Final

Upper Coliban

Integrated Catchment Management Plan

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Contents

Executive Summary

The Upper Coliban catchment provides raw water for drinking water purposes for over 130,000 people as well as having a range of additional environmental, social, cultural and economic values. The catchment faces known threats from existing and future developments, uncontrolled livestock access to waterways and riparian areas and from climate change. Without a long-term vision and action plan, the catchment will degrade meaning that Coliban Water will not be able to maintain its service obligations cost-effectively and communities will experience lower rural environment liveability values.

Over 2015-16, in response to the threats facing the catchment, Coliban Water and the North Central Catchment Management Authority (CMA), with active participation of other stakeholders (landholders, local Landcare groups, local and Victorian government agencies and Goulburn Murray Water), undertook a comprehensive analysis of the benefits and costs of protecting and enhancing the Upper Coliban catchment. As a result this Integrated Catchment Management Plan was developed. It will enable provision of a safe and secure water supply for communities in central and northern Victoria along with enhanced river, biodiversity and catchment health outcomes.

The Plan has a 20 year horizon and has been developed around three specific, measurable, achievable, realistic and time-bound goals which address future development pressures, waterway protection and habitat connectivity goals. A fourth water security goal will be the subject of further investigation because legislative change would be required to achieve it. Water corporations are required to prepare an Urban Water Strategy (formerly Water Supply-Demand Strategies) every five years. The strategy primarily considers the growth in demand and available supply over the next 50 years to 2065. Coliban Water will be releasing the strategy for public comment in 2017 and further detail is provided in supporting document Policy and Planning Context.

The Plan has been developed for implementation over a 20 year period. It has been estimated to cost $10.81 million over the first 10 years of implementation and thereafter $0.24-0.46 million/year to maintain the benefits (expressed in 2016 dollars). The environmental benefit:cost analysis was conducted using the Investment Framework for Environmental Resources. Based on available information, results show that a benefits costs ratio of at least $1.81 per dollar spent can be achieved. The benefits could be significantly higher if avoided water treatment plant upgrade costs were included.

The Plan involves a range of on-ground actions (stock exclusion from waterways, riparian regeneration and revegetation, willow removal) and additional municipal planning scheme amendments through development of Environmental Significance Overlays to protect raw water supplies. In addition it proposes supporting community education, extension and compliance activities. A parallel program of research and monitoring will help fill knowledge gaps and assess the effectiveness and efficiency of implementation.

Protecting the catchment as the first and most important barrier in a multiple barrier approach makes sense from both a risk management and cost-effectiveness perspective. This Integrated Catchment Management Plan is potentially the most robust and integrated approach undertaken to

date in Australia and serves as a model for how organisations and communities can work together to manage precious natural resources in the face of current and future development pressures.

Section 1: Introduction

As key organisations responsible for managing the regions natural resources, Coliban Water and the North Central CMA have led a coordinated approach to developing this Integrated Catchment Management Plan. Working in collaboration with other catchment stakeholders is crucial to protecting the catchments values into the future. Collaborative partnerships with landholders and community groups such as local Landcare networks are critical to achieve integrated catchment management outcomes. Local government (Macedon Ranges Shire Council and Hepburn Shire Council), Goulburn Murray Water and Victorian government agencies are also key stakeholders. The Integrated Catchment Management Plan aims to protect future supplies of drinking water as well as ecosystem and cultural values including the sense of place and wellbeing gained from living in the region.

The state, regional and local planning context is outlined in a supporting document '*Planning and policy context for the Upper Coliban catchment*'. Coliban Water's duty of care to its customers is the need to supply safe and secure drinking water sourced from open water supply catchments, manage associated risks and maintain sustainability of the resource. The North Central CMA is primarily focused on waterway, riparian and catchment health outcomes. The aspiration of the two organisations is a shared vision and approach to improving the catchment and waterway health over coming decades through a combination of public and private investment and community engagement.

The Integrated Catchment Management Plan has a 20 year horizon, acknowledging that pressures from an increasing regional population and climate change, as well as the current threats of livestock accessing waterways, requires a strategic and targeted approach. Implementation of the Plan will:

- provide reliable and safe supplies of raw water for drinking water purposes,
- ensure greater sustainability of the water resource for communities throughout central and northern Victoria,
- facilitate sustainable approaches to use and development within the catchment whist avoiding detrimental impacts to natural resources and community liveability values,
- provide the local community the opportunity to develop whilst minimising the risks to natural resources,
- improve river health and
- provide broader biodiversity outcomes for the catchment

1.1 The Upper Coliban catchment

The Upper Coliban catchment is a designated open water supply catchment in the southwest portion of the Campaspe River basin on the northern slopes of the Great Dividing Range in central Victoria (Figure 1). It is approximately 27,750 ha[1] in size and contains agricultural and lifestyle land uses and

[1] 27, 785 based on GIS data or 27,711 ha based on LIDAR (Coliban River catchment 16,151 ha; Little Coliban 7,678 ha; Kangaroo Creek 3,882 ha).

native forests. The Dja Dja Wurrung people are the traditional owners of the land. The Dja Dja Wurrung Clans Aboriginal Corporation (DDWCAC) and the Victorian Government entered into a Recognition and Settlement Agreement under the *Traditional Owner Settlement Act 2010* (Vic). Commencing in 2017 the Dja Dja Wurrung Traditional Owners will be conducting an Aboriginal Waterways Assessment on the Upper Coliban catchment. This is a tool developed by the Murray Darling Basin Authority to help Traditional Owner groups assess the cultural health of waterways, in order assist them to participate in planning and management of waterways, and develop culturally informed management objectives.

The catchment contains the Lauriston, Malmsbury and Upper Coliban Reservoirs (combined storage capacity of almost 70,000 ML). The catchment supplies raw water for distribution and treatment to the townships of Trentham and Tylden and also supplies the major regional centres beyond the catchment including Kyneton, Bendigo, Castlemaine and associated townships. These reservoirs provide potable water for around 130,000 people, a figure expected to grow significantly over the life of the Integrated Catchment Management Plan. Additionally, they supply water for other domestic and commercial purposes both within and downstream of the catchment. The catchment faces a range of threats from existing and future developments, uncontrolled livestock access to waterways and riparian areas and from climate change. A detailed overview of the catchment, including the values and threats faced, and the current work being undertaken is provided in a supporting document *'An overview of the Upper Coliban catchment: values, threats and current work'.*

1.2 Why develop an Integrated Catchment Management Plan?

The Upper Coliban is the most important water supply catchment for Coliban Water customers. In addition to water reform and predicted climate change which are likely to place increasing demand on water resources, the catchment faces increased growth and development pressures from residential development and small lifestyle blocks. The existing high density of unsewered dwellings shown in Figure 2 illustrates current development. Unmanaged development, which includes domestic wastewater and a broad range of diffuse pollutants associated with development, will further impact water resources (both quality and quantity) and pose challenges in balancing the environmental, economic and social requirements for water.

The Department of Health and Human Services (DHHS) administers the *Safe Drinking Water Act 2003* which is a risk based regulatory framework for the supply of safe drinking water. The SDW Act details the requirements upon water storage managers and water suppliers regarding risk management plans, auditing, public disclosure and reporting and empowerment of the Secretary of the Department of Health and Human Services to enforce the Act.

In addition to improving overall catchment and ecosystem health, the Integrated Catchment Management Plan has been developed based on ten important principles, the details of which are outlined elsewhere (Billington, 2016). Implementing the Integrated Catchment Management Plan water quality will maximise the chances of the Upper Coliban catchment being able to continue to supply drinking water for towns and settlements dependent upon it.

