



RMCG

OCTOBER 2019

Integrated catchment management plan - scoping

Tullaroop catchment – Final Report

North Central Catchment Management Authority

Table of Contents

Introduction	1
Context	1
Catchment management planning	3
ICMP business case	9
Appendix 1: Tullaroop catchment	11
Appendix 2: Indicative summary of entitlement	12
Appendix 3: Central Highlands Water groundwater pumping bores	13
Appendix 4: Stakeholder overview	14

Introduction

The Tullaroop catchment supplies potable water for Maryborough and neighbouring towns - servicing a population over 14,000 - while also meeting significant other environmental, urban and rural demands. Integrated management will be essential in the long-term to allow the catchment to continue to meet these diverse needs amid increasing climatic, user and environmental pressures.

This report summarises initial planning discussions for the long-term integrated management of the Tullaroop catchment. Two workshops brought together representatives from catchment authorities, water corporations, government agencies, Landcare and other interested community groups. These stakeholders explored the need to develop an Integrated Catchment Management Plan (ICMP) for the Tullaroop catchment, identified focus areas, considered potential barriers and determined a long-term vision for the catchment.

To undertake this work, North Central Catchment Management Authority (NCCMA) engaged RM Consulting Group (RMCG) to lead the community engagement and analysis.

Context

The Tullaroop catchment is located in Victoria along the southern tip of the Murray Darling Basin. The catchment area upstream of Tullaroop Reservoir (including Tullaroop, Birch's and Creswick Creeks) is a closed system in Dja Dja Wurrung Country. Traditional Aboriginal culture revolved around relationships to the land and water – relationships that hold deep physical, social, environmental, spiritual and cultural significance. Rivers were, and remain, the veins of Dja Dja Wurrung Country, and provide food and medicine, and places to camp, hunt, fish, swim and hold ceremonies. They are places that are central to their creation stories, and many of their cultural heritage sites are associated with waterways – burial sites, birthing sites and middens.

Birchs, Creswick and Tullaroop creeks are still the lifeblood of the region. Beyond economic and urban water supply, the catchment's system of creeks sustain the interconnected natural and built environment around it. Oral histories suggest the cultural significance is substantial, but yet to be properly assessed – a key gap that is largely overlooked through current usage. The catchment also supports complex local biodiversity; including platypus and trout populations.

The Tullaroop catchment is a significant natural community asset. Research has found that access to safe, high quality green space benefits individuals across every stage of the lifespan, enhancing their physical, mental, social and spiritual health and wellbeing.¹ Around \$7.4 billion is also spent each year on nature-based outdoor activities in Victoria. This expenditure makes a \$6.2 billion contribution to Victoria's economy, and supports around 71,000 direct and indirect full-time equivalent jobs.² Fishing tourism has grown significantly in the catchment with almost 200,000 brown and rainbow trout stocked into the reservoir. In March 2019, Tullaroop Reservoir was also stocked with 100,000 golden perch.

¹ Parks Victoria. 2015. [Healthy Parks Healthy People: the state of the evidence 2015](#)

² Outdoors Victoria and Sports and Recreation Victoria. 2015. [Victoria's nature-based outdoor economy](#).

TULLAROOP CATCHMENT SUMMARY

- The entire catchment is a declared potable water supply catchment
- Most of the catchment is cleared farmland
- The southern watershed of the catchment is the Great Dividing Range. The highest parts of the catchment are located in the southeast near Mollonghip where the elevation is over 700 m above sea level. The catchment drains to Tullaroop Reservoir which has a full supply level of 223 m
- Geographically, the catchment is predominantly basalt, with some patches of sedimentary landform around Creswick and the western flank near Talbot
- Groundwater and surface water resources contribute significant volumes of water to users located within and beyond the catchment. Figure 2 shows a schematic illustration of the main water resources
- The supplement from Tullaroop Reservoir to the Goulburn Irrigation system near Boort accounts for approximately 23 GL/year, approximately half of the current combined total water entitlements. This is however only made available once the current year Loddon allocation is 100% and there is enough resource available to allocate 100% in the following year.
 - There is more than 10 GL of annual groundwater entitlement within the catchment.
 - Entitlements drawn from the catchment total approximately 50GL/yr.

Further context of the Tullaroop catchment is available at the end of this report:

- Current land zoning in the Tullaroop Reservoir catchment is visualised at Appendix 1.
- A summary of water entitlements associated with the catchment is included at Appendix 2.
- A summary of Central Highlands Water Groundwater Pumping Bores is included at Appendix 3.
- The diverse cross-section of stakeholders that manage and are invested in discrete elements of the catchment is summarised at Appendix 4.

