Tasmania

DEPARTMENT *of*
PRIMARY INDUSTRIES,
WATER *and*
ENVIRONMENT

ENVIRONMENTAL MANAGEMENT GOALS *for* TASMANIAN SURFACE WATERS

GREAT LAKE & BRUMBYS CREEK CATCHMENTS

LOWER MACQUARIE & SOUTH ESK RIVERS

May 2000

Environmental Management Goals for Tasmanian Surface Waters:

Great Lake and Brumbys Creek Catchments and the Lower Macquarie and South Esk Rivers.

This discussion paper was used as the basis for community and stakeholder participation in the process of developing environmental management objectives for the waterways that are located within the Great Lake & Brumbys Creek Catchments and the Lower Macquarie and South Esk Rivers.

It was prepared by the Environment Division and the Land and Water Management Branch, of the Department of Primary Industries, Water and Environment; and Tasmanian Parks and Wildlife Service, the Central Highlands, Northern Midlands, Meander Valley, West Tamar and Launceston City Councils.

Words and expressions used in this paper have, unless the contrary intention appears, the same meaning as defined in the *State Policy on Water Quality Management 1997* and the *Environmental Management and Pollution Control Act 1994*. Ecosystem refers to physical, chemical and biological aspects of the aquatic environment.

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1 INTRODUCTION

1.1 Why do we need water reform?

A good supply of fresh, clean water is an essential requirement for human life, a healthy environment and a productive economy.

We need it for drinking, for recreational activities like fishing, swimming and boating, to provide the food we eat and export, to generate clean electricity, and to support farming, mining and other industries.

We also expect our rivers and lakes to look healthy, and provide a healthy environment for a wide range of aquatic plants and animals.

We take for granted that our use of water resources is sustainable; that our hard-working water will still be there in a healthy state to provide the same benefits for future generations.

Tasmanian rivers range from relatively short, swiftly flowing rivers fed from mountain sources to slowly flowing rivers which may be reduced to a series of pools during dry periods. Our waterways are not immune from problems, however, and many of our river systems are showing signs of stress.

River health, and the health of the economies that depend upon them, is clearly linked to the way we use the waters; the degree of regulation we impose; the quantity of water we take out; and the quality of water we return.

In response to a general recognition across the community of the importance of having clean water and appropriate river flows, the Tasmanian Government is currently finalising a range of reforms designed to ensure that these values are protected for the future of the State.

1.2 What are these reforms?

Two major aspects of the water reforms are water quality management and water quantity management.

(a) water quality management

The *State Policy on Water Quality Management 1997* is designed to **maintain or enhance** the quality of Tasmanian surface waters. Principal objectives of the Policy include:

- Move on from reliance on 'end of pipe' controls to take into consideration the number of discharges into a given water body, or the sensitivity or current condition of the water body.

- Ensure that diffuse source and point source pollution does not endanger the achievement of water quality objectives, and that pollutants discharged to waterways are reduced as much as possible by the use of best practice environmental management;

- Facilitate and promote integrated catchment management.

- Focusing on overall water quality management strategies by identifying those water quality values and uses which are considered worthy of protection.

The first purpose of this discussion paper is to explain how the water quality values will be identified and used. Local communities have a key

role in identifying these values in their catchments.

(b) water quantity management

The recent introduction of the *Water Management Act 1999* to replace the *Water Act 1957* provides for:

- major changes to the institutional arrangements for water management;
- the ready transfer of water rights between different users;
- enhanced stakeholder and community input into water allocation and management; and
- a more transparent and equitable water allocation system, including formal allocation of flows to maintain a healthy river environment.

The second purpose of this discussion paper is to canvas your views on what you value in your water resources from a water quantity perspective. To this effect you will be asked what you value in relation to water quantity. Your comments will be of assistance to the Department in undertaking water quantity planning in your catchment.

1.3 What will this community input achieve?

The objective is to identify water management goals for the catchments within your region. These water management goals will incorporate Protected Environmental Values (as defined in the *State Policy on Water Quality Management*) and identified water quantity values.

1.4 What do we want you to do?

Local communities have a valuable understanding of their regional waterways. You are asked to contribute your knowledge to the consultative process for the Great Lake and Brumbys Creek catchments and the lower Macquarie and South Esk Rivers.

What uses or values do you have for surface waters in this area that rely upon maintaining or enhancing water quality? Which of your activities rely upon maintaining or enhancing the flow of water into catchment waterways? Are there certain places on your rivers that you traditionally use for swimming or other recreational activities? Do you fish in them? Are there specific features of your rivers and streams that are recognized scenic attractions, such as rapids or waterfalls? Do you know of rare or endangered animals or plants in, or adjacent to, specific areas of your rivers or streams? Do you use water for livestock watering? Does your river supply the local town water supply? Do you draw water from it to irrigate your farm? How often do you need to draw water from it, and when?

Your answers to these questions (and those of other catchment stakeholders) will help to develop the community water values for regional wetlands and waterways. People will have different views on these questions. What we all need to do is to try to think about the "big" picture, and how our own objectives may impact on the whole catchment and the wider community.

Planning to ensure sustainable use of these waters and protection of river health requires sound knowledge of local water quality and quantity issues. Your input to this process is important. We invite you to make a submission on the form at the back of this booklet.

1.5 How will your input be used?

Information from you on values particularly relating to water quality will assist the Board of Environmental Management and Pollution Control and your council to finalise the range of

Protected Environmental Values for the surface waters of your regional waterways. These values will be shown in management plans for the region, and used in regional natural resource management. Further details of what this means is given in section 5 below.

Information from you on water quantity values will be utilised along with advice from stakeholders, catchment groups and the public to better plan the water resources of your catchment. Water management planning will be closely linked with overall catchment management planning to put water resource management on a sustainable footing for the State. Water management planning will be undertaken on a priority basis, with stressed rivers in the State being targeted initially.

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3 GREAT LAKE CATCHMENT OVERVIEW

3.1 Catchment description

For the purposes of this paper, the Great Lake catchment is considered to include those areas draining into both Lake Augusta on the upper Ouse River and Arthurs Lake (a total area of approximately 850 square kilometres). This recognises the modification of storage heights and transfer of water between the natural catchments within the Poatina Power Scheme. Lake Augusta and Arthurs Lake are both diversion storages used to increase the catchment yield of Great Lake. Other small areas of the Central Plateau (upper Liffey River, upper Westons Rivulet and upper Brumbys Creek catchments) are also used to increase yield to the Great Lake over winter months. Water harvest from this catchment supplies the requirements of the Poatina Power Scheme before discharging into Brumbys Creek.

While the Central Plateau on which the Great Lake is located is at a relatively high altitude, the catchment is of only moderate relief ranging between 1030 and 1384 metres [1]. Widespread glacial landforms are indicative of extensive glacial and periglacial (intense frost action on glacial limits) activity in the past. The geology of the region is characterised by metamorphic basement rocks (Pre-Cambrian, Cambrian, Ordovician and Silurian) overlain by Permo-Triassic sediments. These sediments outcrop on the northern edges of the catchment. The dominant outcropping geology is, however, Jurassic dolerite. Rocky gradational soils, derived from this doleritic parent material, are extensive across the catchment.

Sheet erosion as a result of rabbits, fire and land use practices is a significant problem on the Central Plateau.

Rainfall decreases from west to east across the catchment (approx. 2000 mm to 800 mm) with snow accounting for about 30% of total annual precipitation.

Vegetation changes from extensive areas of alpine moorland/heathland north-west of the Great Lake to dry eucalypt woodland in the south-east. Small areas of grassland are also present around Great Lake and Arthurs Lake. The high altitude means that much of the catchment is on the tree-line, with small topographic variations having significant impacts on plant growth.

Land use activities include hydro-electric power generation, conservation,

[1] Hydro Electric Commission. *Draft Environmental Statement on the Raising of the Great Lake*. 1980.

tourism, bush-walking, power-boating, duck hunting, shack-based recreation, fishing and forestry. Because of the poor soils and unsuitable weather conditions, agriculture is generally restricted to sheep and cattle grazing.

There are significant gaps in knowledge regarding Aboriginal sites near the Central Highlands lakes. It can be guessed though, from the high density of sites recorded around the Great Lake, that the area had a long history of Aboriginal use. Lunettes (wind-formed landforms) on the eastern shore of Lake Augusta also have significant Aboriginal heritage value. Some Aboriginal sites have been flooded during hydro development.

