



VICTORIAN MURRAY FLOODPLAIN RESTORATION PROJECT

HEALTHY LANDSCAPES, STRONG COMMUNITIES

Gunbower National Park Floodplain Restoration Project

Community & Stakeholder Information Summary December 2020

A summary of information contained in referrals to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and the Victorian Environmental Effects Act 1978.

Full referrals available at:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999: www.epbcnotices.environment.gov.au/referralslist/
- Victorian Environmental Effects Act 1978: <https://www.planning.vic.gov.au/environment-assessment/referrals-and-decisions>

Contents

Community & Stakeholder Information Summary.....	1
Purpose	3
Part 1. Project description, location and implementation.....	3
VMFRP Outline	3
Where will work be done	5
What works are being proposed?	7
Where will the water go in the forest?.....	9
Construction of the infrastructure.....	9
Required approvals.....	11
How much will it cost?.....	14
How long will it take until water is put into the forest?	14
Part 2 Potential Environmental effects (describing the current status and potential changes)	15
How do we know when the project has worked?	15
Native plants (flora).....	18
Native animals (fauna).....	19
Fish	20
Water – Where does it come from and go to and what will it do	21
Groundwater	23
Noise	24
Part 3 Social environments	26
First nations people and aboriginal cultural heritage.....	26
Other historical Heritage	26
Consultation	27
Part 4 Environment management and monitoring.....	28
Management	28
Part 5 More information.....	28

Purpose

The purpose of this document is to provide interested people with an in-depth overview of this proposed restoration project. It is a plain English version of some of the technical information contained in the referrals and information is set out in a parallel format to the referral form.

Part 1. Project description, location and implementation

VMFRP Outline

This Victorian Murray Floodplain Restoration Project (VMFRP) aims to achieve targeted environmental outcomes whilst using less water than a high river or natural flood that sees water flow over the river banks. Using less water would keep more water entitlements in the hands of irrigators and communities in the region. VMFRP would enable Victoria to meet its ecological and water savings obligations under the Murray Darling Basin Plan. VMFRP is being delivered in partnership by Lower Murray Water, Goulburn Murray Water, Mallee CMA, North Central CMA, Parks Victoria and the Department of Environment, Land Water and Planning (DELWP). The VMFRP is funded by the Australian Government's Department of Agriculture, Water and Environment.

The VMFRP consists of nine discrete environmental works projects that aim to return a more natural inundation regime across approximately 14,000 ha of high-ecological-value Murray River floodplain in Victoria through the construction of new infrastructure and the modification of existing infrastructure.

The proposed works would allow environmental water to be diverted from the Murray River to water high value wetlands and forested floodplains. This would mimic the benefits of natural flood events and improve the condition of vegetation communities and provide habitat for native fish, birds, frogs and turtles and work to restore the floodplains. Supplying water to floodplains, wetlands and waterways has changed significantly over the past 100 years or so and will need to continue changing as the climate varies and competition for water increases. As water for irrigation and the environment need to co-exist across the region, alternative ways to supply water to environmental assets must be considered and adopted. Under the Basin Plan commitments and with climate change it will not be possible for environmental water to be delivered and held on the floodplains in a way that would benefit the environment. There is currently no way for environmental water to be delivered into these parts of the Gunbower National Park to supplement the reduced frequency and duration of natural river flood events, therefore, the do-nothing scenario is not an option if we want to stop further decline in the health of the forest.

If there's a better way to restore the health of these forests and enable them to continue to be an asset to our communities into the future and efficiently deliver water to the floodplain while keeping irrigation water in the region, we'd be happy to have it presented to us.

Involving First Nations People

Floodplains and wetlands have been the lifeblood of First Nations People for tens of thousands of years. The project involves First Nations People in the decision-making processes to protect cultural heritage and restore ecological value.

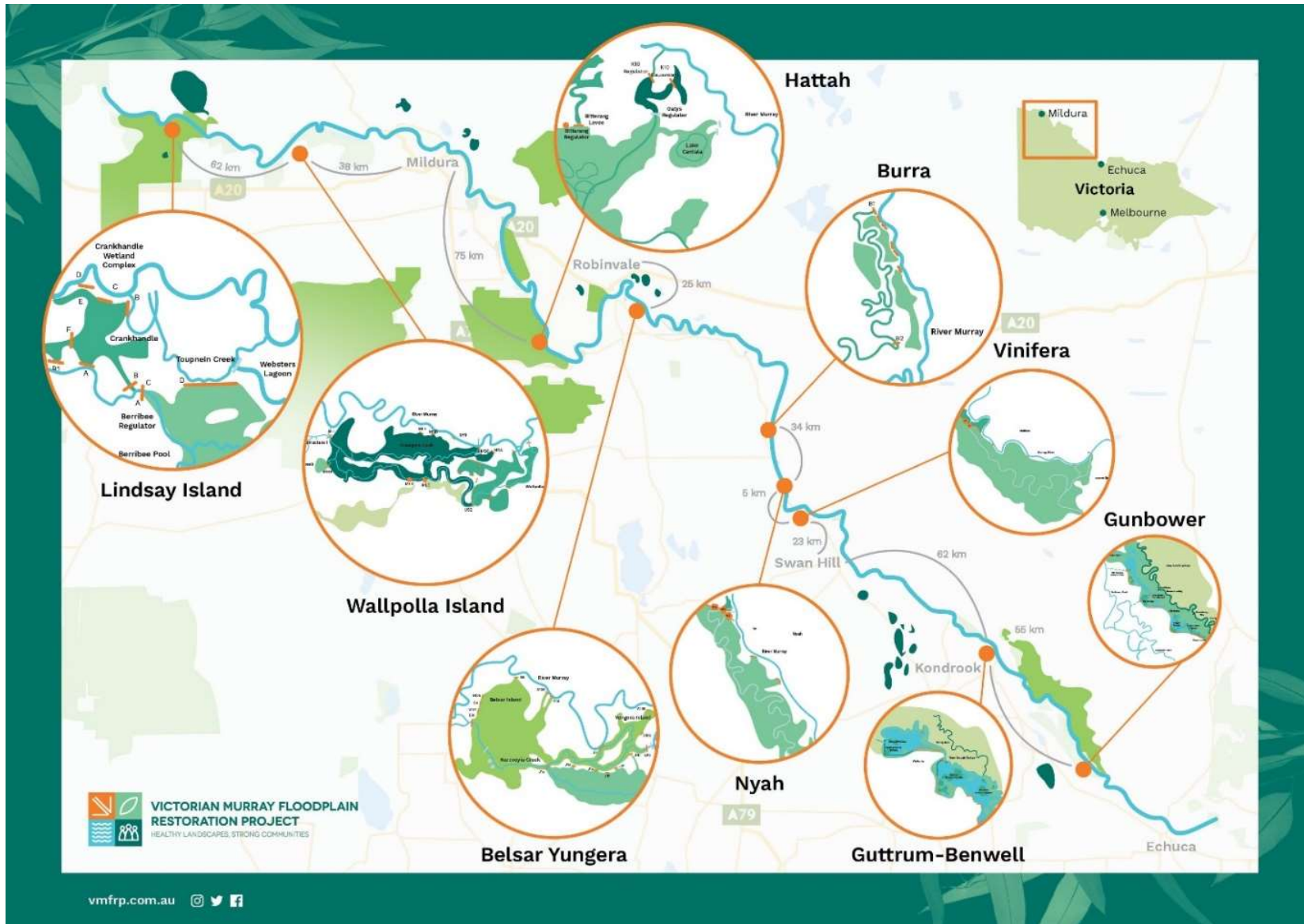


Figure 1. Location of all VMFRP proposed projects

Where will work be done

The Gunbower National Park Floodplain Restoration Project (the Project) is located predominantly within the Gunbower National Park, which forms part of the broader Gunbower Forest on the mid-Murray floodplain of northern Victoria. Figure 1 shows the Project location in relation to Victoria and also shows where some of the work is proposed. Gunbower Forest covers approximately 20,218 hectares (Ramsar listing area) and is comprised of the following land tenures (DEPI, 2013):