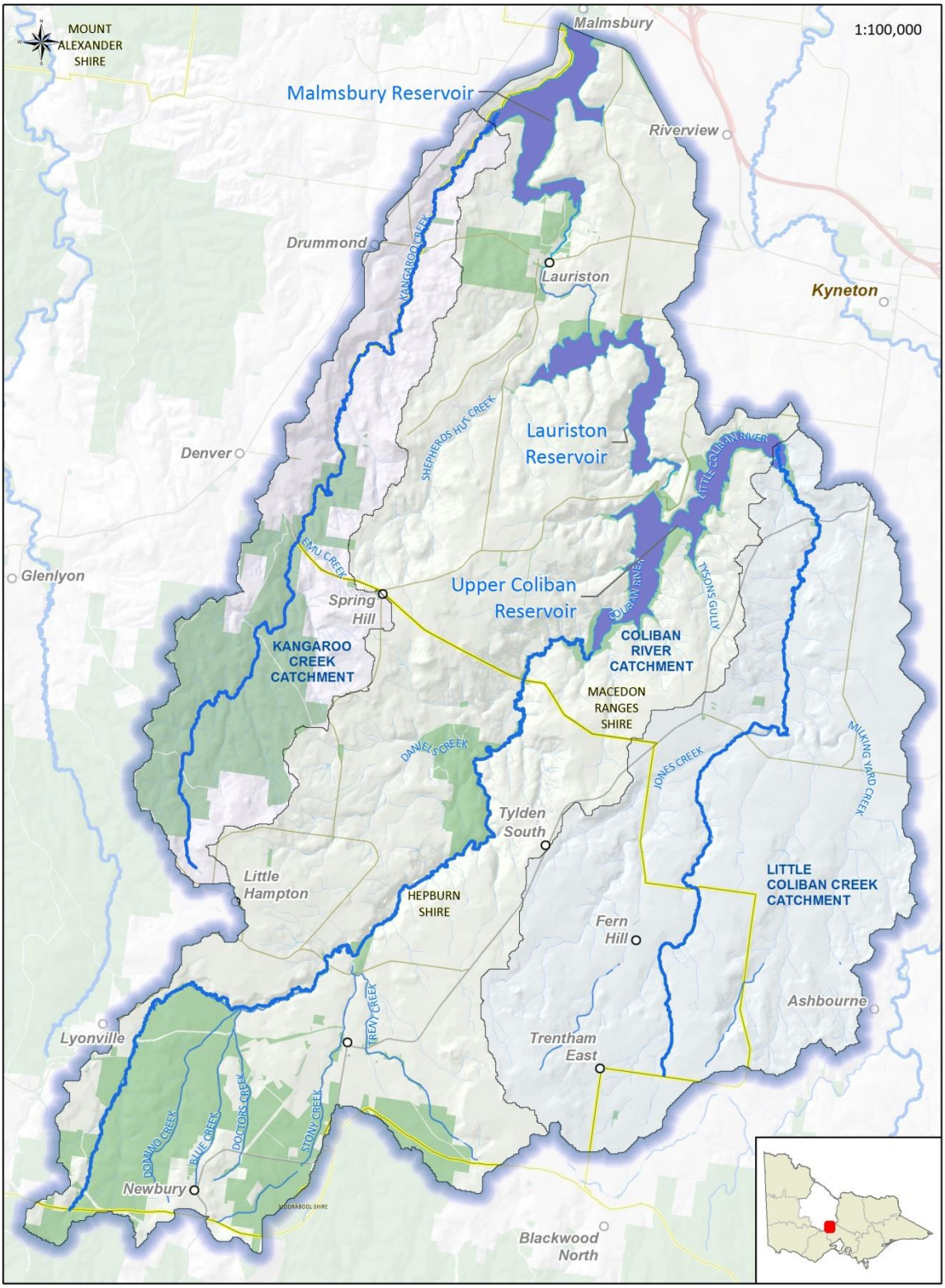

Figure 1: Overview of the Upper Coliban catchment.

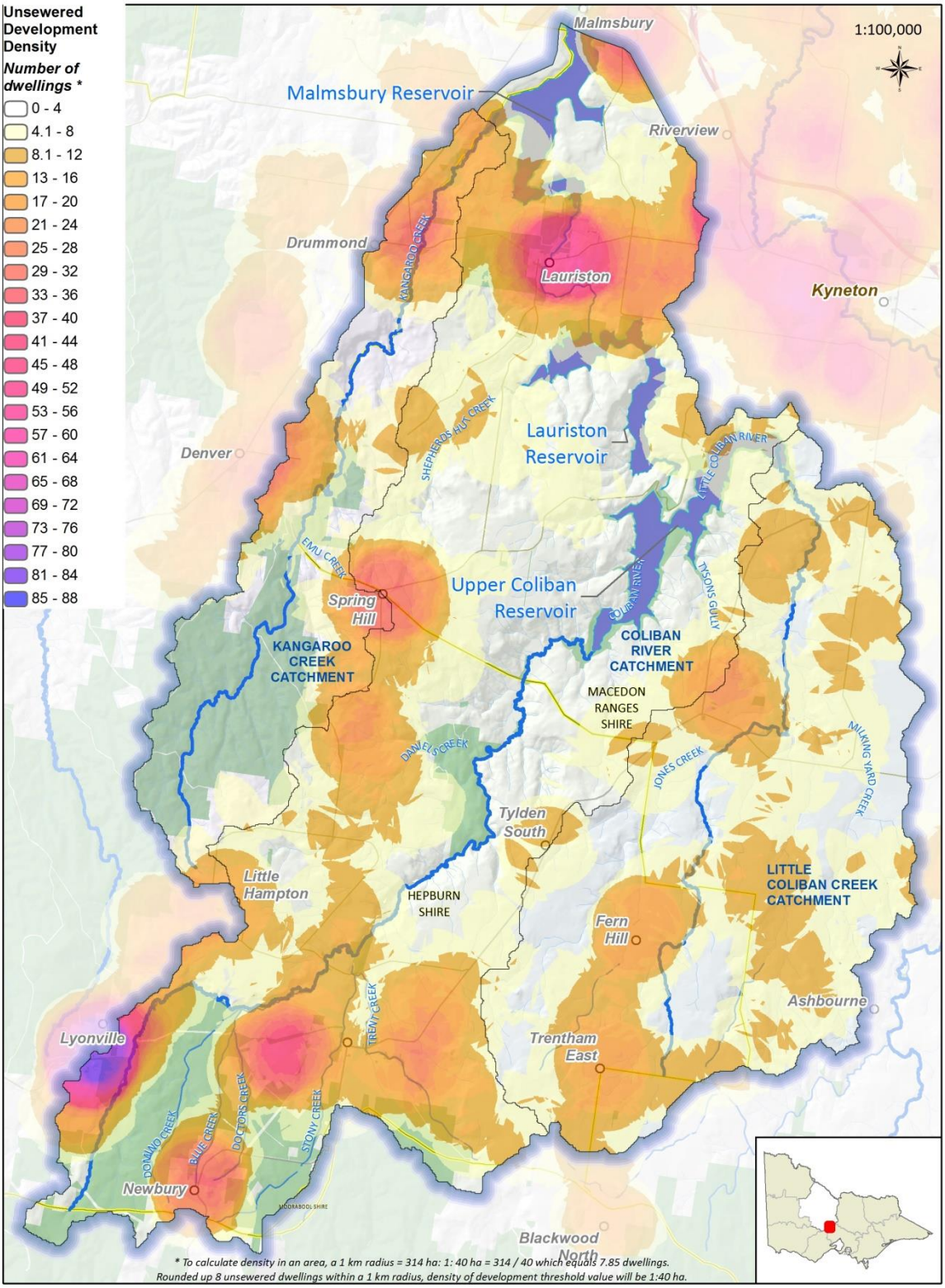

Figure 2. Density of unsewered dwellings in the Upper Coliban catchment.

