REFERRAL OF A PROJECT FOR A DECISION ON THE NEED FOR ASSESSMENT UNDER THE ENVIRONMENT EFFECTS ACT 1978

REFERRAL FORM

The *Environment Effects Act 1978* provides that where proposed works may have a significant effect on the environment, either a proponent or a decision-maker may refer these works (or project) to the Minister for Planning for advice as to whether an Environment Effects Statement (EES) is required.

This Referral Form is designed to assist in the provision of relevant information in accordance with the *Ministerial Guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Seventh Edition, 2006). Where a decision-maker is referring a project, they should complete a Referral Form to the best of their ability, recognising that further information may need to be obtained from the proponent.

It will generally be useful for a proponent to discuss the preparation of a Referral with the Impact Assessment Unit (IAU) at the Department of Environment, Land, Water and Planning (DELWP) before submitting the Referral.

If a proponent believes that effective measures to address environmental risks are available, sufficient information could be provided in the Referral to substantiate this view. In contrast, if a proponent considers that further detailed environmental studies will be needed as part of project investigations, a more general description of potential effects and possible mitigation measures in the Referral may suffice.

In completing a Referral Form, the following should occur:

- Mark relevant boxes by changing the font colour of the 'cross' to black and provide additional information and explanation where requested.
- As a minimum, a brief response should be provided for each item in the Referral Form, with a more detailed response provided where the item is of particular relevance. Cross-references to sections or pages in supporting documents should also be provided. Information need only be provided once in the Referral Form, although relevant cross-referencing should be included.
- Responses should honestly reflect the potential for adverse environmental effects. A Referral will only be accepted for processing once IAU is satisfied that it has been completed appropriately.
- Potentially significant effects should be described in sufficient detail for a reasonable conclusion to be drawn on whether the project could pose a significant risk to environmental assets. Responses should include:
    - a brief description of potential changes or risks to environmental assets resulting from the project;
    - available information on the likelihood and significance of such changes;
    - the sources and accuracy of this information, and associated uncertainties.
- Any attachments, maps and supporting reports should be provided in a secure folder with the Referral Form.
- A USB copy of all documents will be needed, especially if the size of electronic documents may cause email difficulties. **Individual documents should not exceed 2MB as they will be published on the Department's website.**

- A completed form would normally be between 15 and 30 pages in length. Responses should not be constrained by the size of the text boxes provided. Text boxes should be extended to allow for an appropriate level of detail.
- The form should be completed in MS Word and not handwritten.

The party referring a project should submit a covering letter to the Minister for Planning together with a completed Referral Form, attaching supporting reports and other information that may be relevant. This should be sent to:

Postal address

Minister for Planning
PO Box 500
EAST MELBOURNE VIC 8002

Couriers

Minister for Planning
Level 16, 8 Nicholson Street
EAST MELBOURNE VIC 3002

In addition to the submission of the hardcopy to the Minister, separate submission of an electronic copy of the Referral via email to ees.referrals@delwp.vic.gov.au is required. This will assist the timely processing of a referral.

PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Name of Proponent:	**Victorian Murray Floodplain Restoration Project (VMFRP)**
Authorised person for proponent: **Position:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	Josh White Project Director PO Box 1438, Mildura VIC 3502 Josh.White@vmfrp.vic.gov.au 0400 697 304 n/a
Person who prepared Referral: **Position:** **Organisation:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	Josh White Project Director PO Box 1438, Mildura VIC 3502 Josh.White@vmfrp.vic.gov.au 0400 697 304 n/a Josh White
Available industry & environmental expertise: (areas of 'in-house' expertise & consultancy firms engaged for project)	**VMFRP** The VMFRP is a regional partnership model between Lower Murray Water (LMW), Goulburn Murray Water (GMW), the Mallee Catchment Management Authority (Mallee CMA), North Central Catchment Management Authority (North Central CMA) and Parks Victoria set up to deliver the VMFRP works on behalf of DELWP Water. **R8** Jacobs and GHD teamed in December 2018 to form a joint venture (R8 Joint Venture) to deliver an integrated program approach across all packages of work. Both Jacobs and GHD are large consultancies who are providing a comprehensive suite of technical consulting services to support the VMFRP. These services include planning and approvals, design, cultural heritage, terrestrial and aquatic ecology, landscape and visual, hydrology, geotechnical, survey and spatial amongst other services.

2. Project – brief outline

Project title:

Nyah Floodplain Restoration Project

Project location: (describe location with AMG coordinates and attach A4/A3 map(s) showing project site or investigation area, as well as its regional and local context)

The project is located to the west of the Murray River within the Nyah-Vinifera Park, which is managed by Parks Victoria. The project is located 30 km north of Swan Hill in the northwest region of Victoria between Nyah and Wood Wood. The project involves works to support inundation of 488 hectares (ha) of regionally and internationally significant floodplain. The location of the project is shown in **Attachment 1 – Location of the project**.

The main components of the project (N1a, N1b, N2, N5, N7 regulators, a series of containment banks, block banks, overflow sills and hardstand) are located near the downstream, river connection of Parnee Malloo Creek. The Nyah floodplain has an area of 913 ha of wetland, forest and woodland areas, extending across the Murray Valley Highway to the west, from the township of Wood Wood in the north to the township of Nyah in the south.

Throughout this referral the following terms are used to describe the project:

- Area of investigation - this includes the development footprint, as well as a substantial buffer around the development footprint. This area has been the basis of desktop and field investigations
- Development footprint - this is the area that the project infrastructure will occupy. This includes tracks used for access during construction and operation
- Construction footprint - this includes the project infrastructure as well as the land required to construct the infrastructure. This includes access tracks. For the purposes of this referral this is the 'disturbance footprint'
- Inundation area - area of land subject to flooding during managed events, up to a specific design water level

Reference to 'the project area' throughout this referral includes both the construction footprint and the inundation area.

Construction footprint

Construction of the project would occur within the area identified in the construction footprint map (**Attachment 2 – Project structures, construction and access**). Construction activities would include:

- Establishment of construction sites, set down areas and access routes
- Removal of existing structures where required
- Construction / installation of new structures

Construction would involve use of vehicles and machinery such as trucks, excavators, and access equipment.

For the purposes of this referral, the term 'construction footprint' includes the project infrastructure as well as the land required to construct the infrastructure, and includes access tracks.

Inundation area

The proposed inundation area is entirely within Crown land as shown in **Attachment 3 – Managed Inundation Area**. The majority of the inundation area is within Victorian jurisdiction within the Nyah-Vinifera Park however, the inundation area does extends slightly into NSW Crown land (being the Murray River).

Access tracks

Access to Nyah-Vinifera Park is achieved via the Murray Valley Highway and connecting public roads. The location of major works at sites N1, N2, N5 and N7 would be accessed from existing access tracks such as the Golf Club Track or other areas of disturbance. Bank 4, referred to as spillway 4, 5 and 6, would be accessed by an informal track for much of its length. The tie into the natural river levee would require some tree removal on the alignment. Minor works for some sites within the forest are much more remote and most can be readily accessed by existing forest tracks.

Access tracks are shown in **Attachment 2 – Project structures, construction and access.**

Regional and local context

The project is located almost entirely in the Rural City of Swan Hill and the Mallee Catchment Management Authority (CMA) region, with the exception of the upgrading of the outfall, which would extend into the banks and bed of the river within the border of NSW.

The project is situated near the western limit of the Murray Fans bioregion. The floodplain is one of the most downstream areas of the central river red gum forests which include Barmah-Millewa, Gunbower-Koondrook-Perricoota, Werei, Campbells Island, Guttrum and Benwell.

Short project description (few sentences)**:**

The project involves the construction of five regulators (N1a, N1b, N2, N5, N7), a series of containment banks, block banks, spillways and hardstand to facilitate managed inundation of the Nyah floodplain. The proposed works would facilitate an inundation of up to 488 ha of water, including river red gum and black box forests and woodlands. The project also involves the decommissioning of a number of redundant structures in the Parnee Malloo Creek.

3. Project description

Aim/objectives of the project (what is its purpose / intended to achieve?):

Through the construction of new infrastructure and the modification of existing infrastructure, the Nyah Floodplain Management Project aims to restore a more natural inundation regime across approximately 488 ha (refer **Attachment 3 - Managed Inundation Area**) of high-ecological-value Murray River floodplain within the Nyah-Vinifera Park. The proposed works will flood over half of the forest and provide inundation-dependant habitat with a water level of 63.2 m AHD, replicating the flood extent of the Murray River of up to 25,000 ML/day (Mallee CMA, 2014).

Project aim

Nyah is a low-lying floodplain area that, under a natural flow regime, was reliably inundated annually from the Murray River. Flows of approximately 25,000 ML/d from the Murray River to the floodplain occurred on annual flows, and much of this area remained flooded throughout the year. However, increasing regulation of the Murray River and extended periods of drought has resulted in a decline in the condition and productivity of the floodplain due to the reduced flood frequency and

durations (Cunningham et al, 2011). A condition assessment undertaken in 2014 by Ecological Associates identified a sparse understory within Nyah-Vinifera Park, with reduced diversity and habitat value (Ecological Associates, 2014). See further discussion of the current ecological condition of the floodplain in the section below.

The project aims to mimic the impact of natural flood events by providing inflows from the Murray River and additional pumping when required. Analysis of the inundation flow equivalences (Jacobs, 2016a) and **Figure 1** shows that the proposed works will replicate inundation flows of 25,000 ML/d at the Nyah floodplain. A comparison of the modelled extent of flooding across the Nyah floodplain under natural (pre-regulation), existing and proposed works conditions by Jacobs (2017) illustrates that floodplain works and river regulation have substantially reduced flooding in this area (**Attachment 4 – Natural, Existing and Proposed Flood Extent Maps**). A copy of the Jacobs report (2017) further describing of the effects of river regulation on floodplain hydrology is provided in **Attachment 5 – Hydrodynamic Modelling of SDL Sites - Nyah Forest**.

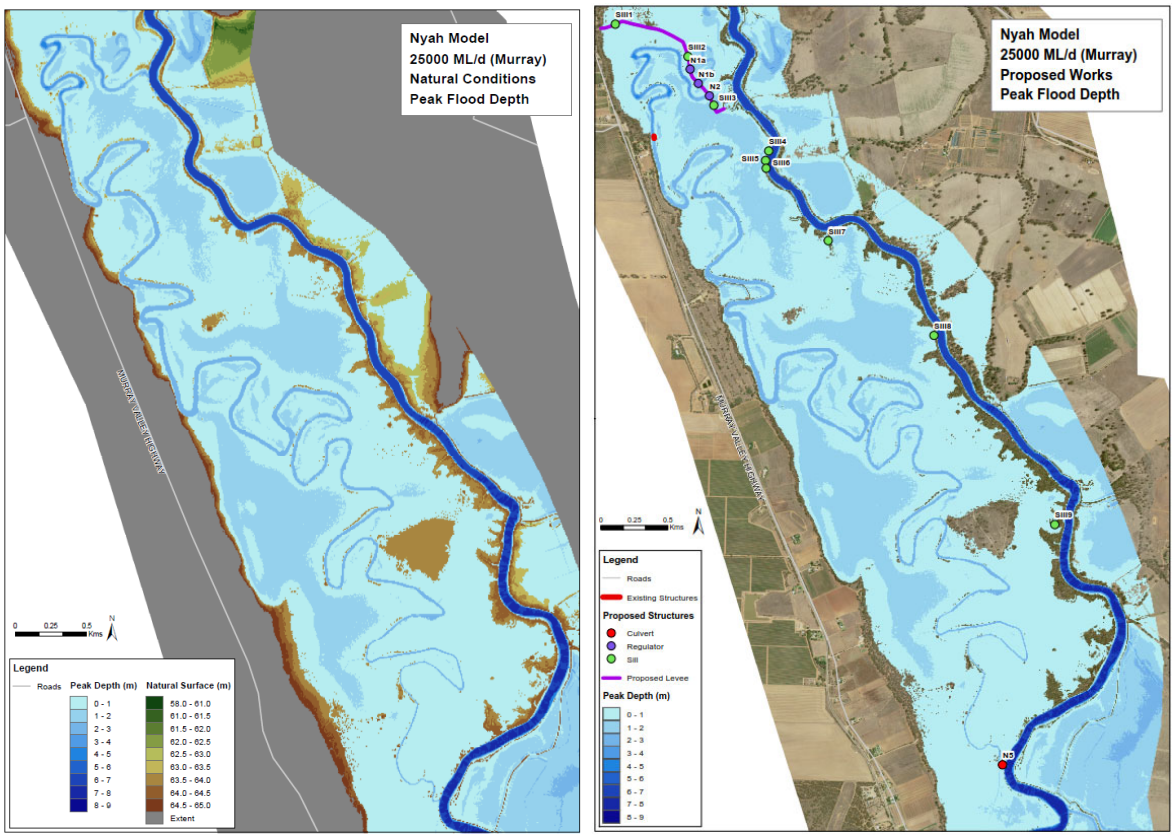

Figure 1 Comparison of the natural flooding conditions corresponding to Murray River flow of 25,000 ML/d (image left) against the proposed works flooding conditions (image right) (Jacobs, 2017)

Ecological objectives and targets

Four water regime classes comprised of nine ecological vegetation classes (EVCs) have been identified for restoration through this project as described by Ecological Associates (2014), including Red Gum Swamp Forest, Red Gum Forest and Woodland, Seasonal Anabranch and Seasonal Wetland (see **Attachment 6 – Rationale and Outcomes Report**). A summary of water regime classes and constituent EVCs within the managed inundation area and the Nyah floodplain area generally as identified by Ecological Associates (2014) is provided in **Table 1**.