- Gunbower National Park, often referred to as the upper forest, which is managed by Parks Victoria (9,330 hectares) (Parks Victoria 2018)
- Gunbower State Forest, the mid and lower forest, which is managed by the Department of Environment, Land, Water and Planning (DELWP)
- The Murray River Reserve (land abutting the Murray River), which is also managed by Parks Victoria
- Spences Bridge Education Area.

Gunbower Forest is bounded to the north by the Murray River and along its southern edge by private land and Gunbower Creek. It is bordered by the localities of Koondrook, Cohuna, Gunbower and Torrumbarry and within both the Gannawarra Shire and Campaspe Shire Local Government Areas. The forest borders the Torrumbarry Irrigation Area.

The forest supports a range of rare and threatened flora and fauna species; and is home to the Yorta Yorta and Barapa Barapa First Nations People who have cared for Country for thousands of years. The Gunbower Forest is internationally significant; the Gunbower National Park is one of the few remaining river red gum floodplain systems in Victoria and has a significant ecological importance in the Murray-Darling Basin. The forest is a prime example of remnant floodplain and the remaining habitats have high conservation value, providing refuges and hotspots for biodiversity. The Project is designed to use existing water for the environment to be delivered efficiently and effectively, and to give the plants and animals of Gunbower National Park the water they need to flourish. The water would help to restore the extent and distribution of wetland vegetation and build resilience into the forest. Native fish numbers in the river would also benefit, as food-rich water (containing carbon and nutrients) would be returned to the Murray River and possibly Gunbower Creek into the future.

Gunbower Forest is listed under the Ramsar Convention and also in the Directory of Important Wetlands in Australia (DIWA). The Ramsar Convention encourages the designation of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. Once designated, these sites are added to the Convention's List of Wetlands of International Importance and become known as Ramsar sites. DIWA identifies nationally important wetlands, it provides a substantial knowledge base of what defines wetlands, their variety, and the many flora and fauna species that depend on them.

Traditional Owners or First Nations People, which is appropriate

There are various terms to refer to people and they have different meanings to different people. The Yorta Yorta peoples have let us know they have a preference for First Nations People so in this document we will use this term rather than the term Traditional Owner. Traditional Owner is a term used in our referral documents and some of our specialist reports as well.

Figure 2: Project location, existing and proposed infrastructure.



What works are being proposed?

The project is proposing to use engineering works such as regulators, containment banks and pump stations to deliver water to the wetlands and floodplains without placing additional strain on local irrigators, and the local irrigation system. This project would be a major step towards restoring the floodplain's health and protecting it for future generations to experience and enjoy. The health of the forest has declined due to a lack of water and droughts.

Forests are comprised of many different areas with differing physical features and different connections to the river which are significant factors leading to a variety of forest vegetation types and their watering requirements. These different areas that have watering requirements are summarised down to the categories as below:

- Permanent wetlands
- Semi-permanent wetlands
- Forest floodplain.

Before there was river regulation, the lower landscape areas that are better connected to the river, would have received more water and for longer periods. Each forest category progressively requires more regular watering events and for longer periods the lower the category is physically in the landscape.

It should be noted that within each of the areas, there are sub-areas and in particular the forest floodplain can be broken down into vegetation with:

- Flood dependent understorey
- Flood tolerant understorey.

It is the vegetation with flood dependent understorey that needs managed environmental watering and is targeted for forest floodplain watering. The vegetation with flood tolerant understorey will have its occasional watering requirements met by larger river floods that may occur approximately one in every 10 years and so the project does not need to water these areas. Flood tolerant understorey is typically on the higher ground of the forest.

Under natural conditions, water would flow from the Murray River into the different forest areas and inundation would have occurred between six and seven years in 10 across the lower lying areas. At present inundation occurs much less and even with the higher river flows proposed under the Murray Darling Basin Plan there will still be a shortfall in water requirements for the forest. Operation of the infrastructure included within this project would fill the gap in what water the forest is currently receiving and what it would need to be healthy. The table below (Table 1) shows the best possible watering frequency, expected inundation frequency from the Murray River and the proposed frequency of managed water for the environment. The expected timing and approximate duration of the watering events are also shown.

Table 1. Optimal watering frequencies

Watering Category Area / Scenario and Location	Optimal watering frequency (years in 10)	Inundation frequency from River (1) (years in 10)	Expected frequency of operation (1) (years in 10)	Expected timing of managed environmental watering operation	Target Duration of inundation (months)
Permanent Wetlands					
Camerons Creek Lagoons	10	-	10	Throughout year	1-12
Black Charlie Lagoon	10	-	10	Winter/Spring	1-12
Semi-Permanent Wetlands					
Pig Swamp	7	3	4	Winter / Spring	6
Forest Floodplain (<i>with flood dependent understorey</i>)					
Baggots Swamp ⁽²⁾	6	3	3	Winter / Spring	2-3
Emu Hole Lagoon ⁽²⁾	6	3	3	Winter / Spring	4
Middle Forest floodplain at Deep Creek	6	3	3	Winter / Spring	3-5
Red Rise Swamp (Lower)	6	3	3	Winter / Spring	3-5

(1) Inundation frequency from river and operating regime based on modelling of Basin Plan 2750 flows.

(2) Locations will likely be operated between Semi-Permanent Wetland and Forest Floodplain requirements.

More recently, the forest has only received five natural inundation events in the past 20 years, almost half of the long-term average expected under more natural conditions. The managed floodplain watering proposed aims to restore a more natural watering regime over a similar extent to that of flows between 30,000 and 50,000 megalitres per day over Torrumbarry Weir in the Murray River by providing a combination of pumped inflows from the Murray River and the National Channel and gravity flows through the Camerons Creek system into the Forest. The project would enable the inundation of approximately 704 hectares of the Gunbower National Park (457 hectares in Middle Gunbower Forest and 247 hectares in Upper Gunbower Forest).

The managed floodplain watering events proposed would require a much lower flow volume of water in the Murray River than that involved in a natural flooding event, as the proposed infrastructure would enable a combination of pumping and gravity-fed mechanisms to deliver water to target areas (River Red Gum flood dependant understorey) on the floodplain. Therefore, environmental outcomes could be achieved using less water than a natural watering event, and the water savings can remain in the Murray River system for other users.

What happens if we do nothing?

