Derwent Catchment Review

EXECUTIVE SUMMARY

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1.1 Introduction

The Derwent Catchment Review project was initiated by organisations with a significant interest in the management of water quality and quantity in the greater Derwent catchment: NRM South, Derwent Estuary Program, Southern Water, Hydro Tasmania, DPIPWE and Derwent Catchment NRM. The main purpose of the review is to build upon earlier reviews of water quality issues in parts of the Derwent catchment under taken by individual stakeholders (Coughanowr, 2001; Hydro Tasmania, 2001; Andrew 2002; Hobart Water, 2006), and to integrate this information with more contemporary datasets across the entire catchment.

Data from water quality and stream flow monitoring programs and studies within the Derwent catchment were targeted for review, with a focus on quality, long-term ambient datasets from strategic locations within the catchment. Information on the current condition of the catchment was identified as the highest priority, however older monitoring datasets were utilised where contemporary data was missing or spatially fragmented. Analysis of identified key water quality datasets was used to develop a conceptual model of the catchment, reflecting land-use and water use, including diversion and regulation of waterways (for hydroelectric power generation and irrigation), and those waterways with no significant modification to the flow regime. The models were used to help identify major stressors, data and information gaps, and requirements for additional monitoring to better assess the health of the broader catchment

Like many catchments in Tasmania, the Derwent is a multiple use catchment, with a drinking water intake situated at the base of the freshwater extent of the catchment. Extensive development in the south of the State has lead to the Derwent River providing 60% of drinking water supply for Hobart. Historically, the Derwent has been considered to be a low risk with respect to water quality due to the headwaters of the catchment incorporating a large pristine area which is managed to provide year round flow to the lower catchment. This results in a Derwent 'baseflow' which is of very high quality. However the analysis of water quality results for this project reveals that there are a range of actual and potential water quality issues in the Derwent which could affect drinking and ambient water quality. Risks are generally linked to large inflows associated with storm events (turbidity, nutrients), or no or low flows associated with drought (salinity, blue-green algae). Unfortunately, a detailed understanding of these issues throughout the catchment is limited by a lack of long-term information from strategic locations.

With this in mind, the major outcomes of the review are to provide an assessment of the adequacy of existing monitoring, to identify any emergent water quality issues within the Derwent catchment, and to provide recommendations for an integrated monitoring program that can be implemented by stakeholders. The study does not include estuarine water quality, or the Jordan River catchment, nor does it include groundwater quality.

1.2 Report content

The report is divided into 3 sections: Part 1 describes the physical setting of the greater catchment with a focus on hydrology, and detailed information on water allocations and use within the Derwent catchment. Land-use, natural values, and a brief summary of water quality and quantity management plans and strategies are also included. Identified water quality threats include regulated flow regimes, associated with power generation and irrigation, point-source inputs, such as sewage treatment plants and aquaculture operations, and land-use driven inputs such as forestry and agriculture. Climate change has also been identified as a potential risk to water quality in the catchment. The impact of Level 1 activities is under-represented in the analysis due to a lack of data availability within the time-frame of the project.

Part 2 describes the methodology used for obtaining and assessing the various datasets. A “data harvest” was undertaken through consultation with stakeholder groups, literature reviews and discussions with regulatory agencies. A series of criteria were developed to prioritise available datasets, with location within the catchment, length of dataset, range of parameters of interest and availability of flow data identified as key factors. Data currency, availability, and format were also considered. Analysis of ambient water quality in Part 2 is divided into five regions, largely based on the grouping of waterways within the power generation scheme, as this is one of the most significant influences on water movement in the Derwent catchment. The regions are:

- The Upper Derwent headwaters of the Central Plateau which have been developed into the Upper Derwent Power Scheme. This group includes the upper Derwent (Lake St Clair through to Tungatinah) the Clarence, Nive and upper Dee Rivers which flow to Tungatinah, and Lake Liapootah. This region was found to have overall good water quality with issues generally associated with flows regulation and lake level changes;
- The Lower Derwent Power Scheme Lakes, downstream of Lake Liapootah, including, Wayatinah and Cluny Lagoons, and Lakes Catagunya, Repulse, and Meadowbank. These lakes are generally a ‘throughput’ for the water from the upper catchment overprinted by local land use impacts, point source inputs and seasonal changes within the lakes;
- Western inflows to the Derwent River (Florentine, Broad, Tyenna, Styx and Plenty Rivers). These unregulated rivers have generally good water quality, with aquaculture, agriculture and forestry activities common in the catchments;
- Eastern inflows to the Derwent (Dee, Ouse and Clyde Rivers). These rivers have highly modified flow regimes due to water diversions and regulation for irrigation. Land use impacts are most intensive in these catchments with turbidity, elevated nutrients and salinity identified water quality risks; and,
- Derwent below Meadowbank to New Norfolk Bridge, including the intake for the Bryn Estyn Drinking Water Treatment Plant. Similar to the lower Derwent lakes, this part of the Derwent is dominated by power station releases with water quality affected by local land-use.