Ecological Associates (2014) developed ecological objectives for the water regime classes identified for restoration by project based on:

- Environmental objectives set out in Chapter 5 of the Basin Plan 2012 (refer **Attachment 7 –**

Environmental Objectives of the Basin Plan)

- Expected environmental outcomes set out in the Basin-wide Environmental Watering Strategy (MDBA, 2014)[1]
- Ecological values identified through desktop and field-based baseline flora and fauna surveys
- An ecological objectives workshop with an expert panel comprised of aquatic wildlife and restoration ecologists and key project stakeholders (DELWP, Mallee CMA)

Ecological targets were also developed by Ecological Associates (2014) to measure progress towards achieving the ecological objectives.

The ecological objectives and targets were then refined as part of the VMFRP Monitoring Evaluation and Reporting (MER) Plan (ARI, 2020) to provide more specific objectives and targets against which progress can be measured and to support quantification of the degree of environmental benefit expected from the project. The specific ecological objectives and targets are based on the Ecological Associates (2014) ecological objectives and targets.

A summary of the ecological objectives and targets developed for the water regime classes identified for restoration by this project is provided in **Table 1**. The timeframes specified in these ecological targets are based on an assumed commissioning date for the proposed environmental works of 2020. These timeframes would be adjusted to reflect the actual commissioning date in the final Nyah Floodplain Environmental Watering Management Plan and Operational Plan that would be submitted for approval by the Murray-Darling Basin Authority (MDBA) prior to environmental watering being undertaken.

Table 1 Ecological objectives and targets for the project with reference to associated water regime class and Basin Plan objectives

Objective (Ecological associates, 2014)	Specific objectives (ARI, 2020)	Ecological Target (ARI, 2020)	Water Regime Class (Mallee CMA, 2014)	Associated Basin Plan Objective
Restore the vegetation structure of wetland plant communities	Restore the vegetation structure of wetland plant communities to predominantly treeless systems.	New River red gum encroachment absent from Seasonal Watering Plans in all years After Works Operation Commencement (AWOC).	Seasonal Anabranch Seasonal Wetlands	1,2,4,6,7,8,9,10, 11,12,13,14
	Restore the native aquatic and semi-aquatic macrophytes communities in seasonal wetlands and anabranches.	The projected foliage cover of native aquatic and semi-aquatic macrophytes exceeds 50% in seasonal wetlands and anabranches in December when flooded by ten years AWOC; and that cover is comprised of at least 5 species.		

[1] Expected environmental outcomes contained in the recently updated Basin-wide Environmental Watering Strategy (November 2019) (MDBA, 2019) are unchanged from the 2014 strategy.

Re-establish resident populations of frogs and small fish	Develop seasonal populations of small-bodied native fish.	Small-bodied native fish species are present every spring within the first ten years AWOC. At least four species in all wetlands.	Seasonal wetlands	1,2,4,6,7,8,9,10, 11,12,13,14
	Develop seasonal populations of native frogs.	At least three frog species are present in all wetlands every spring in the first ten years AWOC.		
Provide seasonal feeding and reproductive opportunities for riverine fish species	Provide suitable habitat conditions for large-bodied native fish spawning.	Spawning of Murray cod occurs in Parnee Malloo Creek in all years where adults are present in the first ten years AWOC.	Seasonal Anabranch Seasonal Wetlands	1,2,4,6,7,8,9,10, 11,12,13,14
	Provide suitable habitat conditions to maintain seasonal populations for large-bodied native fish species.	Juveniles of Murray cod are present in Parnee Malloo Creek in all years in the first ten years AWOC. Adults of Murray cod are present in Parnee Malloo Creek in spring in six of the first ten years AWOC.		
Provide reliable breeding habitat for waterbirds, including colonial nesting species	Provide reliable native foraging and breeding habitat for waterbirds.	Suitable waterfowl breeding habitat extent is maintained in all years in the first ten years AWOC.	Seasonal Wetlands Red Gum Swamp Forest Red Gum Forest and Woodland	1,2,4,6,7,8,9,10, 11,12,13,14
	Enable successful breeding of waterbirds, including colony-nesting species.	Any species of Anatidae or Rallidae successfully breeds every year in the first 10 years AWOC. Cormorants or Nankeen Night-heron breed on at least 6 occasions in the 10 years AWOC.		
Restoring floodplain productivity to maintain resident populations of	Reduce high threat exotic plant cover.	High threat+ exotic plants make up <5% of total extant vegetation cover in all sampled locations in all years AWOC.	Red Gum Swamp Forest Red Gum Forest and Woodland	1,2,4,6,7,8,9,10, 11,12,13,14

vertebrate fauna including carpet python, sugar glider* and grey-crowned babbler	Maintain plant cover and diversity of target native vegetation groups.	Plant cover and diversity within each previously recorded Plant Functional Group does not decline by more than 25% from Prior Works Operation Commencement (PWOC) levels in any flood year within the first ten years AWOC.		
	Maintain threatened native flora presence.	>90% of threatened flora species previously recorded continue to occur within the site in all flood years AWOC.		
	Maintain the health of native trees.	At least 75% of surveyed trees with 'healthy' canopy condition within ten years AWOC.		
	Increase the abundance of native woodland birds.	Total native woodland bird abundance increases by 10% from PWOC levels within 10 years AWOC.		
	Increase the abundance of bats as an indicator species of increased resources resulting from increased floodplain productivity.	Total bat activity increases by 25 % from PWOC levels within 10 years AWOC, quantifying the target level of restoration for bat populations in the region.		
	Increase the abundance of reptiles as an indicator species of increased resources resulting from increased floodplain productivity.	Total carpet python abundance increases by 10% from PWOC levels within ten years AWOC.		

* Examination of the records held on the Victorian Biodiversity Atlas and the Atlas of Living Australia as part of ARI (2020) revealed this species does not occur in the Nyah floodplain area. Sugar Gliders are a common species that is readily detected using standard fauna surveys techniques, so its absence is most likely due to the habitat being unsuitable for viable populations. This species is therefore considered to be a very low priority for monitoring at these sites and therefore no longer considered in ecological objectives for the site.

Flood frequency and duration

The project aims to better align the water regime (e.g. frequency, duration and timing of future flood events) within the managed inundation area to achieve the specific ecological objectives and targets. The water regime requirements for the four target water regime classes identified above reflect river conditions closer to the frequency, duration and timing of flood events experienced pre-regulation (i.e. closer to natural conditions) within the managed inundation area. Hydrological analysis by Gippel (2014) aimed to identify the water regime deficit within the managed inundation

area by comparing the frequency, interval and duration of flood events based on implementation of the proposed measure (the project) with flood events under natural, baseline (current) and Basin Plan (2012) flows without the measure. The hydrological analysis shows that while implementation of the Basin Plan flows does bridge the gap between natural and baseline conditions, it primarily impacts flows in the Murray River which are less than that required for floodplain watering at Nyah (Mallee CMA, 2014). Therefore, environmental works are required to deliver water to the managed inundation area to achieve the ecological objectives and targets.

Gippel (2014) modelling found that the proposed works associated with the project can be operated to meet shortfalls in the water required to achieve the frequency and duration across all of the water regime classes (refer to **Table 2** for more detail). The operational changes as a result of the proposed constructed works include harnessing water from natural high flow events in the Murray River and / or flows released from managed events to distribute, retain and in most cases release floodwaters within the managed inundation area. Use of constructed works enables environmental watering of targeted inundation area to be undertaken using smaller volumes of water than would typically be needed in a general overbank flooding event (Jacobs, 2017).

The expected ecological benefits of the project are:

- **Vegetation**: Hydrological regimes are the major factor responsible for determining the composition, structure, diversity and function of floodplain forest and wetland communities
- **Trees:** Successful regeneration of floodplain trees usually occurs after major floods, while floods also provide an essential source of water to maintain tree canopy health
- **Lignum:** Provides unique floodplain habitat and is dependent on floods for rapid vegetative growth and reproduction
- **Waterbirds:** Flooding acts as the primary stimulus for breeding waterbirds, increasing reproductive performance as the flood pulse stimulates productivity in the wetlands
- **Fish:** Flooding may trigger spawning or migration to suitable breeding habitat
- **Frogs:** Flooding promotes a rapid response in frog activity, including calling, spawning, and tadpole development and metamorphosis

Other benefits

In addition to the expected ecological benefits, the project is also expected to contribute to the following socio-economic benefits:

- Enhanced tourism and recreational opportunities by improving the health and condition of riverine landscapes that attract visitors to the region
- Improved health of wetlands and floodplain ecosystems valued by Traditional Owners
- 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

Background/rationale of project (describe the context / basis for the proposal, e.g. for siting):

Legislative and policy context

The Murray-Darling Basin Plan establishes the legal and policy framework for the use of environmental water in the Murray-Darling Basin and places a Sustainable Diversion Limit (SDL) on

the water that can be extracted from the system for irrigation and other consumptive uses. The SDL is based on an assessment of the water that must be left in the system to maintain ecosystem health. To comply with the initial Basin Plan SDL, water must be purchased from existing entitlement holders and applied to environmental needs. However, the Basin Plan includes a mechanism to adjust the SDLs (i.e. the SDL may be increased) if there are supply measures available that achieve an equivalent environmental benefit with less water.

Central to the SDL adjustment mechanism is a requirement that the environmental benefit of a proposed offset measure must exceed that of the base case (benchmark) scenario to justify an offset. Environmental benefit can be assessed in terms of how well the proposed measure addresses the Basin Plan's priorities for environmental water use, including, among other things, delivering benefits to ecosystems that are rare, near-natural or unique; provide vital habitat; support threatened species or communities; and support significant biodiversity.

In early 2019, the VMFRP secured funding from the Commonwealth government to progress engagement with communities and the development of detailed designs and approvals for nine sub-projects designed to deliver water to floodplain ecosystems to directly address environmental water needs. The nine sub-projects, listed in upstream to downstream order are:

North Central CMA jurisdiction:

- Gunbower
- Guttrum and Benwell

Mallee CMA jurisdiction:

- Vinifera
- Nyah
- Burra Creek
- Belsar-Yungera
- Hattah Lakes North
- Wallpolla Island
- Lindsay Island

The relative location of the proposed nine sub-projects is shown in **Attachment 8 – SDL Projects.**

Together, these sub-projects aim to return a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and the modification of existing infrastructure designed and operated to mimic the impact of natural flood events and improve the ecological condition of floodplain ecosystems.

Rationale

To support the Business Cases for the seven VMFRP sub-projects located in the Mallee CMA region and to justify the SDL offset mechanism, an environmental benefits assessment was prepared by Ecological Associates (2014) to:

- Describe the ecological character of the floodplain systems
- Set objectives for the use of water to promote ecosystem function and health; and

- Describe the contribution of each of the proposed SDL offset projects to achieving the ecological objectives

A copy of this assessment *SDL Floodplain Watering Projects: Rationale and Outcomes Report* (October 2014) prepared by Ecological Associates is provided in **Attachment 6 – Rationale and Outcomes Report**. In relation to the Nyah project in particular, further detail of the floodplain hydrology, ecological conditions and ecological objectives are provided below:

Floodplain hydrology

The natural hydrology of the river at Nyah Park is characterised by very frequent and sustained floodplain inundation events of between 12,500 and 22,500 ML/d (Mallee CMA, 2014). Under a natural inundation regime, flooding persisted for four to eight months in most years and frequently lasted throughout the year. Most floodplain depressions at Nyah are shallow and retain little water, but under pre-regulation river hydrology they would have frequently remained flooded throughout the year.

Water first enters the Nyah floodplain at the downstream end of Parnee Malloo Creek. The upstream connection of the channel is connected soon after with through-flow occurring at river discharges approaching 12,500 ML/d. As river levels continue to rise above 17,500 ML/d, water spills from Parnee Malloo Creek to adjacent wetlands. Effluents along the river bank also introduce water to wetlands, the most important of which is Green Swamp which is flooded at river levels over 20,000 ML/d. Water spreads through the forest understorey as river levels rise and at river discharges exceeding 25,000 ML/d approaches the higher ground along the river bank and terrestrial boundary of the floodplain.