There is no current way for water for the environmental to be delivered into the areas of Gunbower Forest being targeted by the VMFRP project unless water was bought back from irrigators, but Government has committed to not doing that. Therefore, not doing this Project would lead to the further deterioration to the health of the floodplains and wetlands that are significant on a local, national and international level.

Not only that, but it would mean missing an opportunity to have long-term positive impacts on the floodplains, the community and the economy.

Where will the water go in the forest?

The Project involves works to support the inundation of approximately 704 hectares of floodplain across the Gunbower National Park. The Project comprises the following three water management areas (WMAs):

- 247 hectares in the Upper Gunbower Forest WMA, inundating the wetlands containing upper Camerons Creek, Camerons Creek Lagoons 1, 2, 3 and 4, Black Charlie Lagoon and Baggots Swamp
- 336 hectares in the Middle Gunbower Forest (upstream of Deep Creek) WMA, inundating the areas containing Deep Creek, Middle forest floodplain area and including the semi-permanent wetlands, Pig Swamp and Emu Hole Lagoon
- 121 hectares in the Middle Gunbower Forest (downstream of Deep Creek) WMA, inundating the Red Rise Swamp wetlands containing or connecting to the upper reaches of Broken Axle Creek, Spur Creek, and associated flood runners in the swamp complex.

The proposed inundation area is located almost entirely within Victoria as shown in Figure 2. - Project location, existing and proposed infrastructure. The majority of the inundation area would be within Crown land; some small areas of land are located between the existing forest perimeter levee and private (freehold) properties. VMFRP are currently in consultation with these potentially affected private landowners to discuss planned environmental watering events. Options to manage potential areas of inundation include purchasing private land, creating flood easements, or a combination of the two approaches. Agreement would be obtained prior to the project implementation commencing.

Construction of the infrastructure

The Project proposes the construction of 12 small regulators, one fishway, three pipelines, two pump stations, power supplies, one channel upgrade, two drop structures, three culvert crossings, two drainage outlets, road / access track upgrades (approximately 25 km), erosion control works and a series of containment banks to divert, retain and release water associated with the Gunbower National Park project.

What disruptions would be caused by construction activities?

The construction activities proposed may cause a temporary increase in traffic on some tracks and adjoining roads and may temporarily disrupt access to some parts of the Murray River. VMFRP would continue to work with DELWP and Parks Victoria to minimise any disruptions and make sure the community and stakeholders are aware of them.

The Project, if approved, is expected to improve the visitor experiences in the forests and floodplains in the medium to longer term associated both with improvements to infrastructure, including access, immediately after construction and also from increased health and amenity of the forest over time.

Construction activities would include:

- Establishment of construction sites, some vegetation removal, stripping and stockpiling of topsoil, establishing temporary parking and truck turnaround areas, laydown and stockpiling areas
- Removal of existing structures where required
- Construction / installation of new structures.

The construction footprint would occur within both Crown land and on private land within Victoria and a small portion of NSW (the southern bank of the Murray River). The majority of the Crown land is associated with the Gunbower National Park, under ownership and management of Parks Victoria. Camerons Creek Pump Station and a section of the Camerons Creek pipeline is located within Crown land managed by Department of Land, Water and Planning (DELWP) and an additional section of Camerons Creek pipeline and a small section of access track is located on land managed by Campaspe Shire Council. The inlet pipes associated with the Brereton Road Pump Station would be located within the Murray River in NSW which is a Crown Land Waterway. These inlet pipes would be entirely submerged below the water surface even at low river levels. Works on private land would include the Camerons Creek pipeline and property outlets, access tracks and potential levee works.

A Construction Environmental Management Plan (CEMP) would be prepared for the works and would detail the actions to be taken to avoid and minimise potential impacts during construction. Once construction of regulators, containment banks and all associated works were complete, all waste and surplus spoil would be removed from the sites and disposed of in accordance with the measures outlined in the CEMP.

What does that piece of infrastructure do?

Pump Stations: pump stations are to deliver environmental water from the Murray River / the National Channel onto the floodplain. Pump Stations are located to enable targeted flow delivery to permanent / semi-permanent wetlands and to enable forest floodplain inundation when required. Pump stations will be largely underground but with some surface level infrastructure such as switchboards.

Regulators: concrete structures with flow control gates located in waterways or low points within the floodplain to control the flow of water into and out of the inundated areas; and importantly to contain water on the floodplains when the river level is lower. These structures are designed to capture and/or pass natural floods and manage environmental watering releases. The gates are designed to allow natural floods to pass unrestricted.

Fishway: a structure typically associated with and adjacent to a Regulator to enable fish passage in areas with significant fish communities. Fish can use the fishway to climb up and through the Regulator site which maintains connection of a greater length of waterway.

Containment banks: earthen banks that, often in combination with a regulator, contain water in targeted areas for managed inundation. Where possible, containment banks would be built on the alignment of existing access tracks with the tracks reinstated on top.

Required approvals

As a part of the approvals phase of the Victorian Murray Floodplain Restoration Project we are required to refer applications for planning approval under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC) and Environmental Effect Act 1978 (EE).

Initial referrals for this project have now been submitted to the Victorian Government (EE) and the Commonwealth Government (EPBC) and can be viewed online.

VMFRP are awaiting a determination by these Governments detailing the requirements to be met before the projects are approved to proceed.

These referrals outline key details of the Project, as well as how any environmental impacts would be managed while achieving significant ecological benefits.

Next, the relevant Ministers will determine the required pathways to further develop the project. This will tell us the formal approval process and consultation pathway we need to take over the next one to two years. Once the approval process is complete near the end of 2022, a decision to construct the project or not can be made. Once the approval process is known, a project timeline with the proposed next steps will be released. This will likely be towards the end of 2020.

Victorian State Environmental Effects Act 1978 (EE Act)

Victorian EE Act referrals provide an assessment of proposed works which are capable of having a significant effect on the environment.

The Victorian EE Act referrals can be viewed on:

<https://www.planning.vic.gov.au/environment-assessment/referrals-and-decisions>

Note that the applications when listed show Lower Murray Urban and Rural Water Corporation as the Proponent, the reference number is 2020-R17.

Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Commonwealth EPBC Act referrals provide an assessment of proposed actions that has, will have or is likely to have a significant impact on any matters of national environmental significance.

The Commonwealth EPBC Act referrals can be viewed on:

<http://epbcnotices.environment.gov.au/publicnoticesreferrals/>

Note that the applications when listed show Lower Murray Urban and Rural Water Corporation as the Proponent, the reference number is 2020/8771.

