West Gippsland
Catchment Management Authority

Water for wetlands

Seasonal Watering Proposal for the Lower Latrobe Wetlands 2022-23

Acknowledgement of Country

The West Gippsland Catchment Management Authority (WGCMA) would like to acknowledge and pay our respects to the Traditional Landowners and other indigenous people within the catchment area: the Gunaikurnai people.

Traditional Owner input and guidance on river objectives and values was received from GLaWAC via the Gunaikurnai Cultural Water Team.

We also recognise the contribution of Aboriginal and Torres Strait Islander people and organisations in land and natural resource management.

Cover photo: Lower Latrobe wetlands looking south from Swingbridge

Document control

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Organisation: West Gippsland Catchment Management Authority
Author(s): Adrian Clements, Tash Marty-Cripps (WGCMA) & Timothy Paton (GLaWAC)

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West Gippsland Seasonal Watering Proposal 2022-23

List of Acronyms and terms

AHD	Australian Height Datum
BoM	Bureau of Meteorology
DELWP	Department of Environment, Land, Water and Planning
EE	Environmental Entitlement
ENSO	El Niño/La Niña Southern Oscillation
EWAG	Environmental Water Advisory Group
GL	Gigalitre
LEWRI	Latrobe Environmental Water Requirements Investigation
ML	Megalitre
MW	Melbourne Water
PAG	Project Advisory Group
SRW	Southern Rural Water
VEWH	Victorian Environmental Water Holder
Water year	Year starting on the 1st of July
WGCMA	West Gippsland Catchment Management Authority

Executive Summary

The purpose of the document is to present the proposed watering actions and priorities for the Lower Latrobe Wetland environmental water entitlement (covering Dowd Morass, Heart Morass and Sale Common) entitlement for the 2022-2023 water year.

The objectives, scenarios and associated potential watering actions in this proposal take into consideration the best available ecological and natural resource management science and the long-term environmental objectives for the wetlands. Also considered are the past and forecast seasonal conditions, and ongoing environmental monitoring which inform adaptive management. Various stakeholders including landholder and community group representatives, Traditional Owners, Southern Rural Water, Parks Victoria, Field and Game Australia, and the Victorian Environmental Water Holder have been engaged during the preparation of these proposals. The risks associated with implementing the proposal have been identified through consultation with various stakeholders and appropriate mitigation strategies have been identified.

This proposal was developed along with seasonal watering proposals for the Latrobe, Thomson, and Macalister rivers in which consideration for wetland requirement are considered. This allows a landscape scale adaptive management used when managing water for the environment in West Gippsland.

Environmental Objectives

The broad, system scale objectives for lower Latrobe Wetlands are summarised in Table 1-1 Summary of the system scale environmental objectives for each environmental water entitlement:

Table 1-1 Summary of the system scale environmental objectives for each environmental water entitlement

Value	Lower Latrobe Wetlands
Birds, turtles, frogs and reptiles 	Maintain/ enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities Maintain abundance of freshwater turtle and frog populations
Vegetation 	Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species
Water quality 	Provide suitable physio-chemical conditions to support aquatic biota including Acid Sulfate Soil inundation
Critical Watering 	Provide critical watering or drawdown to avoid catastrophic conditions

Potential Watering Actions

Table 0-3 summarises the highest priority watering actions for each of the river and wetland systems for 2022-23.

Table 1-2 Summary of the highest priority watering actions for each environmental water entitlement

Flow Component	Primary Ecological Objectives
Partial fill with top ups as required (most likely in summer/Autumn	Provides conditions suitable for vegetation growth and flowering, bird breeding, foraging, and nesting
Urgent fill and urgent drawdown (anytime)	To manage unexpected or out of season events which may lead to catastrophic conditions

Risk Assessment and Management

Potential risks arising from the implementation of the 2022- 23 seasonal watering priorities were assessed and risk tables developed during the Gippsland Risk Planning Workshop in February 2022. Risks and mitigation strategies for each system are provided in section 6.

Engagement

Table 1-3 summarises the engagement that has occurred in the development of the West Gippsland Seasonal Watering Proposal for 2022-23.

Table 1-3 Partners and stakeholders engaged by West Gippsland CMA in developing seasonal watering proposals for the Latrobe River, lower Latrobe wetlands, Thomson River and Macalister River systems and other key foundation documents that have directly informed the proposals

Who	Lower Latrobe wetlands
Community groups and environment groups	**IAP2 level: Inform** • Greening Australia • Latrobe Valley Field Naturalists • Native Fish Australia
Government agencies	**IAP2 level: Collaborate** • VEWH • Parks Victoria
	IAP2 level: Consult • Gippsland Water

Who	Lower Latrobe wetlands
	IAP2 level: Inform • Department of Land, Environment, Water and Planning (Latrobe Valley Regional Water Study) • Department of Land, Environment, Water and Planning (Waterways and Catchments) • East Gippsland CMA
Landholders/ farmers	**IAP2 level: Collaborate** • Field and Game Australia (Heart Morass)
	IAP2 level: Inform • Individual landholders
Local businesses	**IAP2 level: Inform** Port of Sale Heritage River Cruises
Recreational users	**IAP2 level: Collaborate** Field and Game Australia (Dowd Morass and Sale Common)
	IAP2 level: Inform VRFish
Technical experts	
Traditional Owners	**IAP2 level: Collaborate** Gunaikurnai Land and Waters Aboriginal Corporation

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1. Introduction

This seasonal watering proposal outlines the West Gippsland Catchment Management Authority's (WGCMA) proposed priorities for use of environmental water within the Lake Wellington catchment. This is as per the requirements under section 192A of the *Water Act 1989* and is a priority of the West Gippsland Waterway Strategy (WGCMA, 2014). This proposal covers the Lower Latrobe wetlands environmental entitlement managed on behalf of the Victorian Environmental Water Holder (VEWH), by the WGCMA.

This proposal will be used by the VEWH to inform the development of the Seasonal Watering Plan 2022-23. The plan will outline the full scope of state-wide priorities for use of environmental water, including the West Gippsland catchment environmental entitlements. Environmental water in the Latrobe, Thomson and Macalister rivers will be used to protect and enhance the ecological health of their respective waterways. Where applicable, coordinated management of the three river entitlements will also be used to protect and enhance the Lower Latrobe Wetlands and the Latrobe Estuary. The extent to which this is achieved will be governed by the amount of water available and the relevant climatic scenario.

Climatic conditions and system regulation strongly influence river flows, and thereby the opportunities and need to actively manage environmental water. Flexibility is built into this proposal to enable adaptive management.

1.1 Landscape overview – Lake Wellington catchment

The Lake Wellington catchment extends from Lake Wellington to the slopes of the Great Dividing and Strzelecki Ranges. It includes almost 1.2 million hectares of land in the catchments of Latrobe, Thomson, Macalister and Avon Rivers and runs from Noojee and Warragul in the west to Stratford in the east. Lake Wellington is the most westerly of the Gippsland Lakes and forms part of the Gippsland Lakes Ramsar site, a wetland complex of international conservation significance. Three of the four major rivers in the catchment are regulated (Latrobe Thomson and Macalister rivers) and each have an environmental water entitlement. A fourth environmental water entitlement is held to divert water to the lower Latrobe wetlands (Dowd Morass, Heart Morass and Sale Common) (Figure 1-1).

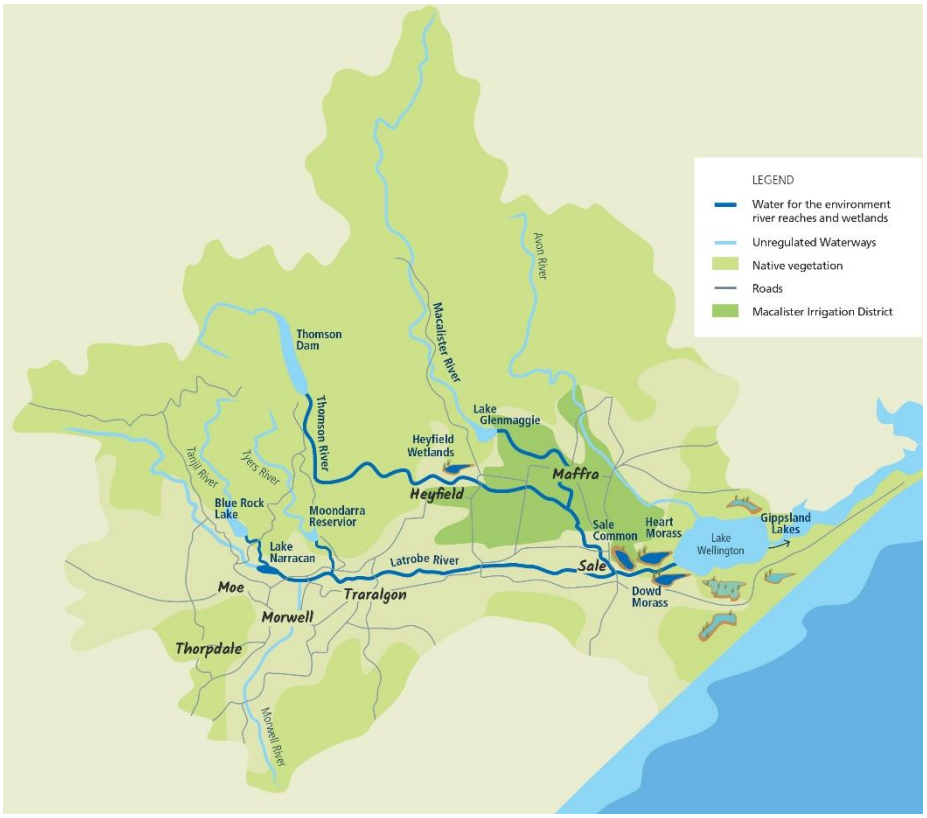


Figure 1-1 Map of the Lake Wellington Catchment, with environmental water receiving rivers and wetlands highlighted (dark blue)

The lower Latrobe wetlands are situated along the Latrobe River between its confluence with the Thomson River and Lake Wellington (Figure 1-2 and Figure 1-3) and form part of the Gippsland Lakes Ramsar Site. This includes Sale Common (230 ha) and Heart Morass (1,870 ha) on the northern floodplain, and Dowd Morass (1,500 ha) on the southern floodplain. Sale Common and Dowd Morass are wholly Crown land reserves managed by Parks Victoria (PV). Heart Morass is comprised of Crown land (managed by PV) and private land. Nearly 60% of the Heart Morass is owned by the Wetlands Environmental Taskforce Trust.