The hydrology of the Murray River has significantly changed as a result of regulation. Modelling was undertaken to analyse the flow in the Murray River at Swan Hill under natural and current conditions (Ecological Associates, 2006) to understand the changes to the hydrology of the river and floodplain at Nyah Park under current (regulated) conditions. The results indicated that the median daily discharge (ML/d) at Swan Hill have declined under current conditions, with the greatest impacts being in the higher flow months from June to December (**Figure 2**). The modelling also showed that very high flows of greater than 30,000 ML/d rarely occur in this reach.

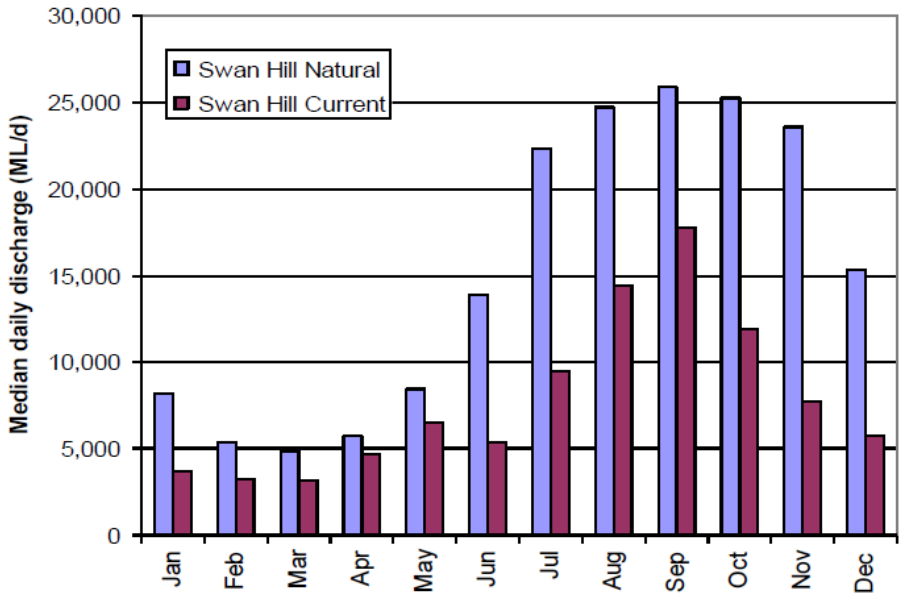

Figure 2 Distribution of median daily flows for each month in the Murray River for natural and current conditions. Derived from MDBC MSM-Bigmod 109 year data (Ecological Associates, 2006)

A detailed analysis of the frequency, extent and duration of flows in Murray River was also undertaken by Gippel (2014) to compare the natural flow regime (pre-regulation) with current (baseline) conditions. The analysis as shown in **Figure 3** illustrates that:

- The frequency of flow peaks greater than 10,000 ML/d has declined somewhat but the median duration of these events has declined even more (**Figure 3**).
- Flows of 10,000 to 15,000 ML/d, which would have occurred almost 15 times every 10 years under natural conditions, last only 5 weeks under current conditions, rather than the 5 month median duration under natural conditions (**Figure 3**).
- The duration of events greater than 25,000 ML/d has almost halved from 75 days to 30. The frequency of these events has also declined significantly from 10 events every 10 years to only 6 (**Figure 3**).

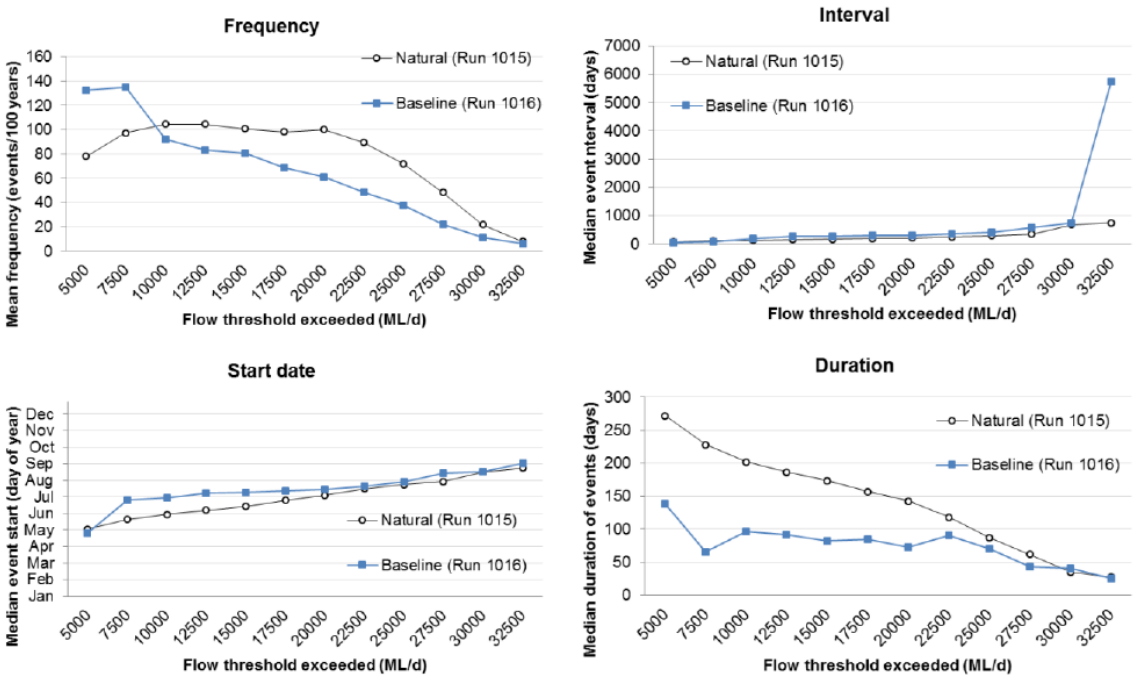

Figure 3 Comparison of frequency, interval, duration and start date of events at Swan Hill under Natural and Baseline modelling flow scenarios, over a 114 year modelled period (Gippel, 2014)

The changes in hydrology of the Murray River as a result of river regulation (and diversions) has also compromised the water regimes experienced by each water regime class (refer to **Table 1**) identified for restoration through this project. The hydrological analysis by Gippel (2014) identified a water regime deficit within the managed inundation area by comparing the frequency, interval and duration of flood events under natural (pre-regulation) conditions with baseline (current) and Basin Plan (Water Act *2007* s 44 (3) without measure) conditions. Table ***2*** provides a summary of the result of the modelling and indicates that although Basin Plan flows will contribute towards addressing current deficiencies in the environmental water requirements of Nyah floodplain compared to baseline conditions, the project is required to further bridge the gap between Basin Plan flows and the environmental water requirements of Nyah floodplain. Therefore, the project has been designed to address this water regime deficit, delivering the operational flexibility and maximum design water levels identified as required, through the work by Ecological Associates, to satisfy the ecosystem water requirements of the EVCs / water regime classes targeted for restoration within the Nyah floodplain.

Table 2 Comparison of water regimes provided by natural, baseline, Basin Plan and the proposed project

Threshold (ML/d)	WRC	Scenario	Frequency Mean (/100 yrs)	Interval Median (days)	Duration Median (days)	Event start date Median (day of year, 1 Jan = 1)	Prevalence years with event %
15,000	Seasonal Anabranch	With Measure[1]	100	190	150	152	100
		Natural	100.9	172	174	170	95
		Baseline	80.7	274	82	196	74
		Basin Plan without measure	86	230	133	179	82
17,500	Seasonal Wetland	With Measure[1]	90	210	120	152	90
		Natural	98.2	191	157	181	94
		Baseline	68.4	290	84	198	65
		Basin Plan without measure	85.1	344	110	185	81
20,000	Red Gum Swamp Forest	With Measure[1]	90	220	120	182	90
		Natural	100	205	143	190	92
		Baseline	61.4	307	72	201	59
		Basin Plan without measure	78.9	259	93	192	72
25,000	Red Gum Forest and Woodland	With Measure[1]	70	260	77	182	70
		Natural	71.9	286	87	210	68
		Baseline	37.7	402	70	216	36
		Basin Plan without measure	47.4	248	77	209	46

[1] Figures based on interpretation of the preliminary operations plan adapted from (Ecological Associates 2014c).

Source: Gippel (2014)

Ecological condition

The forests and woodlands of the Murray River floodplain have been declining rapidly in condition over the past two decades. The decline is associated with increasing regulation of the Murray River and extended periods of drought (Cunningham et al, 2011).

Reductions in flood duration (as discussed above) within the Nyah-Vinifera Park has resulted in a decrease in tree density and canopy cover, and a loss of seasonal wetland habit (Ecological Associates, 2014). Flood duration is too short to support aquatic marshland vegetation and the understorey is now dominated by grasses and seasonal floodplain herbs, with river red gums establishing on the former wetland beds (Ecological Associates, 2014). The decline in wetland habitat means the floodplain now only provides opportunistic habitat for aquatic fauna that

recolonise the system when water is available, and the encroachment by trees excludes many waterbirds that rely on open water (Ecological Associates, 2014).

Flood durations are also too low to sustain perennial aquatic macrophytes and more drought-tolerant species are now more abundant. Flood duration in the Parnee Malloo Creek is also too brief to meet the habitat requirements of channel specialist fish species and Murray crayfish (Ecological Associates, 2014).

While the overall health and integrity of red gum woodland at Nyah has been maintained, productivity has declined (Ecological Associates 2014). The understorey vegetation growth has reduced, providing less physical habitat and contributing less to ecosystem carbon requirements. The food resources and structural habitat carpet python, swamp wallaby, grey-crowned babbler and other woodland species have reduced (Ecological Associates, 2014).

To address the issues noted above, in 2004 an emergency environmental watering program was initiated as an immediate response to the poor condition of the floodplain (Mallee CMA, 2014). Over four years, environmental water was delivered to the Parnee Malloo Creek, two wetlands and low lying riparian zones via portable pumps and ponded on the floodplain using temporary earthen containment banks. These works were able to partially facilitate the necessary inundation depth, duration and extent and as a result the condition of the red gum stands improved (Mallee CMA, 2014). Results to date indicate that the floodplain systems of the mid-lower Murray respond positively to flooding, whether it be landscape-scale overbank flooding or smaller scale events, e.g. watering of creeks, floodrunners and low-lying wetlands (refer to **Attachment 9 – Fauna and Flora Assessment - Nyah).**

In 2012, the Mallee CMA developed an Environmental Water Management Plan (refer to **Attachment 10**) for Nyah-Vinifera Park identifying ecological objectives and hydrological targets for the Park, consistent with Ecological Associates (2014), recognising the requirement for infrastructure to better manage the inundation regime (Mallee CMA, 2014). These ecological objectives and targets have been refined as part of the VMFRP MER Plan (ARI, 2020) and have been adopted for the project (the Nyah Floodplain Management Project) (as outlined in **Table 1**).

Ecological objectives and extent of project benefit

As outlined in Section 3 (Aim/objectives of the project), ecological objectives have been established to address the problems outline above and to restore the four specific water regime classes on the Nyah floodplain: Red Gum Forest, Red Gum Woodlands, Seasonal Anabranch and Seasonal Wetland. A summary of water regime classes and constituent EVCs within the proposed inundation area, as identified by Ecological Associates (2014), is provided in **Table 3**. Spatial analysis has confirmed that the areas identified by Ecological Associates (2014a) for each water regime class generally align with groupings of the relevant EVCs identified by DELWP's modelled 2005 EVC extents (see **Table 3**).

The location of modelled 2005 EVCs and associated water regime classes occurring within the managed inundation area is shown in Figure 2 in **Attachment 9 – Flora and Fauna Assessment - Nyah.**

Table 3 Summary of EVCs / water regime classes within the Nyah floodplain managed inundation area

Water Regime Class	EVCs	Modelled EVC extent within managed inundation area (ha)	Area of water regime class (as identified in Ecological Associates (2014))
Seasonal Anabranch	Parnee Malloo Creek mapped by Murray Wetlands Working Group "Wetlands54	37	37
Seasonal Wetland	EVC - 819 Spike-sedge Wetlands (Vulnerable) EVC - 810 Floodway Pond Herbland (Depleted)	23	23
Red Gum Swamp Forest	EVC - 814 Riverine Swamp Forest (Depleted)	132	128
Red Gum Forest and Woodland	EVC - 106 Grassy Riverine Forest (Depleted) EVC - 811 Grassy Riverine Forest / Floodway Pond Herbland Complex (Depleted) EVC - 812 Grassy Riverine Forest / Riverine Swamp Forest Complex (Depleted) EVC - 816 Sedgy Riverine Forest (Depleted) EVC - 817 Sedgy Riverine Forest / Riverine Swamp Forest Complex (Depleted)	326	293

The required frequency and duration of flooding for each water regime class targeted for restoration by the project, has been determined through a series of studies undertaken by Ecological Associates (2007, 2014, 2015) by analysing where each vegetation community associated with the water regime class occurred on the floodplain (mapped extent, elevation range) supported by hydrological modelling (Gippel, 2014; Jacobs, 2017) to determine the Murray River flow threshold that would have flooded these elevation ranges under natural, pre-regulation conditions. Mapping by Jacobs (2017) of the modelled extents of flooding under natural conditions is provided in **Attachment 4 – Natural, Existing and Proposed Flood Extent Maps**.