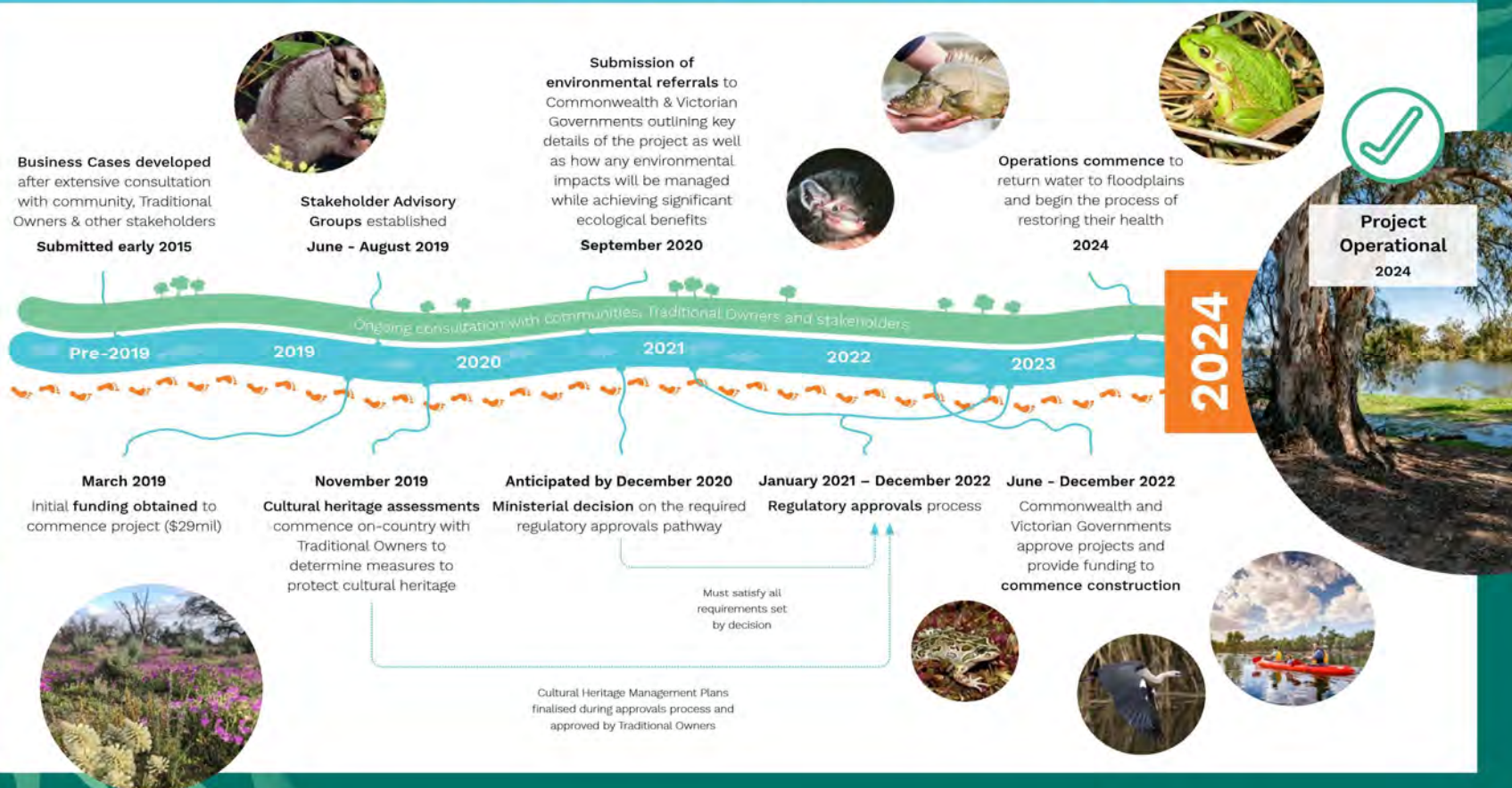
Table 2. Approvals

Project	Environmental Effects Act	Environmental Protection and Biodiversity Conservation Act
Gunbower	Awaiting pathway decision	Controlled action - Awaiting pathway decision

Note: This table was current at 17 November 2020.

The image on the next page shows the predicted timeline for the Project, including the approvals.

Victorian Murray Floodplain Restoration Project Timeline



How much will it cost?

Estimated capital expenditure is currently, \$11,680,000 for the whole of Gunbower. This includes \$2,240,000 for Upper Gunbower and \$9,440,000 for Middle Gunbower.

Currently stage one of the project is funded. This includes all of the environmental, cultural and social studies by specialists to form the documents for the approvals. It also includes the design work for infrastructure that is proposed and includes applying for and working through State and Commonwealth approvals.

Stage two is construction of the infrastructure, we will find out if stage two will be funded around the end of 2022 once the approvals have been applied for and decided on.

Will there be local economic benefits from the projects?

Spending almost \$12m in the local area on construction alone would bring much-needed economic investment to the nearby towns and communities. This spending would be on things like the specialist studies for ecology as well as the Cultural Heritage Management Plans, then also construction, accommodation, food and other supplies for various contractors. Water for the environment has benefits to the economy well after it has arrived on the floodplain.

Water for the environment has significant socio-economic benefits on local communities, tourism, and agriculture. Improving the forest and increasing water can do things such as attract more tourists for water activities, animal watching, camping, fishing etc. Healthier forests can also make an area more attractive to live near.

What about ongoing cost?

There would be ongoing costs associated with the Project. This would include operating and maintaining the infrastructure, complementary works like weed control and also monitoring and evaluation to track how the water is improving the environment.

Operation and maintenance: Goulburn Murray Water would be responsible for operation and maintenance of the infrastructure. Watering would be planned in partnership with North Central Catchment Management Authority (CMA).

Complementary works: Would be undertaken in partnership with Parks Victoria, DELWP, North Central CMA, local council and communities. Activities may include invasive plant control (weed management), revegetation, improving access tracks and visitor and camping facilities.

Monitoring and evaluation: As part of the approvals process the Government will request that we monitor the changes that occur during and after water inundation. This would help to show that the projects are beneficial and track the health of the plants, animals and functions of the ecosystem in the forest and river.

How long will it take until water is put into the forest?

If approval to construct is granted, VMFRP are aiming to have construction complete by June 2024 to meet Government requirements. This is of course after the designs are finalised, the approvals process is complete, and the project has been given permission to proceed. After this point we would then move water onto the wetlands at the best time for the environment. This decision will be made based on a number of factors, some of which include, water already in the area, river water levels, time of year, water dependent species present/breeding in the area. Decisions to water (or not to water) are made on an annual basis through the development of Seasonal Watering Plans – a process which includes community engagement every year and takes into account what is happening with water at the time (i.e. drought, flood, water availability).

Part 2 Potential Environmental effects (describing the current status and potential changes)

The proposed works will allow environmental water to be diverted from the Murray River to high value wetlands and floodplains. This will mimic the benefits of natural flood events and improve the condition of vegetation communities to provide habitat for native fish, birds, frogs and turtles and work to restore the floodplains. The entire Victorian Murray floodplain contains some of the most important vegetation and animal life in the country, and Gunbower Forest is a key part of that landscape. This project aims to help repair more than a century of damage caused by river regulation, landscape change and a variable climate.

Overall, we predict a positive outcome for the wetlands and surrounding forest as well as the Murray River, as the area of impact is small in comparison to the area that will experience positive benefits from more frequent inundation.

Water for forests and farmers

Doing these projects would prevent further water buybacks and keep water in the hands of irrigators and communities. One of the great things about these projects is they would be a win-win for the communities and the floodplains.

How do we know when the project has worked?

When visiting the forest and wetlands, people should be able to see that it is healthier. This may take a number of years though as the forest needs to recuperate first until the seed stores recover in the ground and the water has helped to recover some of the less healthy areas of the floodplain but that is why we will monitor a range of things in the forest. People may see things like tree canopies with more leaves and a range of different animals and insects. It will of course depend on what season the area is visited, for example, in summer it may still look very dry but in spring there may be water on country and people would be able to see a range of wetland plants that are otherwise not there.