Catchment management planning

Integrated catchment management (ICM) underpins the sustainable management of land and water resources and contributes to biodiversity management. Through this approach, partners seek to achieve sustainability and ensure the long-term viability of natural resource systems, and human needs for both current and future generations, incorporating environmental, economic and social considerations.

Victoria's framework for the integrated management of catchments is established under the *Catchment and Land Protection Act 1994* (the CaLP Act).

For Tullaroop, such an approach is particularly applicable as the catchment:

- Is a closed system with a diverse range of end users and significant environmental and cultural value
- Is an important urban and rural supply for growing communities and industries
- Has different elements managed by a large number of diverse stakeholders
- Is likely to experience increased demands alongside increased environmental pressures from the changing climate.

To initiate integrated catchment management planning, twenty representatives attended a workshop on 16 July in Creswick. This workshop aimed to:

- Identify the key values and threats of the Tullaroop catchment.

Nineteen representatives also attended a second workshop on 31 July in Clunes. This workshop aimed to:

- Determine the scope and feasibility of the Tullaroop ICMP
- Recommend next steps in developing the ICMP.

The outcomes from these workshops and key findings are provided in the following section.

KEY FINDINGS

CHALLENGES

While agencies are currently actively managing the catchment to ensure its long-term health, stakeholders highlighted that the catchment is coming under increased pressure. The changing climate is likely to significantly affect both supply and demand within the catchment. This will bring increased temperatures and reduced rainfall contributing to changes in catchment processes affecting runoff, flows, waterway and habitat health, salinity, erosion, prevalence of pests and weeds and localised flash flooding.

Key climatic impacts	Potential impacts
<ul style="list-style-type: none"> - Decreasing rainfall and water Supply - Decreasing surface water - Increasing temperature - Infrastructure vulnerable to fire and flood 	<ul style="list-style-type: none"> - Increased pressure on water supply and security for irrigators - Increased incidence of algal blooms - Increased energy costs associated with extended irrigation periods

Figure 1-1: Regional Adaptation Snapshot – Loddon Mallee 2018

Forecast population growth and changing land uses may generate increased demand for potable and irrigation water, while simultaneously degrade natural protections. Demand for potable water supplies beyond the catchment may also increase, with significant population growth forecast in nearby population centres such as Ballarat, Geelong and Ballan. These challenges are summarised in Table 1-1 and demonstrate the need for increased attention to planning for the future sustainable management of land, water and biodiversity resources in the catchment.

Alignment of supply and demand will be a challenge for the Tullaroop catchment. Demand such as environmental flows, Central Highlands Water, GMW/Irrigators, Dja Dja Wurrung each require different things.

Table 1-1: Threats

KEY THREATS	CONTRIBUTING FACTORS (IDENTIFIED BY STAKEHOLDERS)	IMPACTS (IDENTIFIED BY STAKEHOLDERS)
Loss of culture and connection	<ul style="list-style-type: none"> ▪ Population growth and urban encroachment ▪ Land use changes 	<ul style="list-style-type: none"> ▪ Loss of stories ▪ Cultural heritage not protected (including sacred sites and relics) ▪ Loss of connection to land
Poor water quality	<ul style="list-style-type: none"> ▪ Variable climate ▪ Unrestricted stock access ▪ Increased algae blooms ▪ Changes to water entitlements ▪ Prevalence of aging septic systems ▪ Nutrient-rich runoff (farming/mining) ▪ Sediment runoff (roads, bicycle tracks) ▪ Reduced flows ▪ Salinity 	<ul style="list-style-type: none"> ▪ More expensive treatment required ▪ Reduced potable water security ▪ Challenge regional prosperity
Increased potable water scarcity	<ul style="list-style-type: none"> ▪ Variable climate ▪ Decreased rainfall ▪ Population growth and urban encroachment ▪ Land use changes 	<ul style="list-style-type: none"> ▪ Reduced potable water security ▪ Less water flowing through system ▪ Loss of productive agricultural land ▪ Reduced soil quality