Previous investigations on the benefits of environmental watering has occurred at the Hattah-Kulkyne National Park. The park had received environmental water in spring –summer 2014-2015, followed by a natural flood in 2016-17 and which was supplemented with an allocation of environmental water. Following the 2017 monitoring, it was concluded that the overarching ecological objective for Hattah Lakes (i.e. “to restore a mosaic of healthy wetland communities”) was being achieved (Wood et al. 2018).

The environmental benefits of watering at the Hattah Lakes were multiple and included (DELWP 2017a; VEWH 2019):

- Maintenance or improvement in the abundance of native vegetation and water-dependent plant functional groups, particularly on the lakebed, lake edges and the lower floodplain

(DELWP 2017a)

- Reduction in abundance of plants favouring terrestrial dry habitats (DELWP 2017a), although this trend was most evident at sites receiving more frequent flooding (whereas rarely flooded sites were still dominated by drought tolerant species) (Wood et al. 2018); and
- Improved tree canopy cover (and by extension, health) of River Red Gum and Eumong (DELWP 2017a; Wood et al. 2018)

All EVCs identified in the Nyah inundation area (refer Part 2, Section 12 (Native vegetation, flora and fauna) of this referral) are swampy or wetland vegetation communities that require or are tolerant of inundation and therefore are likely to positively respond to the proposed inundation. No obligate dry-land communities are modelled as occurring within the inundation area that may be adversely impacted by the proposed inundation.

On this basis, diverting water into the potential inundation area to enhance the existing flood regime is considered to be the most effective method to improve the ecological condition of the area. To replicate a more natural flood regime, the project must have the flexibility to operate under a range of flow conditions. This flexibility is also required to enable the operational regime to trigger a range of ecological responses across a representative area of flood dependent communities.

Main components of the project (nature, siting & approx. dimensions; attach A4/A3 plan(s) of site layout if available):

The project involves the construction of five new regulators (N1a, N1b, N2, N5 and N7) and a 1.3 km containment bank to divert, retain and release water within downstream end of the Nyah-Vinifera Park. The development footprint is shown in the project plans (**Attachment 2 – Project structures, construction and access**).

Under the proposed scheme water would travel north along Parnee Malloo Creek after entering from the Murray River through the proposed N5 regulator, and then back into the Murray River at the main downstream regulator N2. The N2, N1a and N1b regulators are intended to isolate a large section of Parnee Malloo Creek from the Murray River and detain water in a managed event. The N5 regulator also prevents backflow into the Murray River when water is retained during a managed event. At low flows (below 17,500 ML/d) inundation of the floodplain can occur from backflow through regulator N2.

The proposed works to achieve the inundation are shown are shown in the project drawings (**Attachment 2 – Project structures, construction and access**) and include:

- A main containment bank at the northern end of the floodplain
- A large regulator on the containment bank at Parnee Malloo Creek, referred to as regulator N2. This is the primary structure for regulating flow on return to the Murray River at the end of a managed event.
- Two smaller regulators on the containment bank located on the floodplain and referred to as N1a and N1b. These are to distribute flow across the floodplain.
- A box culvert (referred to as regulator N5) to replace an existing pipe culvert. The purpose of this is to contain flow in the system during a managed inundation event and prevent it flowing back into the Murray River.
- A box culvert (referred to as regulator N7) to replace an existing pipe culvert. The purpose of this is to contain backflow into the town drainage channel.

- Drop structure downstream of regulator N2, at the confluence of the Parnee Malloo Creek and the Murray River to reduce erosion and provide a plunge pool for downstream fish passage. This will consist of
    - Rock erosion protection within the basin, gabion cut off beam/weir at the upstream end and rock mattress in the outlet cutting and extending to the edge of the Murray River
    - A second gabion cut off beam at the location where the channel steepens as it re-enters the river
    - Rock mattresses down the river bank into the water.
- Three overfill spillways on the main bank (spillways 1, 2 and 3)
- A small block bank and 2 overflow spillways on flood runners within the forest to maintain flow distribution across the flood plain during high river flows (bank 5 and spillways 7 and 8)
- Decommissioning of 2 structures in Parnee Malloo Creek (refer below) Creek to allow a more natural and unhindered flow to the creek

Table 4 Summary of regulator design specifications

Regulator	Open/Close or regulate flow	Proposed design	Proposed gates
N1a	Open/Close	3 No. 1800W x 1500H Box culverts	Single leaf gate
N1b	Open/Close	3 No. 1800W x 1500H Box culverts	Single leaf gate
N2	Regulate	8 No. 1800W x 2800H to deck. Cast In Situ	Split leaf gate
N5	Open/Close	1 No. 1800W x 1800H Box Culvert	Penstock
N7	Open/Close	1 No. 1200W x 1200H Box Culvert	Penstock

The following design philosophy has been applied:

- The structures are designed to allow natural flows to pass unhindered, to and from the floodplain when the structures are not in use (fully open)
- The arrangement of structures, the containment bank and spillways have been developed to minimise the potential for erosion over the whole range of flow conditions
- The regulating structures would be designed to provide safe downstream fish passage in accordance with the recommended design criteria for native fish contained in **Attachment 11 - Fish Management Plan**

The design relies on natural banks along the Murray River, supplemented by targeted infrastructure to impound water at the Design Water Level. Permanent pump infrastructure is not included in the design however, the proposed works include a hard stand area (located near N5) and erosion control to enable the set-up of temporary pump infrastructure when required.

Temporary pump infrastructure would include a diesel powered trailer-mounted rig with a suction pipe extending into the Murray River. The temporary pump, when required, would be located at Regulator N5. While the frequency and duration of pumping will depend on actual inundation events and the method to achieve environmental watering targets, it is estimated that pumping may be needed approximately one year in 10 years, over a period of several weeks, but could occur for up

to 2-3 months.

Fish passage

The project includes provision for fish passage through regulator bays, across the spillways, and across the containment bank and natural ground when submerged. Regulator N2 would provide the primary fish passage, located on the deepest flow path. This would be achieved by split leaf gates with overshot functionality within regulator N2, providing upstream fish passage for low and intermediate flows and depending on the velocity, may provide passage across the entire flow range.

Fish passage may also be provided at certain times through the other regulators and across the overflow spillways. The 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 have passage through the regulator both in managed release and natural flood scenarios. Structures have been designed to have flow velocities appropriate for fish passage (as determined through O'Connor et. Al, 2015).

No specific provision would be provided for upstream or downstream fish passage at regulator N5, although the structure would be designed to allow for fish passage when the regulator is not in operation, and the structure in inundated.

Structures to be decommissioned

Two redundant structures and a block bank are to be removed or decommissioned in Parnee Malloo Creek as listed in **Table 5** below.

Table 5 Structures to be decommissioned at Parnee Malloo Creek

Structure	Description and approach to decommissioning
N4 Block bank and pipe	Existing asbestos pipe which passes under the nearby road and connects the creek to the floodplain. Location next to a fenced cultural heritage area makes complete removal impractical. N4 will be decommissioned by excavating and removing pipe sections.
N6	Old regulator which is no longer required. Remove the regulator

Ancillary components of the project (eg. upgraded access roads, new high-pressure gas pipeline; off-site resource processing):

Containment banks / access tracks

Most of the containment banks would be built on the alignment of existing access tracks. Once the containment bank has been constructed, the tracks would be reinstated on top of the bank with a gravel surface. The containment banks would provide operator access to the regulators. A few short lengths of non-trafficable bank would be required at tie in locations where the bank needs to match the natural river bank.

The proposed locations of the proposed containment bank and access tracks are shown in **Attachment 2 – Project structures, construction and access**. Some of these tracks would need to be upgraded as part of the project, the extent of which would be confirmed following outcomes from geotechnical investigations, complex cultural heritage assessment (as part of the Cultural Heritage Management Plan) and ground truthing. Section 12 (Native vegetation, flora and fauna) of this referral identifies the extent of vegetation within the access tracks. Design and construction of the final access tracks would need to comply with the mitigation measures as outlined in Part 2,

Section 18 (Environmental management).

Maintenance

Maintenance will need to be undertaken to existing access tracks to ensure they are suitable for use during construction and operation. This would involve grading and applying additional road base to the surface.

Borrow pits / quarry sites

Construction of the project would require the import of material (clay/rock). VMFRP is in the process of identifying possible borrow pits to acquire this material, with the objective of selecting locations as close as possible to the project, on private land outside of the Nyah-Vinifera Park, while also avoiding and minimising impacts. Once the locations are confirmed, the permits and approvals required for establishing new quarry/borrow sites or expanding existing sites will be sought.

Key construction activities

Construction activities would occur within the area identified in the construction footprint map (**Attachment 2 – Project structures, construction and access**). Construction activities would include:

- Establishment of construction sites, set down areas and access routes
- Removal of existing structures where required
- Construction / installation of new structures

Construction would involve use of vehicles and machinery such as trucks, excavators, and access equipment.

Importation of construction materials, including regulators and imported soils. Imported soils would comply with Parks Victoria consent under Section 27 of the *National Parks Act 1975*.

An Environmental Management Plan (EMP) would be prepared for the works and would detail the measures to avoid and minimise impacts during construction. Once construction of regulators, stop banks and all associated works are complete, all waste and spoil will be removed from the sites and disposed of as required by the EMP.

Construction in the Murray River

Construction of the drop structure requires modifying (re-shaping and re-grading) of the existing outlet channel and extending sections of rock mattress erosion protection into the Murray River. Preliminary discussions with the manufacturer (Geofabrics Australia) indicate that it is feasible to fabricate the mattress and crane them into place.

Works are proposed to be conducted when the river level is low (5000ML/d). The mattress would extend into the river no more than 6 m, to a water depth of about 1.0 m to 1.5m. Excavation would consist of stripping the surface by 0.3 m so that the finished surface is flush with the natural surface/bed. Lengths of 6 m x 2 m mattress would be fabricated on the bank, complete with geotextile and lifting points. They would be lifted into place with a purpose built lifting frame. The top ends of each mattress would be secured at the top end to a gabion beam on the bank. Mattresses placed below water would not be tied at the sides.

It is likely that a cofferdam would be temporarily installed in the Murray River to allow the rock mattress to be placed and tied together. The cofferdam would extend only partially across the

Murray River, allowing fish passage while works are being undertaken.

Construction laydown areas

The containment bank and regulators would require a clear buffer zone along the containment bank and work sites. Specific details at each site are as follows.

- Sites N1a, N1b, and N2 are located on the main containment bank. The forest is reasonably thick and a clear area will need to be created as part of the works. This is shown in the construction footprint.
- Sites N5 and N7. There is a large clear area nearby to the south which is suitable for storing materials. An informal camping area next to the structure is reasonably clear. A number of tracks lead to and intersect near the site.

Bank 5 and Spillways 7 and 8 have reasonable access and the design assumes the work is contained to the track area where possible.

Key operational activities

The proposed works are intended to inundate areas of the Nyah floodplain with inflows from the Murray River or with additional pumping when required. Under the proposed scheme water would travel north along Parnee Malloo Creek after entering from the Murray River through the proposed N5 regulator, and then back into the Murray River at the main downstream regulator N2. The N2, N1a and N1b regulators are intended to isolate a large section of Parnee Malloo Creek from the Murray River and detain water in a managed event. The N5 regulator also prevents backflow into the Murray River when water is retained during a managed event. At low flows (below 17,500 ML/d) inundation of the floodplain can occur from backflow through regulator N2.

The sources of water for managed inundation are:

- Gravity inflow from the Murray River via backflow through regulator N2
- Pumped inflow from the Murray River
- Gravity inflow from the Murray River through structure N5 and overland flow

The method of draining the floodplain would be managed through release from regulators at specified/controlled release rates. The structures will be operated to achieve environmental watering targets under three scenarios:

- Under ‘normal’ flow conditions (when no environmental watering is occurring) the upstream and downstream regulators on Parnee Malloo Creek will be open
- When a flow peak is anticipated, the regulators will remain open to promote flowing habitat in Parnee Malloo Creek. As river levels fall, the regulators will be closed to store flood water. The level at which water is stored will depend on the ecological objectives of the event. When the hydrological targets of the watering event are met, water will be released at the downstream regulator.
- If peaks in river flow are too infrequent to meet environmental watering targets, part or all of the system may be flooded by temporary pumps installed on the river bank

Key decommissioning activities (if applicable):

The design life of the structures is 100 years. If the structures are no longer required at the end of life, all structures will be removed to a practical extent from the site by the operator, and the area

rehabilitated to the satisfaction of Parks Victoria.