So that we can track changes in the forest, VMFRP have developed ecological objectives and targets along with things we would monitor that would help to indicate that the water is making an improvement. Things that we would monitor include tree canopy health, plant species and composition, what animals are in the forest and wetland areas as well as a range of others. The document that outlines these is called the monitoring, evaluation and reporting plan (MER plan). It is still in draft and will continue to be improved as we progress.

Attachment 2 to the EE Act referral (Gunbower National Park Ecological Objectives and Hydrological Requirements Justification Paper) contains the detailed ecological objectives and targets for the project and an overview of how these have been developed. The ecological objectives for the project can be summarised as:

- Healthy River Red Gum and temporary wetlands:
 - Achieve an appropriate cover and diversity of plants found in the River Red Gum with flood dependent understory
 - Maximise the proportion of trees with healthy canopy condition in the River Red Gum flood dependent understory
 - Maintain and where possible increase the current diversity of threatened flora species
 - Reduce the area of high threat weed species.
- Drought refuge habitat provided for animals (particularly small-bodied native fish communities) in Black Charlie Lagoon (Permanent Wetland).
 - Maintain and where possible improve the current diversity of the small-bodied native fish community in Black Charlie Lagoon
 - Promote increased number of small-bodied native fish such as the Southern Pigmy Perch and the Murray Darling Rainbowfish in Black Charlie Lagoon.
- Healthy Wetland bird community through improved access to food and habitat that promote breeding and recruitment.
 - Support waterfowl breeding events in most years
 - Contribute to the success of breeding events of colonial nesting waterbirds in the lower Gunbower Forest by providing foraging areas in Gunbower National Park
 - Maintain and where possible increase the current diversity of threatened wetland bird species.

Some of the benefits for the environment and all it supports that we would expect to see if the Project were to go ahead area are summarised in the table below.

Table 3: Expected ecological benefits of water on country

Floodplain area	Ecological benefits of water on country
River Red Gum Forest	<ul style="list-style-type: none"> • Delivery of optimum inundation regimes to maximize the condition and function of the significant River Red Gum floodplain dependent understorey (FDU), including vulnerable and depleted EVCs • Increase in diversity of FDU in the upper Gunbower Forest, over time • Support and enhance the presence of threatened plants • Enhance tree canopy health • Promote growth of drought-tolerant plants and habitats to support aquatic animals, including frogs, fish and water birds • Increase resources for woodland animals • Increase riverine food web contributing to improved fish numbers and productivity
Wetlands	<ul style="list-style-type: none"> • Promotion of diverse wetland habitats • Enhanced inundation regime will mineralise organic matter and support microbial and planktonic productivity, providing abundant resources for aquatic animals and wetland birds, including migratory waders • Provision and enhancement of critical habitat for threatened animal species, including threatened fish, frogs, turtles and birds • Improved wetland vegetation diversity, abundance and recruitment • Provision of diverse habitats for threatened plants

What does this mean????’mineralize organic matter and support microbial and planktonic production’.

Some of the benefits being sought by the Project sound very technical and they are really important to the ecologists who understand what is required for a healthy River Red Gum forest with flood dependant understory and wetlands.

Supporting microbial and planktonic productivity is supporting the base of the food chain. These small things are the first building blocks of all other life on a wetland and across areas that need floods. Insects and birds feed on these small things, plants use them as nutrients and then the chain of life and productivity improves. Larger and larger plants and animals benefit from this base of production. So without it, the whole ecosystem begins to fail. Much like we have been seeing in other areas which used to have regular floods that now don’t have them.

Microbial productivity = microbes are tiny forms of life such as bacteria and fungi. Making the minerals available to them via inundation will allow them to become more productive.

Planktonic productivity = plankton are the microscopic organisms drifting or floating in fresh water, consisting mainly of diatoms, protozoans, small crustaceans, and the eggs and larval stages of larger animals. Many animals are adapted to feed on plankton, especially by filtering the water.

Native plants (flora)

River regulation has altered the inundation regime of the high value floodplain habitats in Gunbower, and the significant reduction in the frequency and duration of natural flood events has impacted the condition of the ecological values, by reducing the availability and quality of wetland and river red gum floodplain habitat.

What is an Ecological Vegetation Class?

You will see the acronym 'EVC' used a lot throughout the specialist reports and the referrals documents. It stands for Ecological Vegetation Class. These EVCs are groupings of plants based on floristic, structural and ecological features. **There are over 300 EVCs in Victoria, all have been assigned a number, that will often also be listed alongside the name of the EVC.**

The Project area to benefit from inundation is approximately 704 hectares and contains the following EVCs:

- 316.37 ha Riverine Swampy Woodland EVC 815 – Vulnerable (VU)
- 92.69 ha Riverine Chenopod Woodland EVC 103 – Endangered (EN)
- 85.95 ha Grassy Riverine Forest – Riverine Swamp Forest EVC 812 – Not Classified (NC)
- 78.10 ha Sedgy Riverine Forest – Tall Marsh Complex EVC 1071 – NC
- 56.75 ha Grassy Riverine Forest EVC 106 – Depleted (D)
- 12.84 ha Billabong Wetland Aggregate EVC 334 – NC
- 12.58 ha Tall Marsh EVC 821 – Least Concern (LC)
- 10.77 ha Riverine Swampy Woodland EVC 815 – VU
- 9.17 ha Drainage Line Aggregate EVC 168 – NC
- 8.92 ha Lignum Swampy Woodland EVC 823 – VU
- 5.95 ha Riverine Swamp Forest EVC 814 - D
- 3.94 ha Sedgy Riverine Forest EVC 816 – D
- 1.26 ha Riverine Swamp Forest – Floodway Pond Herbland EVC 954 – NC
- 0.98 ha Plains Woodland EVC 803 – Endangered (EN)
- NA ha Riverine Grassy Woodland EVC 295 - VU
- NOTE: 7.84 ha of proposed inundation has not yet been mapped for EVC

As you can see from the list, quite a few of these are listed as vulnerable or endangered. Putting water onto them will help to improve their health in the ways listed in the previous tables.

One EVC, the Plains Woodland EVC 803 (0.98 ha) which is listed as endangered is not a wetland EVC and may be negatively impacted by the inundation, however we do not expect it to be so impacted it would no longer meet the criteria for this EVC.

The proposed construction footprint contains approximately 19.57 hectares of native vegetation, including 58 large trees. The following EVCs are in the footprint which means that they may be lost or negatively impacted by the projects activities:

- 7.62 ha Riverine Swampy Woodland EVC 815 – VU
- 4.19 ha Plains Woodland EVC 803 – EN
- 4.04 ha Riverine Chenopod Woodland EVC 103 – EN
- 2.37 ha Sedgy Riverine Forest EVC 816 – EN
- 0.73 ha Riverine Swamp Forest EVC 814 - D
- 0.22 ha Floodplain Riparian Woodland EVC 56 – D
- 0.19 ha Grassy Riverine Forest EVC 106 – D
- 0.17 ha Riverine Grassy Woodland EVC 295 – VU
- 0.06 ha Tall Marsh EVC 821 – LC

The construction footprint vegetation clearance area does not include clearance associated with power supply or levee works. VMFRP will continue to do more work on this once the approvals pathway is known and we can confirm the final layout of infrastructure. The vegetation to be impacted is within existing disturbed areas or is next to vehicle tracks and areas of previous disturbance, representing poor quality vegetation.