Together, the lower Latrobe wetlands provide habitat for a diverse range of water-dependent species, especially plants, waterbirds and frogs, including threatened species and communities. Individually, each wetland provides a range of ecological benefits.

Sale Common is one of only two remaining freshwater wetlands in the Gippsland Lakes system and provides sheltered feeding, breeding and resting habitat for a very diverse range

of waterbirds for its relatively small size, particularly species that prefer densely vegetated freshwater and fish/frog feeders.

Dowd Morass is a large, brackish wetland that, in the past, has supported an important rookery of colonial nesting waterbirds which can include White and Straw-necked ibis, Little Black and Little Pied cormorants, Royal Spoonbills and Great Egrets.

Heart Morass is also a large brackish wetland. Its open expanses provide shallow feeding habitat for large numbers of waterfowl including Black Swans, Eurasian Coots and numerous species of ducks, waders, and other waterbirds.

Many of the fauna that these wetlands support are threatened, including some that are listed under the State's Flora and Fauna Guarantee (FFG) Act 1988, the Commonwealth's Environment Protection and Biodiversity Conservation (EPBC) Act 1999 or international agreements (Japan-Australia Migratory Birds Agreement (JAMBA), China-Australia Migratory Birds Agreement (CAMBA) and the Bonn Convention). For example:

- Great Egret (vulnerable in Victoria, FFG, JAMBA & CAMBA)
- Intermediate Egret (critically endangered in Victoria & FFG)
- Australasian Bittern (endangered in Victoria, FFG & EPBC (endangered))
- Royal Spoonbill (vulnerable in Victoria)
- White-bellied Sea-Eagle (vulnerable in Victoria, FFG, JAMBA & CAMBA)
- Dwarf Galaxias (vulnerable in Victoria, FFG & EPBC (vulnerable))
- Green and Golden Bell Frog (EPBC (vulnerable))
- Growling Grass Frog (endangered in Victoria, FFG & EPBC (vulnerable)).

The wetlands also contain vegetation types that are threatened in the Gippsland Plain Bioregion such as:

- Swamp Scrub (endangered)
- Brackish Herbland (rare)
- Aquatic Herbland (rare).

Culturally, the lower Latrobe wetlands were an important site for the Gunaikurnai people. Dowd Morass is of high cultural significance with over thirty registered indigenous cultural heritage sites such as scarred trees, artefact scatters, earth features and shell deposits. Detailed surveys are yet to be completed at Heart Morass and Sale Common

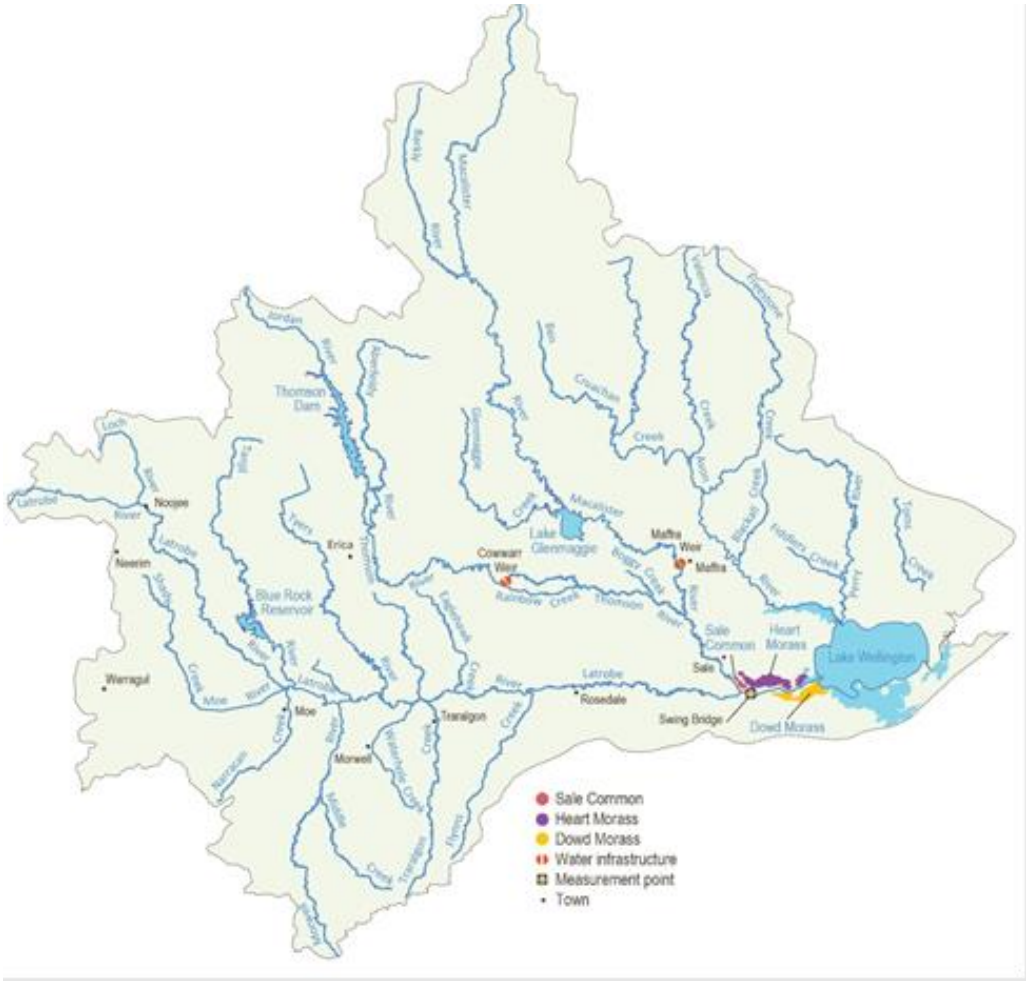


Figure 1-2 Map showing the locations of the lower Latrobe wetlands within the West Gippsland Catchment.

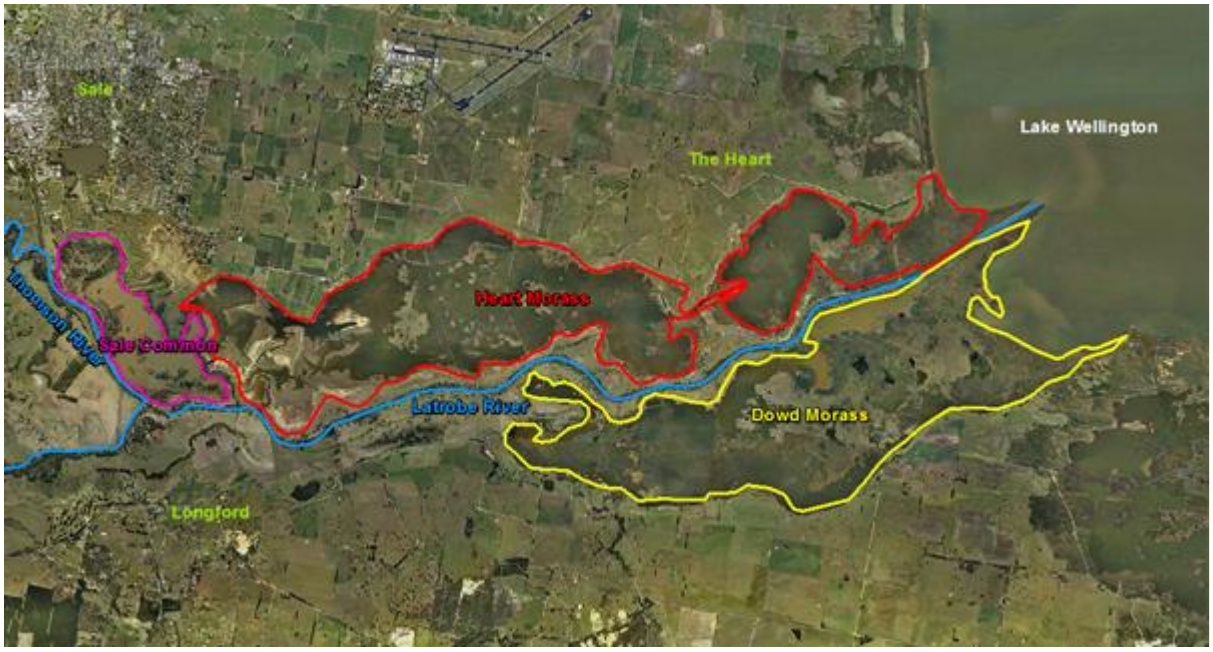


Figure 1-3 Satellite image showing the extent of Dowd Morass, Heart Morass and Sale common.

1.2 Gunaikurnai watering objectives and vision for the Lower Latrobe wetlands

The following information has been provided by the Gunaikurnai Land and Waters Aboriginal Corporation, for the purpose of informing the seasonal watering proposal and outlining some key cultural objectives.

1.2.1 Watering objectives

The Lower Latrobe Wetlands are a place of spiritual and cultural connection for the Gunaikurnai people. Over many thousands of years, custom and lore has been passed orally from generation to generation on the cultural values and uses of the wetlands, and their importance to all Gunaikurnai people. The Brayakaulung clan of the Gunaikurnai owned the country comprising the Lake Wellington catchment including the lower Latrobe wetlands.

The overarching objective for the wetlands is to provide and maintain Gunaikurnai cultural values of healthy Country. Healthy Country includes the importance of place and the health of the entire ecosystem, such as water quality, controlling pest species, maintaining a natural, seasonal flow regime and overbank flood events. The concept of healthy Country includes the practices of only taking what you need and moving seasonally.

Environmental watering objectives for the lower Latrobe wetlands should maintain a cultural lens with a cultural landscape approach, and a focus on cultural values dependent or threatened by water impacts.

Keystone species

The following is a list of some of the keystone species important to the Gunaikurnai, however it should be noted that the health of all native flora and fauna are important and should be considered in planning for environmental water

- *Boran (Pelican) and Tuk (Musk Duck)* are significant totem species as highlighted in the Mother and Father song line within the Gunaikurnai creation story. If Boran and Tuk are living and breeding there, it is a sign Country is healthy. If they are not present, flows should be provided to promote required habitat/ecosystem services and Boran and Tuk will return.
- *Yeerung and Djeetgun (Fairy wren)* are also a totem species. While they are not considered water dependent and environmental flows may not directly support them, a diversity of flows supporting shrubs and riparian vegetation will provide habitat for fairy wren. For example, when flooding inundates wetlands, bush birds (including Yeerung and Djeetgun and other species) are known to increase in abundance and diversity (Parkinson et al. 2002; Baxter et al 2005; Ballinger and Lake 2006).
- *Other Birds* are important for Woorngan (hunting) / food, including Nalbong (water hens colloquially known as Bush Chooks, Gidai (black swans) and Boyangs (eggs), and Koortgan (ducks except Tuk, musk duck). Gidai (swans) require submerged and softer emergent vegetation to make nest mounds. The nest is placed either on a small island or floated in deeper water. Gidai breed in late winter to early spring following water level increases. Objectives which produce filling of the large wetlands and support the growth of Loombrak (water ribbon) and submerged aquatic plants will support Gidai (Pringle 1985). Ensuring the lower wetlands and floodplain depressions (e.g., billabongs) receive freshwater flows in Winter / Spring will provide the conditions for submerged and emergent aquatic plants to grow and provide the food and nesting materials for the water birds (Alluvium 2020).