Is the project an element or stage in a larger project?

☐ No ☒ Yes If yes, please describe: the overall project strategy for delivery of all stages and components; the concept design for the overall project; and the intended scheduling of the design and development of project stages).

In 2004-2005, an emergency environmental watering program was initiated on the Nyah floodplain as an immediate response to the poor condition of the floodplain. Over four years, environmental water was delivered to the Parnee Malloo Creek, two wetlands and low lying riparian zones via portable pumps and ponded on the floodplain using temporary earthen levees.

Where temporary works were able to partially facilitate the necessary inundation depth, duration and extent, condition of red gum stands improved (Mallee CMA, 2014).

An Environmental Water Management Plan (Mallee CMA, 2015) was developed for Nyah-Vinifera Park in 2012. The plan identified ecological objectives and hydrological targets for the Park consistent with Ecological Associates (2014) and recognised the requirement for infrastructure to better manage the inundation regime. These ecological objectives and targets have been refined as part of the VMFRP MER Plan (ARI, 2020) and have been adopted for the Nyah Floodplain Management Project.

No further stages are currently proposed at Nyah floodplain beyond the current project.

Is the project related to any other past, current or mooted proposals in the region?

☐ No ☒ Yes If yes, please identify related proposals.

The Nyah Floodplain Management Project is one of nine discrete environmental works sub-projects being undertaken as part of the VMFRP, which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. The VMFRP aims to return a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and modification of existing infrastructure.

A summary of the nine sub-projects in order from east (upstream) to west (downstream) along the Murray River floodplain is provided in **Table 6**.

Table 6 Summary of VMFRP projects

Project	Proposed Floodplain Inundation Area	CMA	LGA	Implementing Authority	Bioregion
Gunbower	500 ha	North Central	Campaspe Gannawarra	GMW	Murray Fans
Guttrum and Benwell	1,200 ha	North Central	Gannawarra	GMW	Murray Fans
Vinifera	350 ha	Mallee	Swan Hill	LMW	Murray Fans
Nyah	476 ha	Mallee	Swan Hill	LMW	Murray Fans
Burra Creek	325 ha	Mallee	Swan Hill	LMW	Murray Fans (small area of Murray Mallee)
Belsar-Yungera	2,443 ha	Mallee	Swan Hill	LMW	Robinvale Plains (small area of Murray Mallee)

Hattah Lakes North	1,130 ha	Mallee	Mildura	LMW	Robinvale Plains (small area of Lowan Mallee & Murray Mallee)
Wallpolla Island	2,500 ha	Mallee	Mildura	LMW	Murray Scroll Belt
Lindsay Island	5,365 ha	Mallee	Mildura	LMW	Murray Scroll Belt

The location of the VMFRP sub-projects is shown in **Attachment 8 – SDL projects**.

The VMFRP is being implemented by a partnership between LMW, GMW, Mallee CMA, North Central CMA, Parks Victoria and the DELWP, and is funded by the Commonwealth Department of Agriculture and Water Resources. LMW is the project proponent.

Further details of these projects are available at: https://www.vmfrp.com.au/

Separate referrals are being prepared for these sub-projects under the *Environment Effects Act 1978* and the *Environment Protection and Biodiversity Conservation Act 1999.*

4. Project alternatives

Brief description of key alternatives considered to date (eg. locational, scale or design alternatives. If relevant, attach A4/A3 plans):

Planning and design of the project has considered a range of alternatives to achieve the specific ecological objectives described in Section 3 (Aim/objectives of the project) of this referral. This has involved numerous studies over the last decade to evaluate and refine water management options to identify the most effective and efficient design for environmental watering of the Nyah floodplain.

Water Management Feasibility Investigations

Four water management options for the Nyah Floodplain were initially investigated by Ecological Associates (2006 and 2007) and generally involved inundating Nyah floodplain from the south by removing blockages at Parnee Malloo Creek (Option 1), regulating Parnee Malloo Creek near the downstream connection (Option 2a), lowering the spillway from Parnee Malloo Creek and wetland to the north (Option 2a) and lowering and regulating the connection between Parnee Malloo Creek and the wetland between the Creek and the Murray Valley Highway (Option 4).

Option 3 considered lowering the spillway between the wetland and Parnee Malloo Creek, but this was found to have little value as the wetland is small.

A summary of the options investigated and the assessment of these options is provided in **Table 7**.

Table 7 Summary of options investigated by Ecological Associates (2007)

Option	Description	Evaluation
1	Remove blockages to flow on Parnee Malloo Creek	Extent of benefit[2] – 11 ha Second lowest environmental benefits score[3] Blockages on the Parnee Malloo Creek could be removed (i.e. Removal of the earthen bank and other similar structures) to deliver higher river flows to the wetlands filled via the Creek. Nyah Golf Club would require alternative arrangements for water.
2a	Regulate Parnee Malloo Creek at downstream junction with river	Extent of benefit – 13 ha Provides the second highest environmental benefit score out of the four options Water could be captured during flood peaks and retained to achieve a more natural flood duration with a regulator. The success of this option would depend on the removal of blockages in the creek.
2b	Lower sill from Parnee Malloo Creek and wetland to north end of creek	Least expensive out of the four options Lowest environmental benefits score Extent of benefit - 3.5 ha Option similar to 2a, with the addition of the lowering or regulating the sill connecting the channels.
4	Lower and regulate connection between Parnee Malloo Creek and wetland between the creek and the Murray Valley Highway	Provides the highest environmental benefit score out of the four options Provides the largest extent of benefit – 47 ha (i.e. affects the largest area) Most expensive out of the four options

Option 4 was later eliminated during further analysis as it was found that this option has little value as the wetland is small and the connection would most likely be active when the creek is full (Ecological Associates, 2007).

In 2010 the Mallee CMA formalised environmental water planning in the Nyah-Vinifera Park through the Nyah Vinifera Floodplain Management Unit Environmental Water Management Plan. These options were then investigated by Alluvium (2013), proposing upgrades to several culvert structures, installation of pump hardstand, and raising of access tracks as described in **Table 8** below.

[2] Area affected by the project and, presumably provide benefit to plant and animal communities.
[3] The environmental benefits was calculated by Ecological Associates (2007) by multiplying scores from: conservation significance, water regime (difference between the natural and current water regime), extent of benefit and effectiveness (the degree to which the options address the water requirements of the sites they affect).

Table 8 Summary of proposed infrastructure works for Nyah floodplain project (Alluvium, 2013)

Structure	Description
Regulator N1	Raise the access track to enable water to be held at inundations up to 63.2 m AHD and install a regulated box culvert with a minor regulator on Parnee Malloo Creek to permit additional floodplain watering downstream. Increased height of the access track will allow retention of high flows and also release of water to additional floodplain area to the north.
Regulator N2	Upgrade regulated box culvert containment structure to lower the commence to flow level and increase flow capacity (when open) and to enable water to be held at inundations up to 63.2 m AHD (when closed) and released as required.
Regulator N5	Install culvert regulation structure on upstream side of existing culvert to increase flow capacity (when open) and to enable water to be retained at inundations up to 63.2 m AHD (when closed). Culvert may require replacement and sill lowering to improve the commence to flow from this end of the creek.
Regulator N7	Replace existing culvert with an outlet valve that allows discharge on either the upstream (Nyah South) side of the culvert, or on the downstream (Nyah North) side of the culvert.
Raised access tracks (Nyah North)	Raise access tracks at a number of locations and extend the track at the downstream end of the floodplain to enable water to be retained at inundations up to 63.2 m AHD. The location of these raised access tracks align with existing roads where possible to reduce environmental and cultural heritage impacts.
Raised access tracks (Nyah South)	Raise access tracks at a number of locations to enable water to be retained at inundations up to 64.0 m AHD.
Pump Hardstand	Establish a hardstand for temporary pumps between N5 and N7 to enable water to be pumped from the river to both Nyah North and Nyah South.

Review of Water Management Options Assessment and Concept Design

A strategic review of the water management options and designs proposed by Alluvium (2013) was undertaken by GHD (2014). Findings of this report listed six options (refer to **Table 9** and **Attachment 12 – Design considerations and water management options**) that were assessed against a range of design considerations (refer to **Attachment 12**).

Table 9 Summary of options subject to detailed analysis (GHD, 2014 and Mallee, 2014)

Option	Description	Evaluation
1 Nyah North	Two main regulating structures N1 and N5 at each end of Parnee Malloo Creek and a main raised track located on the north-west side of the floodplain. Other works include: • Three minor regulating structures (N2, N4, N8) along the upstream section of Parnee Malloo Creek • A short containment bank (by raising tracks) on the north-west boundary mid-way down the floodplain.	• Inundation area of 488 ha • No interactions with Irrigation Schemes or demand requirements • Design concerns for larger regulators • Some limitations to access during planned flood events

2 Nyah North	Includes all of the option 1 works plus: • A series of short raised tracks on the north-west boundary at the top of the floodplain • All structure heights have been raised by 0.2m.	• Inundation area of 568 ha • Cost of option is significantly more than other two northern options • No interactions with Irrigation Schemes or demand requirements • Design concerns for larger regulators • Some limitations to access during planned flood events
3 Nyah North	Two main regulating structures on Parnee Malloo Creek, N101 in the middle of the floodplain and N5 and the downstream extent of the floodplain. Other works include: • One raised track in the middle of the floodplain to support regulator N101 • One short raised track on the north-west boundary mid-way down the floodplain.	• Inundation area of 412 ha • No interactions with Irrigation Schemes or demand requirements • Design concerns for larger regulators • Some limitations to access during planned flood events
4 Nyah South	One major raised track at the upstream end of the southern section of the floodplain. Other works include: • Four minor raised tracks down the north west boundary closest to the Murray River • One smaller regulator located adjacent to the Murray River	• Inundation area of 61 ha • Reasonable access during planned flood events • No interactions with Irrigation Schemes or demand requirements • Cost of containment banks high • Design concerns for larger regulators • No passive fish passage provided
5 Nyah South	Seeks an additional area of inundation over option 4 by increasing the length of containment bank. Comprises two minor regulating structures on Parnee Malloo Creek and a constructed containment bank (by track raising) located mostly on the north east of the floodplain, with a small section located on the north west closest to the Murray River.	• Inundation area of 79 ha • Reasonable access during planned flood events • Cost of option is significantly more than other two southern options • No interactions with Irrigation Schemes or demand requirements • Cost of containment bank high • Design concerns for larger regulators • No passive fish passage provided

6 Nyah South	One main regulating structure adjacent to the Murray River on the north west boundary of the southern section of the floodplain.	• Inundation area of 17.4 ha • Reasonable access during planned flood events • No interactions with Irrigation Schemes or demand requirements • Cost of levees high • Design concerns for larger regulators • No passive fish passage provided

When assessed against the design considerations all of the Nyah South options were omitted from the preferred works package as they increased the project's construction footprint and achieved a limited additional area of inundation (17 to 80ha). In addition, Nyah South Option 4 and Option 5 failed to meet the criteria for cost effectiveness (Mallee CMA, 2014).

Option 1 (Nyah North) was considered preferable to Option 3 (Nyah North) due to the significant clearing required for Option 3 to construct the raised track and regulator midway along the Parnee Malloo Creek which did not coincide with any existing tracks or other clearing.

The preferred option (Nyah North Option 1) was chosen over Option 2 after due consideration of the cost effectiveness and risks associated with each alternative, according to factors including capital and expected operating costs, ecological benefit, ease of construction and community support (Mallee CMA, 2014).

2018 Advanced Concept Design

The designs proposed by Alluvium (2013) were further developed by Jacobs (2018) to determine the preferred option as summarised in **Table 10**.

Table 10 Inundation extents and water usage for the preferred option (Alluvium, 2013 and Jacobs, 2018)

Description	Total area of inundation (ha)	Water level
Construction of five new regulators and a 1.3 km containment bank to divert, retain and release water within downstream end of the Nyah Floodplain • Temporary pumping – 1 in 10 years (2.8 GL to be pumped per event)	488	64.4m ADH

2019/ 2020 Project refinements

The project design as developed in 2018 is currently being refined further by R8. Findings from on-site assessments particularly ecology fieldwork and cultural heritage complex assessment (undertaken for the Cultural Heritage Management Plan) have progressively fed into the design, with modifications made to avoid and minimise environmental impacts.

For Nyah, the key refinements of the design to date have included:

- Minimising containment bank width to reduce the construction footprint

- Altering the alignment of some of the containment banks / access tracks to avoid areas of high ecological value
- Selecting areas for construction laydown to avoid areas of high ecological value

This work is ongoing and refinements will continue. During construction consideration will be given to the timing of works, and in particular works within the Murray River would be conducted when the river level is low.