3.2 Land tenure

The Great Lake catchment is located principally within the Central Highlands Municipality. There is a varied pattern of land tenure and land use within the catchment. Areas of land fringing the Great Lake, Lake Augusta and Arthurs Lake are vested in the Hydro for use in the generation and distribution of hydro-electricity.

The Central Plateau Conservation Area and the Great Western Tiers Conservation Area (to the north, west and east of Great Lake) is administered under *the National Parks & Wildlife Act 1970*. To the north and west of Great Lake this is included within the Tasmanian Wilderness World Heritage Area. Lake Augusta is entirely within the World Heritage Area.

World Heritage listing is recognition of the unique natural and cultural values of the region. These features and other special values - recreational, economic, scientific, educational and inspirational - are identified in the Tasmanian Wilderness World Heritage Area Management Plan [2]. These values are briefly detailed below. The region is characterised by outstanding landform features; a profusion of threatened, rare and endemic plants within a mosaic of plant communities; a unique assemblage of wildlife; the area has a significant cultural history of Aboriginal use and more recent activities since European settlement. The wide range of recreational opportunities in the region is also seen to have economic importance as a basis for sustainable nature-based tourism.

The catchment includes a number of reserve classes that are managed under the *National Parks and Wildlife Act, 1970* or the *Crown Lands Act, 1976.* Both of these Acts has defined management objectives for each reserve class for which it is responsible. In all reserve classes 'preservation of water quality' is a management objective.

Areas of State Forest, which lie to the east and south of Great Lake, are managed by Forestry Tasmania under the *Forestry Act 1920*.

The future tenure of approximately 430 shacks located on Crown land around the Great Lake is currently being assessed by the Department of Primary Industries, Water and Environment (DPIWE) within the Shack Sites Project. To be suitable for transfer to freehold title, in accordance with the *Crown Lands (Shack Sites) Act 1997*, a shack site must be environmentally sustainable, not cause significant impact to natural values and cultural heritage and must not prevent public access to adjoining public land. Approximately 550 shacks are already covered by freehold title.

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[2] *Tasmanian Wilderness WHA Management Plan.* Tasmanian Parks & Wildlife Service. 1999

There are also areas of existing private land located to the south of Great Lake and Arthurs Lake. The Arthurs Lake area has an estimated 250-300 shack sites covered by freehold title.

3.3 Water usage

Under the 1957 *Water Act*, the Hydro is entitled to all water within the Great Lake Catchment. Consequently, hydro-electric power generation is a major water use within the catchment. Since 1964, the Poatina Scheme has operated by diverting water (around 700 million cubic metres annually) from the Derwent River system to the South Esk River system.

There are three main water storages within the catchment providing water to the scheme – Great Lake (3178 million cubic metres reservoir volume), Arthurs Lake (511 million cubic metres volume) and Lake Augusta (23 million cubic metres volume). The two smaller storages transfer water to the Great Lake for long term storage. Great Lake has never reached full supply level during the period of record and its larger storage capacity means longer time frames for filling or emptying and little seasonal variation of storage level. Arthurs Lake also shows little seasonal variation both because of defined upper and lower limits arising from operational and fisheries requirements.

The connection of Tasmania to the mainland electricity grid via the Basslink cable is likely to result in changes to the Hydro's system operations, possibly affecting the larger power stations, that is Gordon and Poatina. The State Government has announced there will be an environmental impact assessment process to assess the potential affects of Basslink operations on Tasmanian waterways. In anticipation of the EIA for Basslink, the HEC will be conducting a number of investigative studies to determine any possible environmental effects on inland Tasmanian waterways associated with the Basslink proposal.

The Great Lake catchment is the source of water used downstream for township supply, irrigation, industry and recreation. However, water usage within the catchment is principally for tourism and recreation pursuits (fishing and boating). The Great Lake and Arthurs Lake are particularly popular for pursuing rainbow trout and brown trout. Rainwater tanks and bores are the major source of domestic water supply in this area. Sheep and cattle grazing, as the major agricultural activities, place minimal demands on water resources.

3.4 Water Quality

The water quality of the Highland Lakes does not appear to be significantly affected by surrounding land use. Sampling conducted since the early 1990s shows that lake waters are characterised by high oxygen concentrations, neutral pH and low conductivity (used to indicate salinity problems). There are occasional high turbidity episodes (loss of water clarity) in Lake Augusta arising from turbulence in its shallower waters.

Nutrients are those elements and compounds required by animals and plants for growth and survival. While their availability is a critical aspect of functioning aquatic ecosystems, an excess of nutrients – particularly nitrogen and phosphorus – can result in excessive algal growth and degraded waterways. Generally nutrient levels and algal concentrations in these lakes are at low levels.

One water quality concern is at Pine Lake just north of Great Lake and within the Great Western Tiers Conservation Area. This has been

declared a quarantine zone by the Tasmanian Parks and Wildlife Service due to dieback of conifers and other flora. The cause has not been isolated but it may be the fungus *Phytopthera* sp *nova* which can be spread by water [3].

An environmental investigation of the Great Lake shack sites is currently under way to determine whether it is possible for domestic wastewater from each shack to be treated and disposed, either on or off site, without impacting on the receiving environment. The effects of leachate from old tip sites on groundwater quality are also being investigated at the Flemings Drive tip (Miena). Another old tip in the area (Jones Road) has been fully remediated with removal of all waste from the site.

3.5 Aquatic Ecosystems

Wetlands and waterways are obviously central to regional environmental-ecosystem processes. Great Lake is a wetland ecosystem of high conservation significance because of its great invertebrate diversity. Aquatic algal beds (*Nitella* and *Chara* spp.) harbour many of the invertebrates that are considered threatened under the Tasmanian *Threatened Species Protection Act* 1995. Several species of caddisfly that occur in the weedy areas of Great Lake are of high conservation significance. Other important species recorded in the Great Lake are a hydrbiid snail (vulnerable) and several endemic species of amphipods (rare).

The native fish, *Paragalaxias eleotroides*, which has been listed as rare under the *Threatened Species Protection Act* 1995, also appears to use these algal beds for habitat. Other rare galaxiid species are also found in the waters of Great Lake (*Paragalaxias dissimilis*) and the Western Lakes draining into Great Lake (*Paragalaxias julianus*). Arthurs Lake is an important habitat for the saddled galaxias (*Galaxias tanycephalus*) which is listed as vulnerable and the Arthurs paragalaxias (*Paragalaxias mesotes)* which listed as rare under the 1995 *Threatened Species Protection Act*.

Lakes and streams within the catchment also support significant (from a recreational viewpoint) non-native species of brown and rainbow trout.

3.6 Catchment environmental issues

As stream conditions are determined both by in-stream activities and surrounding land-use activities, waterways act as a touchstone of catchment health. Healthy waterways are indicative of sustainably managed catchments. There are a number of environmental issues relating to waterways of the Great Lake catchment.

- Maintenance of water quality for the areas lakes and streams.
- Maintenance and enhancement of habitat quality and diversity for aquatic flora and fauna.
- Maintaining viable populations of animal and plant species and communities of high conservation value in aquatic environment.
- Translocation of biota via inter-basin water transfers – e.g. Arthurs Lake to Great Lake; Lake Augusta to Great Lake.
- Potential impacts to Great Lake algal beds and associated fauna of changes in lake level, siltation and competition from aquatic weeds.
- Investigation of dieback of conifers and other flora in some areas to determine whether it is caused by a water-borne fungus.

[3] *Tasmanian Wilderness WHA Management Plan.* Tasmanian Parks & Wildlife Service. 1999

- Protection of species listed under the *Threatened Species Protection Act* 1995 (such as the saddled galaxias) that may be affected by habitat modifications due to Hydro operations or direct trout predation.
- Impacts on fish migration and dispersal of the Arthurs, Augusta and Miena (Great Lake) dams and other levees, weirs and culverts within the catchment.
- Dispersal of exotic redfin perch into the Great Lake (already possible) and World Heritage listed wetlands further west via Liawenee Canal (unlikely with a fish migration barrier in place) or by human translocation.
- Dispersal in Lake Augusta, Arthurs Lake and Great Lake of Canadian Pondweed (*Elodea canadensis*) - a prohibited aquatic weed which may displace native instream vegetation and clog pumps, pipes and hydro operating systems.
- Degradation of lunettes (wind-formed landforms) on the eastern shore of Lake Augusta due to fluctuations of the lake level. Vegetation loss along lake fringes from rising water levels has allowed some foreshore wind erosion.
- Some erosion in Liawenee Canal.
- Protection of alpine aquatic environment (lakes, tarns etc.)
- Some shoreline erosion on the western shore of Great Lake and sedimentation issues associated with long term variation in storage levels.
- Treatment and disposal of wastewater from commercial and private properties
- Effluent entering lakes from informal campsites.
- Development and implementation of stormwater management plans for shack sites. More formal roads and drains are being developed with an increasing concentration of run-off.
- Investigation into effects of leachate from old tip sites on groundwater.
- Runoff issues associated with roads, quarrying etc.
- Boating related impacts – i.e. pollution of water, sediment disturbance, translocation of fish and plant species.
- Changes in water quality (e.g. dissolved oxygen and temperature) arising from impoundment and water level regulation.
- Alterations to downstream flow and sediment load.
- Possible environmental effects on waterways associated with the Basslink proposal.

