sand, gravel, mud and silt) is starved of existing load downstream of Trevallyn Dam.
- A number of threatened flora species in the Gorge were identified from a survey conducted by North Barker in 2001. The long-term conservation of these species is dependent upon the management of populations with Trevallyn Reserve.
- Flow requirements for riparian plant species were presented. Floods of various sizes are required to promote renewal through disturbance, germination triggers, replenishment of substrate through new sediments and dispersal of seed. Low flow periods are also necessary to maximise diversity through exposure of river bed for recruitment, exposure of aquatic margin for germination, drying of terrestrial riparian zones and draining of floodplain.
- Impacts brought about by Trevallyn Dam have not been quantified. Sudden changes to an existing regime may have a profound impact. The loss of regular flood events and associated riverbank scouring could have an impact upon opportunistic colonisers.

- Many plants are currently locked into rock walls which is perhaps a remnant of the natural environment. Permanent inundation is therefore not a good option as plants are unable to relocate.
- Terrestrial vegetation encroachment from willows and weeds can change the current environment and shade existing plants.

3.4 Hydro Tasmania Operations affecting Cataract Gorge by David Marshall (Hydro Tasmania)

Hydro Tasmania's infrastructure on the South Esk and the impact of an increase in flow on other water bodies, e.g. Great Lake was presented.

Key points included:

- It is a key driver for Hydro Tasmania to act commercially to return a dividend to the State and to act responsibly to manage the resource and infrastructure sustainably
- Hydro Tasmania did not supply all of Tasmania's demand for power in 2006-08. Hydropower only supplied 67% of the demand. The remainder was sourced from wind, gas and Basslink imports (which is mainly brown coal).
- Every cumec of environmental flow in Cataract gorge is equivalent to ~9000 MWh of generation annually. This represents up to 9000 tonnes of CO₂ emissions in the replacement import generation. This is equivalent to approximately 2000 cars for a year or the electricity use for 1000 households. Every extra cumec of environmental flow down Cataract Gorge costs Hydro Tasmania approximately \$725,000 pa.
- Water required for any increase in flow during drier summer months will have to come from Poatina. This means more water will come from Great Lake and possibly Arthurs Lake (which are already affected by low water levels). If rainfall is very low and it is dry enough, there are no other options than obtaining water from Arthurs and Great Lake.
- Lake Trevallyn is a designated Recreation Area with a constructed beach. A minimum level of 124.97 m is maintained when possible and Poatina provides nearly all the water for this during summer/autumn. Increasing the environmental flow may mean the water level falls below the agreed minimum level more often in Lake Trevallyn.

4. Main Discussion Items

Following the presentations, the main topics of discussion involved water quality issues, siltation in the Tamar Estuary, water supply for Gunns pulp mill and the proposed re-development of the Duck Reach power station. There was very little discussion on the environmental values, with more emphasis being placed on the effect of low flows on social, community and spiritual values of Cataract Gorge and how this impacts on tourism. It was accepted by stakeholders that environmental issues were being dealt with objectively through scientific studies and that the outcomes of the studies may influence the final outcomes (i.e. preferred environmental flow release).

4.1 Water Quality

Water quality issues in Cataract Gorge including the presence of algal blooms, odour and associated health risk in First Basin, were major concern for stakeholders. Glen Rowlands from Ben Lomond Water was present to answer questions regarding Prospect Vale sewage treatment plant and the discharge of treated wastewater into Cataract Gorge via Dalrymple Creek.

Stakeholders believed water quality issues were fundamental to protect the values in Cataract Gorge. There was anecdotal evidence of no algal blooms before the wetlands were developed at Prospect Vale (< 20 years). It was stated that the development at Prospect needs to be limited as the wetlands have exceeded their capacity to treat wastewater. Glen Rowlands of Ben Lomond Water acknowledged that radical solutions are required to improve the water quality from the sewage treatment plant and this will take time. The General Manager of Meander Valley Council stated that there are now limits to the housing expansion at Prospect and he believed the wetlands are capable of treating wastewater to discharge standards and meet operational guidelines as the plant is regulated by the EPA and conforms to all legislative requirements. Meander Valley Council added that upgrades to sewage treatment plants are required in the whole catchment area and the plant at Prospect is not solely responsible for the decline in water quality in Cataract Gorge.

Poor water quality in the upper reaches of the Tamar Estuary was highlighted as a concern following the workshop. Although this has been acknowledged, the issue will not be addressed in the environmental flow review for Cataract Gorge.

There was an agreement by stakeholders that the wastewater discharge is responsible for water quality issues and not low flows and therefore not the responsibility of Hydro Tasmania. However, flushing flows can mitigate against poor water quality. The Cataract Gorge Protection Society feel there is a need for a combined authority for the South Esk and without this, the issue of water quality in the Gorge cannot be rectified.

4.2 Redevelopment of Duck Reach power station

Points were raised regarding the re-development of Duck Reach power station. Representatives from Hydro Tasmania were present to respond to questions. The mini hydro development is not a financial viable solution in its own right as water is four times more valuable going through Trevallyn power station than through a Duck Reach mini hydro.

The option of a mini-hydro scheme at Duck Reach and another two at Trevallyn Dam could make a return of 50% on the money that would be lost if the water was just going down the Gorge as an environmental flow.

Dr Michael Connarty of Hydro Tasmania stated that the environmental impacts between Deadmans Hollow and Duck Reach power station would need to be considered with the potential for a dewatered riverbed from diversion of the water through the mini-hydro scheme. There was some concern from stakeholders about a reduction in flow or possibility of no flow at Deadmans Hollow with the installation of a mini-hydro. One respondent to the draft workshop summary report stated that they supported the redevelopment of Duck Reach power station, but an adequate flow would need to be provided in all reaches of Cataract Gorge.

The mini hydros are not viable if the flow is too variable (i.e. day/night and summer/winter flow regime). There is a need for high running hours for the scheme to be cost-effective.

4.3 Trevallyn Dam and Sedimentation

Hydro Tasmania were questioned about the effects of irrigation upstream of Lake Trevallyn and the effect of sediment wear on the turbines at Trevallyn Dam. Sediment run-off from irrigating paddocks is perceived to be a source of siltation at Trevallyn Dam. Hydro Tasmania stated that the percentage of sediments coming from irrigation is low as the water quality in Lake Trevallyn is generally very good and therefore wear on turbines is minimal. When the lake was drained in 1991 and 1994, it was found to not be storing sediments from the catchment.

4.4 Siltation in the Tamar estuary

The issue of siltation in the Tamar Estuary was raised. Potential flows required to alleviate the issue were discussed. Launceston City Council were present to discuss the outcomes of the recent hydrodynamic modelling report and discussed the issues associated with establishing a flow to solve the problem of siltation. The report indicates that the flow required to attempt to alter the problem of siltation would be high and that Hydro Tasmania's flow routing assessments indicate flows of the required magnitude are not sustainable or particularly effective, for example a 5 cumecs environmental

flow through the Gorge is only estimated to reduce Yacht Basin siltation by 2% and a 10 cumecs environmental flow would only reduce Yacht Basin siltation by 7%, neither of these flows can be sustained consistently. Siltation was considered to be out of the realms of the current flow review and will therefore not be considered as reason for increasing the flow.

4.5 Water provision for Gunns Pulp Mill

There was some concern regarding the use of water from Lake Trevallyn for Gunns Pulp Mill before the water has been used for electricity generation at Trevallyn power station. Hydro Tasmania discussed the issues with stakeholders but the provision of water for the pulp mill is outside of the objectives for determining a suitable environmental flow for Cataract Gorge.

5. Discussion of Flow Thresholds and Options

5.1 Flow Thresholds

Flow thresholds were discussed in relation to the values and issues identified in Cataract Gorge.

Table 1 shows the outcome of this discussion and includes comments made on each issue and the flow perceived to be beneficial in addressing the issue. Note, flow thresholds have not been identified fully for all issues due to time constraints and/or lack of knowledge regarding the issue.

This was followed by further discussion on flow options and management suggestions. The number of values/issues that could potentially be addressed by each flow were totalled and shown at the bottom of Table 1. A flow of around 2.5 cumecs was shown to address the most number of values and issues, however not all values/issues and flows could be assessed and issues affecting the aquatic environment and the most appropriate flow requirements still need to be confirmed by further investigative studies, in particularly the vegetation survey.

The range of values as previously identified and updated during the workshop formed the basis for discussion. These were: aquatic environment, recreation, tourism, cultural heritage, hydropower value of water, drought and water management.

Aquatic Environment

The main issues associated with the aquatic environment were the effects of low flows on threatened species and the problems associated with poor water quality. Determining a flow threshold for threatened flora will only be possible following further investigative studies. A variable flow would be most suitable for germination requirements of riparian plants. The issue of poor water quality can be improved by a short period of high flows (flushing), rather than a baseflow. However, this is not an acceptable long term solution.

The possible effect on the biota of increased cold water releases in the case of an increased environmental flow was discussed. It was acknowledged that this issue would need to be looked into.

Recreation

Issues associated with the recreational values are poor water quality during the summer months that affects both swimming and visual amenity. Poor water quality can be improved by increasing the flow, but it is the management of sewage treatment plants that was highlighted as being the most important factor in improving water quality in the Gorge. Kayaking events in the Gorge require a flushing flow to be released from Trevallyn Dam for a specific period of time, whilst swimming in First Basin requires a constant baseflow. Previous studies have shown that this flow should be less than 3.6 cumecs. Discussions during the workshop revealed it would be safe to swim in the Gorge when there is a flow of 10 cumecs. However, it was also acknowledged that the first basin would be colder if the flow is increased. One stakeholder stated that people have been known to dive off the bridge at First Basin when there has been a flow of at least 10 cumecs. Most stakeholders concluded that swimming in the Gorge is at your own risk and flow should not be set to minimise risk to swimmers. It was also mentioned that Launceston City Council discourages swimming in First Basin.