No project alternative

The other alternative is to not undertake the project. However, this alternative is not being considered further as it would:

- Lead to ongoing deterioration of floodplain ecosystems in the targeted inundation area. The targeted inundation area is displaying evidence of ecological stress caused primarily by river regulation, which has significantly reduced the frequency, depth and duration of flood events entering these areas (refer to further discussion in Part 1, Section 3 (Project description) of this referral.
- Mean foregoing an opportunity to deliver long-term positive impacts to areas that are significant at a local, regional and State level

Brief description of key alternatives to be further investigated (if known)**:**

No alternatives to the project are being further investigated. A Business Case for the project has been submitted to and approved by the Commonwealth government.

No alternatives to the project are being further investigated. Both the Feasibility Assessment and Business Case for this project have been submitted to and approved by the Commonwealth government included extensive documentation of the alternatives investigated. These documents drew upon investigations carried out through the options development phase, which were undertaken with a view to minimising impacts on the ecology and heritage values of the sites whilst maximising the area to receive benefit from watering.

Design of the proposed structures, access tracks and construction laydown areas will continue to be refined through the design process to respond to environmental and heritage assessments, and stakeholder / landowner requirements.

5. Proposed exclusions

Statement of reasons for the proposed exclusion of any ancillary activities or further project stages from the scope of the project for assessment:

No other ancillary activities or further project stages have been excluded from this assessment.

6. Project implementation

Implementing organisation (ultimately responsible for project, ie. not contractor)**:**

LMW will be the implementing organisation responsible for managing construction of the project.

LMW will also be primarily responsible for operation and maintenance of the environmental

watering infrastructure, although it is likely that Parks Victoria staff will assist with operation as required.

In order to minimise potential adverse environmental effects and maximise environmental benefits across the nine sub-projects being undertaken as part of the VMFRP, existing frameworks for collaborative and adaptive environmental water management will be used. The Victorian Environmental Water Holder (VEWH) is the independent statutory body responsible for holding and managing environmental water entitlements on behalf of the state. VEWH administers the ongoing collaborative management of water available under environmental entitlements, which are used to improve the health of Victoria's rivers and wetlands and the native plants and animals that depend on them, through regulation of the river systems. VEWH works collaboratively with a range of partners to plan the release and delivery of environmental water, including:

- The Commonwealth Environmental Water Holder and the MDBA to access water held on behalf of the Commonwealth Government
- Water authorities (e.g. LMW, GMW) and waterway managers (e.g. Mallee CMA, North Central CMA) which oversee investigations to determine water requirements, undertake water planning and coordinate the delivery of water and monitoring programs that support a process of learning and adaptation

An overview of water management responsibilities illustrating how scientific investigations, monitoring and evaluation feedback into decision-making on environmental watering proposals is provided below.

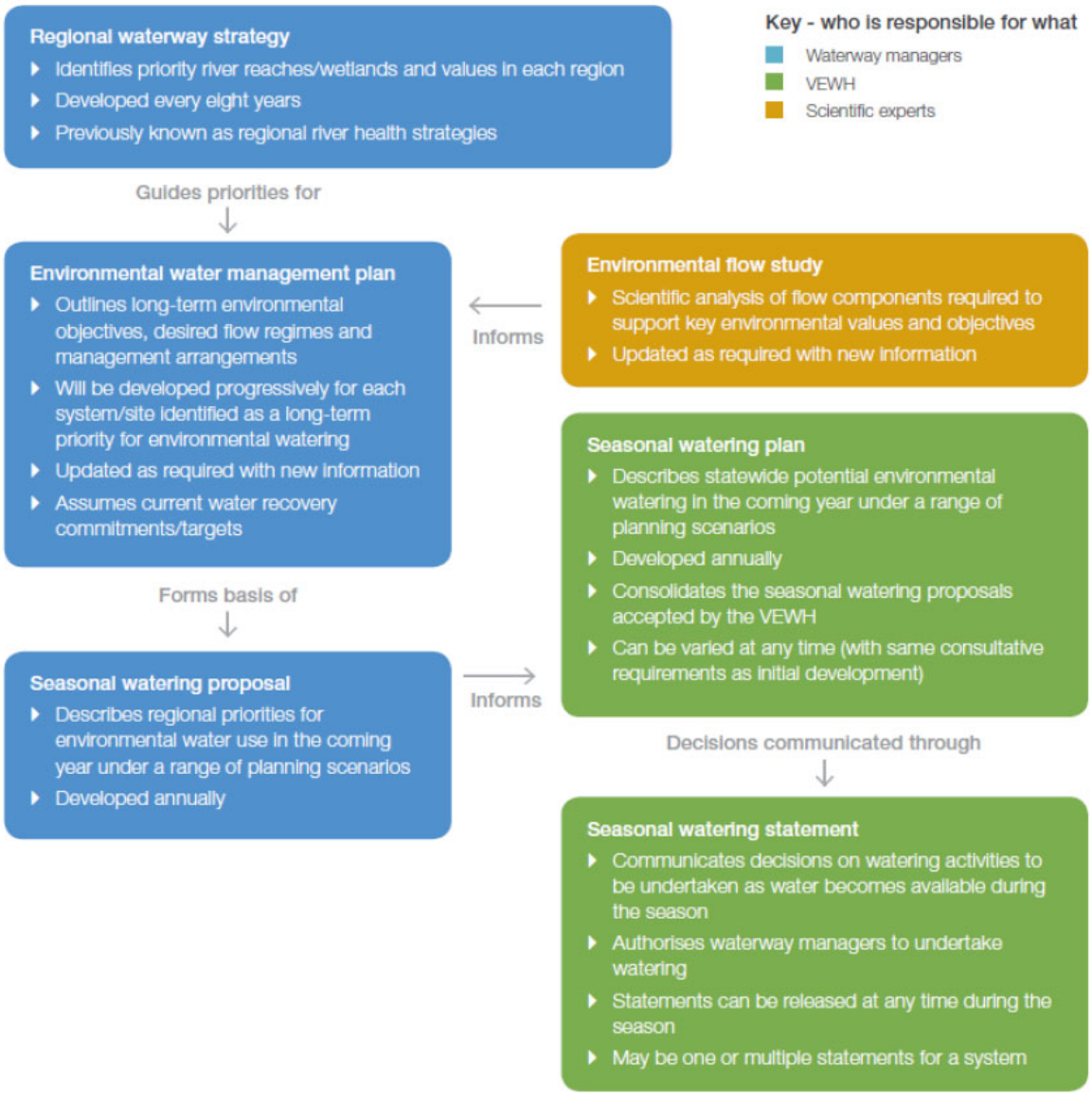

Figure 4 Project implementation, Source: Parks Victoria, 2018 from VEWH, 2016.

Implementation timeframe:

Construction is anticipated to commence in June 2022 and would continue until May 2023.

Proposed staging (if applicable):

Not applicable.

7. Description of proposed site or area of investigation

Has a preferred site for the project been selected?

☐ No ☒ Yes If no, please describe area for investigation.

If yes, please describe the preferred site in the next items (if practicable).

General description of preferred site, (including aspects such as topography/landform, soil types/degradation, drainage/ waterways, native/exotic vegetation cover, physical features, built structures, road frontages; attach ground-level photographs of site, as well as A4/A3 aerial/satellite image(s) and/or map(s) of site & surrounds, showing project footprint):

General

The Nyah floodplain, located between Nyah and Wood Wood, spans across 913 ha and is an elongate basin aligned parallel to the Murray River. The basin is formed between the terrestrial landscape to the west and the natural bank of the river to the east.

The floodplain is at the western limit of the Murray Fans bioregion, and consists of a network of extensive waterways, wetlands and inundation-dependent woodlands that receive water from the Murray River via Parnee Malloo Creek (Mallee CMA, 2014).

Wetlands, waterways and drainage

The Nyah floodplain is a shallow basin aligned parallel to the Murray River. Parnee Malloo Creek is an intermittently flowing anabranch that meanders through the floodplain over a distance of 16 km. Water first enters the floodplain at the downstream end of Parnee Malloo Creek. The upstream connection occurs soon after and flows through the floodplain from Parnee Malloo Creek occurs at 12,500 ML/d. Ecological Associates (2006) derived median flows in natural and existing conditions based on 109 year MDBC Bigmod data as summarized in **Figure 2** in Part 1, Section 3 (Project description) of this referral.

The natural pre-regulation hydrology of the Murray River was characterised by frequent inundation at Nyah, with flooding persisting for 4 to 8 months. Changed river operations has resulted in a decline in the condition and productivity of the floodplain due to the reduced flood frequency and durations.

Groundwater

The Nyah floodplain is located within the Murray Geological Basin. This basin was infilled with sediments during the Tertiary and Quaternary period. The groundwater environment and current conditions of the shallow aquifer systems shows a series of aquifer layers present at the site, to a depth of approximately 300m below ground.

The shallow groundwater hydrological conditions at the site can be described as:

- The alluvial aquitard: Floodplain clays and silts that are part of the contemporary floodplain and the recent geological past
- The Channel Sands Aquifer: This unit is the sands and silts of associate with the current and former river traces. It is also referred to as the Coonambidgal Formation or the Alluvial Aquifer. Within the contemporary floodplain it forms a sheet like deposit that is in hydraulic connection with the Murray River. The water quality in this aquifer is fresh to brackish.
- Parilla Sand Aquifer: A thick sequence of Teritiary age Marine sediments that underly the river and floodplain sediments. This is the regional aquifer and is typically saline or brackish in water quality.

Groundwater salinity at the site is interpreted to range from about 500 mg/L to around 3,500 mg/L. Most of the site is underlain by groundwater of about 500 mg/L. The interpreted distribution of salinity is shown in **Figure 5**.

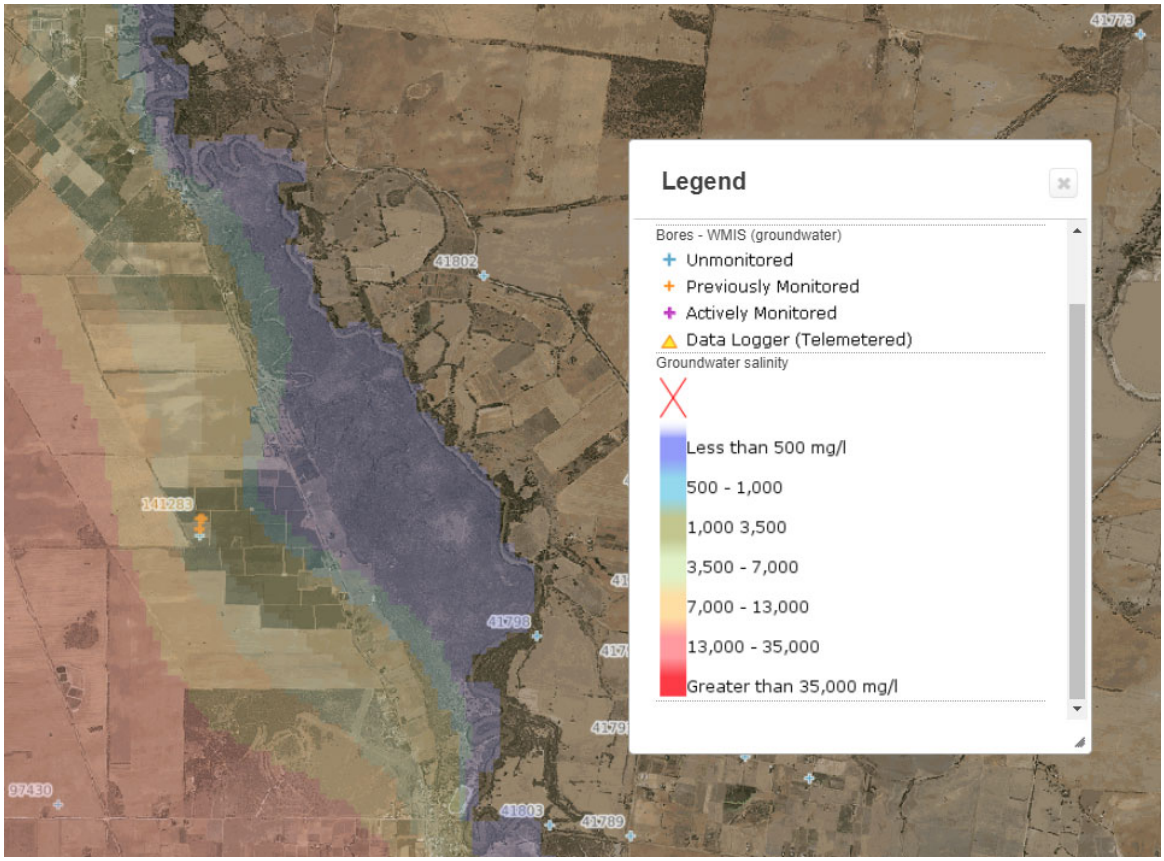

Figure 5 Interpreted groundwater salinity for the Nyah project area (source - R8, Groundwater Assessment, 2020)

Groundwater flow is generally to the north and west, away from the Murray River. In some cases, there will be flow toward the Murray River. Local flow cells are possible that may change the local flow direction. There is fresher water located adjacent to the river.