Managing risks by keeping contamination out of source waters is inherently more reliable than attempting to remove contamination through fallible water treatment processes and should be the first line of defence in protection of water quality in drinking water catchments as part of a multiple barrier approach (Billington *et al.*, 2011), (Billington, 2016), (Anon., 2015). It also means that water treatment is likely to be more effective and efficient (using less chemicals) and future costs can be avoided in terms of expensive water treatment plant upgrades. Avoiding these costs means customers (both present and future), don't pay as much as they would have to otherwise. The Integrated Catchment Management Plan provides a vision and long-term plan of action to better protect the catchment and deliver benefits to consumers. It shows that Coliban Water, the North Central CMA and partners are doing as much as is practical to protect the drinking water supply catchment as part of the multiple barrier approach.

1.3 Process used to develop the Integrated Catchment Management Plan

Development of the Integrated Catchment Management Plan commenced in September 2015 with input from key stakeholder organisations including local community members, Macedon Ranges Shire, Hepburn Shire, Goulburn Murray Water, Department of Economic Development, Jobs, Transport and Resources and local Landcare groups and networks. It also included background work to assess available data, monitoring and modelling which is provided in a supporting document '*FINAL Discussion paper Phase 1: Upper Coliban Integrated Catchment Management Project'* (Roberts, Dickson and Park, 2016).

Stakeholder workshops developed the goals and assessed the feasibility of actions to achieve these goals for the Integrated Catchment Management Plan. The Investment Framework for Environmental Resources (INFFER) was used to develop the business case for assessing the benefits and costs to achieve catchment protection goals. INFFER provides a robust basis to assess catchment actions including clearly outlining assumptions made. A number of supporting documents underpin this Plan (outlined in Section 6).

The INFFER analysis showed that even with the conservative catchment values used, investment to protect the catchment is cost-effective (at least $1.81 worth of benefits for every dollar spent). There are additional and potentially significant benefits in investing more heavily in long-term source catchment protection including avoided or delayed costs for increased water treatment.

1.4 Integrated Catchment Management Plan Goals

Goals for the Integrated Catchment Management Plan need to be specific, measurable, achievable, realistic and time-bound. The Plan has been developed for implementation over 20 years from 2017-2037.

Goals were initially set using the recently developed health-based targets approach (Anon., 2015) which provide a useful basis to assess the existing level of catchment protection. Challenges with the evidence base emerged and so more measurable and practical goals were developed. The three goals underpinning the Integrated Catchment Management Plan are:

1. Future development: From 2018 all proposed developments in the catchment require the implementation of appropriate actions to mitigate risks to the supply of high quality raw water for the drinking water supply, through offsetting impacts from stormwater runoff

quality and quantity in rural living and town zones. This goal can only be achieved through amendments to the Municipal Planning scheme recommended as an additional Environmental Significance Overlay (see section 2.3).

2. Waterway protection: By 2037 there is no uncontrolled livestock access to Kangaroo Creek, Upper Coliban River and Little Coliban Rivers as well as additional nominated waterways[2] and the Malmsbury, Lauriston and Upper Coliban Reservoirs[3].
3. Connectivity: By 2037 there is a continuous vegetated riparian corridor of at least an average of 20m wide each side of Kangaroo Creek, Upper Coliban River and Little Coliban Rivers where land availability permits and for the Malmsbury, Lauriston and Upper Coliban Reservoirs. Other nominated unnamed waterways will be revegetated to 10m each side.

A fourth goal was developed to address water security challenges. The goal is that the maximum future capacity of all dams on private land should not exceed 2017 capacity. At this stage the goal is aspirational, and without additional legislative changes and associated measures it will not be achieved. Whilst Coliban Water and the North Central CMA will strongly encourage such changes, this goal is not feasible to address at present without further investigation.

Section 2: The Plan of Action

The actions required to protect the integrity of the Upper Coliban catchment are outlined. Significant additional investment is required, over a sustained time period using a complementary suite of on-ground actions, planning controls, community education and extension activities. A parallel program of research and monitoring is also required to fill knowledge gaps and assess the effectiveness and efficiency of implementation (Roberts and Park, 2016). Protecting the catchment as the first and most important barrier in a multiple barrier approach makes sense from both a risk management and cost-effectiveness perspective.

Table 1 describes the actions required to meet the goals, the estimated cost for an initial or upfront 10 year implementation period (costs are estimated in 2016 dollars) and underlying assumptions. A figure showing the values in the catchment, threats and actions is outlined in Figure 3.

The total costs for the first 10 years were estimated to be $10.81 million dollars. For the following 10 year maintenance phase an annual cost of $460,000/year has been estimated (2016 dollars). Details about assumptions are further explained in a supporting document '*Upper Coliban project: Final INFFER results report*' (Roberts and Park, 2016).

[2] Based on additional work by (Billington, 2016) and analysis by the North Central CMA.
[3] Noting that reservoir fencing is not costed within this project, on the basis that Coliban Water will complete this regardless of this project.