4

BRUMBYS CREEK CATCHMENT OVERVIEW

4.1 Catchment description [4]

The Brumbys Creek catchment covers 310 square kilometres of mid north-east Tasmania. It is marked by a dramatic change in topography from the high escarpments in the west and south to the lower undulating plains and river terraces further east. This is a reflection of the underlying geology, with the Great Western Tiers characterised by Jurassic dolerite intrusions into the Permian-Triassic calcareous and siliceous glacio-marine sediments of the Upper and Lower Parmeneer Supergroups. Further east across the catchment there is a transition from these exposed sediments in the lower Tiers to a catchment characterised by alluvial Quaternary deposits of windblown sands, river terraces, gravels and sands. Soils in the area may be moderately susceptible to gully and stream-bank erosion.

There is considerable variation in rainfall across the catchment. Average annual rainfall in the Tiers (over 1200 mm) is double that recorded in the lower catchment (630mm), much of which is located in a rain shadow. Rain producing weather patterns generally originate in the north west or north east, with winter the period of highest rainfall.

The characteristic vegetation found in the upper catchment area is moorland-heathland complexes. Dry eucalyptus forest is found on the escarpment slopes with clearing of lower areas for agricultural purposes intensifying over the last 30 years. Virtually all the original natural vegetation in the lower catchment (grassy open forest and dry eucalypt woodland) has been cleared for agriculture.

Brumbys Creek rises near Drys Bluff in the Great Western Tiers at an altitude of over 1200 metres. It flows through the Bluff Marshes before dropping over 700 metres from the escarpment to the foothills below. There is, however, some water diversion in the upper catchment at Brumbys Weir and Westons Weir over the winter months. After leaving the Highlands, Brumbys Creek is extensively modified in flow and direction due to irrigation use. Below its confluence with Palmers Rivulet and the Poatina Power Station tailrace canal (where it receives water from the Great Lake catchment), Brumbys Creek flows in a north-easterly direction for about 16 kilometres before joining the Macquarie River near Cressy. Three weirs were constructed along this stretch of the creek as part of the Poatina Power Scheme.

While the majority of land in the catchment is privately owned, there are some areas of Crown Land and State Forest on the slopes of the Tiers. Agricultural activity is focussed on sheep and cattle grazing (both improved and unimproved pasture) and cropping. The Hydro owns some land as part of the Poatina Power Scheme in the upper catchment and a strip along Brumbys above its junction with the Macquarie River. The Cressy Research Farm, operated by the Department of Primary Industries, Water and Environment, also has about seven kilometres of river frontage above this junction. This is a declared Public Reserve under the *Crown Lands Act 1976*. The Sevrup Fisheries trout farm is located close to this junction.

[4] *Brumbys Creek Rehabilitation & Management Plan for Hydro Managed Land.* Prepared for Generation North: Hydro-Electric Corporation by the Environmental Services Department, Consulting Business Unit. Dec 1998.

Past Aboriginal use of the region would be expected to have been extensive, including many sites in the bordering dunes adjacent to rivers (e.g. the sand sheets on the banks of Brumby Creek). However, land clearance and use for agriculture over the last 200 years would have resulted in widespread disturbance of many sites. The historic Longford Mill dam is seen as an example of more recent important heritage values associated with the region's waterways.

Except for a small area of the upper catchment that is located in the Central Highlands municipality, Brumbys Creek catchment is within the Northern Midlands council area. Cressy, at the confluence of the Macquarie River and Brumbys Creek, is the major town in the Brumbys Creek catchment with a population of around 600.

Brumbys Creek is ranked fourth in the state's top trout fisheries, with a high national profile for fly-fishing and attracts many tourist anglers. Hence, ample access to fishing spots on stream banks and boat access to waterways are ongoing concerns.

4.2 Water usage [5]

Comparison of area and mean annual discharge for the five principal sub-catchments shows an obvious discrepancy in discharge for the Palmers/Tailrace sub-catchment (Table 1). This is a consequence of inputs from the Great Lake as part of the Poatina Power Scheme.

[5] Unless otherwise cited, information from *Brumbys Creek Rehabilitation & Management Plan for Hydro Managed Land.* Prepared for Generation North: Hydro-Electric Corporation by the Environmental Services Department, Consulting Business Unit. Dec 1998.

Prior to commissioning, Brumbys Creek had low or nil summer flow, a series of flood events in winter of around 100 m^3/sec and a mean annual discharge of 101,000 ML. Following commissioning of the scheme in 1964, summer flow increased, as did the occurrence of small floods. Flow variability increased and mean annual discharge rose to 738,500 ML. Average annual discharge increased from 3.2 m^3/sec to 23.4 m^3/sec in Brumbys Creek downstream of the tailrace.

These hydrological changes can be linked to observed erosion, sedimentation and weed infestation issues within Brumbys Creek. Extensive river works were undertaken as part of the Poatina development. Modifications included channel clearing and excavation; clearing of riparian vegetation; weir and levee construction; and development of allied drainage works.

Table 1: Brumbys Creek sub-catchments

Sub-catchments	Area (km^2)	Est. mean annual discharge (10^6 m^3)
Upper Brumbys	106	32
Palmers/Tailrace	56	582
Cressy-Longford Irrigation	31	9
Woodside Dairy	72	22
Lower Brumbys	45	14

Under the 1957 *Water Act*, the Hydro is entitled to all water within the Brumbys Creek Catchment (as part of the South Esk Hydro Water District) for power generation purposes. In practice, provision is made for the needs of town water supply, riparian stock and domestic uses. An amount of 2500 ML per annum has been made available to the Rivers & Water Supply Commission for allocation of Commissional Water

Rights to landholders along Brumbys Creek (and users on the Macquarie and South Esk Rivers downstream).

The Cressy-Longford Irrigation Scheme also draws off between 3000 and 10,000 ML annually at the Poatina Power Station tailrace canal. About 80 properties covering 10,000 hectares are within the irrigation district. Part of this area is outside of the Brumbys Creek Catchment so that some diverted water may drain into the neighbouring Liffey River. The major use for irrigation is pasture production (40%) and vegetable crops such as potatoes, peas, beans and onions (40%) [6].

Landholders with stream frontage also take an unknown volume of water for stock or domestic purposes.

The Sevrup Fisheries Trout Farm is also reliant upon extraction of water from Brumbys Creek with Commissional Water Rights of up to 475 ML per day from two intakes. Water is returned to the creek after use.

Treated sewage from Poatina Power Station is discharged into the start of the tailrace canal.

4.3 Water Quality [7]

Brumbys Creek, while subject to seasonal variation, had lower temperatures (4.6 to 17.6 °C) than other local waterways. This reflects the impact of cooler water drawn from Great Lake.

Electrical conductivity, which can be used to detect salinity problems, was typically at low levels. Poatina tailrace inputs to Brumbys Creek were again evident with drops in conductivity from spring through autumn.

Although there is a considerable degree of variation in pH (acidity) over time (5.6 – 7.8), levels are generally within the range required for healthy aquatic ecosystems. This fluctuation indicates that waters are poorly buffered with low alkalinity concentrations.

While it has been suggested that the increased flow into Brumbys Creek from the Poatina Scheme has increased bank erosion and stream sediment load, only low levels of suspended solids (less than 7 mg/L) were recorded in the lower reaches of Brumbys Creek.

Total phosphorus concentrations in Brumbys Creek were at low levels (median of 9 µg/L) unlikely to support nuisance algal blooms. Nitrogen concentrations were also generally at low levels.

Limited microbiological sampling (which may not truly reflect the general condition of Brumbys Creek) recorded bacterial concentrations at levels above the guidelines recommended for swimming and, at one site, for consumption of water by livestock. Faecal contamination of waterways may be linked to the entry of stock into rivers.