Tourism

For tourism purposes, improved water quality was seen as a priority to improve aesthetics, particularly between Duck Reach and Kings Bridge. One view was that water level was not important for tourists as long as the water looked aesthetically pleasing.

Cultural Heritage

There is a perceived loss of spiritual and cultural indigenous and non-indigenous values associated with the Gorge at the current flow regime. A flow of 2.5 cumecs was stated as being the minimum flow required to improve this issue. Redevelopment of the Duck Reach power station was a main focus of discussion at the workshop and its importance in terms of cultural/heritage values was highlighted.

Hydropower Value of Water and Operations

The importance of the value of water was discussed, with the acknowledgement that any increase in flow would reduce the amount of water available for hydropower generation as well as the increased risk to other environments within the catchment, i.e. Great Lake and Arthurs Lake. An increase in flow could also reduce reliability of water supply for other water users, particularly recreational water users at Lake Trevallyn and irrigators. There may also be an electricity trade-off for hydropower with Basslink imports (brown coal or other more polluting power sources). This was not viewed well and the use of renewable energy was encouraged.

The capacity of the Trevallyn Dam release valves were discussed which is an important when determining the flow regime. It was stated by Hydro Tasmania that there are three valves with a capacity of 8.3 cumecs each. The total release capacity would therefore be 25 cumecs. Reasonably accurate settings are possible, however all are manually operated which makes a variable flow more difficult to achieve. Following the workshop, discharge rating curves for Lake Trevallyn were obtained. The curves showed that the capacity of the outlets on Trevallyn Dam varied with storage level. At Full Supply Level, the maximum release from one valve is approximately 18 cumecs. At the water level required for recreational purposes, the maximum release is about 17.5 cumecs from each valve. With three valves at Trevallyn Dam, it is therefore possible to provide a much larger maximum release than stated at the workshop. The value of 8.3 cumecs is the maximum flow release from one valve at very low water levels. The outlet valves were originally installed to allow Lake Trevallyn to be dewatered which is where the specified capacity originates.

Drought

Management of water during droughts was discussed, with the consensus that it is acceptable to allow flows to drop during drought conditions. This would be concurrent with natural variability.

Stakeholders felt that even during drought conditions, the flow should not drop below the current 1.5 cumecs.

Water Management

A single water authority for the management of the South Esk was suggested as being a way to coordinate the improvement of water quality and other issues in the Gorge. This suggestion is out of the realm of Hydro Tasmania and the scope of the project, but was an important discussion point for the participating stakeholders.

5.2 Summary of Flow Options Discussion

The workshop finished with a general discussion on flow options and management action. It was understood by the stakeholder that their input would be looked at in conjunction with the environmental studies and legislative requirements, as well as the operational and financial aspects of potential flow options.

The main outcomes from the discussion on potential flow options were as follows:

- Stakeholders would like an increase in flow.
- Local residents would like to see enough water so First Basin does not appear stagnant. They suggested that 2.5 cumecs might be sufficient. One stakeholder did not agree with this flow and

believed a significant increase in flow is required to reverse any degradation and restore the Gorge to pre-dam conditions.

- Provision of a variable flow that might differ during the day/night and during summer/winter i.e. base flow higher during the day in summer than over night or in winter. The effect on the environment will have to be assessed before considering short term variability in flow as this type of variability is not within the natural range. Cost and feasibility associated with automated valves would also be required as well as feasibility with mini hydro scheme.

There was strong stakeholder support for variable flow, especially the day/night option, however it was recognised that scientific/ecological issues and/or operational logistics may make such a flow regime undesirable or unfeasibility. The feasibility of such flows will be assessed further by Hydro Tasmania.

- Enough increase in flow to see whitewater over the weirs (under the bridge and at edge of First Basin) which would provide improved aesthetics for visitors. This flow was estimated to be between 1.5 and 2.5 cumecs.
- The walkway at First Basin would potentially need to be raised with an increase in flow.
- Stakeholders stated that the river section from First Basin to Kings Bridge is most important because of easy access, but felt that all parts of the Gorge are of significance. Very high flows would prevent access to people with disabilities.
- Install a mini-hydro scheme at Duck Reach and Trevallyn Dam that can work with an appropriate environmental flow (needs to be continuous), but there is an awareness of Reaches 2 and 3 becoming dewatered.
- The general consensus is that people do care about the issue of polluting sources of energy, e.g. brown coal and have a preference for renewable energy.

Table 1
Flow thresholds (in cumecs) divided into baseflows and pulse releases previously established for values/issues associated with Cataract Gorge

Value	Issues	Reach	Base						Flush	Variable	Comments
			0.43	1.5	2.5	3.6	10	25			
Aquatic environment (threatened species, conservation significance, river health)	Extended low flows resulting in loss of suitable habitat for fish, and reduced longitudinal passage	1-5	?	?	?	?	?	?			
	Flow for threatened flora		?	?	?	?	?	?			<ul style="list-style-type: none"> Legislative issue – state and federal
	Flow for threatened snail habitat		✓	✓	✓	✓	?	?			<ul style="list-style-type: none"> Legislative issue - state
	Reduced flushing and medium flow events allowing encroachment of terrestrial vegetation including weeds	1-5							✓	✓	
	Poor water quality from Dalrymple Creek causing a decline in biological condition	3-5	x	x	✓	✓	✓	✓	✓		<ul style="list-style-type: none"> Diversion of flows is desirable Are flushing events more desirable than base flows to deal with the issue in the interim? More flow improves conditions due to dilution
	Reduced through-flow events resulting in loss of germination cues and sediment replenishment for threatened flora								✓		<ul style="list-style-type: none"> Germination possible due to floods Cannot manage sediment throughputs
Recreation (swimming, kayaking, walking, passive recreation/visual amenity)	Poor water quality and algal blooms make condition unsuitable for swimming and reduce the visual amenity of the gorge	3-4	x	x	✓	✓	✓	✓	✓		<ul style="list-style-type: none"> Lake Trevallyn (and u/s catchment) also contributing to WQ issues WQ issue can be managed through flow
	Flow limits necessary to provide safe swimming conditions	3-4	✓	✓	✓	✓	✓				
	Flushing and/or medium flow events required for kayaking	1-5	x	x	x	x	x	✓	✓		

Value	Issues	Reach	Base						Flush	Variable	Comments
			0.43	1.5	2.5	3.6	10	25			
	An increase in flow would affect pedestrian access across the weir at First Basin	4	✓	✓	✓	✓	✗	✗		<ul style="list-style-type: none"> Can be raised (+ pathways) if flows are increased or increased. Culverts to allow increased flow through Walkway is less important with increased flows Current walkway possible to a flow of 5 cumecs 	
	Extended low flows reduce habitat for fish populations and therefore impact on quality of fishing for recreational purposes	1-5		✓						<ul style="list-style-type: none"> Fly fishing (all reaches) and spinner (lower reaches) Maximum flow depending on style of fishing Not a high priority 	
	Water quality issues in Tamar estuary		✗	✗	✗	✗	✓	✓			
	Visual amenity		✗	✗	✓	✓				<ul style="list-style-type: none"> Want to see removal of algal bloom 	
Tourism	Low flows impacts on aesthetics and visual amenity which are important aspects of the Gorges' appeal to tourists and visitors	3-5	✗	✗	✓	✓					
Cultural Heritage	Loss of spiritual and cultural indigenous and non-indigenous values associated with the gorge	1-5	✗	✗	✓	✓	✓	✗ (affect access to upper reaches, ok for lower reaches)		<ul style="list-style-type: none"> If flow increased then greater appreciation of place in summer Not an important issue Flow of water invigorates peoples spirits, as low flows are depressing Want more water Focus around easily accessed areas Less people use Reach 1, but this can be attraction for some 	
	Duck reach mini hydro power station redevelopment		✗	✗	✓	✓	?	✗		<ul style="list-style-type: none"> 1.5 cumecs is lower limit for mini hydro. Launceston ratepayers may be interested in rebuilding Duck Reach 	
Hydropower Value of Water	Any increase in environmental flow will reduce the amount of water available for hydropower generation	N/A	✓	✗	✗	✗	✗	✗		<ul style="list-style-type: none"> Is there potential to replace value of water to HT – cataract users 	
	Increased risk to other environment in HT catchments e.g. Great Lake, Arthurs Lake		✓							<ul style="list-style-type: none"> Issues associated with threatened species in Great Lake and Arthurs if have to draw the lake down too far 	

Value	Issues	Reach	Base						Flush	Variable	Comments
			0.43	1.5	2.5	3.6	10	25			
	Reliability of water for other users of Lake Trevallyn	✓								<ul style="list-style-type: none"> Increased environmental flows could reduce reliability 	
	Increased demand for electricity and trade-off with brown coal or other sources									<ul style="list-style-type: none"> Encourage management of energy demand and alternative sources of electricity Educational issue 	
Drought	Management of water for all users and environments during drought								<ul style="list-style-type: none"> ✓ >1.5 (should be higher to maintain ecological values) 	<ul style="list-style-type: none"> Allow flows to drop during drought – allows natural variability that would have occurred Still want some flows through, but shouldn't go less than 1.5 cumecs 	
	Total no. ✓ for each flow		7	7	10	10	6	5		<ul style="list-style-type: none"> 	

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6. Moving Forward

The workshop provided an opportunity to gauge stakeholder opinion on environmental flows in Cataract Gorge. The information will be used to help determine the most suitable environmental flow, as well as information gaps. The information gaps identified at the workshop include; knowledge of the location of threatened plant species and how they are affected by flow changes, an understanding of the effect of potential temperature changes in the Gorge and First Basin from an increased flow; and understanding the effects of variable flows (day/night) on biota.