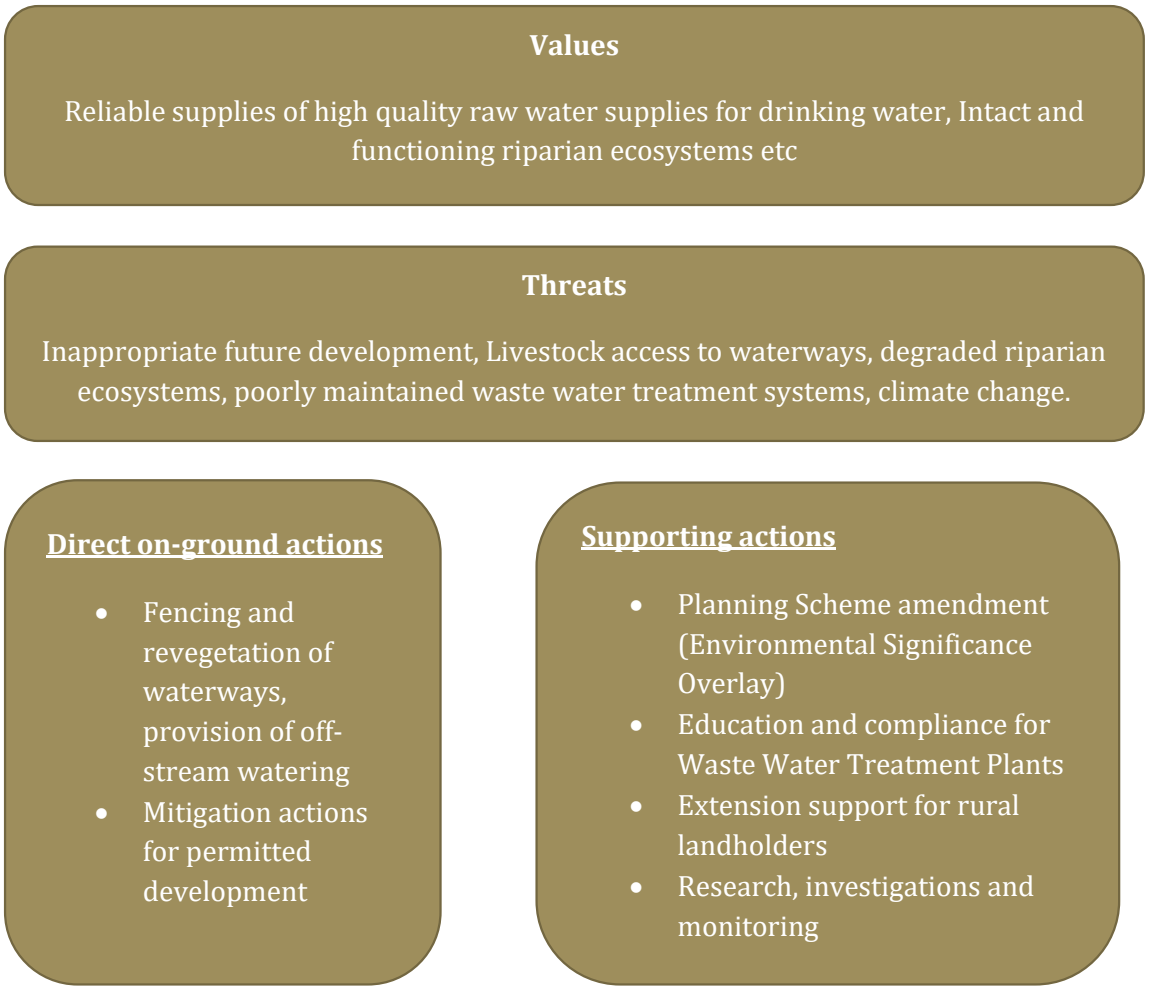

Figure 3: Link between catchment values, threats and actions

Table 1: Integrated Catchment Management Plan Implementation Action Plan (10 years)

Action	Description	$M (10 years)	Assumptions
Direct on-ground actions			
Fencing – major named waterways	Establishment of permanent stock control fencing with 20 metre buffer. Limited, managed grazing to control weeds/biomass.	1.10	110km @ $10,000/km
Off-stream watering – major named waterways	Establishment of off-stream watering systems for stock	0.15	50 units @$3000/unit
Revegetation – major named waterways	Revegetation of fenced buffers with local indigenous species	0.22	Revegetation cost estimated at $2,000/ha. 50% of total buffer area assumed to require revegetation
Fencing – unnamed minor waterways	Establishment of permanent fencing of 10 metre buffer to control stock access. Limited, managed grazing to control weeds/biomass.	1.90	190 km @ $10,000/km
Off-stream watering – unnamed minor waterways	Establishment of off-stream watering systems for stock	0.57	Assume 1 water point per km @ $3000 per unit

Action	Description	$M (10 years)	Assumptions
Revegetation - unnamed waterways	Revegetation of fenced buffers with local indigenous species	0.38	Revegetation cost estimated at $2,000/ha.
Willow control	Extensive mechanical removal	0.31	4.5km @ $40k/km = $180,000, Scattered stem injection = $100,000, Removal of stem injected willow from key sites = $ 30,000
Staff costs			
Project Management	Responsible for overall project coordination	1.50	Assumed $150,000 annually for 10 years
Extension and works support	Provision of technical advice, coordinating on-ground works with landholders	1.68	Assumed 0.5FTE@ $135,000 and 1FTE@$100,000 for 10 years
Education officers	Provision of information, awareness raising and advice regarding Land Management Planning, domestic waste water treatment plants and small dams	1.20	1 FTE @$120K across both Shires for 10 years
Compliance officers	Inspection, auditing and compliance associated with land management plan offsets, domestic waste water treatment plants and small dams	1.20	1 FTE across both Shires ongoing
Improved planning and investigations to fill knowledge gaps			
Planning Scheme amendment	Development of Environmental Significance Overlay	0.20	Advice and involvement from Local Government
Investigation re stormwater	Assessment of options for stormwater retention and reuse	0.10	
Investigation re longer term water resource outlook	Assessment of climate change and variability implications and catchment development on water yield	0.10	Assumed to be additional to efforts already being undertaken by Coliban Water and the CMA
Improved monitoring and modelling			
Water quality monitoring	Develop and implement water quality monitoring regime including event monitoring	0.00	Was costed at $80,000/year for 10 years but the cost will be part of Coliban Water's business as usual
Catchment modelling	Build on existing modelling to improve water quality and quantity modelling. Modelling calibrated with improved monitoring data	0.05	Builds on existing Source Catchments modelling support through eWater and assumes Coliban Water have in-house modelling expertise
Monitoring to assess practice adoption	Assessment of uptake of improved land and water management incentives practices,, attitudes and barriers to adoption	0.15	$75k every 5 years for 10 years
Total initial cost over 10 years		**10.81**	

A range of people and organisations will be involved in the implementation of the Plan. Coliban Water and North Central CMA will form a coordinating project steering committee to provide appropriate governance for allocation of resources to particular actions of responsibility (Section 5: Governance and implementation). Where actions are linked to local government responsibilities

such as assessment and monitoring of onsite wastewater systems (section 2.2 Staff Requirements) the appropriate level of coordination with the responsible authority will be provided through this steering committee. It is envisaged that the North Central CMA will continue to be the lead organisation deliver riparian programs and extension activities. Supervision of compliance responsibilities and education program delivery will be decided by Coliban Water, Hepburn and Macedon Ranges Shire Councils. Water quality monitoring or raw water supply will be the responsibility of Coliban Water. Landholder practice adoption and riparian activities is likely to be led by the North Central CMA. Successful engagement and participation of community members will be critical to the success of the Plan and maintaining relationships and education is very important.

2.1 Direct on-ground works

Waterway (riparian fencing)

A total of 300 km of fencing for livestock exclusion has been estimated. This includes 110 km for named waterways, the Coliban River, Kangaroo Creek and Little Coliban River and 190 km for additional smaller waterways (Table 1). This quantity has been estimated by the North Central CMA and Coliban Water to achieve both ecosystem health and water quality benefits noting that if only reducing risks to drinking water supplies were considered, approximately half this amount would be required (Billington, 2016). While some of the waterways are on land adjacent to Coliban Water reservoirs, this plan does not consider any fencing arrangements along reservoir boundaries as this is currently being facilitated through an existing Coliban Water project.

A map of the extent of currently fully fenced waterways is shown in Figure 4.

Off-stream watering systems

Stock exclusion from waterways requires the provision of alternative off-stream water sources and the estimated costs are shown in Table 1 for named and unnamed waterways associated with fencing. Improved water quality, ease of livestock management and increased livestock performance can all enhanced by supplying an alternative off-stream water supply.

Revegetation of riparian areas

Historical factors associated with the development of agriculture in the Upper Coliban catchment have resulted in extensive loss of riparian vegetation along waterways, and consequent impacts on water quality and an overall significant decline in river health. While fencing and controlling stock access to waterways will have benefits for water quality, additional measures, especially revegetation with indigenous plants is required to improve riparian habitat extent and quality. Greater riparian connectivity may also help improve the adaptive capacity of species and habitats in response to climate change challenges. Estimates of the amount of revegetation required are outlined in Table 1.