- *Fish* flows should be considered within natural cycles of events that prove reproduction. Early accounts from eastern Victoria describe a range of Aboriginal fishing practices including netting, spear fishing, trapping and opportunistic harvesting, with live storage pens also utilised (Clark 2002). Gippsland Perch / Bass were an abundant staple resources for thousands of years before they were out resourced by invasive species (carp). They were an endemic species to Gippsland. They have been fished for and cooked for a year-round freshwater diet, a freshwater diet is necessary and historically people with a freshwater diet of plants, fish and eels were healthier and had healthier bone structure

1.2.2 Vision

The following highlights other key issues and values provided by GLaWAC, providing an indication of the importance of the wetlands in a broader context than environmental values alone and, starting to articulate a vision for Country aligning with GLaWAC Whole of Country plan.

Healthy Country

Healthy Country is determined by Traditional Owners, knowing Country, and traveling Country. Country that is healthy will reflect the spiritual and cultural values of its Traditional Owner custodians. Healthy Country also contributes to wellbeing values for Traditional Owners.

Water access

Access to water is crucial for many cultural values, including identified identity and relational values, future economic values, place values and many others. Access to water – through ownership or management - means water being made available to Gunaikurnai people on the Latrobe system and the Thomson system that provide fresh water to the wetlands.

While the Lower Latrobe Wetlands were once a freshwater system, the system has been fundamentally changed since the opening of the Gippsland Lakes. This is acknowledged in the Ramsar objectives. Every effort should be made to maintain fresh water dependent values, which in turn deliver cultural values

Cultural and economic use

Returning to Cultural Practices and aboriginal informed management is key for development of the Lower Latrobe Wetlands in returning to a more freshwater habitat for cultural uses and cultural species. It will also provide for opportunities such as water-based tourism, cultural education and ecotourism (camping experiences)

Connection

Continual connection to Country was determined in the Native Title Settlement decision 2010. GLaWAC takes its responsibility very seriously to work closely with the people it represents on management decisions concerning Country and health of Country. Gunaikurnai cultural obligations reflect the Gunaikurnai Community's views on healthy Country and in turn, help Traditional Owners continue their ongoing connection to the land and waters of Country.

Quarenook - Meeting Place is an important value. This includes lifestyle, family, storytelling, camping values as well as hunting, tool making and food / materials and providing fresh fish. These wetlands are an important Quarenook, including the rookery at Dowd Morass, Gidai

(Black Swan) nesting at Sale Common and Heart Morass as well as Canoe Scar Trees. (Alluvium 2020)

Climate change

The Gunaikurnai Traditional Owners have cared for Country for thousands upon thousands of years, through many cycles of climatic change, and understand how to manage the landscape as it too changes. When cared for using traditional knowledge, Country can be healed.

Resources and water access should be made available to Traditional Owners to help realise self-determined objectives for healthy Country. Mitigation of climate change factors impacting the Lakes system, river systems and waterways at the lower latrobe wetlands can be effective with resources and empowerment provided to Traditional Owners.

Salinity, water users, agriculture and mining impacts should be considered through cumulative impact statements that should be developed for these wetlands and made available for Traditional owners to evaluate for healthy Country and future changes to the ecosystem. Each water use should have a cumulative impact statement.

1.3 Climate review and Climate outlook

1.3.1 Climate review

Gippsland rainfall for 2021 was 50% above average, with particularly heavy rain and widespread flooding in June and November. This continued the trend set by 2020-21 which was the coolest and wettest for Australia since 2016, generating above average streamflow across Victoria.

In West Gippsland, the wet winter was reflected in above average rainfall across the eastern catchments of the region (see Figure 4).

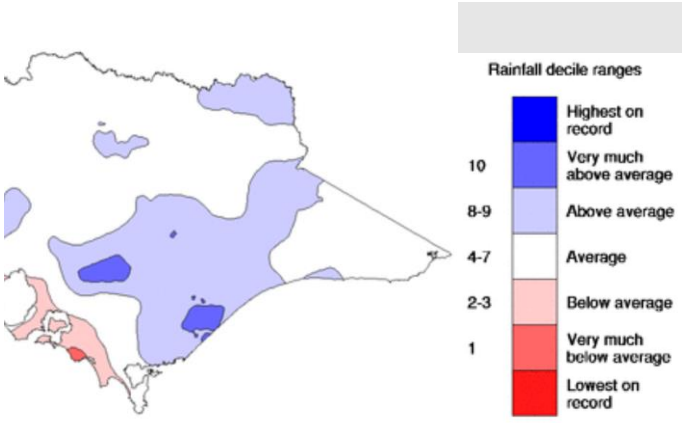


Figure 4: West Gippsland rainfall deciles from 1 June to 31st August 2021, showing above average rainfall across the eastern end of West Gippsland (Source: BoM Victoria in Winter 2021 (bom.gov.au)

During June 2021, an East Coast low developed off the coast of NSW and Victoria and produced heavy rainfall over a 24-hour period from 9th June - 10th June. As the catchments in the rainfall area were already relatively wet, this produced a significant flood event with minor to major flood warnings issued by the BoM across the region, impacting the catchments of the Latrobe, Macalister and Thomson rivers (Table 1). The largest rainfalls occurred at the higher altitudes of the Strzelecki and Baw Baw Ranges, with the Baw Baw weather station recording the highest June daily rainfall on record which is more than 100-

year ARI. This rainfall varied with the Traralgon EPA gauge and the Sale weather station, lower in the catchment, recording a 2-to-5-year ARI.

Table 1: *A sample of water level recordings in the Latrobe, Macalister and Thomson catchments, from June 10th 2021.*

Waterway	Gauge	Height	ML/day	Flood Class Level	ARI
Traralgon Creek	Traralgon	5.76	16,500	Major	50
Morwell River	Boolarra	5.1		Moderate	20-50
Tanjil River	Tanjil Junction	5.72	25,085	Major	17
Latrobe River	Willow Grove	4.7	19,240	Minor	50
	Thoms bridge	6.39	86,134	Moderate	50
Traralgon Creek	Traralgon	5.76	16,500	Major	50
Macalister River	Licola	4.2	42,200	Major	32
Thomson River	Wandocka	6.89	45,009	Major	8
	Upstream of Cowwarr weir	7.6	73,931	Major	30

(Ref: Rainfall and Flood Magnitude Summary, WGCMA 2021)

West Gippsland also saw higher than average spring rainfall, with some portions of the region (e.g. Traralgon EPA station) showing the highest rainfall on record (see figure below). Higher in the catchment, Mount Baw Baw was the wettest place in Victoria this season. This above-average rainfall was due to a developing La Niña in the Pacific Ocean among other factors. It was the wettest November on record for Australia as a whole.

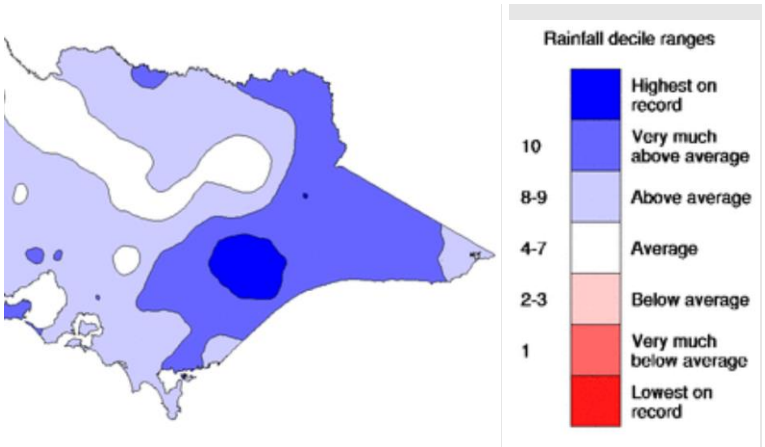


Image above: West Gippsland rainfall deciles from 1 September to 30th November 2021 (Source: BoM Victoria in Spring 2021 (bom.gov.au))

These natural rain events across Winter and Spring naturally flushed the Latrobe, Macalister and Thomson rivers and allowed them to retain high flows throughout the year. River and overland flows provided full inundation to Sale Common, Heart Morass and Dowd Morass, with no water for the environment being delivered to the Lower Latrobe wetlands in 2021.

1.3.2 2022-23 Climate Outlook

Available forecast information from the Bureau of Meteorology (BoM) indicates that while La Nina is still active, there are signs that it will return to neutral conditions in mid-Autumn 2022. Predictions indicate that there is an increased chance of the unusually high rainfall continuing into May for southern Victoria (Figure 5) and the streamflow outlook for February – April indicates that high flows will continue across South-eastern Australia.

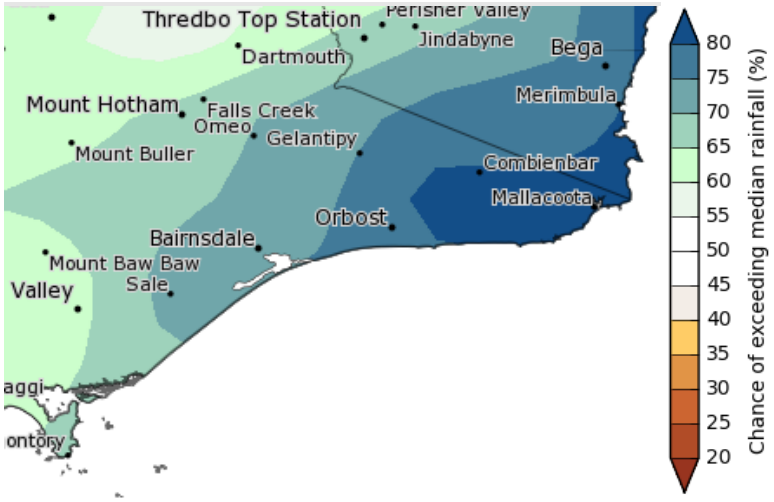


Figure 5: Chance of above median rainfall for March to May 2022. (Source: BoM [Rainfall - The chance of above median for March to May - Climate Outlooks (bom.gov.au))]

2 Seasonal watering proposal

The following section provides details for the lower Latrobe wetlands 2022-23 proposed watering actions.