In addition, whilst Hydro Tasmania is committed to the review of the Cataract Gorge environmental flow release, any change in the current release will need to take into account not only the values and issues associated with the Gorge but also Hydro Tasmania's operational constraints/requirements (ability to physically provide releases, cost of downstream releases, availability of water, management of Lake Trevallyn, flows for Trevallyn Power Station)

An update on the review process will be provided before the end of the year. At this stage, a timeframe for completion of the review has not been determined, but all stakeholders we will be kept informed of the outcomes as the project progresses.

There were a number of comments from stakeholders congratulating Hydro Tasmania on the open and inclusive approach to the issue of flows in Cataract Gorge and that they looked forward to hearing more regarding the project.

A Workshop Agenda

Stakeholder Workshop:

Cataract Gorge Environmental Flow Review

Location: Room 29, Launceston Tram Shed Function Centre,
Inveresk Rail Yards, 4 Invermay Rd, Mowbray, Launceston
Date: Wednesday, 2 September 2009
Time: 10am-4pm

10:00 Welcome - coffee and tea on arrival

Morning Session: Information Session

10:10 Overview of workshop - Mick Howland, Hydrosphere Consulting (Workshop Facilitator)

10:25 Cataract Gorge Environmental Flow Review - Eleni Taylor-Wood (Hydro Tasmania Consulting)

10:45 Aquatic fauna of Cataract Gorge - Peter Davies (Freshwater Systems)

11:00 Riparian and aquatic plants of Cataract Gorge - Phil Barker (North Barker Ecosystem Services)

11:15 Tourism and recreation in Cataract Gorge – to be confirmed

11:30 Water quality issues associated with Dalrymple Creek – Glen Rowlands (Ben Lomond Water)

11:45 Hydro Tasmania operations associated with Cataract Gorge – David Marshall (Hydro Tasmania)

12:00 Identification of additional information and knowledge gaps (open discussion with stakeholders and presenters)

12:30 Lunch

Afternoon Session: Discussion Session

1:15 Overview of potential flow scenarios and implications

1:45 Suggestions from stakeholders regarding environmental flows in Cataract Gorge and follow-up discussion

3:45 Workshop summary and way forward – Mick Howland

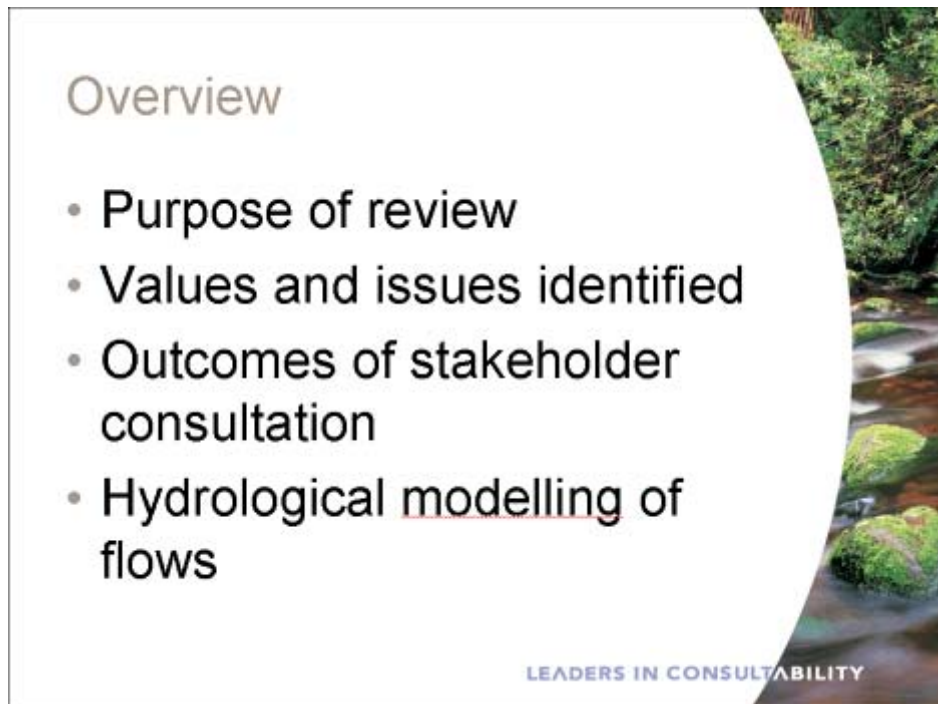
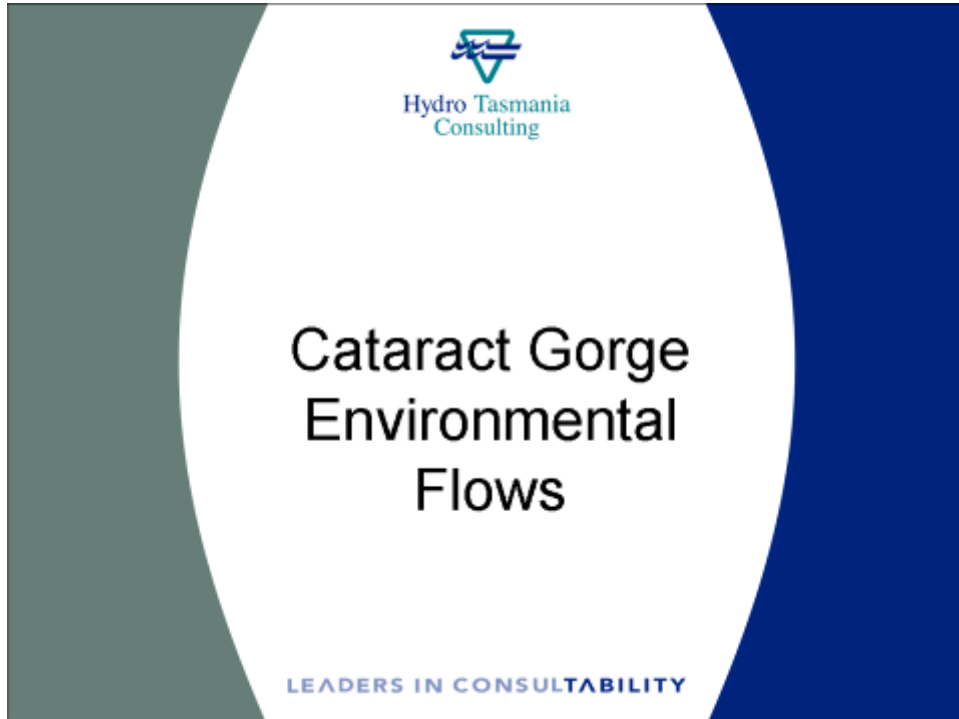
4:00 Workshop close

B List of Workshop Attendees

Name	Position	Organisation
<i>Lionel Morrell</i>	N/A	Cataract Gorge Protection Society
<i>Bernard Duke</i>	Tour Guide	N/A
<i>Barry Larter</i>	Chairlift Operator	N/A
<i>Bill Reynolds</i>	N/A	Cataract Gorge Protection Society
<i>Ruth Clarke</i>	N/A	Cataract Gorge Protection Society
<i>Vyvyan Allchin</i>	Project Coordinator – Northern Region	DPIPWE
<i>Greg Preece</i>	General Manager	Meander Valley Council
<i>Katie Proctor</i>	Environmental Health Officer	Meander Valley Council
<i>James Clark</i>	Environmental Health Officer	Meander Valley Council
<i>Steve Ratcliffe</i>	Manager Hydraulic Modelling	Launceston City Council
<i>Michael Attard</i>	Scientific and Technical Officer	NRM North
<i>Glen Rowlands</i>	Executive Manager - Regional Service Delivery	Ben Lomond Water
<i>Dr Phil Barker</i>	Environmental Consultant	North Barker
<i>Jim Collier</i>	River Campaigner	N/A
<i>Dr Owen Ingles</i>	Engineering Consultant	N/A
<i>Marie Egerrup</i>	Aquatic Environment Program Coordinator	Hydro Tasmania
<i>David Marshall</i>	Manager – Energy Resources	Hydro Tasmania
<i>Michael Connarty</i>	Manager – System Enhancement	Hydro Tasmania
<i>Greg Carson</i>	Water Operations Team Leader	Hydro Tasmania
<i>Eleni Taylor-Wood</i>	Principal Environmental Consultant	Hydro Tasmania Consulting
<i>Caroline Whalley</i>	Aquatic Scientist	Hydro Tasmania Consulting
<i>Mick Howland</i>	Environmental Consultant/Workshop Facilitator	Hydrosphere Consulting

C Presentations

C.1 Overview of the Environmental Flow Review



Purpose of Review

- Environmental release increased in June 2003 from 0.43 to 1.5 cumecs
 - Ecological values – threatened snail
 - Recreational values
 - Water quality issues
- Committed to review release after five years
 - Current study

LEADERS IN CONSULTABILITY

River Reaches



LEADERS IN CONSULTABILITY

Values and Issues

Value	Issues	Reach
Aquatic environment (threatened species, conservation significance, river health)	Extended low flows resulting in loss of suitable habitat for threatened species and reduced longitudinal passage	1-5
	Reduced flushing and medium flow events allowing encroachment of terrestrial vegetation including weeds	1-5
	Poor water quality causing a decline in biological condition	3-5
Recreation (swimming, kayaking, walking, passive recreation/visual amenity)	Poor water quality and algal blooms make condition unsuitable for swimming and reduce the visual amenity of the gorge	3-4
	Flow limits necessary to provide safe swimming conditions	3-4
	Flushing and/or medium flow events required for kayaking	1-5
	Low flows have a detrimental impact on visual amenity and therefore passive recreation	1-5
	An increase in flow would affect pedestrian access across the weir at First Basin	4
	Extended low flows reduce habitat for fish populations and therefore impact on quality of fishing for recreational purposes	1-5
Tourism	Low flows impacts on aesthetics and visual amenity which are important aspects of the Gorges' appeal to tourists and visitors	3-5
Cultural/Heritage	Redevelopment of Duck Reach Power Station and impacts on local residents from high voltage and noise pollution	3
	Loss of spiritual and cultural indigenous values associated with the gorge	1-5
Hydropower Value of Water	Any increase in environmental flow will reduce the amount of water available for power generation	N/A