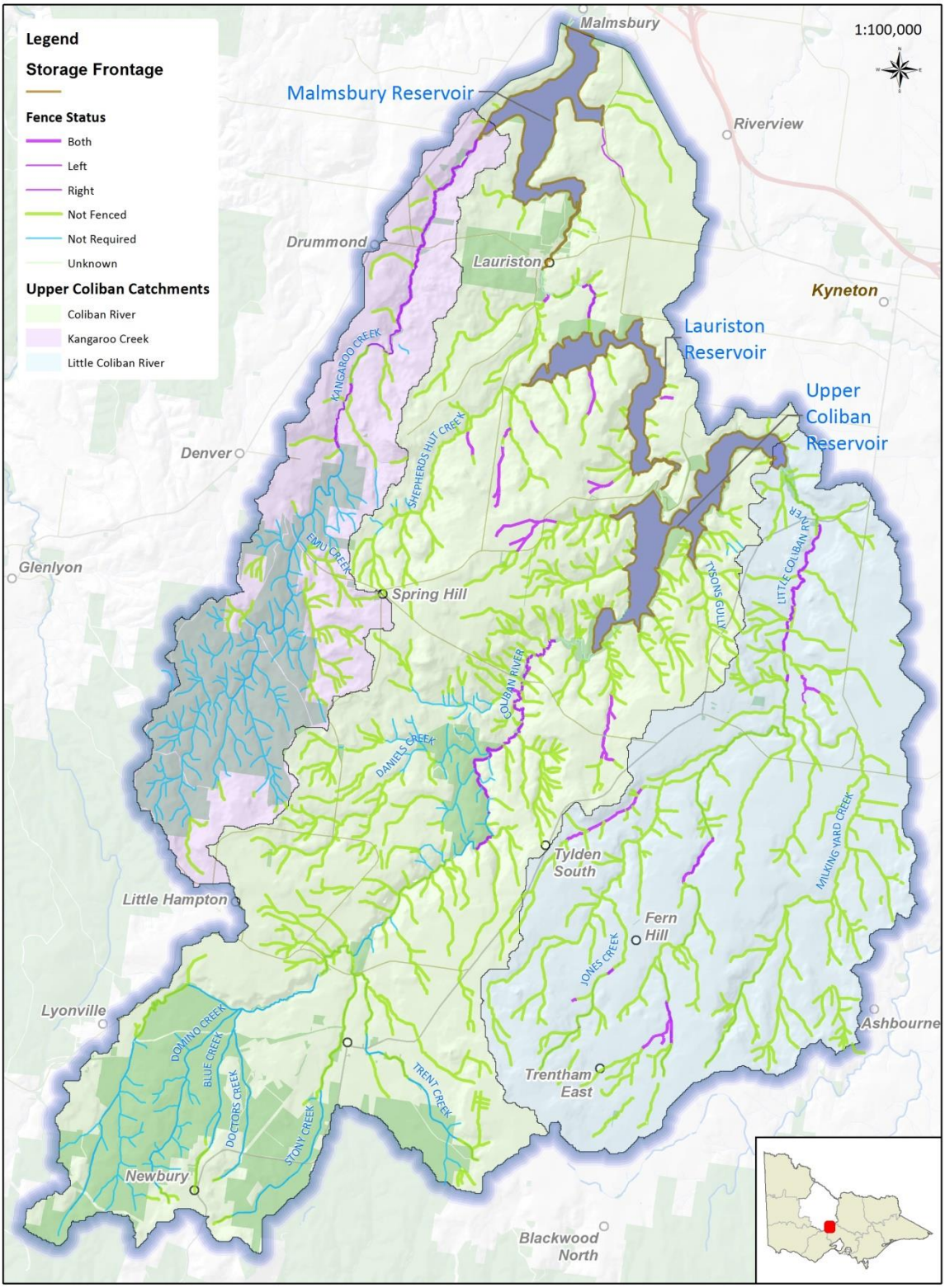

Figure 4. Extent of riparian fencing in the Upper Coliban catchment

Willow control

Most Willows (Salix sp.) are Weeds of National Significance (WoNS) as they spread rapidly along waterways causing erosion, reduce water quality and cause blockages from matted root systems. Willows also use large amounts of water. Additionally, the introduced species are a threat to the habitat values and natural hydrology of waterways. Removal of willows will assist in the achievement of multiple goals the connectivity goal outlined above and contribute to an overall improvement on the health of major and minor waterways. In Table 1 estimates of the amount and cost associated with willow removal are summarised.

2.2 Staff requirements

This ambitious Integrated Catchment Management Plan to achieve improved water quality and ecosystem health cannot be delivered without effective project management, co-ordination and delivery including engagement, extension and compliance. The scale of the project requires collaboration and coordination across relevant agencies and local communities. It will be led through a collaborative approach between Coliban Water and the North Central CMA.

The Integrated Catchment Management Plan has estimated staff costs over the 10 year initial implementation period. Costs (salaries, on-costs and operating) for a full-time Project Manager, extension, works support, community education and compliance for waste water treatment plants are outlined in Table 1.

As well as the project management, extension and direct works staff requirements, additional staff will be needed to increase community awareness and education about the importance of managing the catchment. Targeted community education is important, especially in assisting landholders and developers understand their responsibilities and opportunities for improved land and water management. A full-time equivalent education officer has been included in this Plan (Table 1).

Inspection, auditing and compliance associated with land management planning offsets and for the current domestic waste water treatment plants is essential if it is to be argued that current and future development is not causing unacceptable risks to the catchment and for human health. Both Shires currently have inadequate resources for inspection and compliance. The Integrated Catchment Management Plan includes funding for a full-time equivalent staff member to service inspection and compliance of domestic waste water treatment plants (Table 1).

In view of the importance of the Upper Coliban catchment as a drinking water supply, increased compliance monitoring to ensure that stock remain excluded from waterways will also be required compared to current riparian programs.

2.3 Improved statutory planning to reduce impacts from future development

The Upper Coliban catchment covers parts of two Shires, Hepburn and Macedon Ranges Shire Councils. The Shire boundaries and planning zones are shown in Figure 5. Given the attractiveness of the landscape and proximity to Melbourne development of land will continue to occur in the catchment. Supporting work for this Plan conducted by Billington (2016) assessed source vulnerability of the catchment[4] using sanitary survey information and raw water microbial indicator

[4] There are four categories for source vulnerability: Category 1 is considered well protected, Category 2 is moderately protected, Category 3 is poorly protected and Category 4 is unprotected.

results. Each of the three subcatchments (Coliban River, Little Coliban River and Kangaroo Creek) were classed as not meeting Category 3 (poorly protected) status based partly on domestic waste water treatment systems being in proximity to waterways (Billington, 2016). The assessment highlights the vulnerability of the catchment overall and highlights the strong need for improved planning measures to mitigate future development impacts.

Without such measures Coliban Water, Macedon Ranges and Hepburn Shires cannot meet the principles outlined previously (Billington, 2016) when considering the impact domestic waste water treatment plants in drinking water catchments and the relationship with development applications. Improved planning overlay controls are also required to give greater consideration to development of land in the catchment area as domestic waste water treatment plants are just one point source of potential contamination amongst a broader diffuse pollution impact.

In addition to providing staff resources to better assess compliance of domestic waste water treatment systems as outlined in Section 2.2, another important action in this Integrated Catchment Management Plan is to develop a consistent Environmental Significance Overlay across both Hepburn and Macedon Ranges Shires to better protect the catchment from inappropriate development. The details are outlined in the supporting document *'Improving municipal planning requirements to better protect the Upper Coliban catchment'.*

The work will be led and championed by Coliban Water and conducted in partnership with both Shires. The costs to develop it have been notionally estimated at $200,000 in the first 1-2 years of the plan. The funding will be used to employ expert consultants, seek legal advice and to enable dedicated and resourced engagement in partnership with the Macedon Ranges and Hepburn Shire Councils. An updated Environmental Significance Overlay for the Upper Coliban catchment will provide improved clarity regarding the approval of development applications and guidance on how cumulative impacts will be managed or off-set.

2.4 Investigations to fill knowledge gaps

The development of the Integrated Catchment Management Plan has revealed a number of knowledge gaps which should be addressed through specific research studies and investigations. This includes:

- Developing an improved understanding of the long-term water resource outlook for the catchment in the context of climate change and the current/future impact of small dams.
- Assessment of options for stormwater retention and reuse.