Salinity

Soil and groundwater salinity at the site are at low to moderate levels. Soil salinity has been mapped for the site and for the riverine corridor in the area by airborne electromagnetic surveys (AEM). The project falls in the Boundary Bend to Speewa AEM survey area (Cullen et al. 2008).

Soil salinity in the project area has been mapped as low to moderate. **Figure 6** shows the interpreted salt loads in the area from the AEM survey. It can be seen from this figure that the soil salt store is considered low for this region. The risk of salinity mobilisation is also considered low.

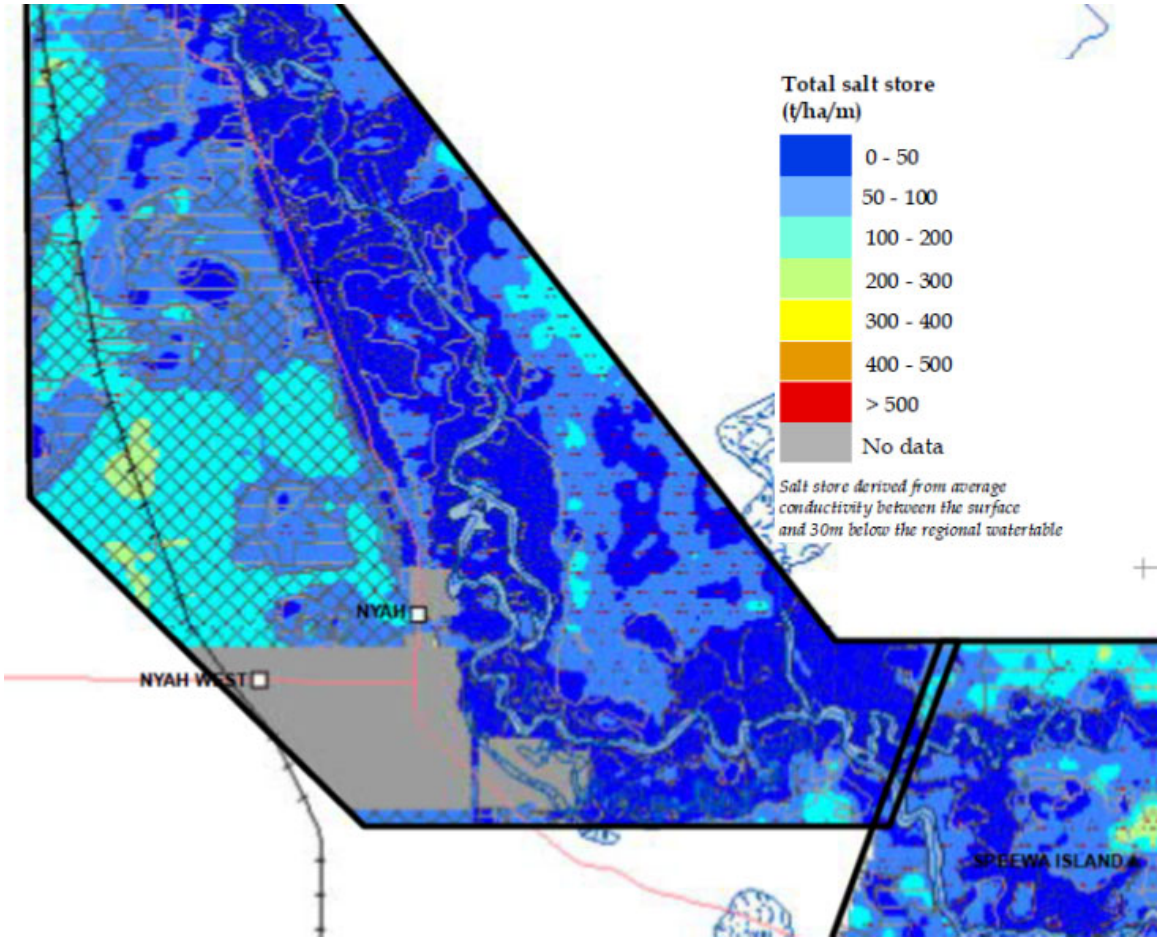

Figure 6 Interpreted salt store in the unsaturated zone for the project area (Groundwater Assessment, R8 2020a, originally from Culleen et al. 2008)

Vegetation and habitat

The Nyah Park floodplain complex covers as area of approximately 913 hectares of wetlands boasting a diversity of mammals, reptiles and fish, including some threatened and significant species and more than 270 indigenous plant species.

The Nyah floodplain forms an elongate basin aligned parallel to the Murray River. The basin is bounded by the terrestrial landscape to the west and the natural bank of the Murray River to the east. The basin is drained by a central watercourse, Parnee Malloo Creek, into which back water enters the downstream end at moderate Murray River flows. At higher river flows (12,500 ML/d) the upstream connection of the creek becomes active and through-flow commences.

Vegetation within the floodplain and surrounding area broadly consists of River-Red Gum (*Eucalyptus camaldulensis*) forests and woodlands. Freshwater wetland complexes are dominated by Spike-sedge and herbaceous species (Australian Ecosystems 2016, Mallee CMA 2015).

Further detail on the flora and fauna present within the Nyah floodplain is provided in Part 1, Section 8 (Existing environment) and also Part 2, Section 12 (Native vegetation, flora and fauna) of this referral.

Site area (if known):

The proposed construction footprint has a total area of approximately 7.8 ha.

The proposed inundation area is estimated to be approximately 488 ha.

(Refer to **Attachment 2 – Project structures, construction and access** and **Attachment 3 – Managed Inundation Area)**.

Route length (for linear infrastructure) ……. (km) **and width** …….. (m)

N/A

Current land use and development:

The project is located entirely within Crown Land within the Nyah Vinifera Park. The park is owned and managed by Parks Victoria in accordance with the objectives of the *National Parks Act 1975.* It is expected that in future, there will be co-management between the Wadi Wadi community, Parks Victoria and DELWP.

The former Nyah State Forest became part of the Nyah-Vinifera Park in 2010 in recognition of its conservation values and its outstanding range and concentration of Aboriginal cultural heritage sites (VEAC, 2008).

The region supports a range of recreational activities such as camping, fishing, boating, four-wheel driving, trail bike riding, horse riding and walking, and these uses will continue in the park.

The Friends of Nyah Vinifera and Friends of the Earth are community stakeholder groups with an interest in the project area, seeking to promote and enhance the cultural and environmental values of the forests and encourage community participation under their management.

Description of local setting (eg. adjoining land uses, road access, infrastructure, proximity to residences & urban centres):

The project is located within the Nyah-Vinifera Park, extending across the Murray Valley Highway to the west, from the township of Wood Wood in the north to the township of Nyah in the south. The Murray Valley Highway is the main arterial road running north-south connecting the townships along the Victorian side of the Murray River from as far as Robinvale (just outside of Mildura) to Echuca.

The Nyah District Golf Course is located adjacent to the Nyah-Vinifera Park just south of Wood Wood and east of the Murray Valley Highway. The Golf Course supports key Aboriginal historical sites such as canoe trees, middens and burial grounds from the traditional owners of the area (the Wadi Wadi people). All project works and the inundation area will fall outside the Golf Course.

Wood Wood and Nyah are small rural towns in close proximity to the investigation area. Wood Wood, which is approximately 36 km north of Swan Hill, supports a population of approximately 85 people (ABS 2016) in less than 50 residential dwellings, a general store and a caravan park (Riverhaven Caravan Park). The town is located directly opposite the northern part of the investigation area with the closest residential property being less than 50 metres from the indicative inundation area. Land south and west of the town supports broadacre crops.

Nyah, 25 km north of Swan Hill is a larger town supporting approximately 530 people in 268 dwellings (ABS 2016). The town is located on the railway line from Swan Hill to Piangil and supports a hotel (the Grand Hotel), retail shops, its own airport (Nyah Airport) a trotting track, swimming pool and other local recreational facilities. Its local school was closed in 1996.

The land west of Nyah supports extensive vineyards along with grazing and grain crops. Grazing includes sheep for wool and meat production. Grain crops include wheat and barley, canola and pulses such as vetch, lupins, lentils, field peas and chick peas.

Other significant land use attributes of the investigation area and surrounds include:

- The Torrumbarry Irrigation Area (TIA) directly to the west of the site
- Four (4) Apiary sites within the investigation area and an additional 4 within 10 km, and
- Murray Darling and Swan Hill wine region

Planning context (eg. strategic planning, zoning & overlays, management plans):

A desktop land use planning assessment has been prepared and is provided in **Attachment 13** – **Land Use Planning Assessment.**

Swan Hill Planning Scheme

The project is situated within the Rural City of Swan Hill and is therefore subject to the provisions of the Swan Hill Planning Scheme.

Planning Policy Framework

The following clauses of the Planning Policy Framework are relevant:

Table 11 Planning policy relevant to the project

Planning Policy Framework		
Clause 12 – Environmental and Landscape Values	Clause 12.01 Biodiversity	12.01-1S – Protection of Biodiversity4 12.01-2S Native Vegetation Management
	12.03 Water Bodies and Wetlands	12.03-1S River Corridors, Waterways, Lakes and Wetland
	12.05 Significant Environments and Landscapes	12.05-2S Landscapes
Clause13 Environmental Risks and Amenity	13.01 Climate Change Impacts	13.01-1S Natural Hazards and Climate Change
	13.02 Bushfire	13.02-1S Bushfire Planning
	13.03 Floodplains	13.03-1S Floodplain Management
	13.04 Soil Degradation	13.04-3S Salinity
	13.05 Noise	13.05-1S Noise Abatement
	13.07 Amenity and Safety	13.07-1S Land Use Compatibility
Clause 14 Natural Resource Management	14.01 Agriculture	14.01-3S Forestry and Timber Production
	14.02 Water	14.02-1S Catchment Planning and Management 14.02-2S Water Quality
	14.03 Earth and Energy Resources	14.03-1S Resource Exploration and Extraction
Clause 15 Built Environment and Heritage	15.01 Built Environment	15.01-1S Urban Design 15.01-2S Building Design 15.01-6S Design for Rural Areas

[4] Including relevant policy documents specified in this clause such as: Protecting Victoria's Environment – Biodiversity 2037 (DELWP, 2017) and the Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017).

	15.02 Sustainable Development	15.02-1S Energy and Resource Efficiency
	15.03 Heritage	15.03-1S Heritage Conservation 15.03-2S Aboriginal Cultural Heritage
Clause 17 Employment	17.04 Tourism	17.04-1S Facilitating Tourism 17.04-1R Tourism - Loddon Mallee North
Clause 19 Infrastructure	19.02 Community Infrastructure	19.02-06S Open Space
Local Planning Policy		
Municipal Strategic Statement		
Clause 21.01 Municipal Profile		The Murray River corridor accommodates the majority of the region's population and irrigated agriculture. The municipality is part of a wider region which features an extensive agricultural area and one of the most productive areas of the Murray Darling Basin.
Clause 21.02 Key Influences and Issues	21.02-1 Key influences and issues	<u>Built form and amenity</u> The municipality's cultural, natural heritage and environmental values, which can be easily and irreparably damaged by inappropriate development. The need to manage and protect the many significant Aboriginal and non-Aboriginal cultural heritage values and historic places that can be found within the municipality. <u>Environment</u> The Murray River, which forms Mildura Rural City's northern and eastern municipal boundary, represents a significant environmental, economic and social asset and underpins the vitality of the region. The municipality contains habitats sensitive to disturbance and unique flora and fauna communities. Public parks, reserves and forests play an important role in protecting significant landscape, flora, fauna, cultural and scientific values. There is a need to manage issues associated with the interface between public and private land
Clause 21.03 Vision and Strategic Framework		The natural resources of the municipality and surrounding region will be protected and maintained to provide a diversity of species and development that is ecologically sustainable.