A summary of the hydrology, data sources presented, and spatial and temporal trends for each region are discussed, where adequate data existed. Catchment loads for a limited number of parameters (N, P, Total Dissolved Solids and turbidity) have been calculated where sufficient information is available.

Part 3 of the catchment review summarises available information on point source and diffuse inputs, and the impact of flow regulation on catchment waterways. This information was used to develop the conceptual models. The stressors and risks include:

Climate change

Stressors and risks include climate change related variations in temperature, rainfall, and evaporation. The seasonality and intensity of rainfall is predicted to have a greater impact on water quality than climate-change induced increases in temperature rise or evaporation, due to the strong linkage between nutrient transport and river flow. On a local scale, temperature rise and increased evaporation may result in increased stress to aquatic fauna, and/or shifts in community composition in the longer term.

Blue-green algae

Blooms of cyanobacteria species occur in the headwater storages of the Derwent, as well as in the lakes in the Lower Derwent Power Scheme. It is believed that blue-green algae are resident in most Tasmanian sewage lagoons, and as such present a source of algae to the receiving environment under bloom situations where discharge cannot be restricted. The presence and downstream transport of blue-green algae capable of producing toxins poses a threat to the drinking water supply intake at Bryn Estyn, and a better understanding of the levels, movement and cycling of algae in the catchment is warranted.

Contaminants

Information on heavy metals, organic contaminants and other chemicals associated with industry and/or trade waste were not easily accessible for this study, and based on the limited monitoring available, appear to be poorly defined within the catchment. The level of risk associated with these contaminants not well understood.

Land use change

Contemporary land-use data was not available within the time-frame of this study, however this has been highlighted as a priority area by NRM South. Land use change may result in increased pressure on water quality, and water availability as vegetation, crop types, forestry or agricultural activities are modified. Changes in cropping type, water use, storage and demand from proposed irrigation schemes in South-East Tasmania may be more accurately assessed if accurate land-use data prior to commencement of the schemes is available.

Hydro power demands

Changes to energy production or demand may potentially affect flows in the Derwent through altered management of the hydro system. Changes to patterns or levels of rainfall may also affect flows through the catchment associated with altered power station operations. Additionally, lake level management has been found to have impacts on water quality, and management of storages for long-term yields is a critical factor in water quality in the upper catchment in particular.

Aquaculture

Water allocations for aquaculture represent the largest single use for many rivers in the catchment. Despite being a "non-abstractive" use, the impact of aquaculture operations on local water quality is believed to be significant, based on the Upper Derwent Nutrient Study; however there was no contemporary data available for this project to re-assess the current situation.

Recreational pressure

Increased visitors to National Parks and Reserves puts pressure on water resources, and demand for accommodation and the 'wilderness experience' requires careful management of associated infrastructure (roads, water supply etc). Increased recreational use and popularity of the lakes in the lower catchment for shack accommodation has been raised as a concern, particularly for drinking water quality downstream of areas where multiple waterfront dwellings have appeared which rely on septic systems.

1.3 Recommendations and information gaps

The goals of existing monitoring programs within the greater catchment are not universal and necessarily reflect the management responsibilities, budget and interests of each organisation. Most water quality monitoring was found to be "reactive" in response to an incident or set of conditions, or involve on-going monitoring of a routine set of parameters for a specific purpose (e.g. drinking water intake). Monitoring programs are spatially and temporally fragmented, with rationalisation of some key longer term sites and programs occurring recently. This variation in spatial and temporal monitoring, along with variation in parameters, makes catchment scale integration of information or comparison extremely difficult.

The primary recommendation arising from the review is that a long-term broad-scale monitoring program be instigated for the purpose of assessing catchment health in the Derwent catchment, and identifying emerging threats. A multi-stakeholder approach, modelled on the Derwent Estuary Program, would provide a template for coordinated monitoring, data management, sharing and review. A collaborative approach to monitoring and reporting will improve communication of existing and emerging issues between stakeholders, provide a basis for whole of catchment reporting, and improve opportunities for management of often complex or widespread natural resource issues.