4.4 Aquatic Ecosystems [8]

Cooler water from the Great Lake and the abundant cover provided by willows has meant that Brumbys Creek has become excellent trout habitat. These changes in temperature and flow and

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[6] DPIF *South Esk Basin State of Rivers Report*. 1997. Funded by NHT & State Government.

[7] DPIF *South Esk Basin State of Rivers Report*. 1997. Funded by NHT & State Government

[8] *Brumbys Creek Rehabilitation & Management Plan for Hydro Managed Land.* Prepared for Generation North: Hydro-Electric Corporation by the Environmental Services Department, Consulting Business Unit. Dec 1998.

loss of native vegetation would cause significant loss of habitat for local native aquatic fauna.

Platypus have been the focus of several studies in the Brumbys Creek area. While accurate population estimates are not given, a high percentage of platypus appear to suffer from skin lesions caused by the fungus *Mucor amphibiorum*.

4.5 Catchment environmental issues

As stream conditions are determined both by in-stream activities and surrounding land-use activities, waterways act as a touchstone of catchment health. Healthy waterways are indicative of sustainably managed catchments. There are a number of environmental issues relating to waterways in the Brumbys Creek Catchment.

- Maintenance and enhancement of water quality in agricultural and urban landscape.
- Maintenance and enhancement of habitat quality and diversity for aquatic flora and fauna.
- Maintaining viable populations of animal and plant species and communities of high conservation value in aquatic environment.
- Lack of clarity in terms of riparian ownership (i.e. whether title extends to middle of river, to riverbank, or to riparian buffer zone) as an environmental issue in terms of complicating effective management and works programmes.
- Degraded water quality in the top Brumby's weir (generally in December) is believed to be unsuitable for stock watering and fish habitat purposes. Source of problem is suspected to be in the Poatina region. Investigation required into the effects, if any, of point source (i.e. Poatina sewage treatment plant) and diffuse source (surrounding land use) inputs.
- Effects, if any, of aerial spraying on water quality.
- Bank erosion in channel below Poatina due to significant increase in discharge and fluctuating water levels.
- Possible environmental effects on waterways associated with the Basslink proposal.
- Stock induced erosion along riverbanks.
- Faecal contamination of waterways from stock entry into streams.
- Flood related issues (silting, levee banks etc.)
- Absent or degraded riparian (riverbank) vegetation.
- Suspended sediments being drawn into agricultural and domestic pumps.
- Willow infestation of waterways
- Skin lesions on platypus
- Security of supply for irrigators.
- Barriers to fish movement due to changes in water flow regime.
- Fluctuating water levels leading to high liver fluke problems amongst stock.

5

LOWER MACQUARIE RIVER AND SOUTH ESK RIVER OVERVIEW

For the lower Macquarie River and lower South Esk River, this Discussion Paper is restricted to a zone fringing these two rivers rather than including the entire catchments. This zone is delineated, more or less, by local sub-catchment watersheds. Because of the great area covered by the South Esk, Macquarie and Meander catchments, the setting of Protected Environmental Values for wetlands and waterways within these catchments, as a whole, will be set upon a municipality basis at a later date.

5.1 Zone Description

Below its confluence with Brumbys Creek, the Macquarie flows generally in a northerly direction for 18 kilometres until it joins the lower reaches of the South Esk River at Longford. The South Esk River flows another 15 kilometres before entering Lake Trevallyn near Launceston. This is the only major storage on the South Esk River. From this point, water flows to the Tamar Estuary via Trevallyn Power Station or along its natural course through Cataract Gorge.

The annual rainfall of 600-750 mm along the lower reaches of the Macquarie and South Esk Rivers is approximately half of that found in the Central Highlands and the Upper Brumbys Creek catchment. The lower lying areas around Longford, Hadspen and Launceston are, however, susceptible to occasional major flood events. Weather patterns associated with these flood events are either frontal activity from the west or rain-bearing, sub-tropical low pressure systems from the east.

The landscape through which the rivers flow is the flat, undulating valleys of the Launceston Tertiary Basin. The underlying geology of this region is a mix of alluvial gravel, sands and till, with outcrops of older volcanic and igneous rocks.

The lower Macquarie and lower South Esk rivers flow within the administrative boundaries of four councils – Northern Midlands, Meander Valley, West Tamar and City of Launceston – before entering the Tamar Estuary. Major population centres in this area are Longford (over 2800), Hadspen (over 1700) and the fringe western suburbs of Launceston such as Blackstone Heights.

Land along the waterways is predominantly privately owned and is generally used for agriculture or for urban use (Cressy, Longford, Hadspen, and Launceston). Extensive agriculture use has meant that most of the original native vegetation has disappeared from these areas. Trevallyn State Reserve (440 hectares) and Cataract Gorge Reserve both have forest remnants representative of original vegetation cover. Tourism and recreational use are permitted where they are consistent with the conservation of the reserve's natural values.

While there is little available information on Aboriginal values associated with the lower Macquarie and South Esk rivers, it would be expected to have an extensive history of Aboriginal use of the waterways.

5.2 Water usage

The Cressy town supply (120 ML per annum) is drawn from the Macquarie River below its confluence with Brumbys Creek. Estimated average yearly extractions for town supply to Longford is 720 ML. An estimated average of 3000 ML per annum is also

extracted for domestic supply from Lake Trevallyn. There are two off-takes - one supplies Blackstone Heights, Prospect Casino and Hadspen, the other larger off-take supplies the West Tamar area.

Treated sewage from Cressy (discharge of 240 kL/day) and Longford (discharge 1700 kL/day) is discharged via Back Creek into the South Esk River below Longford. Prospect Sewage Treatment Plant also discharges 1400 kL/day annually into the South Esk via Dalrymple Creek below Trevallyn Dam.

The Cressy-Longford Irrigation Scheme is a major user of water from Poatina Power Scheme for vegetable production (between 3000 and 10,000 ML annually). Drainage from most of the properties within the irrigation scheme returns to the South Esk below Longford via the Back Creek system. Some landowners on the lower Macquarie and South Esk Rivers share Commissional Water Rights (with landholders along Brumbys Creek) of 2500 ML per annum. Those with river frontage also have riparian rights to extract water for stock and domestic purposes.

Fishing is a major recreational use in the lower Macquarie and South Esk rivers. It has been estimated that over half the total angler use on the Macquarie River takes place between Brumbys Creek and the South Esk and that over forty percent of fishing on the South Esk takes place between the Macquarie confluence and Lake Trevallyn[9]. Some commercial fishing of short-finned eels also takes place in the region. These waterways also provide a focus for swimming, passive recreation and aesthetic appreciation.

The Poatina Power Scheme typically provides 60-70% of summer flows to the South Esk at Launceston. This percentage decreases markedly during winter. While some of this water enters the Tamar Estuary via the Trevallyn Power Station (capacity 83 MW), the small size of Lake Trevallyn (12 million cubic metres reservoir volume) only allows about two-thirds of inflows to be regulated. Flows exceeding power station and storage capacity spill over the dam and enter the Tamar Estuary via Cataract Gorge.

Because Lake Trevallyn is also a designated recreational area, there is a minimal operational storage level agreement between the Hydro and the Launceston City Council. The lake is used for skiing and swimming.

A constant minimum flow of 0.43 cumecs is released into Cataract Gorge as required by the *Water Act 1957*. Releases are also made for canoeing and commercial rafting purposes. The First Basin and stretches of water upstream and downstream are popular swimming areas over summer.

An environmental flow study undertaken on the Macquarie River and South Esk River utilised a risk analysis model to identify sustained flow requirements for these waterways [6]. This study nominated median discharge levels of 1 cumec (86 ML/day) for the Macquarie River and 2 cumec (172 ML/day) over the irrigation season for the South Esk River. Flows at these levels were considered to provide only low levels of risk that a range of ecological and fishery values would be lost. The basis upon which these values were determined should be considered and is outlined in the original environmental flows report.

[9] Davies P & Humphries P 1995. *An environmental flow study of the Meander, Macquarie and South Esk Rivers, Tasmania*. Dept. of Primary Industries & Fisheries.

5.3 Water Quality [10]

The impact of the Poatina Power Scheme on the lower Macquarie and South Esk rivers is evident in changes in water quality parameters. Water temperature of the South Esk at Longford, below its confluence with the Macquarie River, is several degrees colder than it is further upstream at Perth. Electrical conductivity (indicative of water salinity), while typically low throughout the whole catchment, is also reduced. Concentrations of total dissolved salts, which determine alkalinity (the capacity of waters to resist changes in pH) and hardness (the capacity of water to lather soap), decrease with inflow of Great Lake water. These dissolved salts were, however, already at low concentrations upstream in the South Esk River. The introduction of Poatina water does, however, prevent the changes in Brumbys Creek water quality associated with the natural decline and cessation of flows in summer.