KEY THREATS	CONTRIBUTING FACTORS (IDENTIFIED BY STAKEHOLDERS)	IMPACTS (IDENTIFIED BY STAKEHOLDERS)
	<ul style="list-style-type: none"> Increased irrigation demand Construction of stock and domestic dams from new subdivisions 	
Reduced availability and security of water for agriculture	<ul style="list-style-type: none"> Variable climate decreased rainfall Land use changes Increased intensity of agricultural development/productivity in some areas (e.g. Coghills Creek area) 	<ul style="list-style-type: none"> Unsustainable agricultural development Increased risk of water use restrictions for all users in the long-term
Waterway and habitat deterioration	<ul style="list-style-type: none"> Variable climate Reduced environmental flows Increased prevalence of pests and weeds Increased blue green algae (particularly around Hepburn Lagoon and Tullaroop Reservoir) Soil erosion Sedimentation Changes in land use Construction of stock and domestic dams from new sub divisions Unrestricted stock access 	<ul style="list-style-type: none"> More expensive treatment required Reduced potable water security Degraded biodiversity Loss of habitat (native fish, platypus) Loss of productive agricultural land Reduced soil quality
Increased flash flooding	<ul style="list-style-type: none"> Variable climate Urban storm water run off Salinity 	<ul style="list-style-type: none"> Economic, social and personal flood damages Less secure investment landscape Soil erosion
Increased salinity	<ul style="list-style-type: none"> Decreased rainfall Reduced flows Increased irrigation demand Changes in land use 	<ul style="list-style-type: none"> Soil erosion Reduced agricultural production Reduced water quality Heightened flood risk

TULLAROOP CATCHMENT 20 YEAR VISION

In the context of the challenges identified, stakeholders identified their long-term vision for the catchment. The most popular of these visions among stakeholders included:

“Empowered and culturally aware community that are working together to improve the health of the catchment.”

“The catchment is demonstrating how sustainable agriculture and sustainable water use is ensuring regional prosperity today and into the future.”

“Tullaroop catchment is valued by the communities within it and is resilient to future challenges.”

“A healthy Tullaroop catchment which will provide healthy waterways, good water quality, sustainable farming and engaged communities.”

“Healthy aquatic ecosystems and high-water quality to share with downstream uses.”

“Sustainable agriculture connected Indigenous culture and a community that values healthy waterways in as good or better condition than 2020”.

PRIORITIES

Stakeholders considered a range of issues associated with the development of a potential Tullaroop ICMP. To begin, they were asked to identify the ideal scope for the plan. These focus areas have been sorted and categorised along the threat themes identified in workshop one, and are presented in the Table 1-2 below.

Table 1-2: Priority actions

FOCUS AREA	PRIORITY ACTIONS
Sustaining water security	<ul style="list-style-type: none"> ▪ Review and modify water use, increase efficiency ▪ Promote crop water use efficiency ▪ Community engagement and education ▪ Review water trading rules to better achieve environment, water, quality outcomes and promote benefits of water trading ▪ Promote sustainable agricultural practice ▪ Review allocations as part of Loddon Highlands Water Supply Protection Area (WSPA) Groundwater Management Plan review³ ▪ Improve the function of allocations for the Newlyn Zone to assist in maintaining baseflow to Birch Creek during summer ▪ Review current monitoring, including distribution and frequency of water monitoring data ▪ Analyse potential impact of new dams on sub-divided rural living properties in accordance with planned regional growth ▪ Enhance downstream access ▪ Analyse telemetry data collected from State Observation Bore Network sites to better understand the groundwater-surface water connection in the catchment ▪ Undertake land use assessments (particularly high impact horticulture) ▪ Assess water pricing ▪ Assess water infrastructure ▪ Review storm water harvesting
Improving waterway and habitat health	<ul style="list-style-type: none"> ▪ Restrict stock access ▪ Assess environmental flows ▪ Identify erosion prevention measures ▪ Promote sustainable agricultural practice ▪ Address drivers of blue-green algae ▪ Protect endangered species ▪ Promote revegetation and weed control ▪ Undertake erosion control activities instream and adjacent
Improving water quality	<ul style="list-style-type: none"> ▪ Lead community engagement and education ▪ Improve wastewater management ▪ Improve intensive animal waste management ▪ Address drivers of blue-green algae ▪ Address nutrient and pathogen run-off ▪ Improve planning and monitoring process for domestic wastewater

³ Any modification of groundwater allocations within the Tullaroop catchment would need to be achieved through a statutory process to amend the management plan with endorsement by a consultative committee.