LEADERS IN CONSULTABILITY

Values by Reach

	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
Aquatic environment (threatened species, conservation significance, river health)		Threatened species: <i>Becklomeia leucostomensis</i>	Threatened species: <i>Becklomeia leucostomensis</i>	Threatened species: <i>Becklomeia leucostomensis</i>	
	Threatened Riparian plant species	Threatened Riparian plant species	Threatened Riparian plant species	Threatened Riparian plant species	Threatened Riparian plant species
	CFEV database places all river reaches of Cataract Gorge as having a very high potential conservation management priority				
	5 Special values identified by CFEV	5 Special values identified by CFEV	8 Special values identified by CFEV	8 Special values identified by CFEV	8 Special values identified by CFEV
Recreation (swimming, kayaking, walking, passive recreation/visual amenity)	Walking tracks			Walking tracks	Walking tracks
	Swimming	Swimming	Swimming	Swimming	Swimming
	Kayaking/rafting	Kayaking/rafting	Kayaking/rafting	Kayaking/rafting	Kayaking/rafting
			Fishing	Fishing	Fishing
Passive recreation applicable to all reaches					
Tourism			Duck Reach Power Station	First Basin	Kings Bridge/ lower South Esk River
Cultural Heritage			Duck Reach Power Station	First Basin	King Bridge
Hydropower Value of Water (Lake Trevallyn)	Aboriginal Heritage	Aboriginal Heritage	Aboriginal Heritage	Aboriginal Heritage	Aboriginal Heritage

LEADERS IN CONSULTABILITY

Outcomes of Stakeholder Consultation

Values and issues identified by Stakeholders	Number of Respondents	Relative Importance
Values		
Aquatic ecosystems (threatened species)	15 (10)	3
Recreation (swimming/kayaking)	21	3
Tourism	2	3
Cultural and spiritual	10	3
Scientific reference site (e.g. nature studies, archaeology)	3	3
Aesthetic/visual amenity	15	3
Drinking water	5	3
Power generation	1	3
Issues		
Presence of algal blooms	12	3
Water quality	15	3
Loss visual appeal during low flows	13	3
Terrestrial encroachment and weeds	1	3
Reduced habitat for threatened species	10	3
Lack of high flows for kayaking	3	3
Decline in native fish	2	3
Impact of drought	4	3

Total number of responses = 32:

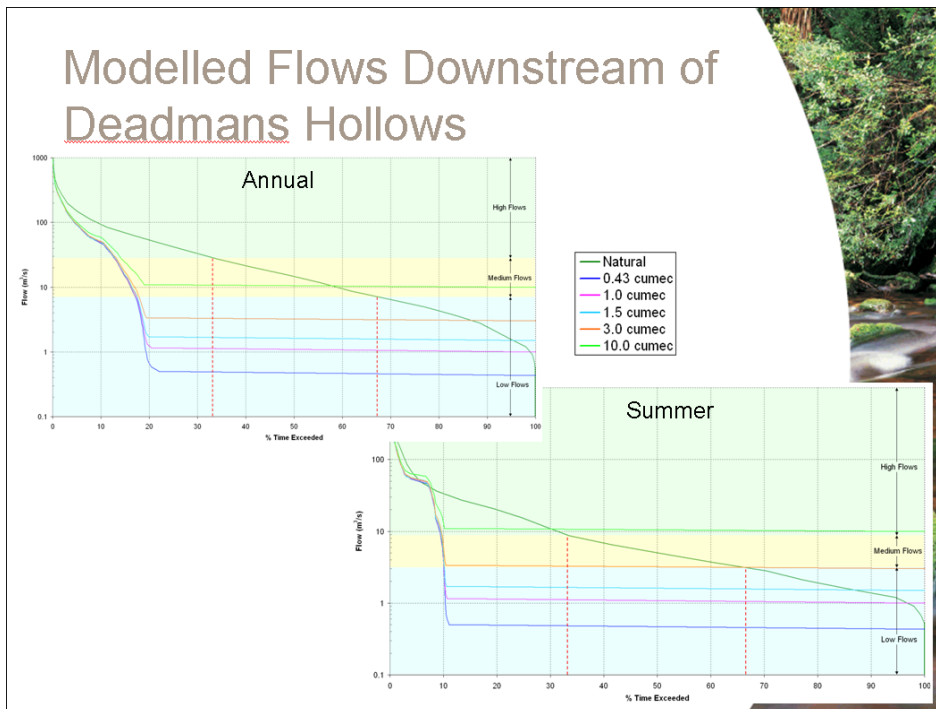
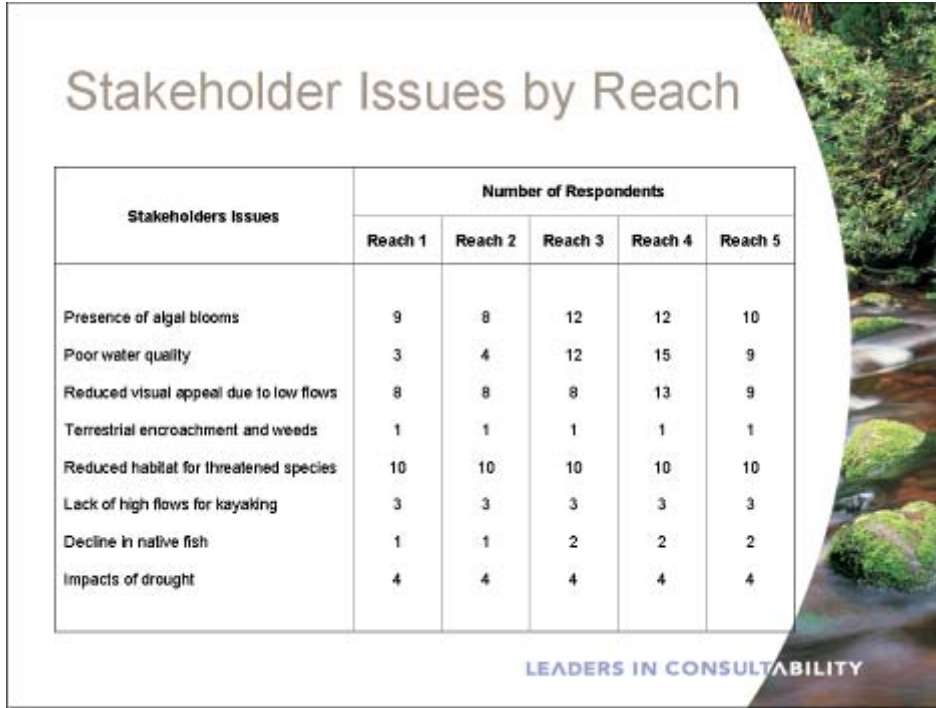
- Government agencies
 - DPIPWE (DPIW + DEPHA)
 - DHHS
 - IFS
 - NRM North
 - Tasmania Aboriginal Land and Sea Council
 - Heritage Tasmania
 - Tourism Tasmania
- Local councils
 - Launceston City Council
 - Meander Valley Council
- Community groups and interested individual
 - Freshwater Systems
 - Canoe Tasmania
 - Northern Waterway Assessment
 - Cataract Gorge Protection Society

LEADERS IN CONSULTABILITY

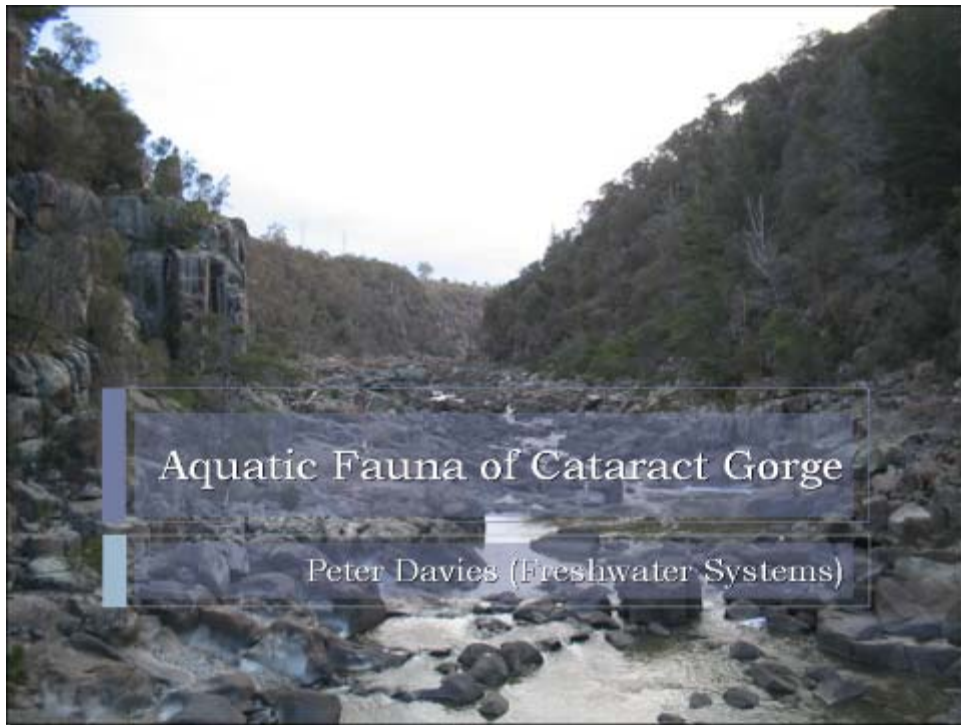
Stakeholder Values by Reach

Stakeholders Values	Number of Respondents				
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
Aquatic Ecosystems	15	15	15	15	15
Recreation	12	12	18	21	16
Tourism	0	0	2	2	2
Cultural and spiritual	6	6	8	9	7
Scientific reference site	2	2	3	3	3
Aesthetics	7	8	13	15	15
Drinking water	5	1	1	1	0
Power generation	0	0	1	0	0