Waters of the South Esk River are generally clear with low turbidity and low suspended solids. The South Esk at Longford and Hadspen, while less clear than further upstream, is still indicative of healthy aquatic ecosystems. The Macquarie River appears to contribute to an increase in turbidity levels, particularly over the winter months with increased catchment runoff. Data reveal, not unexpectedly, that large flood events result in a considerable deterioration in water quality with significant increases in turbidity and suspended solids.

Any propensity for the development of problem algal blooms is indicated by the concentrations of nitrogen and phosphorus in waterways. Monitoring at Longford and Hadspen indicates that the likelihood of nuisance blooms developing is low.

Back Creek, which drains the Cressy-Longford Irrigation Scheme and flows into the South Esk to the west of Longford, appears to be one of the most degraded tributaries in the South Esk catchment. In particular, it is the source of highly saline and turbid waters. Township sewerage schemes at Cressy and Longford discharging into Back Creek also contribute significant nutrient loads. Nuisance growth of the filamentous algae (*Spirogyra* sp.) downstream may be linked to these nutrient inputs.

Water quality data for Lake Trevallyn is limited. Results from past monitoring of electrical conductivity, dissolved oxygen, pH (acidity) and turbidity are typical of healthy aquatic ecosystems. However, levels of the nutrients (nitrate and total phosphorus) are at concentrations within the lake that suggest the potential for development of troublesome algal blooms during the warmer, less windy months. Occasional microbiological results exceeding the guidelines for Primary Contact Recreation - also indicate that there are times when swimming in the lake should be restricted. Whether it is a local source of contamination or is from upstream is undetermined.

5.4 Aquatic Ecosystems

Woodstock Lagoon is an important waterfowl habitat covering about 20 hectares to the west of Longford. It is classed as a Private Sanctuary under the *National Parks and Wildlife Act 1970* and is an area of freehold land where the owner has agreed to the protection of significant natural and/or cultural values.

[10] DPIF *South Esk Basin State of Rivers Report*. 1997. Funded by NHT & State Government.

The Trevallyn Dam on the lower South Esk upstream from the Tamar Estuary affects the migration and dispersal of native fish. It forms a barrier to native species that migrate between fresh and salt water for breeding purposes. While successful downstream passage of adult eels appears to utilise spillway flows, it is not clear if dam overflow corresponds with times of eel movement. An elver ladder has been installed at Trevallyn Dam to allow upstream passage of several elver species, however, its effectiveness is yet to be determined.

Trevallyn Dam also provides a barrier to the juvenile Australian Grayling (*Prototroctes maraena*) wishing to migrate upstream from the Tamar Estuary. This fish is a listed 'vulnerable' species due to loss of habitat arising from instream barriers to migration. A rare species of freshwater snail (*Beddomeia launcestonensis*) found downstream of the dam in Cataract Gorge may also be affected by Hydro flow regulation.

The vulnerable green and gold frog (*Litoria raniformis)*, which is found in permanent swamps and dams of the lower South Esk catchment, may be affected by water regulation and diversion.

The redfin perch, which is an introduced fish in the lower South Esk, Brumbys and Macquarie system, may be having a negative effect on native fish species because of it highly predatory behaviour. Trout, and possibly tench, may also be having a similar detrimental impact.

Pest plants, particularly willows, are excluding native riverside vegetation (and associated fauna) along many stretches of these waterways. Prolific willow growth can strangle or alter waterways by sediment capture and flow diversion.

5.5 Catchment environmental issues

As stream conditions are determined both by in-stream activities and surrounding land-use activities, waterways act as a touchstone of catchment health. Healthy waterways are indicative of sustainably managed catchments. There are a number of environmental issues relating to waterways in the lower Macquarie and lower South Esk rivers.

- Maintenance and enhancement of water quality in agricultural and urban landscape.
- Maintenance and enhancement of habitat quality and diversity for aquatic flora and fauna.
- Maintaining viable populations of animal and plant species and communities of high conservation value in aquatic environment.
- Need for the development of, and compliance with, a strategic framework for regional water resource management.
- The impact of exotic fish, such as redfin perch, which prey upon smaller native fish.
- Maintaining the rivers to carry flood flows by ensuring appropriate and properly engineered levee works.
- Willow infestations along many waterways clog existing channels; divert water to new channels with subsequent erosion; replace native riparian flora; and have impacts on water quality.
- Salinity and turbidity effects in Back Creek arising from Cressy-Longford irrigation district. Saline drainage in the catchment is

affecting the quality of water, especially in minor tributaries. Salinity may increase in the future. Above certain levels, salinity restricts the use of water for irrigation and domestic consumption.

- Other water quality issues in Back Creek such as nutrients and faecal contamination. Investigation is required into impacts of point and diffuse source pollutant inputs and effects of flow variation in creek.

- Possible links between nutrient inputs in Back Creek and nuisance growth of the filamentous algae (*Spirogyra* sp.).

- Impacts of Trevallyn Dam as barrier to fish migration and dispersal.

- Impacts, if any, of discharges from the Blackstone Heights sewage treatment plant on water quality in Cataract Gorge.

- Effects of private forest plantations on water table levels and salinity.

- Sediment load to the Tamar Estuary during flood events and its relationship to catchment management practices.

6 WATER QUALITY: PROTECTED ENVIRONMENTAL VALUES

6.1 Setting Protected Environmental Values

The first step in the implementation of the *State Policy on Water Quality Management 1997* is the identification of **Protected Environmental Values** (PEVs) of the surface waters in your region. **PEVs are the values or uses of the water body for which it is determined that any given area of that water body should be protected.** These values and uses should be clearly in evidence at the time of the implementation of the Policy.

The Policy specifies a range of PEVs which may be applied to a given water body. More than one PEV may be applied to a water body. The PEVs are:

A. Protection of Aquatic Ecosystems

B. Recreational Water Quality and aesthetics

C. Raw Water for Drinking Water Supply

D. Agricultural Water Use

E. Industrial Water Supply

These values are described in more detail in Section 5.2.

The Board of Environmental Management and Pollution Control will then specify a range of pollutant limits called Water Quality Objectives. These will be designed to ensure the quality of water in that water body is maintained at a level which will allow the chosen values to be protected.

The Policy then sets out a range of strategies which are aimed at ensuring that waste water discharges from point sources (such as industrial or sewage treatment plant discharges) and diffuse sources (such as runoff from highways, urban areas, farms, forest harvesting etc.) will not endanger the achievement of the Water Quality Objectives.

The Board and local planning authorities will use these strategies in land use planning and approvals processes, and in ongoing regulation, to ensure that the PEVs for a given water body are maintained or enhanced over time.

6.2 Protected Environmental Values categories

The Policy lists a range of PEVs which are used to describe the identified values and uses of a given water body. These are:

A: Protection of Aquatic Ecosystems

(i) Pristine or near pristine ecosystems;

(ii) Modified (not pristine) ecosystems:

(a) from which edible fish, crustacea and shellfish are harvested, or

(b) from which edible fish, crustacea and shellfish are not harvested.

What does pristine mean?

"Pristine" means waters not subject to human interference through discharges or other activities within the catchment (Australian Water Quality Guidelines 1992).

B: Recreational Water Quality & Aesthetics

(i) Primary contact

(ii) Secondary contact

(iii) Aesthetics

‘Primary contact’ means recreation involving bodily immersion / submersion where there is direct contact with water, & includes swimming, diving, surfing, water skiing.

‘Secondary contact’ means activities where there is some direct water contact, but it is unlikely that water will be swallowed (e.g. paddling, boating, and fishing).

‘Aesthetics’ means visual appearance of the water, being free from oil, grease, floating debris, unnatural colour, algal blooms etc.

C: Raw Water for Drinking Supply

(i) Subject to coarse screening only;

(ii) Subject to coarse screening and disinfection.

This PEV applies to water used as the intake source for **public use** (town water supply, in other words) and to registered private water supplies.

It does not apply to the taking of water from surface waters by individuals for private use for the purposes of drinking etc.

The Director of Public Health recommends that raw water from any surface waterbody should be boiled before use.

D: Agricultural Water Uses

(i) Irrigation

(ii) Stock watering

E: Industrial Water Supply

The actual industry type must be specified in order to identify appropriate guidelines.