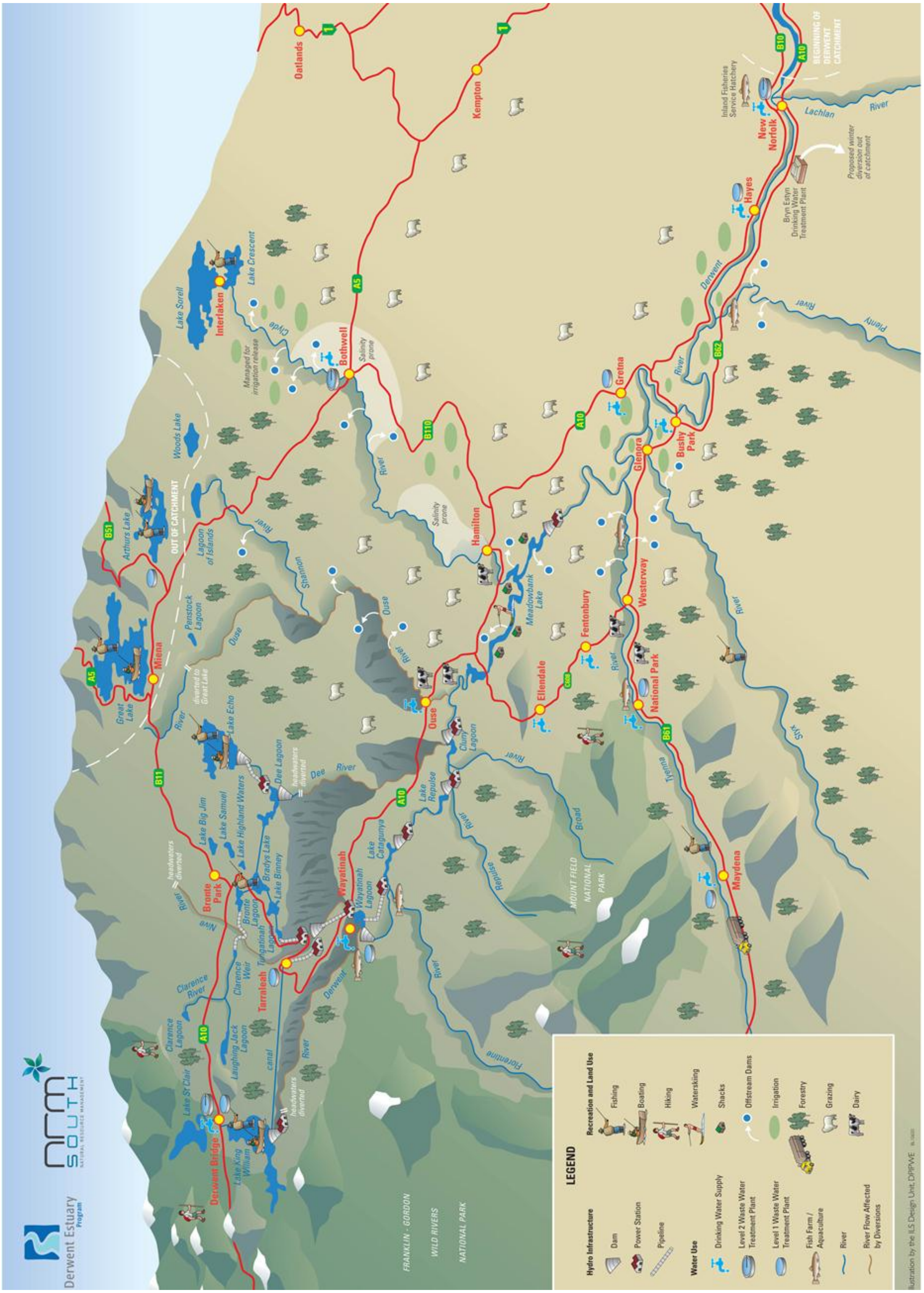
Ideally, an integrated monitoring program would have the following attributes and address the identified data gaps:

- Monitoring sites which are strategically located, sampled on a regular basis and for which flow data is available. Over time these sites would provide an indication of the overall water quality and trends within the catchment. Parameters should include physic-chemical parameters, nutrients, and any applicable sub-catchment specific parameters (e.g. pesticides in agricultural catchments);
- Event based monitoring which includes the long-term monitoring points, storm water runoff, smaller tributaries and ephemeral creeks to understand the quality and quantity of material moving through the catchment on an episodic basis;