FOCUS AREA	PRIORITY ACTIONS
Promote connection and culture and sustainable development	<ul style="list-style-type: none"> ▪ Undertake social benchmarking and associated education program ▪ Map cultural values and heritage ▪ Undertake economic modelling ▪ Identify community and social outcomes ▪ Assess tourism impacts (e.g. Creswick trails)
Mitigate risk of flash flooding	<ul style="list-style-type: none"> ▪ Promote revegetation ▪ Identify and undertake stormwater diversions and WSUD ▪ Lead erosion control activities instream and adjacent
Reduce salinity	<ul style="list-style-type: none"> ▪ Lead community engagement and education ▪ Promote revegetation / ground cover ▪ Fence / protect waterways from stock.

These actions are the starting point in informing the development of an integrated management approach for the Tullaroop catchment. Each action must alleviate or mitigate the contributing threat factors in order to minimise the identified impacts.

From these workshops, the focus areas, threat impacts and high priority actions identified in the proceeding tables are visualised below in Figure 1-2.

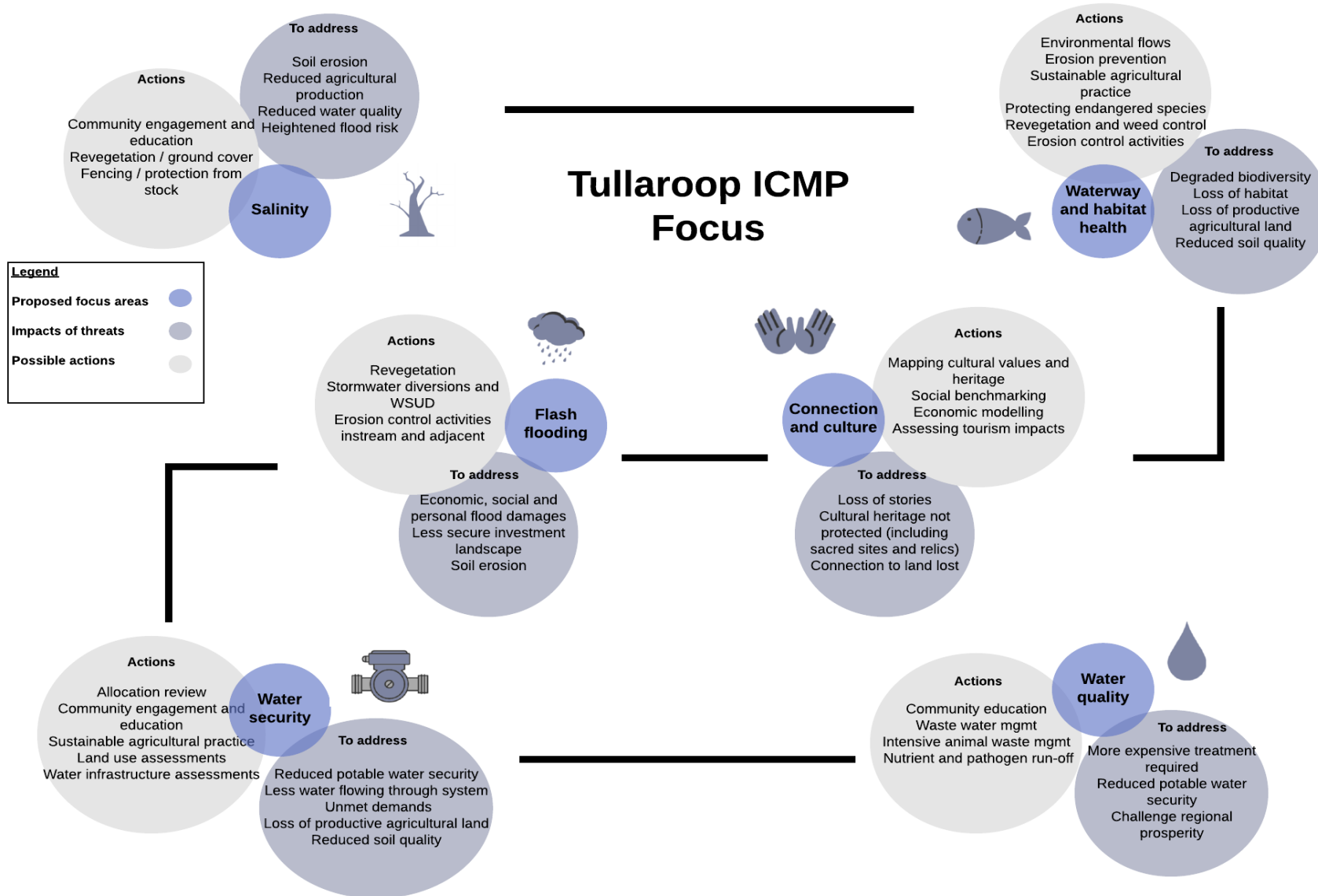


Figure 1-2: Tullaroop Integrated Catchment Management plan focus – threats, focus areas and needs

ICMP business case

The challenges identified for the Tullaroop Catchment, and actions required to respond, require a coordinated approach that does not separate land management from water management and in which various agencies and stakeholders will need to work cohesively together.