These are assumed to be one-off studies in the first couple of years of the Integrated Catchment Management Plan.

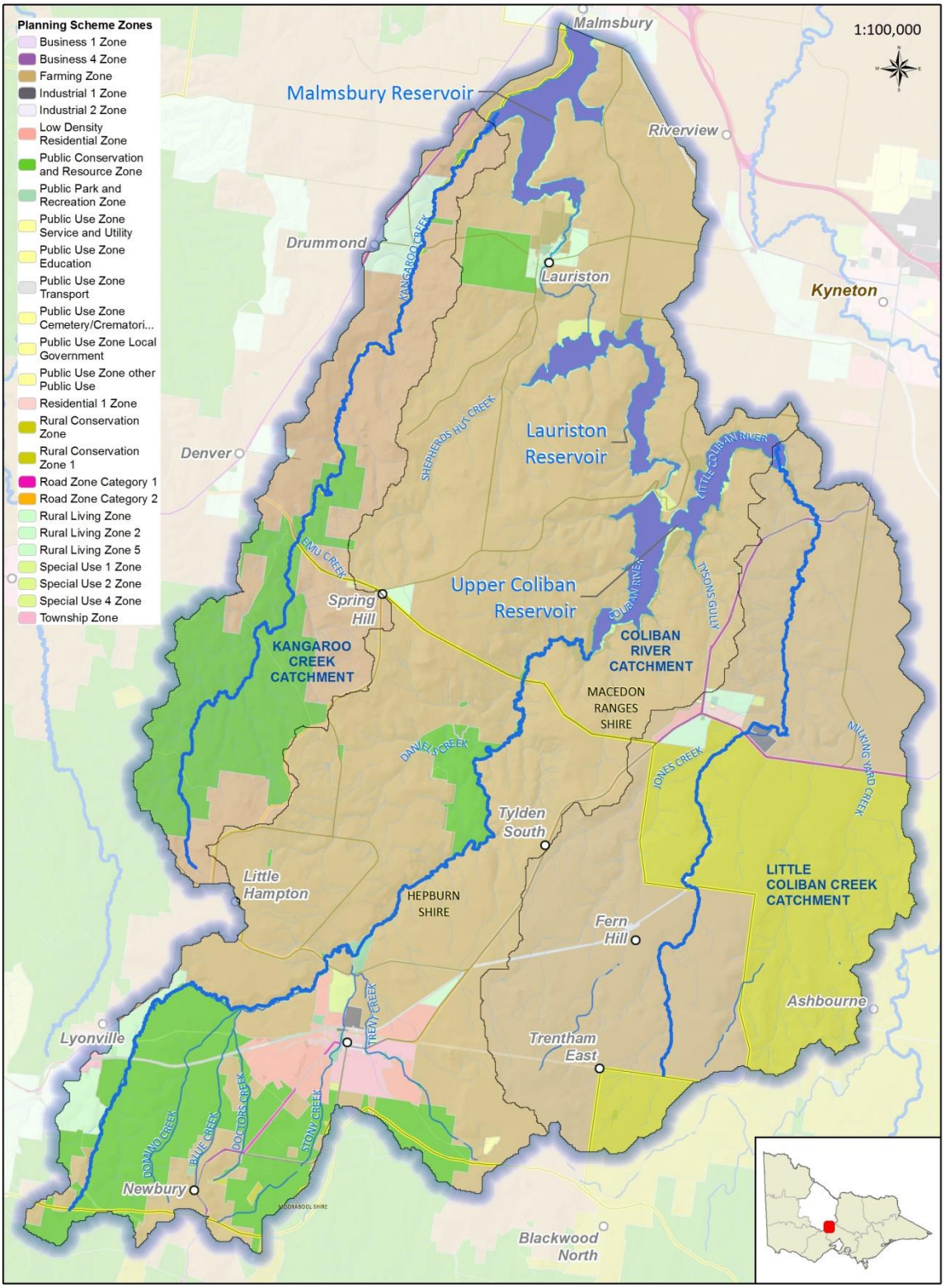

Figure 5. Hepburn and Macedon Ranges Shire Council boundaries and planning zones in the Upper Coliban catchment.

2.5 Improved monitoring and modelling

Monitoring, catchment modelling and evaluation of landholder practice and behaviour change will be required to ensure the Integrated Catchment Management Plan is implemented and adapted as improved knowledge develops. The three main areas of work and the estimated costs are shown in Table 1 and are:

- Water quality including increased number of sites and event-based sampling. This will help monitor progress and improve accuracy of modelling.
- Improved catchment modelling is needed to be able to both understand some of the water quality (levels of nutrient and sediments entering waterways and reservoirs) and quantity aspects as well as providing a stronger evidence-base for monitoring catchment improvements. Further details on the possible scope of modelling to be considered are outlined in the supporting document '*FINAL Discussion paper Phase 1: Upper Coliban Integrated Catchment Management Project'* (Roberts, Dickson and Park, 2016).
- Assessing the extent of change in landholder values, attitudes and especially practice changes associated with riparian management, through ongoing monitoring of the extent of practice change and compliance.

2.6 Cost of actions

The upfront costs of implementing the Integrated Catchment Management Plan are estimated to be $10.81 million (measured in 2016 dollars over 10 years). Following the 10 year implementation phase, a maintenance budget of up to $0.46 million/year for the following 10 years has been estimated. Maintenance obligations are part of landholder responsibilities under standard Riparian Maintenance Agreements delivered by the North Central CMA. Whilst maintenance obligations are well understood and mostly accepted, there is a challenge that obligations cease upon the property changing hands. It is possible that in some circumstances new landholders might not have the awareness, interest and/or capacity to maintain stock exclusion over the long-term. Given this, it was important to flag the potential need for funding to guarantee maintaining the drinking water benefits.

Overall, although the costs of the Integrated Catchment Management Plan are significantly higher than current levels of investment they conservatively generate greater benefits than costs as well as providing better demonstration of the multiple barrier approach to protect this important water supply catchment. Coliban Water and the North Central CMA will be endeavouring to seek opportunities for funding the full implementation of the Plan.

Section 3: Roles and responsibilities of key agencies and organisations

The Integrated Catchment Management Plan is a joint initiative between the North Central CMA and Coliban Water. The roles and responsibilities of key stakeholders involved in implementation of the Integrated Catchment Management Plan are outlined in Table 2 and a more detailed overview of the planning and policy context is provided in a supporting document *'Planning and policy context for the Upper Coliban catchment'*.

Table 2: Summary of responsibilities and interests of key stakeholders for the Integrated Catchment Management Plan.