LEADERS IN CONSULTABILITY



C.2 Fauna in Cataract Gorge



Aquatic Fauna

- ▶ Aquatic mammals
 - ▶ Fish
 - ▶ Macroinvertebrates:
 - ▶ Aquatic insects
 - ▶ Molluscs
 - ▶ Other: (crustaceans, worms etc)
-

Aquatic Mammals

- ▶ Platypus
- ▶ Water rat (Orange bellied otter)
- ▶ Seals



Native Fish

Eels and lampreys:

- ▶ Two eel species, two lamprey species
- ▶ Spring: Large eelver 'run' – mostly diverted
- ▶ Summer: adult lamprey 'run'

Whitebait:

- ▶ Several species: Lovettia, juvenile galaxiids, smelt
- ▶ Spring-summer

Galaxiids:

- ▶ Two main species: Mountain galaxiid, Jollytail

Sandy

Grayling and Blackfish:

- ▶ Low abundance
- ▶ Gorge unsuitable for spawning



Native Fish

- ▶ All species widespread around state
 - ▶ All species common and abundant (except grayling)
 - ▶ Gorge a natural barrier to all species except eels and lampreys
-

Alien Fish

Brown trout:

- ▶ Riverine and sea-run strains
- ▶ Limited spawning in Gorge

Atlantic salmon:

- ▶ Fish farm escapees

Redfin Perch

Tench:

- ▶ Low densities
-



Macroinvertebrates

Dominated by:

- Snails
- Midge larvae

Poorer condition than N Esk gorge fauna


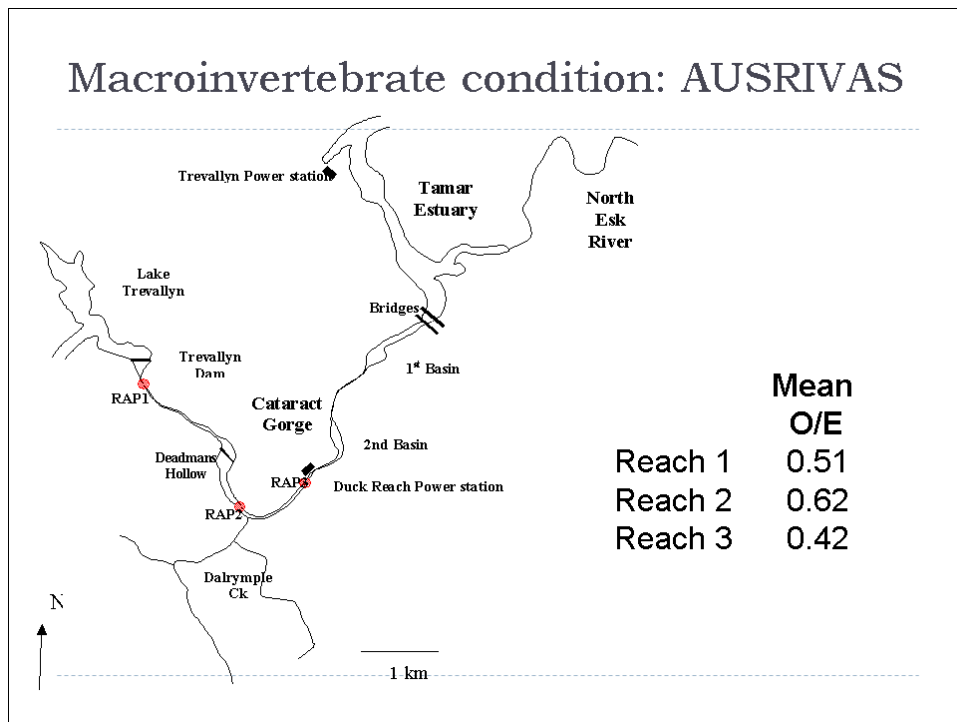
- Fewer expected families
- Low abundances and diversity of aquatic insects

Downstream vs upstream Dalrymple Creek:

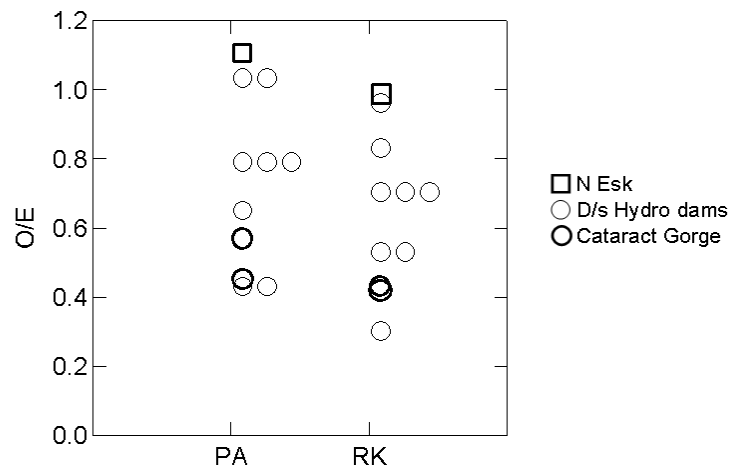
- Nutrient enrichment

1st Basin very productive:

- Shrimp, mites, snails

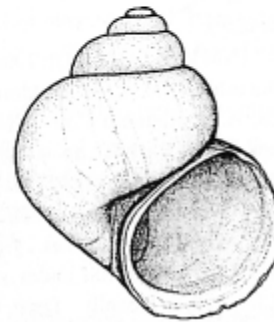



Macroinvertebrate condition: AUSRIVAS

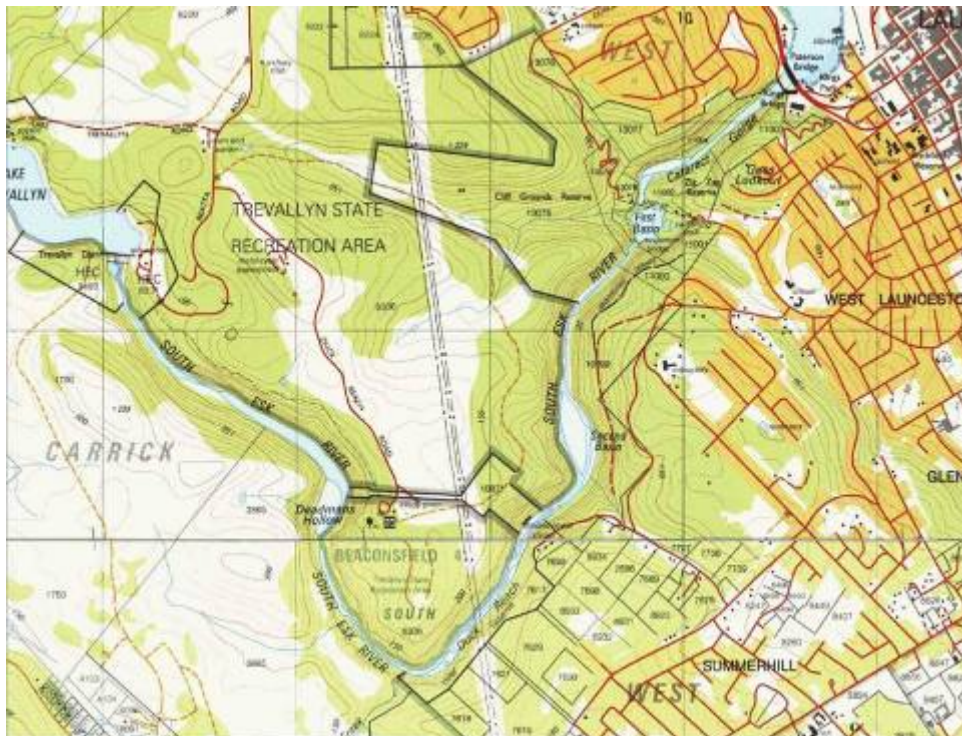


Beddomeia launcestonensis

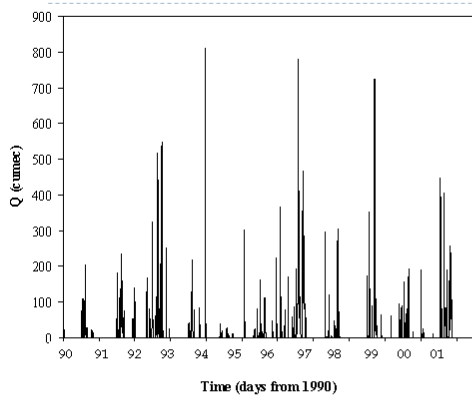
- ▶ Listed species: Endangered
- ▶ Formerly abundant
- ▶ Now rare
- ▶ Restricted to 3 habitats:
 - ▶ Boulders: 1st Basin, pools
 - ▶ Scour holes: Gorge
 - ▶ Boulders, bedrock: lake