Avoid and minimise

Efforts have been made throughout the planning and design phases for the Project to avoid and minimise impacts to ecological values, including native vegetation and animals habitat, threatened plants, animals and communities. This will be further scrutinised during the approval processes to get the best possible outcome for the environment.

Native animals (fauna)

Desktop searches conducted to help write the reports for government referrals identified 56 listed Flora and Fauna Guarantee Act (FFG Act) and EPBC Act terrestrial (land) animal species that have been recorded or have the potential to occur within 10 kilometres of the project area. Of these species, 45 are considered possible to occur or are known to be present within the project construction footprint or inundation area.

Among the 45 species there are 11 listed as threatened under the EPBC Act, 29 listed under the FFG Act, 41 DELWP advisory listed threatened species. Each of these species was assessed for their likelihood of occurrence, taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the project area. Nineteen of these threatened animal species have been assessed as possibly being impacted by the project including:

- Bearded Dragon (*Pogona barbata*) – DELWP Advisory vulnerable
- Broad-shelled Turtle (*Chelodina expansa*) - FFG Act listed, DELWP Advisory endangered
- Carpet Python (*Morelia spilota metcalfei*) – FFG Act listed, DELWP Advisory endangered
- Freshwater Catfish (*Tandanus tandanus*) - FFG Act listed, DELWP Advisory endangered
- Golden Perch (*Macquaria ambigua*) - DELWP Advisory near threatened

- Growling Grass Frog (*Litoria reniformis*) – EPBC Act Vulnerable, FFG Act listed, DELWP Advisory endangered
- Lace Monitor (*Varanus varius*) - DELWP Advisory endangered
- Murray Cod (*Maccullochella peelii peelii*) – EPBC Act Vulnerable, FFG Act listed, DELWP Advisory vulnerable
- Murray Crayfish (*Euastacus armatus*) - FFG Act listed
- Murray River Turtle (*Emydura macquarii*) – DELWP Advisory vulnerable
- Murray-Darling Rainbowfish (*Melanotaenia fluviatilis*) – FFG Act listed, DELWP Advisory vulnerable
- Silver Perch (*Bidyanus bidyanus*) – EPBC Act Critically Endangered, FFG Act listed, DELWP Advisory vulnerable
- Sloane's Froglet (*Crinia sloanei*) – EPBC Act endangered
- South-eastern Long-eared Bat (*Nyctophilus corbeni*) - EPBC Act Vulnerable, FFG Act listed, DELWP Advisory endangered
- Southern Pygmy Perch (Murray-Darling lineage) (*Nannoperca australis*) - DELWP Advisory vulnerable
- Squirrel Glider (*Petaurus norfolkensis*) - FFG Act listed, DELWP Advisory endangered
- Trout Cod (*Maccullochella macquariensis*) - FFG Act listed, DELWP Advisory critically endangered
- Unspecked Hardyhead (*Craterocephalus stercusmuscarum fulvus*) – FFG Act listed
- Woodland Blind Snake (*Anilius proximus*) - DELWP Advisory near threatened.

Further survey work is being carried out to establish the presence of these species in the areas these projects may affect. So that we can reduce the potential impact on these species VMFRP are also planning multiple actions that would be carried out during construction. These actions will be detailed in the CEMP that would be developed by contractors accessing the site. These actions include things like fencing off areas of significance, vegetation clearance minimised, actions to limit and control the spread of invasive species and diseases.

Fish

Native fish are quite specialised and a very important part of the river and wetlands. Putting in infrastructure can be a hazard to them and limit movement, so proposed infrastructure has been minimised as much as possible and measures put in place to help keep native fish populations safe.

The project would include the following things specifically for fish.

- Provision of safe downstream fish passage for native fish through all new regulating structures. This would include safe fish passage from the floodplain and into the Murray River during forest draining events and low Murray River flow water levels
- Provision of screens for fish protection on each intake structure associated with the pump stations. This stops any fish becoming trapped in the pumps and dying
- Active fish passage is planned to be provided at the proposed Camerons Mid Creek Regulator to maintain connectivity for small bodied fish between the wetland areas separated by this structure, aligning with the Upper Gunbower Creek Fish Management Plan (ARI, 2020b). The fish passage provision at Camerons Mid Creek Regulator would be a cone type fishway consisting of a simple channel and precast cones.

- We know that Carp can cause destruction therefore Carp screens have been proposed and would be required on the Murray River pump stations and regulators to exclude large numbers of adult carp entering the floodplain during managed events, causing ecological damage to wetlands and spawning on the floodplain.

Small regulator structures would be operated either in fully open or fully closed position. When water is released with the regulator gate in fully open position, fish would have passage through the regulator both in managed release and natural flood scenarios. Structures will be designed to have flow velocities appropriate for fish passage (based on ARI, 2015).

Water – Where does it come from and go to and what will it do

Water comes from the Murray River, it is water that is already held by the Environmental Water Holder who then allocates that to the environment to support the health of the system. The average estimated water use across the Project area, not including return flows, if a forest floodplain watering is being undertaken, is currently about 7.4 megalitres per hectare. Forest floodplain waterings are planned to be undertaken 3 years in 10. The 10 year averaged water use for the Project across 704 hectares would be about 2.6 megalitres per hectare. In comparison, perennial pasture is 8-12 megalitres per hectare and long-lived annual pasture or summer crops are both 4-6 megalitres per hectare, based on long-term average water use across the local region. If the forest floodplain and semi-permanent wetlands are both watered at the same time, water use is more; or if just the wetlands are watered, average usage is less.

Three potential operating scenarios have been identified for water delivery to the Gunbower National Park. These have been proposed to meet the ecological objectives of the project and are detailed below.

Permanent wetland watering – targeted water delivery would be to the wetlands only. The optimal inundation regime for the permanent wetlands (Camerons Creek and Black Charlie Lagoon) would be to have water there all the time. Black Charlie Lagoon would be filled in winter/spring and allowed to drawdown throughout the year while maintaining minimum residual pool water levels; some years would only require top-up water delivery. The lagoons and waterway of Camerons Creek would be allowed to fluctuate (go up and down) and periodically be topped up to maintain sufficient water depth and connectivity to support all things that live in or on the water.

Forest floodplain watering – water delivery would be to the broader floodplain (including temporary wetlands) and a semi-permanent wetland:

- River Red Gum forest with flood dependent understorey (Baggot Swamp and mid-forest floodplain), temporary wetlands (Emu Hole and Red Rise Swamp) and associated creeks and low-lying areas. The optimal inundation regime is on average six years in ten for between two to five months and would require pumping on average three years in ten to achieve the optimal inundation regime. Inundation in other years is assumed to be provided through natural inundation under the Basin Plan 2750 GL flow scenario
- Semi-permanent wetlands (Pig Swamp). The optimal inundation regime is on average seven years in ten for six months and would require pumping on average four years in ten to achieve the optimal inundation regime. Environmental water would be

delivered to Pig Swamp three years in ten under the River Red Gum forest and temporary wetland scenario outlined above, with an additional one year in ten delivered to achieve the optimal inundation regime for the semi-permanent wetland. Inundation in other years is assumed to be provided through natural inundation under the Basin Plan 2750 GL flow scenario.