The development of an Integrated Catchment Management Plan (ICMP) offers a way to coordinate and discern where investment and resources will be best focussed; ensure all stakeholders understand their responsibilities required for successful whole-of-catchment management; clearly document actions and timeframes, and establish processes for governance and on-going monitoring and review.

There are multiple pathways in which an ICMP may be developed, from shorter timeframes with less stakeholder engagement, to longer timeframes with more extensive engagement and detailed environmental, social and economic assessment. Table 1-3 presents three options for the development of an ICMP. Based on feedback from the initial stakeholder workshops where social benchmarking, economic modelling and detailed technical assessments were identified as important foundational work, it is recommended that Option 3 be adopted for the development of a Tullaroop ICMP. This will require funding in the order of \$250,000. It is recommended that this funding be sought as a matter of priority.

Table 1-3: Development options of the ICMP

OPTION #	OPTION TYPE	COST	TIMEFRAME	GOVERNANCE	INPUTS	OUTPUTS
Option 1	Technical	\$60,000	6-9 months	<ul style="list-style-type: none"> A technical working group should provide operational insights and guidance and meet quarterly 	<ul style="list-style-type: none"> 2-3 stakeholder workshops Cost/benefit analysis Supply/demand analysis Water quality audit 	Business case Hydrology scan Community engagement summary Integrated catchment management plan Actions Roles and responsibilities Monitoring, evaluation and reporting Governance and implementation
Option 2	Technical and community	\$150,000	12 months	<ul style="list-style-type: none"> A technical working group should provide operational insights and guidance and meet quarterly A community working group convened in parallel to review key findings and provide input for local context. 	<ul style="list-style-type: none"> 3-4 stakeholder workshops 1 stakeholder validations workshop Cost/benefit analysis Water quality audit Water balance analysis Supply/demand analysis (including projections) Assess surface water impact of further dam construction Water trading option identification for long-term management Reticulated water option identification – augmented supply Reticulated water options – distribute to customers Water treatment requirements and projections Community interests scan 	Business case Hydrology report Community engagement summary Integrated catchment management plan <ul style="list-style-type: none"> Actions Roles and responsibilities Monitoring, evaluation and reporting Governance and implementation
Option 3	Detailed technical, community and economic	\$250,000	12-18 months	<ul style="list-style-type: none"> A technical working group should provide operational insights and guidance and meet quarterly A community working group convened in parallel to review key findings and provide input for local context. 	<ul style="list-style-type: none"> 3-4 stakeholder workshops 1 stakeholder validation workshop Landholder survey Cost/benefit analysis Water quality audit Water balance analysis Supply/demand analysis (including projections) Assess surface water impact of further dam construction Water trading option identification for long-term management Reticulated water option identification – augmented supply Reticulated water options – distribute to customers Water treatment requirements and projections Social benchmarking Economic modelling Tourism impact assessment Analysis of recreational use of waterways and reservoirs for fishing Analysis of recreational use of waterways and reservoirs for uses other than fishing Environmental trends analysis, impacts on flora and fauna and potential catchment management influences Pay and trade-off analysis Cultural land management review 	Business case Hydrology report Community and stakeholder values report Economic modelling report Integrated catchment management plan Actions Roles and responsibilities Monitoring, evaluation and reporting Governance and implementation