Stakeholder	Role / responsibility
North Central CMA	The North Central CMA is charged with the responsibility of taking a whole-of-catchment approach to natural resource management in the region. Their primary role is to ensure the protection and restoration of land and water resources, the sustainable development of natural resources-based industries and the conservation of our natural and cultural heritage. Under Part 10 of the Water Act 1989, the North Central CMA is the designated responsible manager of waterways, drainage and floodplains.
Coliban Water	Coliban Region Water Authority is a regional urban water authority, which supplies urban and rural water and wastewater services to communities across central and north-central Victoria. As outlined in the *Safe Drinking Water Act (2003)* Coliban Water is responsible for ensuring that water storages and adjoining lands are managed in accordance with this legislation along with the *Safe Drinking Water Regulations (2005)* and the *Water Act (1989)*.
State Government (Department of Environment, Land, Water and Planning, Parks Victoria, Department of Economic Development, Jobs, Transport and Resources, Department of Health and Human Services)	The Department of Environment, Land, Water and Planning (DELWP) is the lead agency for water and waterway management. It is responsible for the development of waterway policy, co-ordination of regional delivery and prioritisation of Government investment in waterways. DELWP and DEDJTR are also responsible for aspects of natural resource management relevant to waterways, including: • ensuring the sustainable management of Victoria's water resources • overseeing the catchment planning framework to promote integrated catchment management throughout Victoria • managing biodiversity and threatened species • management of public land, including Crown frontages • bushfire management on public land • delivering sustainability and environment services at the regional level, including some services that relate to waterway management • managing fisheries and recreational fishing in waterways to optimise economic and social value while ensuring the sustainability of resources • investing in and delivering farming programs on private land where waterways occur • overseeing the management of biosecurity, including aquatic invasives The Department of Health and Human Services (DHHS) administers the *Safe Drinking Water Act* 2003 which is a risk based regulatory framework for the supply of safe drinking water.
Local Government	Councils are involved in the management of waterways in Victoria through their role as responsible planning authorities, managers of stormwater drainage and onsite domestic wastewater systems, users of integrated water systems, land managers, emergency management bodies, and supporters of community groups. Specifically with regard to water quality and waterways, local government have the following roles and responsibilities:

Stakeholder	Role / responsibility
	• incorporate waterway and catchment management objectives, priorities and actions into strategic and statutory planning processes • develop and implement urban stormwater plans • manage on-site domestic wastewater systems
Goulburn-Murray Water	Goulburn-Murray Water's statutory functions include irrigation supply and drainage systems, surface water diversions and groundwater in its region. Goulburn-Murray Water also promotes best practice land use and development within the catchments to its storages for water quality and biodiversity purposes. Goulburn Murray Water's statutory functions of relevance to the Integrated Catchment Management Plan are licencing of surface and groundwater.
Farmers / land managers	Landholders are vital to the successful implementation of this Integrated Catchment Management Plan, as most works are on privately owned land or affect areas that require private co-operation, and their land management practices have a vital role in catchment health. Under the Catchment and Land Protection Act 1994 landholders are required to: • protect water resources • avoid causing or contributing to land degradation which causes or may cause damage to land of another owner • conserve soil • eradicate regionally prohibited weeds and prevent the growth and spread of regionally controlled weeds • prevent the spread of, and as far as possible eradicate, established pest animals.
Indigenous community (Dja Dja Wurrung)	Dja Dja Wurrung are the Traditional Owners of the Land covered by the Upper Coliban ICMP. DDW have entered into a Recognition and Settlement Agreement in 2013 with the State of Victoria. Traditional Owners with recognised native title rights or formal agreements with the State are important in land and water management. In addition the Participation Strategies that are listed in Schedule 16 of the Recognition and Settlement Agreement relate to the activities to be conducted under the plan.
Landcare Networks and Landcare Groups	• Local information sharing and awareness raising • Direct implementation of projects • Community capacity building

Section 3: Information gaps

The science and benefit:cost analysis underpinning the Integrated Catchment Management Plan has used available published and unpublished information including technical expertise and local knowledge. A collaborative and participatory approach has been used and supporting studies have been undertaken. Comment and review have been invited on the component pieces of work.

A number of important information gaps remain, particularly with respect to moving beyond assessing risk to quantifying impacts. Several of the immediate and feasible information gaps have been costed within this Plan, for example the assessment of implications of climate change, climate variability and catchment development on water yield. This said, imperfect information is not a reason for lack of pro-active action. A precautionary approach is well recognised throughout Victoria's natural resource governing frameworks and is particularly important in protecting drinking water supply catchments as has been outlined in supporting work (Billington, 2016) for this Plan.

As knowledge improves, some aspects of the Integrated Catchment Management Plan may be updated as part of adaptive management. Adaptive management should occur as a systematic process to improve management effectiveness by adopting an explicit approach to learning and review.

Section 4: Monitoring, Evaluation and Reporting

Development and application of practical and effective monitoring and evaluation processes will be crucial to assessing the effectiveness of the Plan, to track its progress towards the goals, and enable adaptive management of implementation and supporting activities.

One of the strengths of the Plan is that the three goals have been described in specific, measurable, achieveable, realistic and time-bound (SMART) terms. The key evaluation questions (Table 3) and information sources provide guidance as to what should be monitored against each goal.

Table 3: Overview of MER Plan

Goals	Key Evaluation Questions	Information sources/methods
Future development: From 2016 all proposed developments in the catchment require the implementation of appropriate actions to mitigate risks to the supply of high quality raw water for the drinking water supply through offsetting impacts from stormwater runoff quality and quantity in rural living and town zones	• Has the updated/new ESO been established? • To what extent have permitted developments in the catchment included appropriate and effective off-set conditions? • To what extent have these off-sets been implemented and maintained?	• Local Government Planning Scheme • Inventory of Planning Applications • Results of audits/inspections for developments, particularly domestic waste water treatment system compliance
Waterway protection: By 2036 there is no uncontrolled livestock access to Kangaroo Creek, Upper Coliban River and Little Coliban Rivers as well as additional nominated waterways and the	• What proportion of named and unnamed waterways[5] frontages are fenced to manage stock access? • What proportion of fenced waterways frontages	• Mapping of project works • Satellite imagery/remote sensing • Landholder surveys and auditing to assess practice uptake and compliance

[5] Noting that completion of fencing around storages is currently being undertaken by Coliban Water. It is very important but is costed separately from this Plan.

Goals	Key Evaluation Questions	Information sources/methods
Malmsbury, Lauriston and Upper Coliban Reservoirs	are being appropriately managed?	
Connectivity: By 2036 there is a continuous vegetated riparian corridor at least an average of 20m wide each side of Kangaroo Creek, Upper Coliban River and Little Coliban Rivers where land availability permits, the Malmsbury, Lauriston and Upper Coliban Reservoirs. Other nominated unnamed waterways will be revegetated to 10m each side.	• What proportion of and waterways have established riparian vegetation, either remnant or planted?	• Mapping of project works • Riparian condition monitoring • Satellite imagery/remote sensing • Landholder surveys

Coliban Water and the North Central CMA each have established systems and processes to monitor and evaluate the effectiveness of their activities. For the North Central CMA, a Monitoring, Evaluation and Reporting Framework (Figure 4) has been established to guide review and adaptive management for the Regional Catchment Strategy and Regional Waterway Strategy. The process also provides a consistent basis for communicating implementation results to stakeholders and funding investors. A Monitoring Evaluation and Reporting Framework for this project needs to be agreed, noting that it could be that used by either the North Central CMA or Coliban Water, both or a hybrid version.

Figure 4: Monitoring evaluation and reporting framework used by the North Central CMA.

Along with the monitoring, evaluation and reporting activities associated with this Plan, annual reporting of progress will be reported to partner organisations and made public for the community. A program mid-term review will be conducted after the first five years to assess progress and the extent to which adaptations are required.

Monitoring of the following factors will provide an overall assessment of Plan progress, noting that the specific of the monitoring program will need to be developed and agreed by both Coliban Water and the North Central CMA.

4.1 Water quality

The development of the Plan has revealed the need for more effective and purposeful monitoring of key water quality parameters in the waterways and storages of the Upper Coliban catchment.

While, from a water quality perspective, there is a focus on monitoring for the presence of pathogens, there will also be benefits in understanding the behaviour of other water quality parameters, particularly sediment and nutrients in response to catchment interventions.