7 PEVs FOR THE GREAT LAKE & BRUMBYS CREEK CATCHMENTS; LOWER MACQUARIE & SOUTH ESK RIVERS

The Protected Environmental Vales listed below (Table 2) are those values and uses that are currently in evidence and apply only for those areas covered by the Great Lake & Brumbys Creek Catchments and Lower Macquarie and South Esk Rivers.

The PEVs apply to all surface waters within each land tenure category, other than[11]:

- privately owned waters that are not accessible to the public and are not connected to, or flow directly into, waters that are accessible to the public; or
- waters in any tank, pipe or cistern.

> "Privately owned waters" means any surface waters confined within the boundary of privately owned land and which do not flow into, or do not communicate with:
>
> (a) the sea or arm or creek of the sea;
>
> (b) a source of supply for a water district or irrigation water district;
>
> (b) any river, stream, watercourse, lake, pond or marsh.

Management of all surface waters within the catchment shall focus on the achievement of water quality objectives. The water quality objectives will be determined by the Board of Environmental Management and Pollution Control in accordance with the *State Policy on Water Quality Management 1997*.

Achievement of these water quality objectives will maintain or enhance the water quality of those surface waters to ensure the protection of all of the following values and uses applying to each land use category. These values and uses are derived from the formal PEVs listed in Clause 7 of the Policy.

In general, diffuse source pollution can be managed to protect the PEVs by compliance with approved codes of practice, or by development and implementation of best practice environmental management guidelines where codes are not available.

In general, point source pollution should be managed to protect the PEVs by implementation of best practice environmental management, and by compliance with emission limits set by the regulatory authority. This may also require the setting of a mixing zone by the Board of Environmental Management and Pollution Control. For specific details refer to Part 4 of the *State Policy on Water Quality*.

Protected Environmental Values reflect current values and uses of a water body but do not necessarily imply that the existing water quality will support these values and uses.

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[11] State Policy on Water Quality Management 1997

Table 2: Protected Environmental Values

LAND TENURE	PEVS – GREAT LAKE CATCHMENT
For all surface waters within private land (including forest on private land)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested B: Recreational Water Quality & Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality D: Agricultural Water Uses (ii) Stock watering E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for stock watering purposes; and which will allow people to safely engage in primary and secondary contact recreation activities such as swimming, paddling or fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.
For all surface water on Hydro land.	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (where primary contact recreation permitted) (ii) Secondary contact water quality (iii) Aesthetic water quality D: Agricultural Water Uses (ii) Stock watering E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for stock watering purposes; and which will allow people to safely engage in primary and secondary contact recreation activities such as swimming, paddling or fishing (where Hydro operations permit) in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.
For all surface waters within State Forest	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested taking into consideration Forestry Tasmania's Management Classification

(managed under the *Forestry Act 1920*)	System. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem (recognising the designation of the area for multiple use forestry activities) from which fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming and wading in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.

Surface waters having their headwaters within the Central Plateau Conservation Area (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of pristine or nearly pristine ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* and for those waters within the World Heritage Area, the water quality objectives and management prescriptions outlined in the *1999 Tasmanian Wilderness World Heritage Area Management Plan*. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a pristine or near pristine aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.
Surface waters flowing through the Central Plateau Conservation Area from state forest, un-allocated crown land, hydro or private land (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of modified (not pristine) ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* and for those waters within the World Heritage Area, the water quality objectives and management prescriptions outlined in the *1999 Tasmanian Wilderness World Heritage Area Management Plan*. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; & is suitable for use (following impoundment) in the Poatina Power Scheme.
Surface waters having their headwaters within the Great Western Tiers Conservation Area (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of pristine or nearly pristine ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation)

	That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a pristine or near pristine aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.
Surface waters flowing through the Great Western Tiers Conservation Area from state forest, un-allocated crown land, hydro or private land (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of modified (not pristine) ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.

LAND TENURE	PEVS – BRUMBYS CREEK CATCHMENT
For all surface waters within private land (including forest on private land)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested B: Recreational Water Quality & Aesthetics (ii) Secondary contact water quality (iii) Aesthetic water quality D: Agricultural Water Uses (i) Irrigation (ii) Stock watering E: Industrial Water Supply (Sevrup Fisheries Fish Farm, Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for irrigation and stock watering purposes; and which will allow people to safely engage in secondary contact recreation activities such as paddling or fishing in aesthetically pleasing waters; and is suitable for use in the Sevrup Fisheries Trout Farm at Cressy and use (following impoundment) in the Trevallyn Power Scheme.
For all surface waters on Hydro land.	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (where primary contact recreation permitted) (ii) Secondary contact water quality (iii) Aesthetic water quality D: Agricultural Water Uses (i) Irrigation (ii) Stock watering E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for irrigation and stock watering purposes; and which will allow people to safely engage in primary and secondary contact recreation activities such as swimming, paddling or fishing (where Hydro operations permit) in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina and Trevallyn Power Schemes.
For all surface waters within State Forest (managed under the *Forestry Act 1920*)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested taking into consideration Forestry Tasmania's Management Classification System. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation)

	That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem (recognising the designation of the area for multiple use forestry activities) from which fish may be harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming and wading in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Trevallyn Power Scheme.
For all surface waters within Central Plateau Conservation Area (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of pristine or nearly pristine ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* and for those waters within the World Heritage Area, the water quality objectives and management prescriptions outlined in the *1999 Tasmanian Wilderness World Heritage Area Management Plan*. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a pristine or near pristine aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary & secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.
For all surface waters within the Great Western Tiers Conservation Area (managed under the *National Parks and Wildlife Act 1970*)	A: Protection of Aquatic Ecosystems (i) Protection of pristine or nearly pristine ecosystems from which edible fish are harvested; and having regard for the management objectives for conservation areas outlined in Schedule 4 of the *National Parks and Wildlife Act, 1970* B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality shall be managed to provide water of a physical and chemical nature to support a pristine or near pristine aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary & secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Poatina Power Scheme.

Surface waters within Public Reserves (managed under the *Crown Lands Act 1976*)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested (having regard to the management objectives for Public Reserves outlined in Schedule 4 of the *Regional Forest Agreement Land Classification Act, 1976)*. B: Recreational Water Quality & Aesthetics (i) Primary contact water quality (ii) Secondary contact water quality (iii) Aesthetic water quality D: Agricultural Water Uses (i) Irrigation (ii) Stock watering E: Industrial Water Supply (Sevrup Fisheries Fish Farm, Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for irrigation and stock watering purposes; which will allow people to safely engage in primary and secondary contact recreation activities such as swimming, paddling or fishing in aesthetically pleasing waters; and is suitable for use in the Sevrup Fisheries Trout Farm at Cressy and for use (following impoundment) in the Trevallyn Power Scheme.
LAND TENURE	**PEVS – LOWER MACQUARIE & LOWER SOUTH ESK RIVERS**
For all surface waters within private land (including forest on private land) In addition: Drinking water offtakes at Cressy on Macquarie R. E 507700 N 5385300; Longford on South Esk R. E510300 N 5395400 & E 510200 N 5396000	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested B: Recreational Water Quality & Aesthetics (i) Primary contact water quality (South Esk River – from ¾ km upstream of confluence with Macquarie River down to Longford Mill Dam; at Hadspen and at Lake Trevallyn where permitted) (ii) Secondary contact water quality (iii) Aesthetic water quality C: Raw Water for Drinking Water Supply (Cressy, Longford) (ii) Subject to coarse screening plus disinfection D: Agricultural Water Uses (i) Irrigation (ii) Stock watering E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for irrigation and stock watering purposes; is suitable to supply town drinking water (subject to coarse screening plus disinfection); and which will allow people to safely engage in primary contact recreation (in specified areas) such as swimming and water skiing and secondary contact recreation activities such as paddling or fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Trevallyn Power Scheme.

Woodstock Lagoon Private Sanctuary (freehold land)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems, and having regard to the management objectives for Private Sanctuaries under Schedule 4 of the *National Parks and Wildlife Act, 1970* That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem.
Trevallyn State Reserve (managed under the *National Parks and Wildlife Act 1970*) In addition: Drinking water offtakes at Lake Trevallyn	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested, and having regard to the management objectives for State Reserves under Schedule 4 of the *National Parks and Wildlife Act, 1970* B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (where permitted) (ii) Secondary contact water quality (iii) Aesthetic water quality C: Raw Water for Drinking Water Supply (Hadspen, Blackstone Heights, Prospect Casino and West Tamar) (ii) Subject to coarse screening plus disinfection E: Industrial Water Supply (Hydro-Electric Power Generation) That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem from which edible fish may be harvested; is suitable to supply town drinking water (subject to coarse screening plus disinfection); that allows people to safely engage in primary contact recreational activities such as swimming (where permitted) and secondary contact recreational activities such as wading in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Trevallyn Power Scheme.
Cataract Gorge Reserve (Local government reserve)	A: Protection of Aquatic Ecosystems (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested. B: Recreational Water Quality and Aesthetics (i) Primary contact water quality (where permitted) (ii) Secondary contact water quality (iii) Aesthetic water quality That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem from which edible fish may be harvested; that allows people to safely engage in primary contact recreational activities such as swimming (where permitted) and secondary contact recreational activities such as wading in aesthetically pleasing waters.