Appendix 1: Tullaroop catchment

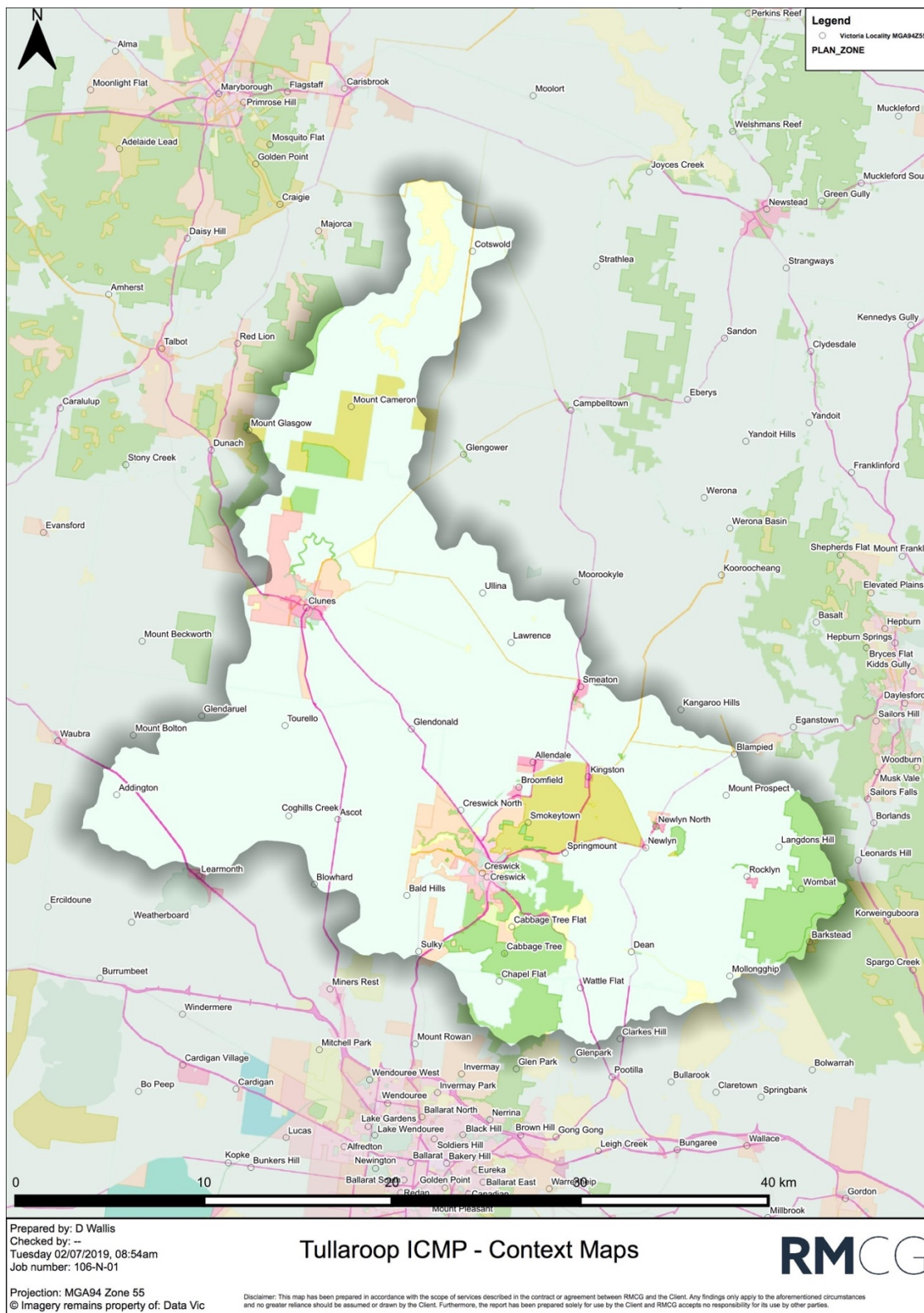


Figure A-1: Current land zoning in the Tullaroop Reservoir catchment. Light blue-green represents Farming Zone (covering the majority of the catchment), dark green, olive and yellow is Public Land, and pink and tan colours are township and rural residential areas.