2.1 Environmental objectives

Objectives for environmental flows in 2022-23 are derived from the Latrobe Environmental Water Requirements Investigation (LEWRI) (Alluvium, 2019).

The objectives set reflect the environmental values of the Latrobe system considered important by both waterway managers and the community. Objectives were determined in the context of the current water resource management, likely environmental conditions, including the likely trajectory of the system over the next 50 years, and the social and economic values of the region. In any given year the level at which an objective can be met will vary depending on the extant weather and climate conditions. For this reason, the goals for environmental water management (wetting and drying) for each of the four climactic conditions used in this proposal are as follows:

- Drought — **Protect** high priority environmental assets, key functions and priority refuges to ensure chance of future recovery and avoid catastrophic events such as saltwater inundation of ASS activation,
- Dry — **Maintain** high priority environmental assets, key functions and priority refuges to ensure chance of future recovery and avoid catastrophic events such as saltwater inundation of ASS activation,
- Average — **Recover** by improving ecological health and resilience and enhance recruitment opportunities for key flora and fauna,
- Wet — **Enhance** by maximising recruitment opportunities for flora and fauna species.

Table 2-1 shows the overarching environmental objectives for the wetting and drying of the lower Latrobe wetlands. The specific values and functions achieved addressing each objective with the wetting/drying actions are shown in Alluvium (2020).

Table 2-1 Overarching environmental objectives for the lower Latrobe Wetlands (adapted from Alluvium, 2020).

Symbol	Environmental objective
	Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species
	Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities
	Maintain abundance of freshwater turtle populations
	Maintain abundance of frog populations
	Provide suitable physio-chemical conditions to support aquatic biota including Acid Sulfate Soil inundation

	Provide critical watering or drawdown to avoid catastrophic conditions

2.2 Wetting/drying requirements

2.2.1 Watering components

Table 2-2 summarises functional objectives for the three main watering components for the lower Latrobe wetlands. These components are used to describe the wetting and drying recommendations in section 2.2.2.

Table 2-2 Summary of functional objectives for each watering component for the lower Latrobe wetlands.

Watering component	Objective
Fill/partial fill	inundation event or events sufficient to fill or partially fill the wetland, typically aimed at supporting waterbird or fish breeding as well as inundating aquatic and semi-aquatic vegetation
Drawdown	a period of receding water levels resulting in large areas of the wetland surface drying out. Allowing soil to oxygenate and terrestrial vegetation to set seed
Flushing flow	inflow sufficient to push water into and out of the wetland and fill it. Typically allowing for import and export of nutrients and dissolved organic carbon

2.2.2 Wetting-drying recommendations

The water levels, timing, duration and frequency outlined in the wetting and drying recommendations are derived from objectives, using conceptual models as described in the Latrobe Environmental Water Requirements Investigation (Alluvium, 2020c).

Flushing flows are currently undeliverable flow components at Dowd Morass and Sale Common due to limitations of infrastructure. Partial flushing flows are achievable at Heart Morass, however, outflows from the wetland are affected by river heights at the outflow regulator limiting the volume of water which can be returned to the river.

2.3 Scenario planning and prioritisation

2.3.1 Observations

After two consecutive wetter than average years, the lower Latrobe wetlands have received their first full flushing flows since 2010/11. Water quality and vegetation responses are showing signs of improved ecological condition. Inundation extent can be seen in the following aerial photographs taken at the Lower Latrobe wetlands during July and December 2021 (Figure 6 and 7).

Figure 6: Sale Common, July 2021

Figure 7: Sale Common, December 2021

Flooding throughout the year has seen the salinity level in Lake Wellington drop to the lowest recorded sine 2004 with the last significant freshening occurring after flooding in 2011-12 (Figure 8). The condition of Lake Wellington gives an indication of the condition of the wetlands fringing the lake (including the lower Latrobe wetlands) and the significance of the flooding experienced.

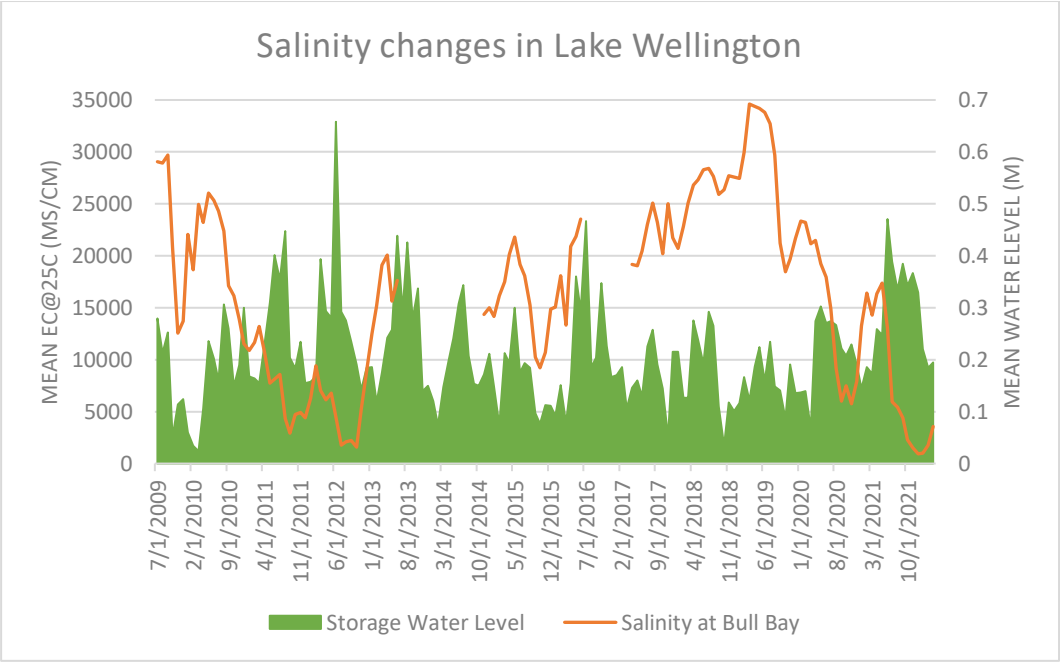


Figure 8: Salinity and water level fluctuations at Bull Bay, Lake Wellington from 2009 to present.

The flows over the past year have created the perfect conditions in the Latrobe estuary for fish breeding with commercial eel Fishers in the area observing Estuary perch *(Macquaria*

colonorum) and Australian Bass *(Macquaria novemaculeata)* recruitment at a scale that many have never seen before. As Estuary Perch only breed around every 10 years, this is a special event (Rob Caune, VR Fish).

At Heart Morass, previous efforts to reduce the salinity in the wetlands have primed the wetland to respond to the floods with freshwater dependent vegetation, such as *Vallisneria australis*, establishing in large areas across the wetland (Figure X) to levels not seen for 30 years (G Howard, FGA).

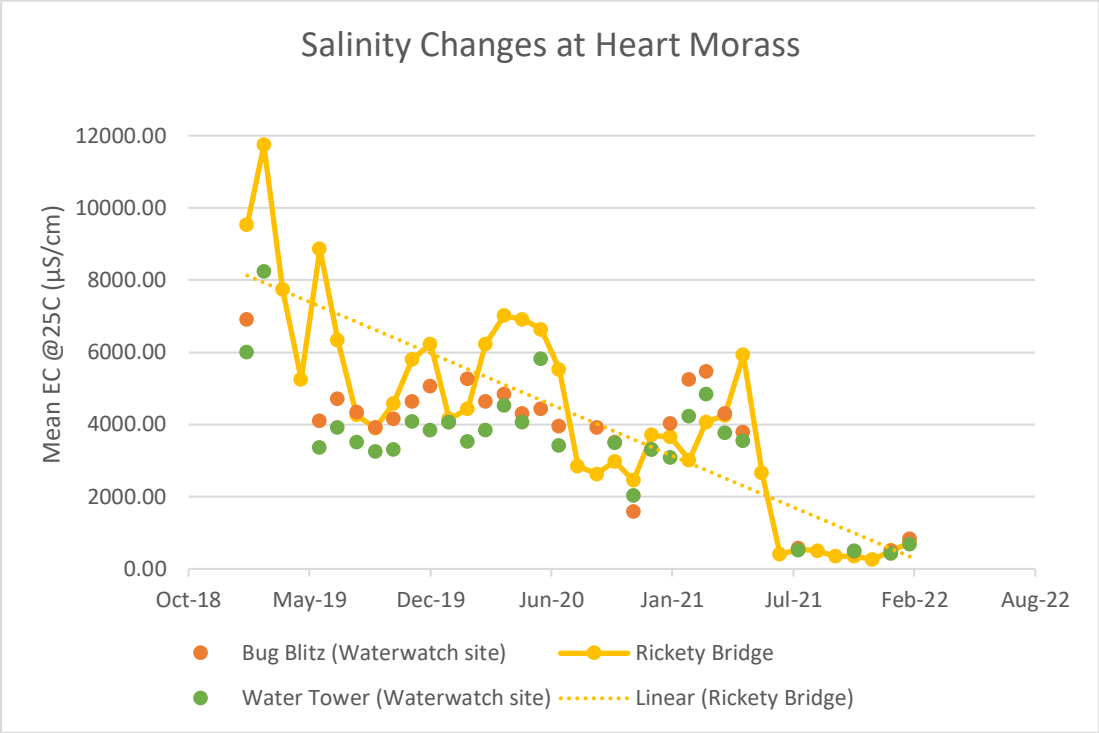


Figure 9: Electrical conductivity (salinity) at Heart morass from 2018 to 2022

Figure 10: *Vallisneria australis* at Heart Morass, December 2021.

The conditions have also been conducive with frog reproduction, with the Green and Golden Bell Frog *Litoria aurea* recorded breeding and successfully reproducing in Heart Morass for the first time (Figure 11).

Figure 11: Breeding *Litoria aurea* at lower Heart Morass (left image) and *Litoria aurea* metamorph at lower Heart Morass (right image).

Bird life has also been abundant across the Lower Latrobe wetlands with Spoonbills and Cormorants observed nesting in Sale Common. Birdlife Australia surveys reported the presence of colonial water birds such as, Little Pied Cormorant (*Microcarbo melanoleucos*), Little Black Cormorant (*Phalacrocorax sulcirostris*), Royal Spoonbill (*Platalea regia*) and Yellow-billed Spoonbill (*Platalea flavipes*) in Sale Common since June 2021. Musk ducks *(Biziura lobata)* have also been observed across several of the Lower Latrobe wetlands which is a culturally significant species the Gunaikurnai.