Hybrid events – topping up natural flood events for the forest floodplain, temporary wetland and semi-permanent wetland watering due to natural duration being too short or too low. There are two options for extending the duration of natural floods that inundate the broader forest and associated wetlands:

- Flood capture to retain floodwater on the floodplain for the required duration by closing the outlet regulators and low-lying inlet regulators from the Murray River after the river flow peak has passed
- Follow up watering of the forest floodplain and wetlands following natural flow peaks and/or flood capture to achieve the required inundation extent and/or duration where the natural inundation extent or duration is inadequate to achieve ecological objectives.

So how often will water be in the forest and wetland areas?

The permanent wetlands are Camerons Creek and Black Charlie Lagoon, VMFRP would aim to have some water in them all the time. The water levels will change to mimic natural drying and we may top them up at the right time to again mimic nature and help create a healthy environment.

Pig swamp is a semi-permanent wetland, this means sometimes it will dry. We would aim to put water into it four years out of ten and for the water to be there for about six months at a time.

Baggots Baggot Swamp and the mid-forest floodplain as well as the temporary wetlands Emu Hole and Red Rise Swamp would have water in them about six years out of every ten for between two to five months. It is expected that we would need to pump water to these areas about three out of the ten years. The other times it will be wet from natural events.

Groundwater

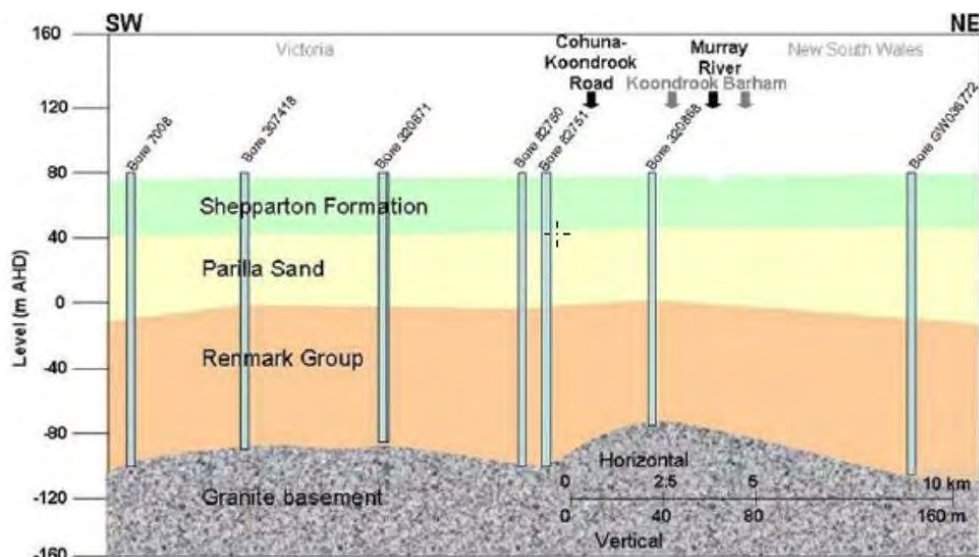
Northern Victoria has been subject to the threat of salinity for more than a hundred years. It occurs because the area is underlain by a series of regional groundwater aquifers comprising saline (salty) groundwater and occurs where this groundwater discharges to the surface of the land.

When vegetation was cleared for agriculture, the groundwater aquifers were recharged by irrigation water and rainfall in excess to the needs of shallow rooted pastures. The water travelled down through the soil profile and into the groundwater aquifers. The northern Victoria irrigation industry overlays the natural discharge area of the regional groundwater system.

Groundwater is often referred to as the watertable, and the levels can fluctuate depending on the volumes of water being available through rainfall, used by irrigators and flowing in through regional aquifers. Local groundwater is recharged following periods of high rainfall and irrigation and is known to increase the elevation of the watertable, thus causing salinity issues. Where the watertable is close to the land surface and the energy from the sun draws salty groundwater to the surface (capillary action), the water evaporates and leaves behind the salt on the ground surface. Another risk is if a lot of groundwater discharges into surface water to increase salt loads in water bodies. On the other hand, due to Millennium drought from 1998 to 2010 and improved water use efficiency measures undertaken by local irrigation farmers with support from government, groundwater levels fall so that capillary action can't draw the groundwater to the surface.

The physical processes responsible for salinity are quite complex as groundwater flow systems vary considerably with respect to scale and process. Local flow systems function over distances less than five kilometres, whilst sub-regional and regional systems typically extend over many tens of kilometres through to hundreds of kilometres.

The interactions between surface water and groundwater also vary in accordance with local stratigraphy (rock layers in the ground). The dynamics of these interactions determine the risk of salinity developing along with changes to the water balance. The Project area (forest) sits on top of the thick Shepparton formation aquifer with the Parilla Sand and then the Renmark Group aquifers underneath. Bedrock underlies these stratigraphic rock layers at a depth of around 180m across the Project area.



The Project area (forest) is underlain by groundwater typically between 5 -10 m depth below ground surface. The forest trees use a lot of water through transpiration (water enters through the tree roots and up through the trunk, stems and leaves to then evaporate). However, groundwater in the southern portion of the Upper Gunbower project area is less than 5 m, probably due to adjacent intensive irrigation areas. Mapping carried out clearly demonstrates the impact of the transpiration by forests on lowering groundwater levels, as well as the impact of widespread irrigation (on the plains to the west and south of the forest) to keep groundwater levels elevated. Outside of the forest, groundwater levels are mapped as less than 5 m below ground level, indicating a hydraulic gradient into the forest.

The Project area groundwater salinity ranges between 11,000 to 55,000 EC (7,000 to 35,000 mg/L). Available groundwater bore information and soil salinity data indicates a range from about 11,000 EC to 20,300 EC across Middle Gunbower (upstream Deep Creek) and the eastern half of the Upper Gunbower inundation extent. For the Upper Gunbower area, groundwater salinity is expected to range between 20,300 EC to 54,700 EC (FedUni, 2015).

There have been and continue to be extensive studies by salinity experts across northern Victoria. Salinity is known to be a key risk for the region and there are 60 groundwater bores being monitored across the forest. As a part of the next steps in trying to gain approval for this project more studies focused on specifics of this project will be done by professionals. If you are interested to look at the water monitoring results for your own interest they can be sourced at <https://data.water.vic.gov.au/>

Noise

VMFRP has had noise modelling completed for the pump station to determine if in the worst case possible, when the pump station is operating throughout the day and night, if noise might be a problem at local sensitive locations.

Where is noise modelled and measured

Noise levels are modelled to determine compliance at things like houses, schools and hospitals, these are called sensitive locations or receptors. A 'sensitive location' is where the noise criteria must be met (for example, a local house not at the pump station site).

Pump station noise outputs from VMFRP's assessment is predicted to comply with the relevant industry criteria for both the Victorian and New South Wales industry noise policies. The policies to comply with are the:

- Victorian Noise from Industry Regional Victoria (NIRV): Recommended maximum noise levels from commerce, industry and trade premises in regional Victoria (EPA publication 1411) (EPA Victoria, 2011)
- New South Wales Noise Policy for Industry (NPI 2017).