8

9 WATER QUANTITY VALUES FOR THE GREAT LAKE & BRUMBYS CREEK CATCHMENT, THE LOWER MACQUARIE & SOUTH ESK RIVERS

9.1 Overview

While water quality is a very important part of any water management regime, the issue of how much water a river or stream carries, and how that flow is managed, is of equal importance.

Water quality and quantity are closely linked.

The State Government proposes to re-organise the way water flow in our rivers and streams is managed, and one of the key understandings is that there needs to be a specific allocation of water for the river or stream itself. This is necessary not only to protect the aquatic life of the river, but also to maintain basic "river health". If there is insufficient flow at crucial times of the year, the overall quality of the remaining water may be badly affected. This will very likely have a negative effect on human uses of the water, as well as on the environment.

In some instances there may be competing uses for the available resource, and that there may need to be trade-offs to ensure a balanced sharing arrangement between human uses and the needs of the river environment.

The allocation of water for the environment must be based on scientific information, and also on legitimate community values and uses.

9.2 Water quantity values

Five broad categories of water quantity values have been identified, and as with the water quality PEVs, it is likely that most rivers will attract more than one value/use category. The categories are:

- Ecosystem values;
- Physical landscape values.
- Consumptive and non-consumptive use values;
- Recreation values;
- Aesthetic landscape values;

Your advice will provide input into a broader process aimed at gathering water management values from stakeholders, community groups and government agencies. This information will be utilised when water management planning for your catchment is undertaken.

An appraisal of water quantity values will be undertaken in order to develop water management goals for the catchment. This will be undertaken during the water management planning process.

An explanation of the water quantity value categories and examples of specific values are given below:

Ecosystem values: The term is used to identify those values which are to be protected and / or enhanced in the current state of aquatic and adjacent land ecosystems. Specific water values associated with the ecosystem value category may be:

- protection of an endangered species (plant or animal);
- protection or improvement in native fish populations;
- protection of riverine vegetation;
- provision of adequate water for stream habitat for flora and fauna;
- provision of water for wetland and/or estuary ecosystems.

Physical Landscape values: These values are closely related to the physical nature of the catchment. This includes the nature and constitution of channels, the frequency of floods and droughts, soil and rock types, and vegetation coverage. These values are also closely associated with ecosystem function, and may overlap with the protection of ecosystem values. Specific water values associated with physical landscape values may include:

- provision of variable flows;
- prevention of erosion;
- protection or improvement of riparian zone.

Consumptive and non-consumptive use values: These are related to the current and potential human uses of water bodies. Consumptive use refers to the extraction of water from the water body, with no return of it to the waterbody. Examples may include:

- provision of water for irrigation;
- provision of water for town supply;
- provision of water for industry.

Non-consumptive use refers to extraction or use of water, where the water is eventually returned to the river. Examples may include:

- use of water for hydro-electricity generation;
- use of water for fish farming.

Recreational values: These include the range of direct human uses of water bodies for purposes such as kayaking, canoeing, sailing, swimming, fishing etc. This type of value is difficult to quantify, but is an essential part of our way of life in Tasmania. Water quality issues are also important, especially where primary contact occurs (swimming for example), or where the recreational activity relies on a base of good quality water, such as a recreational fishery. Examples may include:

- maintenance or improvement of the quantity (and quality) of water for recreational fishery (trout, blackfish etc);
- provision of sufficient water for whitewater rafting;
- provision of sufficient water (of adequate quality) for swimming.

Aesthetic Landscape values: These values relate to human appreciation of water and adjacent environments. It is often extremely difficult to address these types of values, or work out the flow requirements to ensure their protection. They are, however, legitimate values which must be acknowledged in any good management process. Examples may include:

- maintenance or improvement of flow through gorges or over waterfalls;
- protection of scenic features in a river.

Many of the community water values detailed in section 8 are related to water quantity issues. These values will provide the basis for future water management planning processes in the Great Lake & Brumby's Creek Catchments and the Lower Macquarie and South Esk River Catchments.

10 Community Water Values

The community water values tabulated below were obtained from a series of stakeholder workshops held at Miena (1/11/99), Longford (2/11/99) and Prospect (3/11/99). Every effort was made to ensure that regional government, industry, community and interest groups were given the opportunity to participate in these workshops.

These community water values represent the current values and uses of water resources for the Great Lake & Brumbys Creek Catchment, and the Lower Macquarie & South Esk Rivers. Information on values particularly relating to water quality has been used to develop the range of Protected Environmental Values for regional surface waters (Section 6). Information on water quantity values will be utilised for future water management planning in the region.

Information categorised as 'other issues' has been included in the catchment overview sections (Sections 2 - 4).

A series of public meetings were subsequently advertised to discuss information gained from the stakeholder workshops and outline the proposed Protected Environmental Values. These were held at Longford (15/12/99), Prospect (16/12/99) and Miena (18/12/99). Where there has been additional information arising from these meetings or provided subsequent to these meetings, this information has been included in the relevant table below (in italics).

Table 3: Community Water Values from Stakeholder Workshops and Public Meetings

Water Value Categories	Community Water Values
Ecosystem values	• Habitat diversity within waterways • 'Headwater' value – adequate, good quality water for downstream ecosystems (river health) • Presence of key freshwater animals: platypus, frogs, invertebrates • Waterways that support birdlife: swans, pied cormorant, grey goshawk, others? • Invertebrate diversity (to support fishing) • Great Lake algal beds as invertebrate habitat • Rare and threatened aquatic flora (and terrestrial flora) of the region • Threatened galaxiids in Arthurs & Woods lakes • Waterways free of exotic plants: inc. Elodea • Redfin free status of Lake Augusta • Trout habitat • Minimal restrictions on fish migration and fish passage • Minimal phytopthera problems (investigate water borne transmission and manage) • Water clarity at Shannon Lagoon and Woods Lake (minimise turbidity). • Value of pristine aquatic ecosystems in region as pristine 'reference sites' for comparative scientific study with other areas. • *'Trout-free habitat' in some areas to protect native fish species*
Consumptive or non-consumptive values	• Aquaculture use – Liawenee • Hydro electricity generation • Stock watering (stock access) on private and hydro land • Bore water for drinking (Great Lake hotel and lodge?) • Dust suppression by tankers using lake water • Fire fighting using lake waters (impacts of tanker foam units when refilling from waterways?) • Homestead use – non drinking • Drinking water supply – individual house (not registered or town supply) • Drinking water supply – tanker supply from lake • Extremely high value waters of the Great Lake catchment as headwaters for any water uses downstream • Irrigation (Brumbys Ck.) • Dairy use (Brumbys Ck.) • Intensive agriculture (Brumbys Ck.) • Sevrup fisheries (Brumbys Ck.) • Longford abattoirs
Recreational values	• Fishing (impacted by lake level changes) • Boating on lakes – primarily power boating, limited sailing. • Small amount of kayaking and canoeing, primarily for fishing • Water skiing (Great Lake only) • Float plane landing site • Shooting of ducks (where permitted) • Swimming (seasonal on all land tenures in Highland lakes, tarns and waterways) • Drinking water supply for campers, bushwalkers and skiers • Bird watching around waterways • Photography around waterways • Painting around waterways • Field naturalist studies • Educational value – fish spawning etc. • Active and passive tourism linked to regional waterways – for all land tenure areas
Aesthetic landscape values	• Photographic appeal • General tourist appeal of regional waterways • Waterways free of dead trees

Physical landscape values	• Minimal erosion on lake foreshores – natural and human sourced (wading while fishing, boat wake, dust and stormwater runoff from unsealed roads, lake level fluctuations)
Other issues	• Cultural heritage sites associated with lake foreshores • Effluent entering lakes from informal campsites and permanent shack sites • Ample boat access to water for boats while minimising sediment impacts

Table 4: Nominated Water Values - Stakeholder Workshop, Northern Midlands Council Chambers, Longford (November 2)