A large-scale breeding event was detected in Dowd Morass (March 2022), with evidence of >300 nests, attributed to Royal Spoonbills, Little Black Cormorants, Pied Cormorants and Australasian Darter (Figure 12). This is significant as it is the largest breeding event since the 2010-11floods.

Figure 12: Colonial waterbird breeding at Dowd Morass

2.3.2 Provision of wetting/drying recommendations

The table below outlines the historical water regime which has been provided to the three Lower Latrobe wetlands over the past twelve years. As can be seen, all wetlands over the past year have received natural fills and flushing flows. The last time this was achieved was in the 2010-11 water year.

Table 2-3 Historical achievement of water regime recommendations at Dowd Morass, Heart Morass and Sale Common.

Water regime component	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Dowd Morass													
Fill/partial fill	N	N	A/N	N	N	N	A/N	A	A	A/N	A/N	A/N	N
Flushing flow		N	N	N			N			N	N	N	N
Drawdown			N	N	N	N	A/N	N	N	N	N	N	
Heart Morass													
Fil/partial fill	N	N	N	N	N		A/N	A	A	A	A	A	N
Flushing flow		N	N	N			N		A	A	A	A	N
Drawdown			N	N	N	N	N	N	N	N	N	N	
Sale Common													
Fil/partial fill	N	N	A/N	N	N		A/N	A	A	A	A	A	N
Flushing flow		N	N										N
Drawdown			N	N	N	N	N	N	N	N	N	N	

Key to table

Blank cells = no data; N=provided naturally; A = provided through active management.

	No significant part of the water regime component provided naturally or through active management
	Water regime component partially provided
	Water regime component completely provided

2.3.3 Potential watering actions

Potential watering actions for 2022-23 are focused on enhancing the achievements of 2021-22, protecting high priority environmental assets as well as protecting key ecohydrological functions and high priority refuges. The watering actions are also aimed at preventing catastrophic reduction in water quality resulting in vegetation die off and acid events caused by drying and rewetting acid sulfate soils. Each of the wetlands have experienced recent extensive drying, it is important to capitalise on the natural filling experienced this year and maintain wetland vegetation and habitat for endangered and colonial waterbirds and other fauna such as Growling Grass frog. Potential watering actions for 2022-23 are shown in Table 2-4 (Dowd Morass), Table 2-5 (Heart Morass), and Table 2-6 (Sale Common)

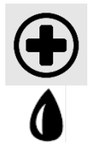
Gunaikurnai Dowd Morass event(s)

Opportunities to enhance environmental watering with Traditional Owner outcomes continue to be explored for the Lower Latrobe Wetlands. Through engagement with the Gunaikurnai Lands and Water Aboriginal Corporation (GLAWAC), WGCMA and GLaWAC have agreed to pursue a Gunaikurnai Cultural event/meeting at Dowd Morass. The overarching purpose of the event is to reconnect people with Country. The event may include but not limited to; demonstrations of cultural practices and various ecological survey techniques as well as a watering action (as proposed in the 2020-21 seasonal watering proposal). The timing of the event(s) is to be determined but will at a time of cultural significance to the Gunaikurnai people.

The watering action may involve pumping water from the Latrobe River into the western end of the wetland. Operation of the existing infrastructure will complement the intended outcome of the watering and monitoring of water quality will be conducted before during and after the event.

Preliminary estimated cost of one Cultural event (including one water pumping event) is $30,000 to $50,000 depending on the condition of the wetland at the time of them event. Appropriate works approvals, cultural heritage approvals and risk assessments will be completed in partnership with interested parties (Parks Victoria, GLaWAC and the VEWH).

Table 2-4 Dowd Morass prioritised potential watering actions for 2022-23.

Potential Watering Action	***Expected Watering Effects***	***Environmental Objectives***		***2022-23 Rationale***	***Priority (H/M/L)***
Top-up (anytime) following bird breeding event If required)	• Prolong wetting of reed beds to maintain habitat and food resources for nesting waterbirds and protect chicks from predators		Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities	In the event of bird breeding, water should be provided to maintain habitat and food to support the breeding event and fledging. This action is a high priority given the colonial bird breeding event observed in Dowd Morass in 2021-22 which may reoccur in 2022-23	H
Fill with top ups as required to manage salinity (anytime)	• Dilute salt concentrations within the wetland that may be caused by king tides from Lake Wellington (likely occurring between March to May) or other sources		Provide critical watering or drawdown to avoid catastrophic conditions Provide suitable physio-chemical conditions to support aquatic biota including Acid Sulfate Soil inundation	This watering action is likely to be triggered if electrical conductivity is rising and reaches 7,000 µS/cm	H
Partial fill with top ups as required to maintain a minimum water depth 0.3 m AHD (April-December)	• Provide seasonal variation in water depth throughout the wetland to support the growth and flowering of semi-aquatic plants • Wet vegetation and soils at middle elevations within the wetland to increase the abundance of water bugs and other food resources for frogs, turtles and waterbirds • Provide connectivity between the river and wetlands and between wetlands, increasing available habitat for frogs and turtles • Support bird breeding (when delivered in spring/early summer following earlier fill) by maintaining wetted habitat around reed beds		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Ten partial fills over ten years are the long term frequency recommendations for Dowd Morass. This watering action, along with the partial drawdown will help maintain the wetland ecosystem after a wet 2019-22.	H
			Maintain abundance of freshwater turtle populations		
			Maintain abundance of frog populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Fill with top-ups as required to maintain a minimum water depth of 0.6 m AHD (August-November)	• Reduce salt water incursion from Lake Wellington • Wet reed beds and deep water next to reedbeds to provide waterbird nesting habitat and to stimulate bird breeding • Wet high-elevation banks and streamside zone to support vegetation growth, creating nesting habitat for waterbirds • Wet vegetation and soils at higher elevations to stimulate ecosystem productivity and increase the abundance of water bugs and other food resources for frogs, turtles, and waterbirds • Provide connectivity between the river and wetlands and between wetlands, increasing available habitat for frogs and turtles		Provide critical watering or drawdown to avoid catastrophic conditions	This watering action has a low priority as it was met in the last two years. It still remains a priority as it is recommended to occur six times in every ten years.	L
			Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species		
			Maintain abundance of freshwater turtle populations		
			Maintain abundance of frog populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Partial drawdown (0 m to -0.1 m AHD (January-March)	• Oxygenation of sediment for aquatic vegetation germination and recruitment		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Partial drawdowns are recommended to occur two to five times over ten years. It is likely to occur naturally through evaporation.	M

Potential Watering Action	*Expected Watering Effects*	*Environmental Objectives*		*2022-23 Rationale*	*Priority (H/M/L)*
	• Provide water level fluctuations for emergent vegetation reproduction and expansion (particularly Swamp Scrub and Tall Marsh) • Breakdown organic matter and promote nutrient cycling • Additional function supported: Minimise European Carp (reduce habitat)				

Table 2-5 Heart Morass prioritised potential watering actions for 2022-23

Potential Watering Action	Expected Watering Effects	Environmental Objectives		2022-23 Rationale	Priority (H/M/L)
Top ups as required to maintain a minimum water height of -0.3 AHD (anytime)	• Minimise acid sulphate soil risk by keeping high risk areas inundated		Provide suitable physio-chemical conditions to support aquatic biota including Acid Sulfate Soil inundation	This watering action is required in order to minimise the risk of exposing acid sulfate soils to the air. Given the wet conditions over the last 12-14 months it is unlikely the wetland will drawdown this low. However, the significant environmental consequences if it was to occur sees this action remain a high priority.	H
			Provide critical watering or drawdown to avoid catastrophic conditions		
Top-up (anytime) following bird breeding event if required)	• Prolong wetting of reed beds to maintain habitat and food resources for nesting waterbirds and protect chicks from predators		Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities	In the event of bird breeding, water should be provided to maintain habitat and food to support the breeding event and fledging. This action is a high priority given the colonial bird breeding event observed in Dowd Morass in 2021-22 which may reoccur in 2022-23	H
Partial fill with top ups as required to maintain a minimum water depth 0.3 m AHD (August-December)	• Encourage growth and flowering of submerged and emergent vegetation • Provided habitat for frogs and turtles • Provide conditions that support macroinvertebrate and zooplankton communities, and food resources for waterbirds • Additional functions supported: Macroinvertebrate populations expand, and Fish grow		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Ten partial fills over ten years are the longer term frequency recommendations for Heart Morass. This watering action, along with the partial drawdown will help maintain the wetland ecosystem after a wet 2019-22.	H
			Maintain abundance of frog populations		
			Maintain abundance of freshwater turtle populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Fill with top-ups as required to maintain a minimum water depth of 0.5 m AHD (August – November)	• Inundate fringing vegetation reproduction water bird habitat and foraging and terrestrial avian species foraging • Provide connectivity and support food sources for frogs and Turtles , and support nesting for turtles • Inundate fringing wetland vegetation E.g. Floodplain Riparian Woodland (EVC 56) • Allow macroinvertebrate populations to expand, stimulate fish growth and breeding		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	This watering action has a low priority as it was met last year. It still remains a priority as it is recommended to occur six times in every ten years.	L
			Maintain abundance of frog populations		
			Maintain abundance of freshwater turtle populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Partial flushing flow (July – November) (combination or fill and drawdown actions	• Export sulfides and salt		Provide suitable physio-chemical conditions to support aquatic biota including Acid Sulfate Soil inundation	Outcomes from previous years suggest this watering action is contributing to the overall decline in salinity and increase in pH. We will continue to provide these flows if the conditions allow. However, significant flushing has occurred because of major floods, lowering the priority of this action	L
Partial drawdown (-0.3 m AHD (January- March)	• Oxygenation of sediment for aquatic vegetation germination and recruitment • Provide water level fluctuations for emergent vegetation reproduction and expansion		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Partial drawdowns are recommended to occur five times over ten years. It is likely to occur naturally through evaporation.	L

Potential Watering Action	Expected Watering Effects	Environmental Objectives		2022-23 Rationale	Priority (H/M/L)
	(particularly Swamp Scrub and Tall Marsh) • Breakdown organic matter and promote nutrient cycling • Additional function supported: Minimise European Carp (reduce habitat)				

Table 2-6 Sale Common prioritised potential watering actions for 2022-23.