1 mm

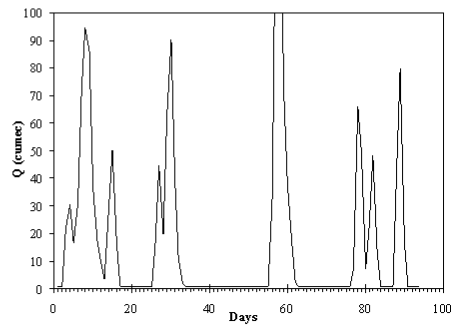


Changed flow environment



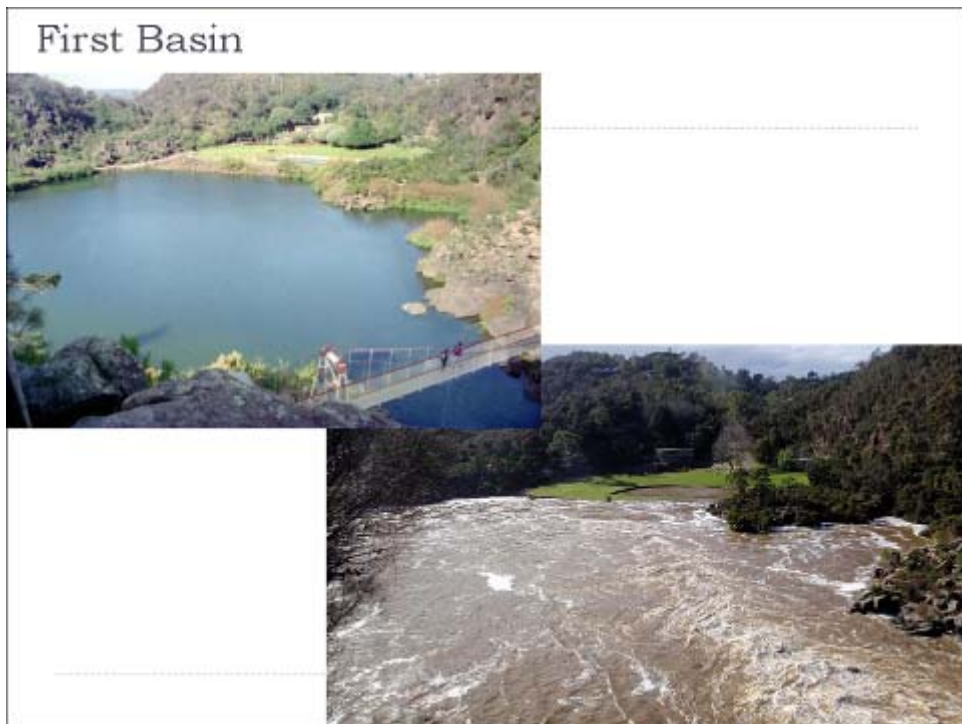
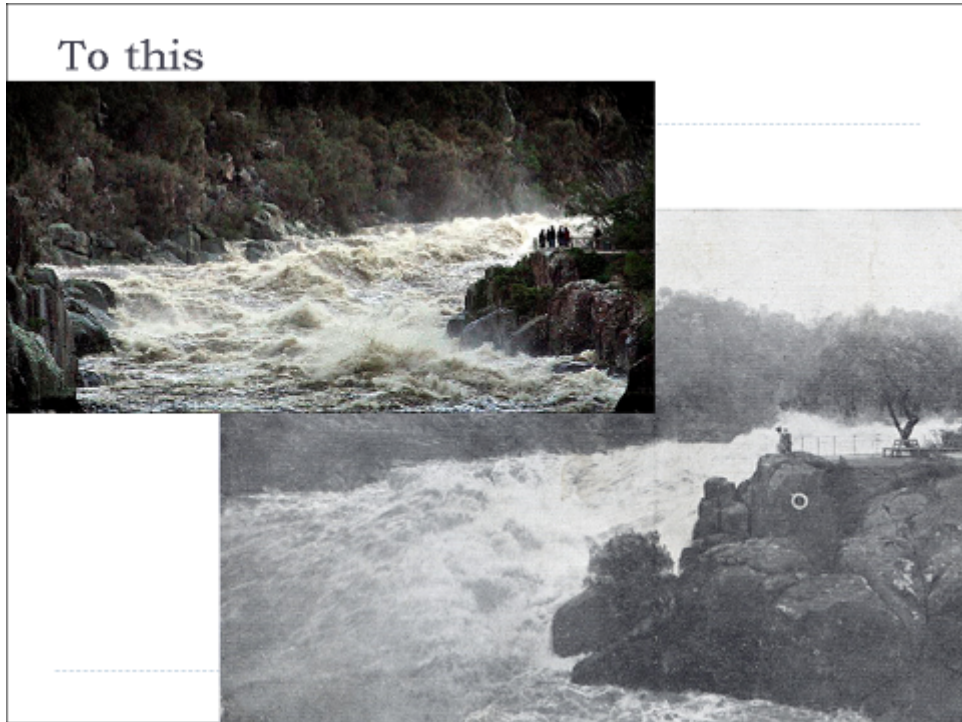
Low flows have favoured algal food for *Austropyrgus* and *Austropyrgus* shell shape better adapted to peak high flow hydraulics

High or Low
and
'Nothin in between'

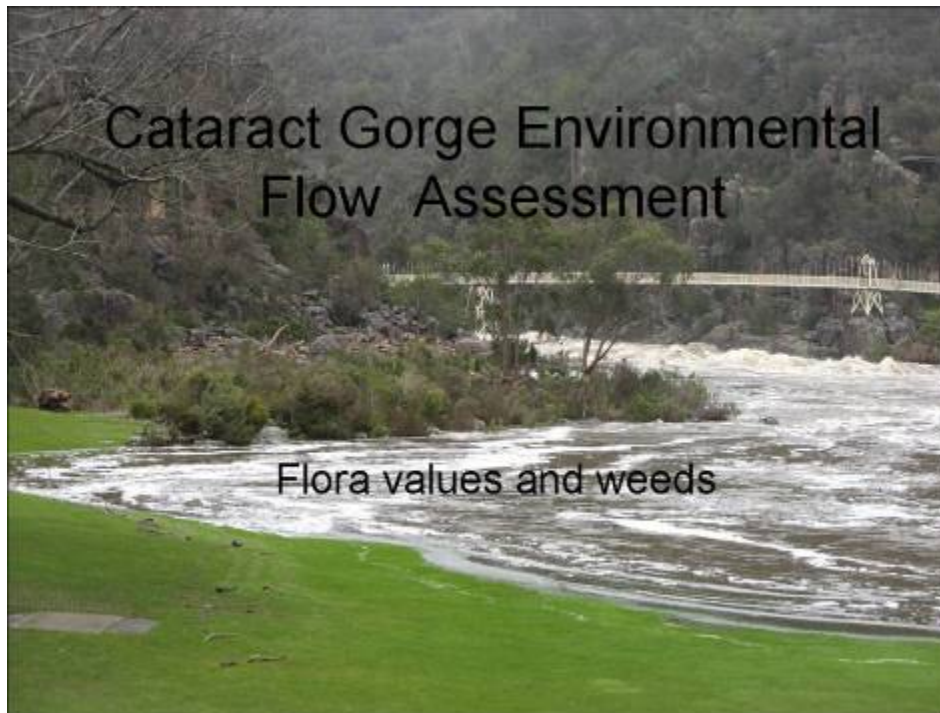


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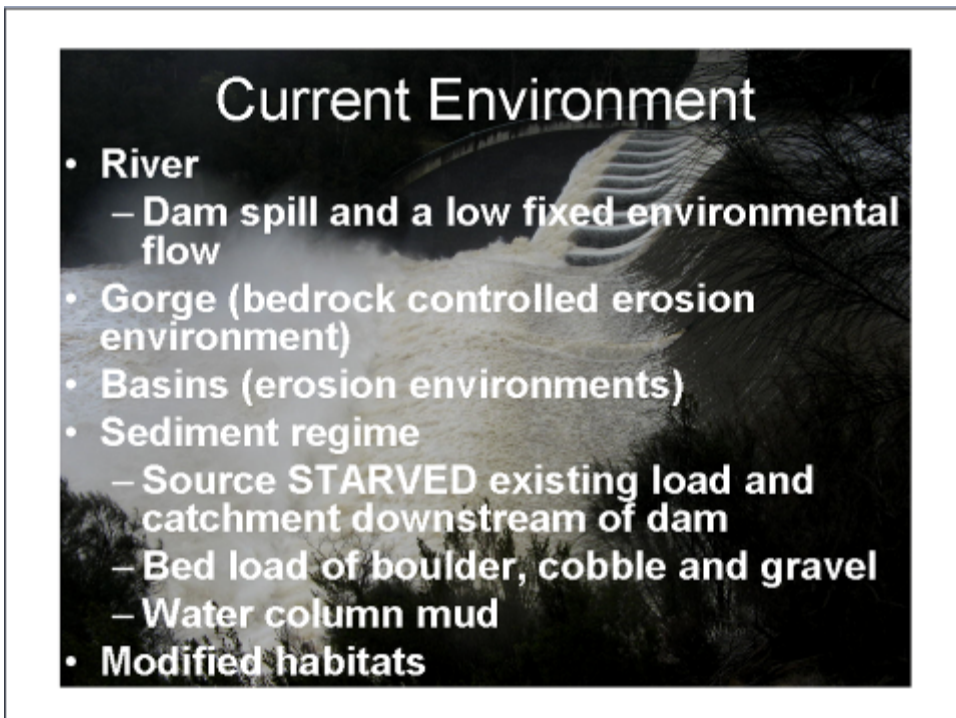
C.3 Flora in Cataract Gorge