The two policies have slightly different methodologies with Victoria having the strictest noise criteria to be met of 34 dB(A) compared to 35 dB(A) for New South Wales at the sensitive receiver locations. VMFRP has adopted Victoria's noise criteria.

Noise modelling was undertaken using Computer Aided Noise Abatement (CadnaA) Version 2020-MR1 noise modelling software. This modelling replicates conditions that commonly occur on clear, calm nights or 'downwind' conditions, which are favourable to carrying sound better. The modelling

assumed the worst case scenario for the pump station with the small and large pumps operating all at once and continuously throughout the day, evening and night time period – although it is unlikely that all pumps would be operated at the same time during future environmental watering operations. The scenario also included the proposed new pole mounted power transformer to ensure all new sources of noise were considered in combination. No noise mitigation measures were applied, and noise levels were predicted for sensitive locations (including nearby houses).

The estimated noise level at the nearest sensitive location is 11 dB(A); approximately 30 metres from the pump station is 34 dB(A) and 75.1 dB(A) at the pump station if all pumps and power transformer were in operation.

For reference, the threshold of human hearing is 0 dB(A). Breathing is said to be around 10 dB(A). Whispering around 30 dB(A). Normal conversation around 50-60 dB(A).

Understanding noise

Decibel is a measurement used to measure sound levels. dB(A) is the 'A-weighted' decibel measurement as an Australian Standard AS IEC 61672- 2004 Electroacoustics. It is an expression of the relative loudness of sounds in the air as perceived by the human ear – as the human ear does not hear all frequencies equally.

Part 3 Social environments

In addition to the ecological benefits summarised in this document and the suite of referral documents and specialist reports, the project if approved would also expect to contribute to the following socio-economic benefits:

- Enhanced tourism and recreational opportunities by improving the health, condition and amenity of riverine landscapes that attract visitors to the region
- Increased health of River Red Gums, and other flowering plants in the area, as a result of environmental watering would increase apiary site opportunities
- Improved health of wetlands and floodplain ecosystems that are highly valued by First Nations people
- Reduced requirements to buyback water from consumptive users (e.g. irrigators) and associated impacts on regional communities, while still contributing to achievement of the environmental objectives set by the Murray-Darling Basin Plan.

First nations people and aboriginal cultural heritage

Gunbower Forest has two Traditional Owner Groups: the First Nations people of the Yorta Yorta Nation Aboriginal Corporation and the Barapa Barapa. The Project area is located within the Gunbower National Park and the Murray River floodplain, which would have been a favourable location for Aboriginal occupation and a good source of resources given the availability of food and fresh water. Remnant mature River Red Gum and Black Box, especially along the Murray River, have potential for cultural scarring with scarred trees being the most commonly recorded Aboriginal Place type within the region and the Aboriginal Place type most likely to be located within the project area. Landforms with the highest archaeological potential are in the margins, terraces and source-bordering dunes of the waterways. Several cultural heritage investigations have been undertaken in the geographic region, with no previous CHMPs covering any part of the project area.

A search of the Victorian Aboriginal Heritage Register (VAHR) identified 30 registered cultural heritage places (Aboriginal Places) containing a total of 36 individual components located within 50 m of the proposed activity area for this project.

The CHMP currently being prepared for the project is the mechanism for managing impacts to Aboriginal cultural heritage within both the construction footprint and inundation area. As a part of the CHMP process, consultation with the First Nations people group is ongoing. The CHMP will include a desktop assessment, standard assessment (field survey) and complex assessment (sub-surface testing).

Other historical Heritage

No places listed on the Victorian Heritage Register (VHR), Victorian Heritage Inventory (VHI), World Heritage List, National Heritage List or Commonwealth Heritage List are located within or adjoining the area of investigation.

The Cohuna and Gannawarra Pumps are currently nominated for the Victorian Heritage Register, but their status is not yet confirmed by Heritage Victoria. Based on this nomination, this heritage place has interim protection under Part 8 of the Heritage Act 2017, which covers a substantial area including the main Cohuna and Gannawarra Headworks remnants, Deep Creek Inlet Channel,

connecting channel and broad areas with visible archaeology or archaeological potential. As such, any works in the headworks area will require a Permit from Heritage Victoria.

Consultation

North Central Catchment Management Authority (CMA) are leading the engagement and communications for this project. The CMA is currently undertaking landholder and community consultation on the projects' proposed outcomes and works designs.

The VMFRP is committed to work with First Nations people, key stakeholders and community members to make sure their views and local knowledge is included in these environmental works projects as they are investigated further and developed. North Central CMA is also taking the lead with First Peoples consultation and engagement.

Targeted and tailored consultation will continue to be offered and conducted with key stakeholders throughout the project, aligning to project milestones, assessments and approvals processes where necessary and/or appropriate. There are two forms of consultation and engagement – formal and informal. The informal process will include responding to questions as they arise, listening to concerns and ideas and making sure anyone who has a query or issue will be heard.

VMFRP staff are committed to finding the right way forward for these projects and are open to any thoughts and ideas from anyone. We're only a phone call or email away and are happy to come and meet with anyone to discuss the Project. Formally, it is expected that Commonwealth and State Government regulatory authorities (under the EPBC Act and EE Act processes) will specify their expectations for engagement when further investigating if the project will have significant environmental impacts and to better understand any community concerns – VMFRP intends to deliver and exceed on these requirements. This is likely to include further face-to-face briefings, presentations, site visits and regular project updates via mail-outs and newsletters. Opportunities will be offered and it will be up to locals to utilise them.

Can I view and comment on the plans?

The VMFRP had submitted referral applications to the EE Act and EPBC Act. These already had a period of public display (EE Act) and a period for comment (EPBC Act). Once the pathways for approval are chosen there will be more opportunities for community comment.

We want to help the community fill in any gaps and answer any questions. The environmental impact process gives the community and stakeholders a chance to comment in the initial proposals, and we think it's important as much information is known about these proposals now.

Part 4 Environment management and monitoring

Various things are being planned to manage and monitor if the Project is approved, this would be for both construction of infrastructure and operating the infrastructure when it is complete.

Management

Site specific working Draft Environmental Watering Management Plan's and Operating Plans are being developed for the sites. Further work on these draft documents will be completed by the VMFRP in consultation with DELWP, Parks Victoria, the North Central Catchment Management Authority, Goulburn Murray Water and other relevant agencies as the project progress. The finalised plans would document the avoidance and mitigation measures to be implemented for the project during operations (including the planned timing of inundation events), as well as responsibilities for implementation.

How will you monitor if your project is successful?

Like everything with water for the environment, repairing more than a century of damage takes time. These projects will have evidence-based expert monitoring built into them at every step along the way, for all kinds of plant and animal responses, monitoring would be publicly available. Watering plans would be prepared annually for each area, this is a process the government and community would have input into.

Part 5 More information

For further information or discussion please don't hesitate to contact:

Tim Shanahan
VMFRP – Project Manager – East
0438 320 944
tim.shanahan@vmfrp.vic.gov.au

Shaun Morgan
VMFRP – Senior Engagement Officer – East
0439 554 186
shaun.morgan@vmfrp.vic.gov.au