Potential Watering Action	*Expected Watering Effects*	*Environmental Objectives*		*2022-23 Rationale*	*Priority (H/M/L)*
Partial fill with top ups as required to maintain a minimum water height of 0.3 AHD (July to December)	• Encourage growth and flowering of submerged and emergent vegetation • Provided habitat for frogs and turtles • Provide conditions that support macroinvertebrate and zooplankton communities, and food resources for waterbirds • Additional functions supported: Macroinvertebrate populations expand, and Fish grow		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Ten partial fills over ten years are the longer term frequency recommendations for Sale Common. This watering action, along with the partial drawdown will help maintain the wetland ecosystem after a wet 2019-22.	H
			Maintain abundance of frog populations		
			Maintain abundance of freshwater turtle populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Fill with top ups as required to maintain a minimum water height of 0.4 AHD (August to November) for at least 2 months	• Encourage growth and flowering of submerged and emergent vegetation • Inundate fringing wetland vegetation • Provide food source and connectivity for frogs • Provide food source and nesting opportunities for turtles • Support breeding and provide food source for waterbirds and other threatened fauna • Support terrestrial and water bird foraging by Inundate fringing vegetation • Provide conditions that support macroinvertebrate and zooplankton communities, and food resources for waterbirds • Additional functions supported: Macroinvertebrate populations expand, and Fish grow and stimulated to breed		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Given the wet conditions observed over the last 12-24 months, maintaining a fill is a medium priority for 2022-23 as the majority of objective related to this action have been met.	M
			Maintain abundance of frog populations		
			Maintain abundance of freshwater turtle populations		
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		
Top-up (anytime) following bird breeding event if required)	• Prolong wetting of reed beds to maintain habitat and food resources for nesting waterbirds and protect chicks from predators		Maintain or restore condition and diversity of aquatic, fringing, and riparian vegetation, and reduce extent of invasive plant species	In the event of bird breeding, water should be provided to maintain habitat and food to support the breeding event and fledging. This action is a high priority given the colonial bird breeding event observed in Dowd Morass in 2021-22 which may reoccur in 2022-23	H
			Maintain or enhance waterbird and threatened fauna breeding, recruitment, foraging and nesting/sheltering opportunities		

Potential Watering Action	***Expected Watering Effects***	***Environmental Objectives***		***2022-23 Rationale***	***Priority (H/M/L)***
Fill/top-up as required to 0.5 AHD (December – January) to drown out and prolong inundation of invasive vegetation	• Discourage undesirable/invasive plant species		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	If warm dry conditions prevail and wetland water levels drop, Giant rush are likely to proliferate. It will be important to provide adequate depth to reduce the extent of giant rush throughout the wetland.	H
Partial drawdown to -0.2 m AHD (December - March)	• Oxygenation of sediment for aquatic vegetation germination and recruitment • Provide water level fluctuations for emergent vegetation reproduction and expansion (particularly Swamp Scrub and Tall Marsh) • Breakdown organic matter and promote nutrient cycling • Additional function supported: Minimise European Carp (reduce habitat)		Maintain or restore condition and diversity of aquatic, fringing and riparian vegetation, and reduce extent of invasive plant species	Partial drawdowns are recommended to occur ten times over ten years. It is likely to occur naturally through evaporation. If wet condition prevail through 2022-23, the watering action may move to higher priority next year to ensure the objectives and values are maintained.	M

2.3.4 Delivery constraints

The delivery constraints within the lower Latrobe wetlands expose the wetlands to two major threats. Salinity and Acid Sulfate Soils. The most significant threat to ecological condition, particularly at Sale Common, is the availability of freshwater. Watering of all three wetlands is reliant on Latrobe River heights and hydraulic head difference between the river and wetlands. This is largely because the infrastructure used was originally designed to drain the wetlands for agricultural purposes as opposed to filling them or retaining floodwaters for ecological benefit. Furthermore, the movement of marine water through McLennan Straits to Lake Wellington has acted to increase salinity in the waterways of the lower Latrobe further reducing the availability of suitable water for the wetlands.

Acid Sulfate Soils (ASS) are prevalent in Dowd and Heart Morass. As the wetlands dry, there is a potential for activation of the ASS if the soils oxidise and is then rewet. The ASS risk is most prevalent at Heart Morass where the effected soils are more exposed to drying. With dry conditions, the threat of an acid event in Heart Morass (and Dowd to a lesser extent) is increased.

Operating Arrangements for the Lower Latrobe River Wetlands Environmental Entitlement have been signed by stakeholders (VEWH, SRW, WGCMA & PV, 2015). Refer to this document for delivery and operating processes and constraints. Additional delivery constraints are listed in Table 2-7.

Table 2-7 Delivery constraints for carrying out the watering regime for the lower Latrobe wetlands.

Potential Constraint	Dowd Morass	Heart Morass	Sale Common	Impact
Environmental flows from the Latrobe, Thomson and Macalister rivers not delivered or delayed	✓	✓	✓	Limited capacity to deliver priority actions due to river conditions.
Lack of resources to operate infrastructure.	✓	✓	✓	Missed watering opportunities.
Size of infrastructure		✓	✓	Unable to deliver sufficient volumes of water
Lack of water quality	✓	✓	✓	Limited capacity to deliver priority actions due to river conditions
Lack of river height			✓	Unable to deliver sufficient volumes of water
Only one inlet/outlet structure	✓		✓	Missed watering opportunities or unable to deliver sufficient volumes of water
Infrastructure vulnerable to vandalism	✓		✓	Unauthorised watering or drawdown allowing water of poor quality to enter wetland

2.3.5 Triggers for action

A water management risk assessment performed for the lower Latrobe wetlands (Hale & Boon, 2019). As part of this risk assessment the following recommendations was proposed:

- For Sale Common, it is far better to allow the wetland to dry than to put water in it with a salinity of > 5000 µS/cm. There is some risk to the site at the upper end of this range
- For Dowd Morass, there is only a small risk if water up to 15,000 µS/cm is used to fill the wetland. When it comes to allowing the wetland to dry, however, while a dry cycle would be beneficial, we do not believe that this is likely to be achievable. It is more likely that if there is no (or little) water in Dowd Morass, then much more saline water will flow in from Lake Wellington, and this is a considerable risk, particularly if the site is not able to be flushed and there is a continued build-up of salts
- For Heart Morass, the situation is more difficult to interpret. Certainly, there is low risk in filling the wetland with water in the 5000 – 10,000 µS/cm range. There is a great deal of uncertainty surrounding the potential effects of activation of ASS and using more saline water to fill the wetland. While the empirical evidence would suggest that low pH and high salinity both represent a risk to values, there is historical evidence that the site is resilient to both these conditions. The question remains about how long this resilience can be expected to continue (in the absence of a flushing flow) and are we approaching a critical threshold with respect to the duration, frequency or severity of low pH and / or high salinity at this site

Table 2-8 summarises these recommendations into triggers for actions for each wetland.

Table 2-8 Triggers for the implementation of the seasonal watering proposal for the lower Latrobe wetlands EC = Electrical Conductivity, a measure of salinity. Swing bridge is the location and name of the gauge used to monitor water level and quality in the lower Latrobe River.

Watering action	Wetland	Trigger
Partial fill (April - December)	Dowd Morass	Divert water if Latrobe River EC is substantially less than Lake Wellington, up to 15,000 µS/cm
Acid sulfate soils inundation (any time)	Heart Morass	Divert water in to maintain water levels above -0.3 m AHD, preferable EC < 1,500 µS/cm, however if critical < 10,000 µS/cm may be used
Fill and partial fills (any time)	All	Divert water if EC in the Latrobe River (Swing bridge) at the top of the water column is <1,500 µS/cm. If > 1,500 µS/cm, undertake spot readings at each regulator, open if EC is <1,500 µS/cm (<1,000 µS/cm for Sale Common), Continue to monitor
Fill and partial fills (any time)	Sale Common	Assuming the water quality conditions above are met, divert water in if the water level at Swing Bridge is: a) greater than 0.4 m AHD and will potentially remain above the threshold for more than 10 days (i.e. no strong wind or storm warmings); and b) the water level in Sale Common is not higher than the Latrobe River

2.3.6 Scenario planning

Four scenarios have been identified for the lower Latrobe wetlands system: drought, dry, average and wet. They were developed in conjunction with Southern Rural Water to be

consistent with the scenarios for the rivers that supply the wetlands for which seasonal watering proposals are also being prepared (Latrobe, Thomson and Macalister rivers). The scenarios are defined in terms of the likelihood and magnitude of overbank flooding as this is the major determinant of changes in environmental watering decisions with climatic variation.

Table 2-9 shows the expected climactic conditions, estuary conditions and environmental objectives for each wetland. Table 2-10 shows the scenario planning and tiered watering actions for the 2022-23 water year. Tier 1a actions have been split into those actions which will be met naturally and those which will require intervention. This is particularly relevant for draw down events which are most likely to require intervention in average a wet climate in order to achieve them, however they are likely to occur natural through evaporation in drought and dry conditions.

Table 2-9 Expected climactic and estuary conditions, and environmental objectives for the Lower Latrobe Wetlands.