Water Value Categories	Nominated Water Values
Ecosystem values	• Healthy river & riverbank vegetation – **native species**, not willows, cumbungii, hawthorn, blackberries, rice grass • Environmental flows to sustain all aquatic creatures – sufficient quantities and appropriate seasonal flow cycles (investigate & maintain flows) • High summer flows in Brumbys Ck. below Poatina • Freshwater oysters in Macquarie below Brumbys (possibly harvested) • Freshwater crayfish in the South Esk upstream of Longford • Trout habitat • Water quality experiencing minimal stock impacts (i.e. from bank erosion and dead stock in waterways) • Well oxygenated waters of acceptable temperatures to support ecosystem generally and fish farms particularly • Waterways that support birdlife: cormorants, ducks etc • Abundant and healthy platypus • Waterways free of exotic plants and animals • Eel habitat and passage at Trevallyn Dam
Consumptive or non-consumptive values	• Irrigation at Brumbys – possible chemical & saline runoff issues • Stock watering • Hydro electricity generation • Domestic use (gardening, washing) – non drinking • Bishopbourne domestic use (non-drinking) – via Cressy Longford Irrigation Scheme • Drinking water town supply – Cressy from Macquarie (turbid); Carrick via Cressy & Liffey; Longford from Macquarie; West Tamar, Prospect and Hadspen from Lake Trevallyn. • Aquaculture use – Sevrup Fisheries on Brumbys • Longford abattoir – from town supply • Farm dams – pump off river to fill • Dairy use for wash downs, irrigation of pasture on Brumbys • Cressy swimming pool – via town supply
Recreational values	• Fishing - all areas; partic top two weirs (Brumbys); Lake Trevallyn • Swimming – from confluence of South Esk & Macquarie down to Longford Mill dam; Lake Trevallyn; First Basin; not at Lees Bridge or weirs on Brumbys Creek • Water skiing – upstream of confluence of South Esk & Macquarie for ¾ km on South Esk; and Lake Trevallyn • Jet skiing – upstream of confluence of South Esk & Macquarie for ¾ km on South Esk • High speed usage – upstream of confluence of South Esk & Macquarie for ¾ km on South Esk • Shooting of ducks (where permitted) from boat – Brumbys down to Hadspen • Picnic areas – Woolmers Bridge Longford; below Longford; Lake Trevallyn • Bird watching around Brumbys weirs • Tourism and heritage appeal linked to waterways at Woolmers Estate & Brickenden; and Cataract Gorge & First Basin • Painting at Woolmers Estate and Brumbys Creek • Riverside walks – below Longford meatworks; Bowthorpe; walk through to boatramp Longford; Trevallyn Recreation Area; Cataract Gorge & First Basin • Kayaking (scouts) – down South Esk and Macquarie to Longford • Sailboarding – Lake Trevallyn • Adaptive rowing (disabled) – Lake Trevallyn • White-water rafting – Gorge • Gorge plastic duck race (Feb 5) below dam
Aesthetic landscape values	• General tourist appeal of regional waterways – partic Brumbys weirs and Longford mill dam
Physical landscape values	• Natural channel form on Macquarie (degree of change due to levee bank construction?)

Other issues	• Cultural heritage values associated with historic Longford mill dam • Boat access to waterways – ample boatramps & minimal willow obstruction • Access to fishing spots • Need for clarification of ownership & land titles to allow effective management &works programmes • Effects, if any, of Poatina sewage treatment plant on downstream water quality • Water quality impacts of aerial spraying • Back Creek water quality (partic. lower end) is degraded – requires investigation into affect of hydro high and low flow effects, point and diffuse source inputs? • *Potential impact of Basslink proposal on water quality if changes in water release pattern* • *The economic importance to the community of a reliable, good quality supply of water needs to be clearly acknowledged* • *Clarification needed on environmental flow setting and environmental flow requirements* • *Setting water quality objectives with the most stringent set of water quality guidelines necessary to protect PEVs will adversely affect farmers who will be forced to fence riparian zone.* • *Important issues surrounding water quality and quantity require more time for consideration by local communities*

Table 5: Nominated Water Values Stakeholder Workshop – DPIWE Offices, Prospect (November 3)

Water Value Categories	Nominated Water Values
Ecosystem values	• Woodstock bird sanctuary • Fish nursery streams – Pisa (off Macquarie), Elizabeth, Macquarie • Stream health not compromised by inappropriate stream modification practices • Adequate environmental flows • Hydro operations (water releases) based on good understanding of ecosystem processes • Reduced bank erosion and siltation in Brumbys below Poatina tailrace • Good water quality in regional waterways (minimal impact from aerial spraying, fertiliser and pesticide runoff) • Healthy instream habitat in regional waterways (enhance where required ie snags in Macquarie downstream of Brumbys) • Appropriate water temperature regime • Waterways free of impacts of stock access (bank erosion, reduced water quality) • Healthy native riverbank vegetation • Areas free of exotic plant pests such as willows, cumbungii & poa (weeds partic. prevalent in regions of river silting on Brumbys weirs and in Pisa Creek). • Nutrient uptake role of willows • Water clarity at Shannon Lagoon and Woods Lake (minimise turbidity). • Water free of dead stock and rubbish (partic. in urban areas) • Endangered aquatic species - Grayling below Trevallyn Dam; rare snail in Gorge
Consumptive or non-consumptive values	• Stock watering – Poatina tailrace • Homestead use – Poatina tailrace • Longford Cressy Irrigation Scheme – Brumbys Creek • Longford abattoir industrial use from town supply (holding paddocks straddle back creek); Coppers treated logs. • Aquaculture use for Sevrup Fisheries on Brumbys Creek (discharge nutrient loading information?) • Tasmanian Symphony Orchestra – background sound of water released to Gorge for concert – regulated hydro release • International kayaking event in Cataract Gorge – regulated hydro release • Rafting in Gorge – regulated hydro release • Common law right of riparian landowners. Change to statutory right under new water management legislation) allows reduced certainty for stock access to rivers. • Hydro electricity generation • Riparian domestic use (gardening, washing) – non drinking • Drinking water town supply – West Tamar, Prospect and Hadspen from Lake Trevallyn. • Unknown/unattributed loss of water between Poatina & Longford

Recreational values	• Fishing - all areas • Boating – upper Brumbys Ck. • Water skiing – Lake Trevallyn • Adaptive rowing (disabled) – Lake Trevallyn • Canoeing/Rafting/Kayaking – Lake Trevallyn • Rafting at Longford • World kayaking championships at Cataract Gorge • Swimming at Longford, Hadspen & Trevallyn – not at upper Brumbys near Poatina tailrace; not at Trevallyn Dam near wall or less than 500 m downstream • Poatina swimming pool – town supply • Gorge plastic duck race below dam • Duck shooting – top weir and upper Brumbys Ck. • Bird watching around Brumbys weirs • Active & passive tourism linked to waterways – new development to the west of Great Lake? • Gorge & First Basin as backdrop to orchestral performances • Highland lake levels to support recreational pursuits
Aesthetic landscape values	• General aesthetic and sightseeing appeal of regional waterways
Physical landscape values	• Natural channel form and flow on Macquarie – effects of levee bank, flow regulation and flood drainage • Areas of stable, non-eroding banks in Brumbys Ck (need to maintain & extend) • Levee banks on Woodside & Dairy maintained at right heights to control flooding
Other issues	• Top weir water quality & quantity (Brumbys Ck.) bad for stock and fish primarily in December, impacts suspected to be sourced to Poatina region? • Impacts (if any) of Blackstone Heights STP discharge on Gorge waters • Private forest plantation impacts on water table levels & salinity • Enhancement of Back Creek water quality – affects, if any, of sewage treatment plant, timber treatment plant, abattoirs, irrigation. • Development (and compliance with) a strategic framework for regional water resource management • *Existing report on environmental flows for the South Esk Basin is seen to be incomprehensible for general public and doesn't provide a good basis for community understanding* • *NHT funding has been provided for some 'river improvement' activities which satisfy proponents but aren't in step with wider needs of catchment. Lack of continuity of funding for ongoing riverworks is another problem* • *Suggested their may be role for water related 'environmental levy' at local government level to fund ongoing works.* • *Suggested that possible changes from Basslink operations in terms of lake levels and flow regimes would not adversely affect fishing in area.* • *Concern that increased profits from Basslink will encourage Hydro to take greater risks in lowering lake levels.* • *Suggested that more ecological assessment needs to be done before setting PEVs* • *Scepticism about how water quality objectives will be enforced.*