Appendix 2: Indicative summary of entitlement

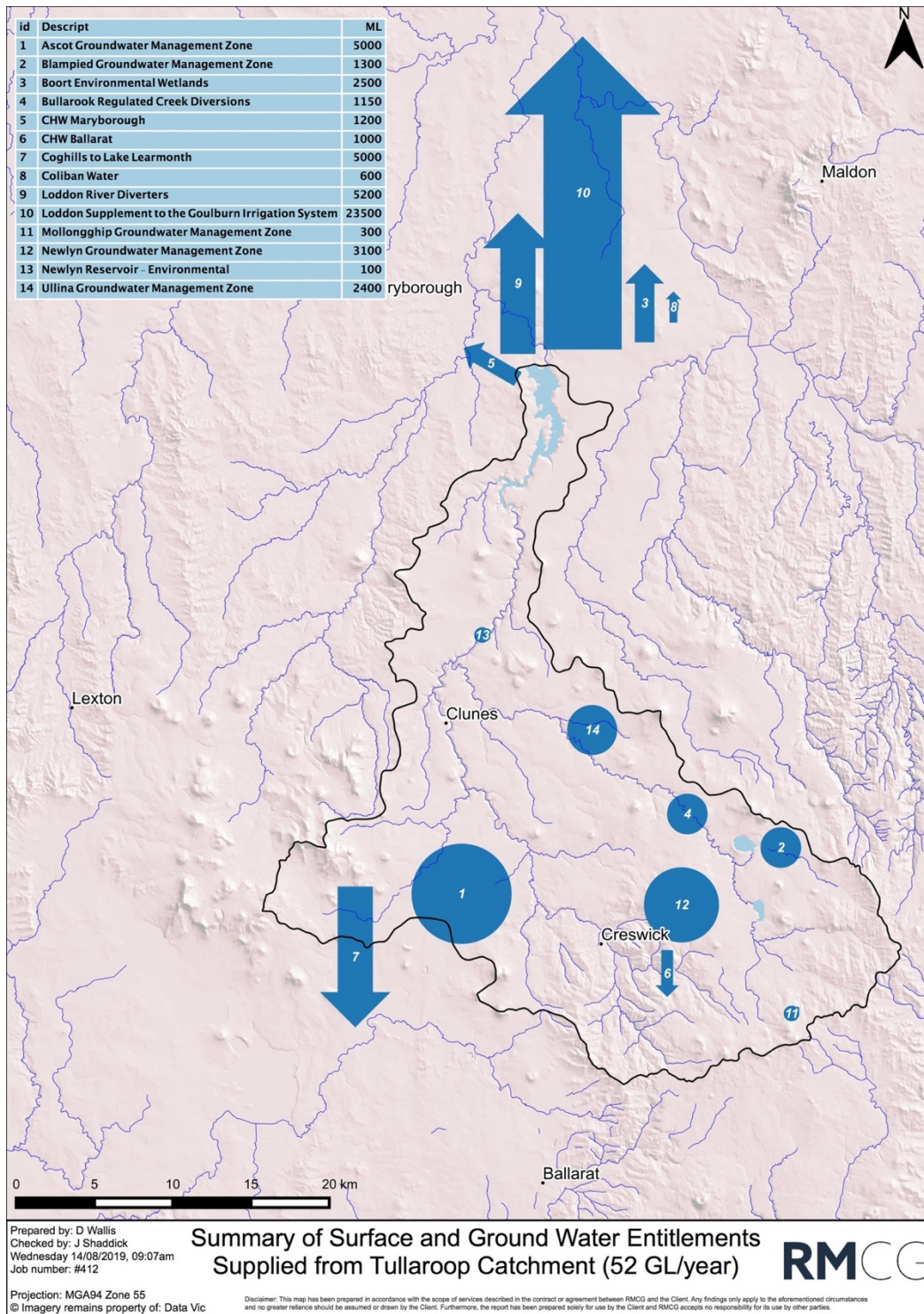


Figure A-2: Summary of entitlement⁴

⁴ There are also 184 Registered Farm Dams across the Tullaroop catchment licensed to take approximately 4.6 GL/yr