		Drought	Dry	Average	Wet
Expected climatic conditions and water availability	Dowd Morass	No riverine inflows. Likely to dry completely.	Minor winter/spring inflows to western Dowd Morass if minor flooding occurs (unlikely). Moderate-substantial drawdown likely over summer/autumn depending on volume of natural inflows	Moderate winter/spring inflows (some flushing), and possibly also in autumn/winter. Wetland could be filled naturally, with minor drawdown over summer	Major flushing in winter/spring and probably also autumn/winter. Wetland will be filled naturally, with very minor drawdown over summer
	Heart Morass		Minor winter/spring inflows to eastern Heart Morass if minor flooding occurs (unlikely). Moderate-substantial drawdown likely over summer/autumn depending on volume of natural inflows		
	Sale Common		No riverine inflows. Likely to dry completely		
Expected estuary conditions	Upper Estuary	Low river levels, extended periods of saline conditions	Low river levels, periods of saline conditions	Average river levels (fluctuating), 1-2 overbank flows, mostly freshwater conditions	Extended periods of high river levels, two or more overbank flows, mostly freshwater conditions
	Mid Estuary	Low river levels, saline conditions	Low river levels, saline conditions	Average river levels (fluctuating), 1-2 overbank flows, periods of saline conditions	
	Lower Estuary				
Environmental objectives		Protect • Promote oxygenation of surface soils, breakdown of	Recover • Promote oxygenation of surface soils, breakdown of	Maintain • Encourage the growth and reproduction of	Enhance • Maximise colonial waterbird breeding opportunities

	Drought	Dry	Average	Wet
	accumulated organic matter and nutrient recycling • Encourage the growth and reproduction of wetland plants across the bed of the wetland • Reduce the number and size of European carp • Avoid/mitigate risks to wetland plants and waterbird habitat from adverse salinity/pH conditions (Dowd Morass and Heart Morass) • Mimic the natural inundation regime	accumulated organic matter and nutrient recycling • Encourage the growth and reproduction of wetland plants across the bed of the wetland • Reduce the number and size of European carp • Encourage the growth and reproduction of wetland plants, particularly Swamp Scrub, Tall Marsh, Aquatic Herbland and Brackish Herbland • Discourage the spread of Giant Rush (*Juncus ingens*) (Sale Common). • Provide feeding habitat for wetland fauna, particularly waterbirds • Import organic matter and nutrients. • Reduce salinity and maintain/increase pH • Import seed/propagules.	wetland plants across the bed of the wetland • Encourage the growth and reproduction of wetland plants, particularly Swamp Scrub, Tall Marsh, Aquatic Herbland and Brackish Herbland. • Provide feeding habitat for wetland fauna, particularly waterbirds • Encourage the growth and reproduction of wetland plants across the bed of the wetland • Discourage the spread of Giant Rush (*Juncus ingens*) (Sale Common). • Import organic matter and nutrients • Reduce salinity and maintain/increase pH (Dowd Morass and Heart Morass) • Import seed/propagules. • Avoid/mitigate risks to wetland plants and	• Encourage the growth and reproduction of Aquatic Herbland and Brackish Herbland (Dowd Morass and Heart Morass) and Tall marsh (Sale Commons) • Encourage recolonisation of submerged aquatic plants • Maintain/enhance condition and extent of structurally dominant plants such as Swamp Paperbark (*Melaleuca ericifolia*), Common Reed (*Phragmites australis*) and River Red Gums (*Eucalyptus camaldulensis*). • Maximise waterbird and fauna breeding, recruitment, foraging and sheltering opportunities • Maximise importation of organic matter and nutrients • Export salt and increase pH (Dowd and Heart Morass)

	Drought	Dry	Average	Wet
		• Avoid/mitigate risks to wetland plants and waterbird habitat from adverse salinity/pH conditions • Mimic the natural inundation regime	waterbird habitat from adverse salinity/pH conditions (Dowd Morass and Heart Morass) • Mimic the natural inundation regime. • Reduce the number and size of European carp • Promote oxygenation of surface soils, breakdown of accumulated organic matter and nutrient recycling	• Maximise dispersal of seed/propagules. • Provide breeding habitat for Growling Grass Frog and Green and Golden Bell Frog • Facilitate movement of Dwarf Galaxias (*Galaxiella pusilla*) from/to Flooding Creek and Cox's Bridge populations (Sale Common) • Mimic the natural inundation regime

Table 2-10 Scenario planning for environmental water deliver to the Dowd Morass, Heart Morass and Sale common for 2022-23

		Drought	Dry	Average	Wet
Dowd Morass	Tier 1 potential natural watering	Partial drawdown (January-March)	Partial drawdown (January-March) Partial fill (April- December)	Partial fill (April- December) Fill (August-November)	Partial fill (April-December) Fill (August-November)
	Tier 1 potential watering intervention	Bird breeding top-up (anytime) Salinity management fill (anytime) Partial fill (April- December) Fill (August-November)	Bird breeding top-up (anytime) Salinity management fill (anytime) Fill (August-November)	Bird breeding top-up (anytime) Salinity management fill (anytime) Partial drawdown (January-March)	Bird breeding top-up (anytime) Salinity management fill (anytime) Partial drawdown (January- March)

	Tier 1 estimated environmental water demand	0-9,000 ML	0-9,000 ML	0-9,000 ML	0-9,000 ML
	Tier 2 potential watering actions	Nil			
	Tier 2 estimated environmental water demand				
Heart morass	Tier 1 potential natural watering	Partial drawdown (January-March)	Partial drawdown (January-March)	Partial fill (August- December) Fill (August – November)	Partial fill (August-December) Fill (August – November) Partial flushing flow (July – November)
	Tier 1 potential watering intervention	ASS top ups (anytime) Bird breeding top-up (anytime) Partial fill (August-December) Fill (August – November) Partial flushing flow (July – November)	ASS top ups (anytime) Bird breeding top-up (anytime) Fill (August – November) Partial flushing flow (July – November) Partial fill (August- December)	ASS top ups (anytime) Bird breeding top-up (anytime) Partial flushing flow (July – November) Partial drawdown (January-March)	ASS top ups (anytime) Bird breeding top-up (anytime) Partial drawdown (January- March)
	Tier 1 estimated environmental water demand	0-24,000 ML	0-24,000 ML	0-24,000 ML	0-24,000 ML
	Tier 2 potential watering actions	Nil			
	Tier 2 Estimated water requirement				
Sale Common	Tier 1 potential natural watering	Partial drawdown (December -March)	Partial drawdown (December - March)	Partial drawdown (December - March)	Partial fill (July to December) Fill (August to November)
	Tier 1 potential watering intervention	Partial fill (July to December) Fill (August to November)	Partial fill (July to December) Fill (August to November) Bird breeding top-up (anytime)	Partial fill (July to December) Fill (August to November) Bird breeding top-up (anytime)	Bird breeding top-up (anytime) Invasive veg top up (December-January)

		Bird breeding top-up (anytime) Invasive veg top up (December-January)	Invasive veg top up (December-January)	Invasive veg top up (December-January)	Partial drawdown (December -March)
	Tier 1 estimated environmental water demand	0-5,000 ML	0-5,000 ML	0-5,000 ML	0-5,000 ML
	Tier 2 potential watering actions	Nil			
	Tier 2 estimated environmental water demand				

3 Risk management & Engagement

3.1 Risk management

A risk assessment workshop hosted by the Victorian Environmental Water Holder (VEWH) was held in February 2022. Risks and mitigation strategies identified at this workshop are shown in Table 3-1.Red text indicates additional information or updates from the 2021 review.

Table 3-1 Risk assessment for 2022/23 watering proposal – Macalister, Latrobe and Thomson systems (DG Consulting 2022)

		Pre-Mitigation Risk					Residual Risk				
Risk category	**Risk description**	**Likelihood**	**Consequence**	**Risk Rating**	**Mitigation actions**	**Lead organisn. for action**	**Likelihood**	**Consequence**	**Risk Rating**	**Remains medium/high after mitigation**	**Risk type** Static or Dynamic
Environment	Timing of environmental flow diversions into wetlands adversely impacts on Australian grayling breeding *Note: need to have regard for grayling impacts in other catchments and the role this system plays in their recovery*	Unlikely	Moderate	Low	• Plan regulator operations to minimise potential impacts on Australian grayling eggs and modify wetland filling procedures as required. - Further analysis through WETMAP & VEFMAP to understand risk issues *Note: further advice from ARI suggests that this may not be a risk - review in 2023 to consider deletion*	WGCMA WGCMA					Dynamic
Environment	High tides coinciding with low water levels in wetlands could result in saline water intrusions into the wetlands, which may cause negative environmental impacts on long term vegetation conditions. *- Based on Sale Common risk, which is the highest risk. Others are Heart - Possible & Moderate Dowds - Likely + Moderate*	Possible	Moderate	Medium	• Implement findings from saline inflow risk assessment study. • Apply findings from the Latrobe River environmental watering recommendations. - Consider the medium to longer term objectives and values to be protected *(Note: This risk is still rated as medium after mitigation actions.)*	WGCMA				Medium	Dynamic
Environment	Poor condition of wetland side of the Dowd Morass regulator results in PV being unable to operate the structure due to OH&S risks, leading to failure to deliver environmental flows and to achieve environmental objectives.	Unlikely	Minor	Low	• PV (Asset owner) to undertake regular maintenance and pre-event asset inspections on delivery infrastructure. **Note that insufficient resources are likely to limit the asset owner's ability to regularly inspect and maintain infrastructure. Increased resources for these activities may further reduce the likelihood and risk ratings.* • Communicate failures to the CMA • Develop design for upgrading regulating structure and seek funding to implement necessary upgrades in conjunction with land manager (in progress).	PV PV WGCMA					Static
Environment	Unauthorised access/operation of wetland regulating structures causes environment harm (e.g. saltwater event)	Unlikely	Moderate	Low	• Ensure structures are locked and monitor structure regularly to minimise likelihood of interference. • Educate the community on environmental water needs and benefits. • Erect signage to identify the importance of the assets for environmental water delivery.	PV WGCMA WGCMA					Static
Environment	Inlet capacity is insufficient to enable Sale Common to be watered at low river levels, leading to failure to achieve environmental objectives	Possible	Minor	Low	• Upgrade or replace existing inlet structure to enable access to low river flows for watering the site. *Note: An upgrade strategy has been developed and is expected to be implemented in next few years* • Investigate other water delivery options	WGCMA					Dynamic
Environment	Inlet capacity is insufficient to enable Dowd Morass to be watered at low river levels, leading to salt water intrusion from Lake Wellington which results in environmental damage	Possible	Minor	Low	• Provide additional upstream inlet structure to enable access to low river flows for watering the site. - Consider temporary pumping alternatives	WGCMA WGCMA					Dynamic
Environment	Inlet capacity is insufficient to enable Heart Morass to be watered at low river levels, leading exposure of acid sulphate soils. which results in environmental damage	Unlikely	Moderate	Low	• Provide additional upstream inlet structure to enable access to low river flows for watering the site. - Consider temporary pumping alternatives	WGCMA WGCMA					Dynamic

3.2 Engagement

This section outlines the engagement that has occurred in the development of the Lower Latrobe Wetlands Seasonal Watering Proposal for 2022-23. Significant engagement was made through the Project Advisory Group for the Latrobe Environmental Water Requirements Investigation. As part of this project participants were informed of the use of environmental objectives and flow recommendations established through for the seasonal watering proposals. It is anticipated that members from this group will for part of the Environmental Water Advisory Group for the lower Latrobe wetlands at commencement of the project soon, lifting the level of engagement from “inform” to “involve”. Levels and purpose of engagement are shown in Table 3-2.

Table 3-2 Summary of the parties engaged and the levels and purpose of engagement for the 2022-23 Seasonal Watering Proposal.