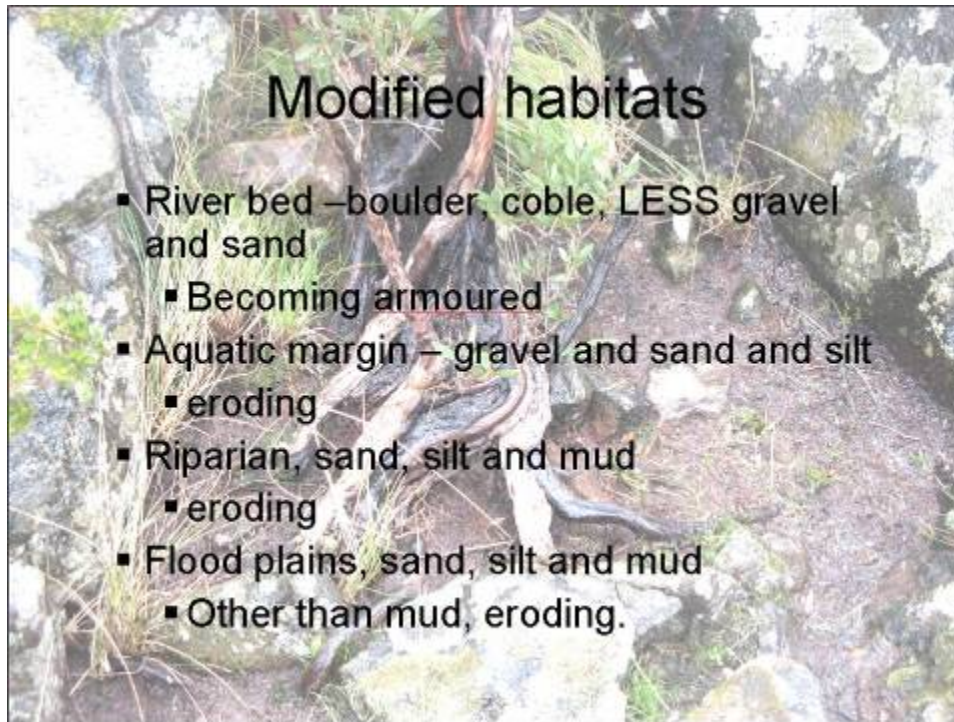
Sediments are plant habitat

- **Sediment regime**
 - Source upstream catchment erosion
 - Bed load of boulder, cobble and gravel
 - Water column of gravel, sand, silt and mud
- **Plant habitats**
 - Aquatic plants in river bed – boulder, cobble, gravel and sand
 - Aquatic margin – gravel and sand and silt- rushes and herbs
 - Riparian shrubs - sand, silt and mud
 - Flood plain scrubs and woodlands sand, silt and mud



Current Environment

- **River**
 - Dam spill and a low fixed environmental flow
- **Gorge (bedrock controlled erosion environment)**
- **Basins (erosion environments)**
- **Sediment regime**
 - Source STARVED existing load and catchment downstream of dam
 - Bed load of boulder, cobble and gravel
 - Water column mud
- **Modified habitats**





Environmental Flow Requirements

- Floods of various sizes
 - To promote renewal through disturbance
 - Provision gap opportunities
 - Germination triggers
 - Replenishment of substrate through new sediments
 - Dispersal of seed



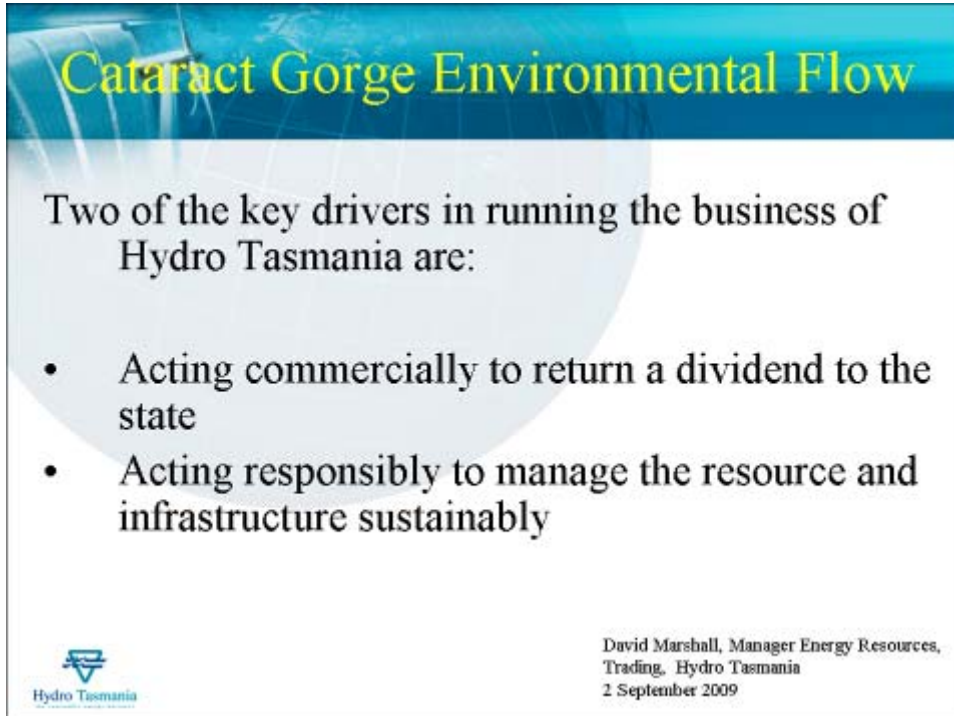
Environmental Flow Requirements

- Low flow periods
 - To maximise habitat diversity through
 - Exposure of river bed
 - Exposure of aquatic margin
 - Drying of terrestrial riparian zones
 - Draining of flood plain

Proposed Assessment

- Location of existing plants
- Location of potential habitats
- Calculate inundation level of environmental flow options
- Determine the impact of inundation on existing plants
- Determine the impact of inundation on suitable habitat


C.4 Hydro Tasmania Operations in Cataract Gorge

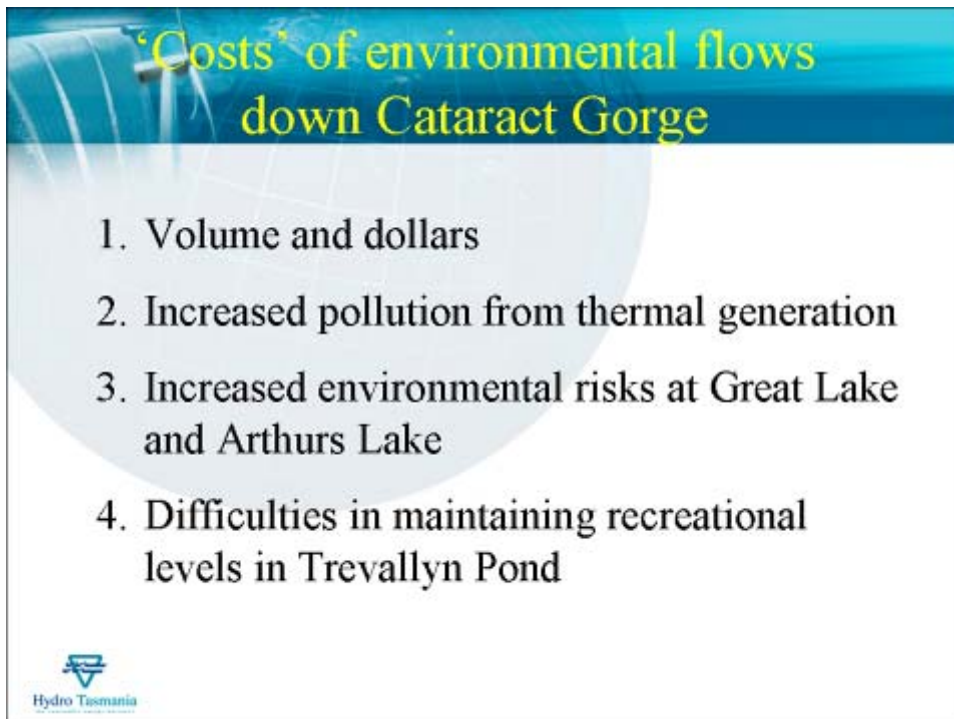


Cataract Gorge Environmental Flow

Two of the key drivers in running the business of Hydro Tasmania are:


- Acting commercially to return a dividend to the state
- Acting responsibly to manage the resource and infrastructure sustainably

 David Marshall, Manager Energy Resources, Trading, Hydro Tasmania
2 September 2009



'Costs' of environmental flows down Cataract Gorge

1. Volume and dollars
2. Increased pollution from thermal generation
3. Increased environmental risks at Great Lake and Arthurs Lake
4. Difficulties in maintaining recreational levels in Trevallyn Pond



Volume and Dollars


Volume Environmental Flow of 1.5 cumecs ~47,000 ML

Price to other users
As at April 2009
www.hydro.com.au/home/Corporate/Water_price/

Reservoir	Annual Price \$ / ML
Great Lake	~\$180
South Esk / Trevallyn	~\$23


Price in the National Energy Market - varies greatly from hour to hour – can be as high as \$10,000/MWh (equivalent to ~\$2,800/ML)

Every extra cumec of environmental flow down Cataract Gorge costs Tasmania ~\$725,000 pa (@\$23/ML)