The extent to which implementation of catchment protection actions are linked to a reduction in pathogen and nutrient hazards (posed from both stock access to waterways and reservoirs and also from domestic wastewater management systems) will be an important measure of success for the Plan. It should be noted that given increasing population and development pressures within the catchment and potential climate change impacts, maintaining the current water quality conditions could be viewed as success.

4.2 Water quantity

Whilst Coliban Water has a strong understanding of inflows, the impacts of climate change have not been factored into water security projections.

Understanding current and future risk with climate change and quantifying the impact of private dams under different trajectories

4.3 River and riparian health

The extent of river and riparian management actions needs to continue and also to be formally recorded. Given that the catchment is a drinking water supply catchment, further consideration needs to be given as to whether there are public benefits in providing ongoing resourcing to ensure stock exclusion measures are maintained. Because of the critical importance of the Upper Coliban catchment as a drinking water supply a budget allocation has been foreshadowed after the initial 10 year implementation phase to enable maintenance of stock exclusion from waterways in situations where this is deemed critical to protecting drinking water. An action plan for implementation will be required to sort out the appropriate mechanism if maintenance payments are made (for example whether an agreement on title is required)

4.4 Landholder uptake of practices and compliance

To date there has been good uptake of improved riparian management practices in the Upper Coliban catchment. A baseline assessment for some landholders (with the notable exception of small landholders) has been conducted by Charles Sturt University (Curtis and Mendham, 2015). This social survey work will form the basis of an on-going program to assess practice uptake and maintenance of practices by all landholders. A very important additional part of assessing practice adoption will need to be conducted on the ground to ensure that landholders are complying with the obligations. Greater emphasis on compliance assessment and auditing than occurs commonly in the North Central CMA region for non-drinking water supply catchments is likely to be needed in view of the fact that the Upper Coliban catchment is a drinking water supply.

Section 5: Governance and implementation

Leadership and coordination in the implementation of this Plan will be a shared responsibility of Coliban Water and the North Central CMA.

In 2015 Coliban Water and the North Central CMA signed a Memorandum of Understanding to work collaboratively in an effort to provide an integrated approach to catchment management in drinking water catchment areas, with an initial focus on the Upper Coliban catchment. The Memorandum of Understanding provides evidence of a shared organisational commitment to address challenges associated with water reform, climate change and changing land use that are likely to place increasing demands on water resources in north central Victoria.

The Plan has been developed through a participatory and collaborative approach, with the active involvement of key stakeholder groups (see Section 1) establishing a sound platform for implementing the actions described above. This approach has ensured that the actions are practical and acceptable to land managers and there is significant degree of local support for them to be undertaken.

It is envisaged that a Project Coordinating Group, led by Coliban Water and the North Central CMA, will be established to guide Plan implementation, provide advice on adaptive management and to ensure an active link to the community of the Upper Coliban catchment.

The Integrated Catchment Management Plan is also linked to the other major Plans and Strategies in the region, including being a particularly important priority within the Regional Waterway Strategy. In particular the Biolinks Plan being developed by the 3 Landscare groups strong, cross-catchment linkages that will complement this plan. There will be no doubt many other pportunities for linkages to the plans and strategies of other stakeholder organisations.

Section 6: Supporting documents

The following supporting documents have been developed to support the Integrated Catchment Management Plan. They are referred to in this Plan in relevant sections and provide further detail on the topics covered.

- **FINAL Discussion paper Phase 1: Upper Coliban Integrated Catchment Management Project (Roberts, Dickson and Park, 2016)**

This report, commissioned by the North Central Catchment Management Authority (NCCMA) and Coliban Water, summarises the available information on which to develop a business case and Integrated Catchment Management Plan (ICMP) for the Upper Coliban catchment.

- **Final INFFER Results Report (Roberts and Park, 2016)**

INFFER[6] was used to assess the benefits and costs associated with protecting the upper Coliban catchment to address source water protection as part of a multi-barrier approach and to provide better catchment health overall. The benefits and costs, and associated benefit:cost ratios, of 22 scenarios were estimated which explored various combinations of addressing the current major threats to water quality and catchment health (though fencing, reduced livestock access and

[6] Investment Framework for Environmental Resources (INFFER), www.inffer.com.au

revegetation) and reducing threats from future development (threats to water quality and water security).

- **An overview of the Upper Coliban catchment, values, threats and current work (Roberts and Park 2017)**

This document has been prepared to support the development of the Upper Coliban Integrated Catchment Management Plan. The Upper Coliban catchment is in the southwest portion of the Campaspe River basin on the northern slopes of the Great Dividing Range in central Victoria. It is approximately 27,750 ha in size and contains three water storages (Lauriston, Malmsbury and Upper Coliban Reservoirs) which have a combined capacity of almost 70,000 ML). The upper catchment of Coliban River and Kangaroo Creek are within the Wombat State Forest. The catchment includes the Upper Coliban River and major tributaries, the Little Coliban River and Kangaroo Creek (North Central CMA. 2006).

- **Planning and policy context for the Upper Coliban catchment (Roberts and Park 2017)**

The Planning and policy context for the Integrated Catchment Management Plan has been developed within the context of relevant legislation, and current government policy and programs that apply at State, Regional and Local levels. An outline of the current Institutional Framework for Catchment Management in Victoria highlights the complex nature of natural resource management through the seven separate pieces of legislation[7] that apply to natural resource management, and the applicable subordinate legislation, policies, strategies and plans.

- **Improving municipal planning requirements to better protect the Upper Coliban catchment (Park, Roberts and Gough 2017)**

The Integrated Catchment Management Plan has been developed to help enable provision of a safe and secure water supply for communities in central and northern Victoria along with enhanced river, biodiversity and catchment health outcomes. Given the current and future development threats facing the catchment, one of the supporting pieces of work (this report) was to investigate whether improved planning mechanisms would be useful in the suite of policy approaches needed. The Upper Coliban catchment incorporates part of two Local Government Areas, Macedon Ranges Shire and Hepburn Shire. Through State Planning Policy and Local Planning Policy, Macedon Ranges and Hepburn Shire Councils have an important role in development and planning to support Water Corporations (Coliban Water) in providing water supply through the 'multi-barrier' approach.

- **Pathogen risk in the Upper Coliban drinking water catchments (Billington, 2016)**

The Upper Coliban Catchment has human and animal faecal pollution sources. The Pathogen risk in the Upper Coliban drinking water catchments report discusses each of these sources and the relevant principles of catchment management in general. This information has been used to inform the specific assessment and recommendations made for the Upper Coliban Catchment.

[7] Water Act (1989), Water Industry Act (1994), Catchment and Land Protection Act (1994), Victorian Environmental Assessment Council Act (2001) , Safe Drinking Water Act (2003) , Climate Change Act (2010, Essential Services Commission Act (2001)

Section 7: References

Anon. (2015) Drinking Water Source Assessment and Treatment Requirements Manual for the Application of Health-Based Treatment Targets.

Billington, K. (2016) Pathogen risk in the Upper Coliban drinking water catchments Pathogen risk in the Upper Coliban drinking water catchments.

Billington, K., Deere, D., Rydan, U., Stevens, D. and Davison, A. (2011) Public health issues associated with stock accessing waterways upstream of drinking water off-takes.

Curtis, A. and Mendham, E. (2015) The social drivers of natural resource management in the North Central region Report No . 80.

Roberts, A., Dickson, M. and Park, G. (2016) 'Upper Coliban Phase 1 Scoping Report 15June2016 Final'. Natural Decisions Report to the North Central CMA and Coliban Water.

Roberts, A. and Park, G. (2016) 'Upper Coliban Project, Final INFFER Results Report'. Natural Decisions Report to the North Central CMA and Coliban Water.