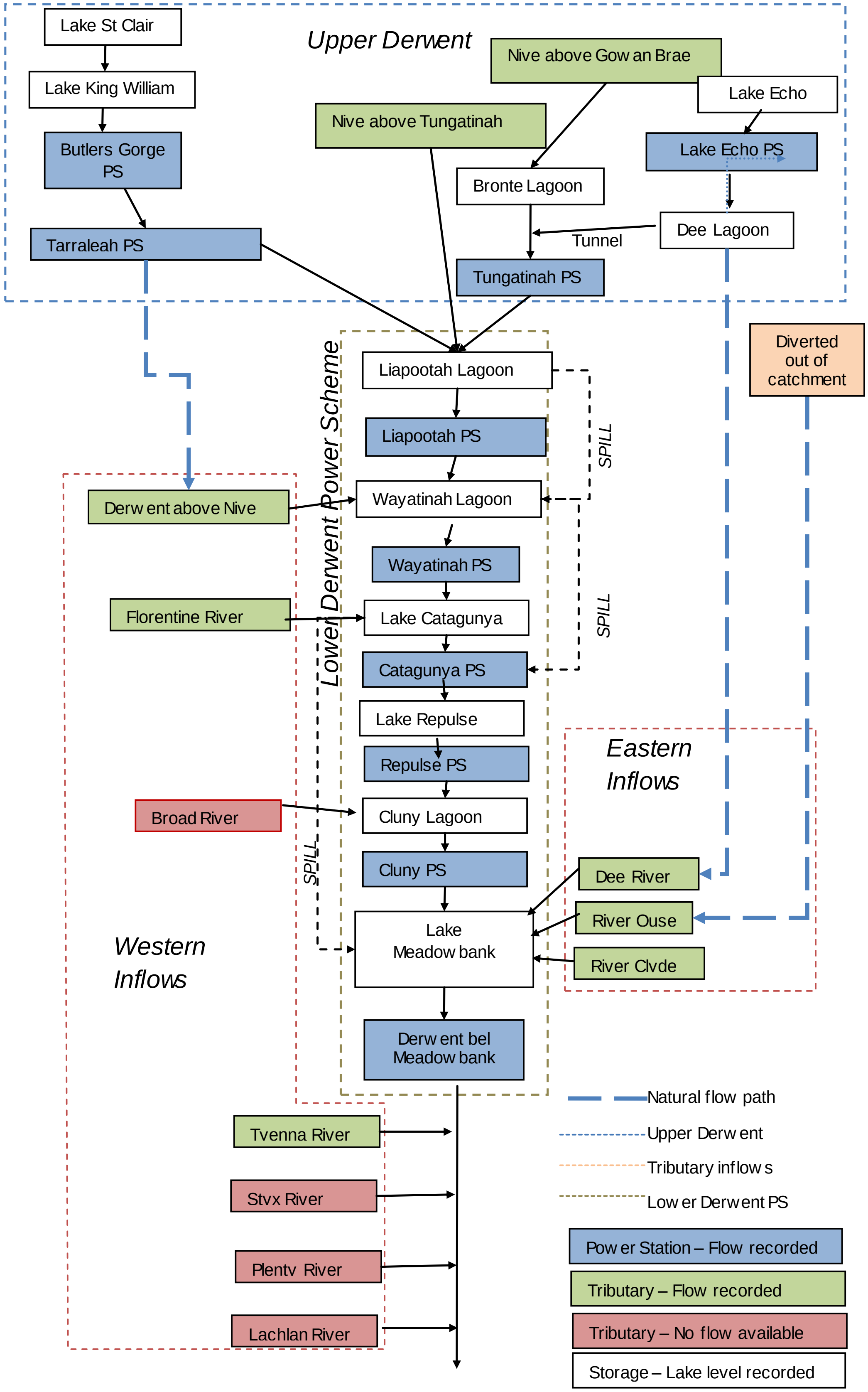
- A limited number of higher frequency monitoring sites (daily) to understand short term variability in the catchment;
- Additional sites, which target specific inputs to the Derwent should be incorporated and monitored until an understanding of the sources and their impacts are gained, including:
    - Level 1 and 2 STPs
    - Other Level 1 and Level 2 activities
    - Drinking water quality for rural communities
    - Historical tips and land fills
    - Sediments in the lakes with an emphasis on nutrients which affect blue-green algae processes
    - Aquaculture activities

An integrated monitoring program also requires a better understanding of actual water usage in the catchment. This could be provided by the metering of water allocations with the information made available for interpretation of the water quality monitoring results.

Some of the suggested monitoring already occurs, but the results are difficult to access efficiently due to data formats or other logistical constraints. Improved data storage and sharing between catchment users would increase the usefulness of this already existing information.



Conceptual model showing major land use, infrastructure and water use in the Derwent catchment.



Conceptual model of flows in the Derwent catchment.