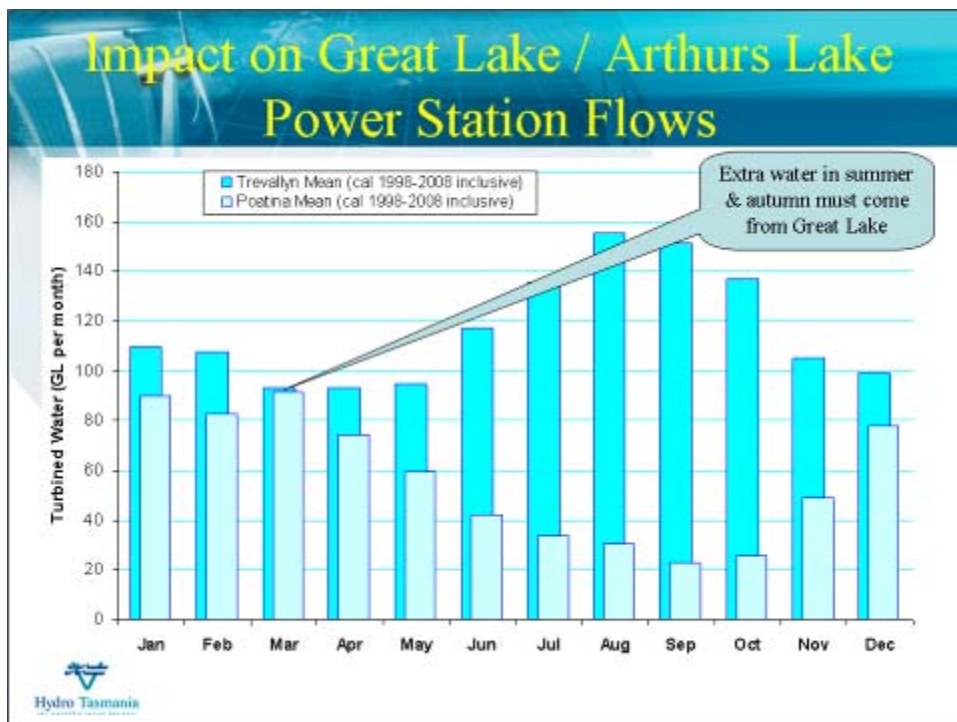
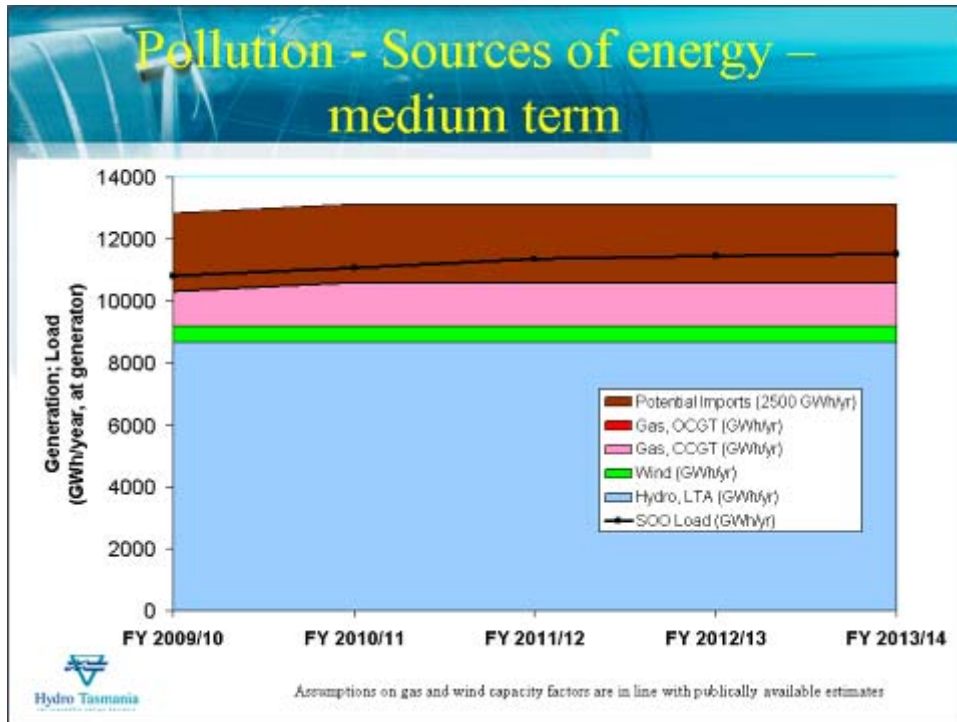
Pollution - Sources of energy 2006-2008

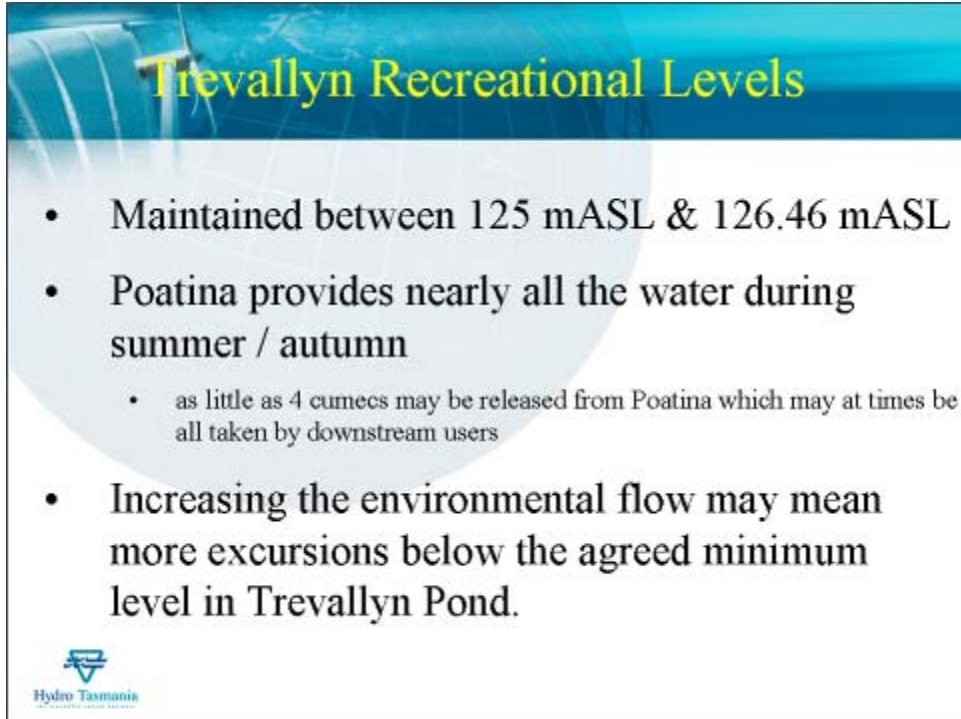
Source	Percentage
Hydro	67%
Basslink	22%
Gas	7%
Wind	4%



Every cumec of environmental flow in Cataract gorge is equivalent to ~9000 MWh of generation pa.

This represents up to 9000 tonnes of CO₂ emissions in the replacement import generation.



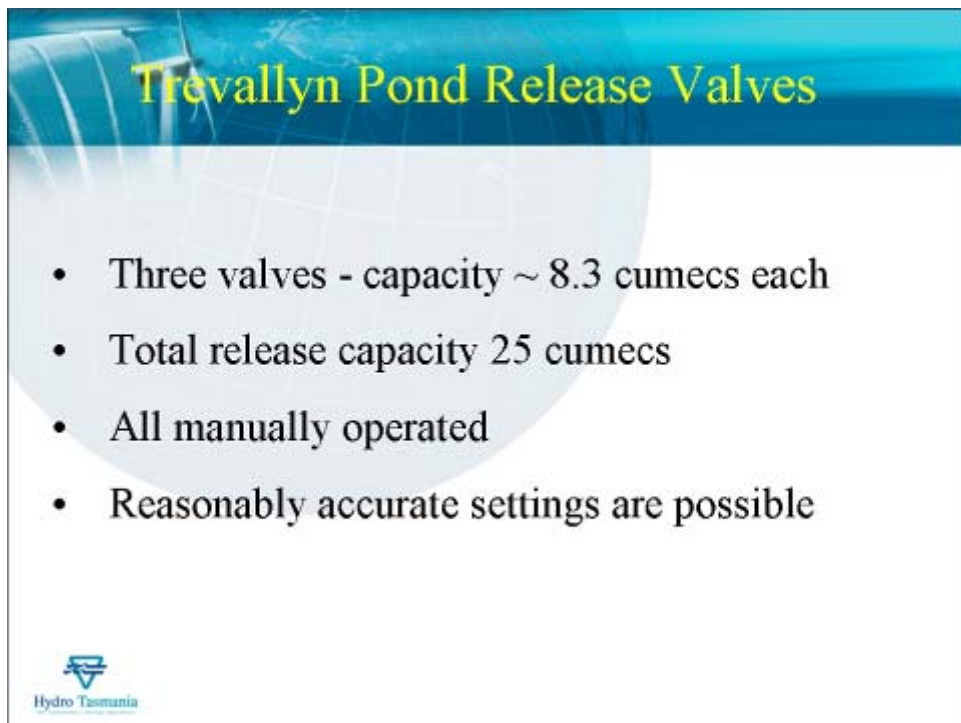
A presentation slide with a blue header and a background image of water flowing over a dam. The title 'Trevallyn Recreational Levels' is in yellow. The main content is a bulleted list. The Hydro Tasmania logo is in the bottom left corner.

Trevallyn Recreational Levels

- Maintained between 125 mASL & 126.46 mASL
- Poatina provides nearly all the water during summer / autumn
 - as little as 4 cumecs may be released from Poatina which may at times be all taken by downstream users
- Increasing the environmental flow may mean more excursions below the agreed minimum level in Trevallyn Pond.

Hydro Tasmania


The following release valve capacities are for a low lake level. When full the combined capacity of the three valves is >50cumecs.

A presentation slide with a blue header and a background image of water flowing over a dam. The title 'Trevallyn Pond Release Valves' is in yellow. The main content is a bulleted list. The Hydro Tasmania logo is in the bottom left corner.

Trevallyn Pond Release Valves

- Three valves - capacity ~ 8.3 cumecs each
- Total release capacity 25 cumecs
- All manually operated
- Reasonably accurate settings are possible

Hydro Tasmania



Some Trevallyn Catchment Water Volumes

Use	ML approx
Power Generation	1,400,000
Irrigation (up to)	145,000
Spill (varies greatly)	100,000
Cataract Gorge Environmental Flow	47,300
Recreational Releases (2pa)	18,000
West Tamar Council	4000
Flushing Releases (2pa)	350

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