Category	IAP2 level	Stakeholder	Engagement method	Engagement purpose
Program partners 	Collaborate	• VEWH	• Formal advisory groups (EWAGs) • Partnership meetings and direct engagement • Review of draft seasonal watering proposal • Project advisory groups (i.e., Latrobe Environmental Water Requirements Investigation project)	• Seek input to the development of SWP • Ensure program partners understand and have an opportunity to contribute to the watering proposed and achieve intended outcomes • Identify opportunities to achieve shared benefits • Identify systems constraints to delivery of environmental water • Identify risk for delivering and not delivering environmental water.
	Collaborate	• Parks Victoria • Field and Game Australia		
Traditional Owners 	Collaborate	• Gunaikurnai Lands and Water Corporation	• Direct engagement (one-on-one) • Formal advisory groups (EWAGs) and project steering committees (i.e.,	• Share information and develop environmental water knowledge for future engagement • Incorporate TO knowledge, values and objectives into planning

Category	IAP2 level	Stakeholder	Engagement method	Engagement purpose
			• Latrobe Environmental Water Requirements Investigation project advisory group) • On-ground assessment and monitoring contributing to e-water planning and management (i.e., AWAs, eDNA project)	• Supporting on-country work • Opportunity to relay community concerns, ideas and comments directly to environmental water officers and other interested stakeholders
Landholders/managers 	Collaborate	• Individual landholders • Sale Field and Game (Heart Morass)	• Formal advisory groups (EWAGs) • Direct engagement (one-on-one) • On-ground monitoring of water quality (Heart Morass) • E-flows subscriber notifications and newsletters (email, SMS)	As above plus: • Identify watering objectives relevant to the group/individual
Recreational users 	Collaborate	• Field and Game Australia (Heart Morass)	• As above	As above
Community and environment groups and NGOs	Involve	• Birdlife Australia (Staff) • Birdlife Australia (Volunteers) • Greening Australia	• Project advisory groups • Environmental monitoring	• Opportunity to both learn more about environmental water and relay community concerns, ideas and comments directly to

Category	IAP2 level	Stakeholder	Engagement method	Engagement purpose
		• Latrobe Valley Field Naturalists • Waterwatch volunteers	• Community environmental and water quality monitoring • E-flows subscriber notifications and newsletters (email, SMS)	environmental water officers and other interested stakeholders • Review previous environmental watering actions and seek feedback on any outcomes or observations • Assist in increasing awareness and understanding of the purpose and objectives of the environmental watering program in West Gippsland • Provide opportunities to contribute to the proposed watering actions and intended outcomes • Identify opportunities to achieve shared benefits
Non-Government Organisation	Involve	• Greening Australia • VR Fish • Native fish Australia	• Formal advisory groups (EWAGs) • Direct engagement (one-on-one)	As above plus: • Sharing of wetland and river knowledge: e.g., emerging evidence, monitoring, or relevant program information
Other Government agencies	Involve	• Gippsland Water	• Direct engagement • Formal advisory groups (EWAGs) and project advisory groups (i.e., Latrobe Environmental Water Requirements	As above plus: • Identify opportunities to achieve shared benefits • Identify systems constraints to delivery of environmental water • Identify risk for delivering and not delivering environmental water.

Category	IAP2 level	Stakeholder	Engagement method	Engagement purpose
			Investigation project advisory group)	
	Inform	• Department of Land, Environment, Water and Planning (Latrobe Valley Regional Water Study) • Department of Land, Environment, Water and Planning (Waterways and Catchments) • EGCMA • Parks Victoria	• Project advisory groups (i.e., Latrobe Environmental Water Requirements Investigation project advisory group)	• Share information and develop environmental water knowledge for future engagement • Identify watering objectives relevant to the group/individual
Local businesses	Inform	• Port of Sale Heritage River Cruises • Frog Gully Cottages	• E-flows subscriber notifications and newsletters (email, SMS)	

4 Shared Benefits

The shared benefits of potential watering actions across each of the lower Latrobe wetlands are listed in Table 4-1.

Table 4-1 Summary of the shared benefits from wetting and drying in the lower Latrobe wetlands, 2022-23.

Component	Wetland	Who?	Shared Benefit
Fills and partial fills	All	Recreational users	Provide amenity for access tracks, canoeing, fishing and bird watching
	Heart Morass and Dowd Morass	Shooters	Provide open water for duck hunting season
		Campers and other recreational users	Provide amenity for camping
	All	Commercial fishers	May advantage commercial eel and carp fishing.
Acid Sulfate Soil inundation	Heart Morass	Shooters	Maintain open water for duck hunting season, or if water levels have receded and water quality is suitable, the partial fill will be timed to coincide with the duck shooting season opening (mid-March)
		Commercial fishers	May advantage commercial eel and carp fishing
Partial fill	Heart Morass and Dowd Morass	Shooters	If water quality is suitable the partial fill will be timed to coincide with the duck shooting season opening (mid-March)
		Commercial fishers	May advantage commercial eel and carp fishing
Drawdown	All	Recreation users	Provide amenity for access tracks, and bird watching
	Heart Morass and Dowd Morass	Campers and other recreational users	Provide amenity for camping

5 Increasing knowledge and addressing constraints/ impacts

5.1 Monitoring

WGCMA will undertake environmental monitoring to inform and evaluate implementation of the seasonal watering plan for the lower Latrobe wetlands. This will include:

- Spring, autumn and event-based water quality monitoring (including pH and salinity) at 2 sites in Sale Common and Dowd Morass and 4 sites in Heart Morass, to inform watering decisions and actions
- River flow rates, water level and water quality in the Latrobe River and lower Latrobe wetlands obtained from VEWH funded telemetered monitoring stations installed at Swing Bridge (on the Latrobe River below the confluence with the Thomson River), Heart Morass, Dowd Morass and Bull Bay (on the southern edge of Lake Wellington)
- Incidental observations and photos of biota to track events and gauge the general condition of the wetlands.

The above will be supplemented with ongoing waterfowl monitoring undertaken by Field and Game Australia and observations from other local community members.

5.2 Reporting

Reporting will be undertaken in accordance with the Entitlement and the Victorian Environmental Water Holder's Guidelines for reporting on the management of the Water Holdings.

A summary report on environmental watering will be presented to the WGCMA Board at the end of each water year. This will include, but not limited to:

- Overview of conditions throughout the water year
- Compliance of flows against the Seasonal Watering Statements
- Results from monitoring program
- Evaluation of delivery success
- Learnings and emerging issues

5.3 Operations and compliance

There is considerable potential to optimise environmental outcomes and improve the efficiency of environmental water delivery to the wetlands by designing and constructing purpose-built watering infrastructure and complementary earthworks. The highest priority – upgrade of the existing structure connecting Sale Common to the Latrobe River – was completed in 2013. Detailed designs have also been prepared for a second regulating structure to service Sale Common as well as new watering infrastructure for Heart and Dowd Morass. Approvals and permits to construct this infrastructure were completed in early 2016/17. Funding is being sought to construct the priority works to realise the benefits of improved environmental outcomes and efficient use of the Lower *Latrobe wetland Environmental Entitlement 2010*.

5.4 Environmental effectiveness

Sound wetland water management requires information about the likely and actual response of water-dependent assets (especially plants as they provide the structural habitat and

organic carbon required by other wetland biota) to the water regimes provided (whether through natural or 'active' means). This enables a genuine adaptive management framework to be applied to increase knowledge and improve management over time. Useful information is available for some long-lived plant species that occur in the lower Latrobe wetlands, such as Swamp Paperbark, due to focussed research having been undertaken in the local area (Dowd Morass). There is however a dearth of locally relevant information about the hydro-ecological requirements of most other aquatic plant species. Boon (2011) identified the following limitations to the currently available information on hydrological requirements of wetland plants in his environmental flows study for Macleod Morass near Bairnsdale:

- What information is available is generally based on studies undertaken in arid or semi-arid parts of the Murray-Darling Basin, and there are likely to be difficulties in extrapolating to coastal eastern Victoria;
- Little recognition is given to the possibility that the hydrological requirements of a given species can vary across its geographical range, especially if its range is large e.g. Common Reed *(Phragmites australis)*; and
- Many plant taxa have little or no information available on their hydrological requirements, and there can be a disparity in recommendations for a single species.

Focussed local research and long-term ecological response monitoring are needed to address these limitations and enable refinement of wetland water regime recommendations over time, including the identification of optimum conditions and critical tolerances (as required for Environmental Water Management Plans). Some research/monitoring questions arising from this seasonal watering proposal are:

- Is there an ecological association between Giant Rush and Upright Water Milfoil, and is the aim of controlling the spread of the former and encouraging the persistence of the latter incompatible? These species germinated under the same conditions and based on monitoring to date, are disadvantaged by permanent inundation.
- What are the hydro-ecological requirements for recolonisation and persistence of submerged and emergent aquatic plants (particularly Aquatic Herbland, Aquatic Sedgeland, Brackish Herbland and submerged angiosperms)?
- What are the benefits and risks of summer/autumn versus winter/spring inundation?
- What is the habitat value of widespread introduced species (particularly Parrot's Feather)? Can this habitat be readily replicated or enhanced using indigenous native species, is this achievable, and what role can water regime management play?

A limitation of preparing individual seasonal watering proposals is that the focus is on management of the site, rather than broader but related considerations such as management of highly mobile populations or entire species of waterbirds that occur across or utilise multiple sites. These inter-site issues should be factored into the development of the Victorian seasonal watering plan.

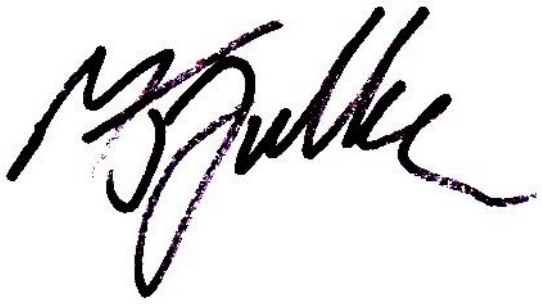
6 Approval and endorsement

I, the authorised representative of the agency shown below, approve the 2022-23 Seasonal Watering Proposal for the Lower Latrobe Wetlands .

SIGNED FOR AND ON BEHALF OF

West Gippsland Catchment Management Authority

Signature of authorised representative



Name: *Martin Fuller*

Title: *Chief Executive Officer*

Date:2/5/2022

I, the authorised representatives of the agency shown below, acknowledge that the priority watering actions being proposed in this proposal are able to be delivered within existing infrastructure of the Lower Latrobe Wetlands system in 2022-23, recognising that there may be additional information to endorse in relevant operating arrangements

SIGNED FOR AND ON BEHALF OF

Parks Victoria

Signature of authorised representative

Name: Chris Corbell

Title: *Regional Director – Eastern Victoria*

Date: 09 May 2022

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