Appendix 3: Central Highlands Water groundwater pumping bores

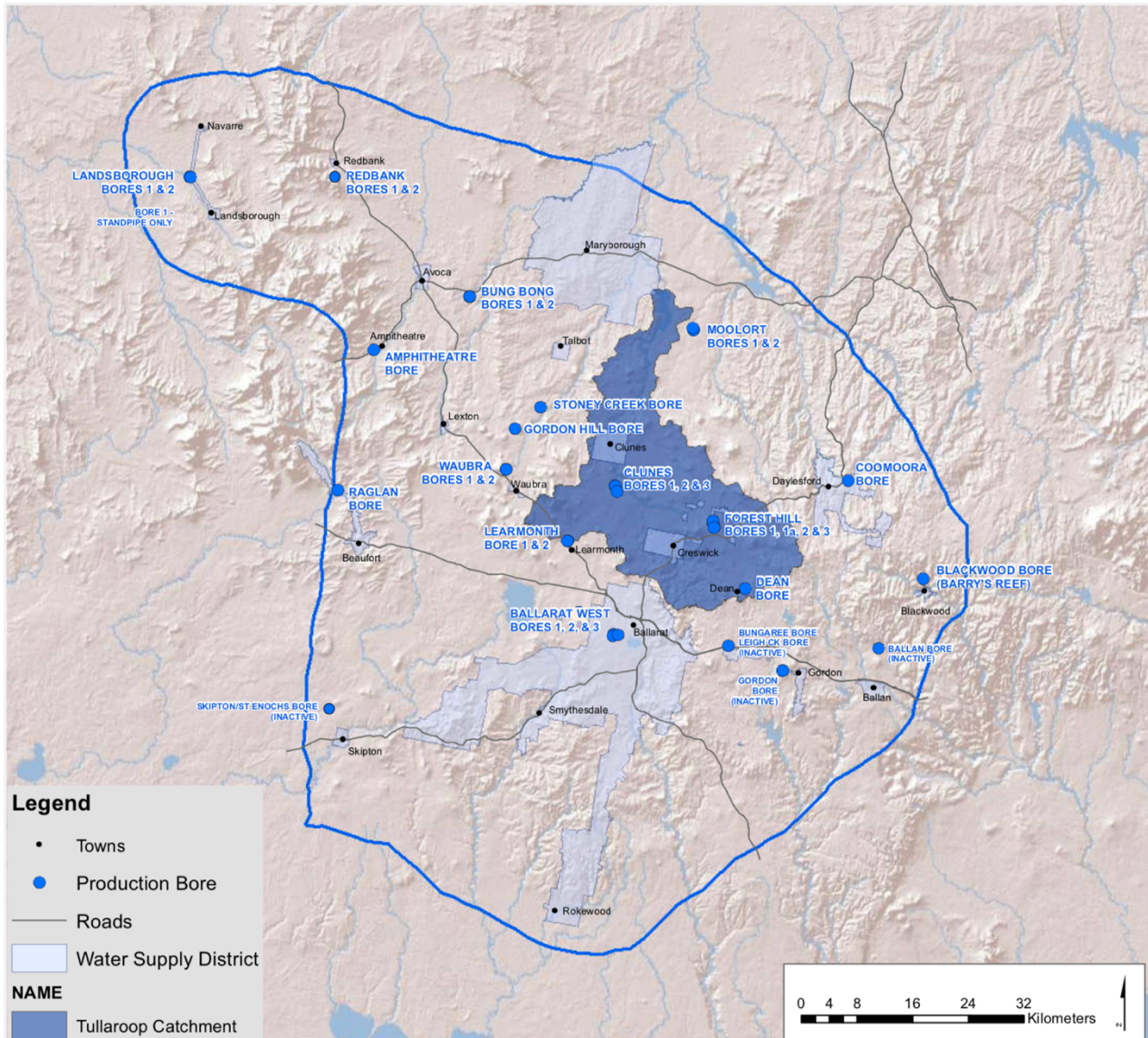


Figure A-3: Central Highlands Water. 2019. Groundwater pumping bores summary. Locations are approximate only and not intended for detailed investigations and planning.

Appendix 4: Stakeholder overview

Table A-1: Stakeholder overview

KEY STAKEHOLDERS
▪ Djandak / Dja Dja Wurrung Clans Aboriginal Corporation
▪ North Central CMA
▪ Central Highlands Water
▪ Goulburn Murray Water
▪ Department of Environment, Land, Water and Planning
▪ Parks Victoria
▪ Environment Protection Agency
▪ Forest Fire Management Victoria
▪ Victorian Fisheries Authority
▪ Agriculture Victoria
▪ Hepburn Shire Council
▪ City of Ballarat
▪ Central Goldfields Shire Council
▪ Country Fire Authority
▪ Ballarat District Anglers Association
▪ Landcare
▪ Victorian Farmers Federation
▪ Farmers / landholders
▪ Recreation groups / users
▪ Interested community members
▪ Local schools
▪ HVP Plantations
▪ Irrigation representatives
▪ Industry representatives (including potato growers)
▪ Horticulture representatives

This report has been prepared by:

RM Consulting Group Pty Ltd trading as RMCG

135 Mollison Street, Bendigo Victoria 3550

(03) 5441 4821 — rmcg.com.au — ABN 73 613 135 247

Offices in Bendigo, Melbourne, Torquay and Warragul (Victoria) and
Penguin and Hobart (Tasmania)



Key Project Contact

David Hale

0428 135 324 — davidh@rmcg.com.au

Document review and authorisation

Job Number: #0412

Doc Version	Final/Draft	Date	Author	Project Director review	BST QA review	Release approved by	Issued to
1.0	Draft	13/09/19	D. Hale	M. Shanahan	J. Longford	M. Shanahan	NCCMA
1.1	Final	09/10/19	D. Hale	M. Shanahan	J. Longford	M. Shanahan	NCCMA