		Land and water systems will be well managed, meeting the community's needs and expectations. Remnant vegetation and habitat on both private and public land will be preserved and enhanced. Public land in the municipality and surrounding region will be recognised, protected, and promoted for its significant environmental, cultural and economic value.
Clause 21.05 Environment	21.05-1 River and wetland health	Objective 1 - To improve river and wetland health within the Rural City of Mildura.
	21.05-2 Flora and fauna	Objective 2 - To protect flora and fauna within the Rural City of Mildura.
	21.05-3 Flooding	Objective 3 - To reduce the impacts of flooding within the Rural City of Mildura.
	21.05-4 Public land	Objective 4 - To protect the environmental, landscape, cultural heritage and archaeological value of public land Objective 5 - To improve the interface between public and private lands.
Clause 21.07 Built Environment and Heritage	21.07-2 Heritage	Objective 2 - To conserve and enhance those buildings, areas and other places which are of aesthetic, archaeological, architectural, cultural, historical, scientific, or social significance, or otherwise of special cultural or natural value. Objective 3 - To acknowledge, respect, protect and appropriately manage Aboriginal places, objects and human remains.
Clause 21.08 Economic Development	21.08-2 Tourism	Objective 2 - To increase visitor numbers and length of stay

Zones and overlays

The following zones and overlay apply to the land in the project area:

- Public Conservation and Resource Zone (PCRZ)
- Township Zone (TZ)
- Road Zone, Category 1 (RDZ1)
- Environmental Significance Overlay (Schedule 1 – Waterway, Wetlands and Lakes Environs) (ESO1)
- Heritage Overlay (HO201 – Former Church, Murray Valley Highway, Wood Wood)
- Heritage Overlay (HO205 – Canoe Tree, Murray Valley Highway, Wood Wood))

- Land Subject to Inundation Overlay (LSIO)
- Bushfire Management Overlay (BMO)

Refer to **Attachment 14 – Planning Zones & Overlays Maps.**

Table 12 Summary of potential planning permit triggers

Swan Hill Planning Scheme	Planning approval		
Planning control	Use	Building and works	Vegetation removal
Zones			
Public Conservation and Resource Zone (PCRZ)	Y	Y	NA
Township Zone (TZ)	Y	Y	NA
Road Zone, Category 1 (RZ1)	N	N	NA
Overlays			
Environmental Significance Overlay (ESO1)	NA	Y	Y
Heritage Overlay (HO201, HO205)	NA	Y (includes demolition)	N
Land Subject to Inundation Overlay (LSIO)	NA	Y	N
Bushfire Management Overlay (BMO)	NA	N	N
Particular provisions			
Clause 52.17 Native Vegetation	NA	NA	Y
Clause 52.29 (Land Adjacent to A Road Zone, Category 1, or A Public Acquisition Overlay for A Category 1 Road)	NA	Y	NA

In accordance with the controls identified in **Table 12** the project will require planning approval in relation to;

- Use
- Buildings and works, including earthworks; and
- Native vegetation and vegetation (in areas of Environmental Significance Overlay) (ESO1)

Particular provisions

The following particular provisions may also be relevant to the project:

- Clause 52.17 (Native Vegetation) – A permit is required to remove, destroy or lop native vegetation, including dead vegetation, that is not subject to an exemption specified in Clause 52.17-7 (Table of Exemptions) or the Schedule to Clause 52.17
- Clause 52.29 (Land adjacent to a Road Zone, Category 1, or a Public Acquisition Overlay) - A permit is required to create or alter access to a road in a Road Zone, Category 1 (RDZ1). Roads within RDZ1 providing access to the project area include the Murray Valley Highway

Referral authorities

Table 13 summarises the referral authorities that may be triggered under the planning scheme for the project.

Table 13 Summary of referral requirements for planning permits

Referral control	Notice and referral requirements	Referral body
Environmental Significance Overlay (ESO1)	Any application of the kind below must be referred as follows: 30 m of a Goulburn Water channel or drain, Goulburn Murray Water land or Infrastructure asset (Goulburn Murray Water). 60 m of a lake or waterway	Goulburn Murray Water as a determining referral authority
	100 m of the Murray River (Goulburn Murray Water)	Goulburn Murray Water and DELWP as determining referral authorities
	50 m of any public land managed by the Department of Sustainability and Environment	DELWP as a determining referral authority
Land Subject to Inundation Overlay (LSIO)	An application must be referred to the relevant floodplain management authority under Section 55 of the P&E Act unless in the opinion of the responsible authority, the proposal satisfies requirements or conditions previously agreed in writing between the responsible authority and the floodplain management authority.	Mallee CMA as a recommending referral authority
Bushfire Management Overlay (BMO)	An application to be referred under Clause 66.03 of the planning scheme referring to an application other than an application to construct a building or carry out works associated with a dwelling. An application is exempt from the notice requirements of section 52(1)(a), (b), and (d) the decision requirements of section 64(1), (2) and (3) and the review rights of section 82(1) of the Act, unless a schedule to this overlay specifies otherwise. A schedule to this overlay may specify that notice be given to any persons or body in accordance with section 52(1)(c) if the Act	Relevant fire authority
Particular provisions		
Clause 52.17	In accordance with Section 52(1)(c) of the Act, notice of an application to remove, destroy or top native vegetation under Clause 52.17 of this	Secretary to the DELWP as a recommending referral authority

	scheme. An application must be referred to the Secretary to DELWP to: ▪ Remove, destroy or lop native vegetation in the Detailed Assessment Pathway as defined in the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b). ▪ Remove, destroy or lop native vegetation if a property vegetation plan applies to the site. ▪ Remove, destroy or lop native vegetation on Crown land which is occupied or managed by the responsible authority.	
Clause 52.29	All applications to create or alter access to a Road Zone, Category 1 must be referred to Regional Roads Victoria.	Regional Roads Victoria as a determining referral authority
Clause 67.03	Notice on an application for a permit to remove, destroy or lop native vegetation under Clause 52.17, which, except for the provisions of Clause 67, would be made to the Minister in accordance with section 96 of the Act. This does not apply if the application is of a kind which must be referred to the Secretary under section 55 of the act	The Secretary to the Department administering the Flora and Fauna Guarantee Act 1988

Relevant strategies and management plans

The following Mallee CMA strategies and plans provide land use and planning objectives and plans for action associated within the region that includes the investigation area:

- Mallee Regional Catchment Strategy 2013-2019
- Mallee Waterway Strategy 2014-2022
- Mallee Floodplain Management Strategy 2018-28
- Mallee Environmental Water Management Plan 2015
- Mallee Region New Irrigation Development Guidelines 2017
- Mallee Dryland Sustainable Agriculture Strategy 2017-2023
- Mallee Natural Resource Management Plan for Climate Change

NSW Planning Framework

Works associated upgrading the outfall into the Murray River will extend into the banks and bed of the river within the border of NSW. The affected land is within the Murray Shire Council.

Local Environmental Plans (LEPs) guide planning decisions for the local government area. The

proposed works do not require development consent from the Murray Shire as the proposed works are permissible without consent under clause 13(3) of the NSW Murray Regional Environmental Plan No. 2 – Riverine Land. The aim of the plan is to

> *to conserve and enhance the riverine environment of the River Murray for the benefit of all users.*

Planning triggers

The area of works is zoned as Natural Waterways (W1) which covers the extent of the river. Land north of the river is within the Primary Production Zone (RU1) under Murray Shire Council planning controls (**Attachment 14 – Planning Zones & Overlays Maps**).

Development in NSW is assessed in accordance with the provisions of the *NSW Environmental Planning and Assessment Act 1979* (NSW EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The EP&A Act institutes a system for environmental assessment, including approvals and environmental impact assessment for proposed developments. The need or otherwise for development control is set out in environmental planning instruments. The drop structures are permissible without development consent under the Murray Regional Environmental Plan No. 2 – Riverine Land and is able to be assessed under Part 5 of the NSW EP&A Act. A Review of Environmental Factors would be prepared to assess the impacts of the drop structure.

The pump station is part of a water supply reticulation system and development for this purpose may be carried out with consent on any land under *State Environmental Planning Policy (Infrastructure) 2007*. A development application would be submitted to the Murray River Council.

Local government area(s):

Swan Hill Rural City Council

Murray Shire Council

8. Existing environment

Overview of key environmental assets/sensitivities in project area and vicinity
(cf. general description of project site/study area under section 7)**:**

Key environmental assets of the project and broader area relate to the ecological values supported within the Nyah floodplain.

The Nyah floodplain comprises 913 ha, dominated by River Red Gum forest, wetlands and Black Box woodlands at higher floodplain elevations. It provides a unique ecological community where the semi-arid Mallee landscape and Murray River and its floodplain connect, providing an essential biodiversity corridor for fauna to move between environments vital to their life-cycles (Ecological Associates, 2014).

The park contains, or is expected to contain, the following numbers of animal species of conservation significance:

- Thirty species listed on the DEPI advisory list of rare or threatened fauna in Victoria
- Sixteen species listed under the FFG Act including fish, bushbirds, waterbirds, bats and reptiles of the 16 species listed directly above, the Regent Parrot (*Polytelis anthopeplus monarchoides*), and

- Murray cod (*Maccullochella peelii peelii*) considered vulnerable under the EPBC Act

The vegetation communities of the Nyah Park are distributed across the floodplain according to hydrological conditions, soil types and groundwater quality. A total of 10 EVCs have been mapped at Nyah Park, all are water dependent;

- Grassy Riverine Forest
- Floodway Pond Herbland
- Grassy Riverine Forest / Floodway Pond Herbland Complex
- Grassy Riverine Forest / Riverine Swamp Forest Complex
- Riverine Swamp Forest
- Sedgy Riverine Forest
- Sedgy Riverine Forest / Riverine Swamp Forest Complex
- Spike-sedge Wetlands
- Riverine Chenopod Woodland and
- Riverine Grassy Woodland

One EVC (Riverine Chenopod Woodland) is endangered in the Murray Fans bioregion, two are vulnerable (Spike-sedge Wetlands and Riverine Grassy Woodland) and the remaining seven EVCs are regionally depleted (Ecological Associates, 2014).

Part 2, Section 12 (Native vegetation, flora and fauna) of this referral provides further information on the ecological values of the project area.

In addition to its ecological values, the Nyah floodplain also contains the following social and cultural values:

- Cultural and historical values: More than a dozen archaeological investigations on the Nyah floodplain have been conducted since 1977, all recording significant Aboriginal archaeological sites (Mallee CMA, 2014). Nyah is an important cultural site for the Wadi Wadi Aboriginal people and there are numerous burial sites, scarred trees and middens listed under the Register of the National Estate (VEAC 2008). Under the Aboriginal Heritage Act 2006 the Nyah-Vinifera Park is specified as an area of cultural heritage sensitivity in accordance with several categories (Mallee CMA, 2014).
- Social and recreational values: Nyah-Vinifera Park is managed for multi-use values, including conservation, recreation, apiary and indigenous values. Recreational uses include dispersed camping (including camp fires and associated firewood collection), fishing, boating, four wheel driving, horse riding, trail bike riding and walking. The Parnee Malloo Creek and wetlands provide high value low impact activities including sightseeing, walking, hiking and cycling (Mallee CMA, 2014). There are also active community groups, including Friends, Field Naturalists, residents and the indigenous community advocating to protect and restore the ecology of the Parnee Malloo Creek system (Mallee CMA, 2014).

Part 1, Section 15 (Social environments) of this referral provides further information on social and cultural values of the project area.

9. Land availability and control

Is the proposal on, or partly on, Crown land?

☐ No ☒ Yes If yes, please provide details.

The proposed construction and inundation areas are located on Crown land within the Nyah-Vinifera Park.

The Nyah-Vinifera Park (Nyah Park total area is 913 ha) and is declared as a Schedule 3 – Other Park under the *National Parks Act 1975.* Parks Victoria is responsible for the control and management of the Nyah-Vinifera Park and in accordance with section 18(2)(a) of *National Parks Act 1975*, must ensure it is controlled and managed to:

- *preserve, protect and re-establish indigenous flora and fauna in the park;*
- *preserve and protect features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest;*
- *enable the park to be used by the public for the enjoyment, observation and study of the countryside and its pursuits, its flora and fauna, its ecology and geology and other features; and*
- *control exotic flora and fauna in the park.*

Existing access roads and access tracks to be used by the project are located on Crown land comprised of either National Park or Government Road.

The location of Crown land affected by the project is shown in **Attachment 15 – Land Tenure Map**.

Current land tenure (provide plan, if practicable):

A summary of land parcels affected by proposed construction footprint and inundation area is provided in **Table 14.** Affected land parcels will be reviewed and updated if needed based once the final design is confirmed.

Table 14 Current tenure of land parcels subject to the project

SPI	Tenure	Description	Land Manager/ Owner	Project component
Victoria				
1A\PP3391	Freehold	3534 Murray Valley Highway, Wood Wood	Private ownership	Within 'area of investigation', but outside of the construction footprint and development footprint for the project
17C\-3\PP3675	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park)	Parks Victoria	Access road construction
17E\-3\PP3675	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	Parks Victoria	Containment bank, spillway, N5 Regulator, laydown area, inundation area

167\PP3391	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	Parks Victoria	Containment bank, Regulation N1 and N2, spillway, access road, inundation area
168\PP3391	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park)	Parks Victoria	Regulator N2, spillway, laydown area, inundation area
168A\PP3391	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	Parks Victoria	Drop Structure, inundation area
2006\PP3675	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	Parks Victoria	Access road, N4, N6 regulators, inundation area, laydown area
2007\PP3675	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	DELWP	Inundation area
2025\PP3675	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park)	Parks Victoria	Inundation area
2018\PP3391	Crown land	Other Park (Schedule 3) – National Parks (Murray Kulkyne Park	Parks Victoria	Drop structure and inundation area
NSW				
NA	Crown land – waterways	Unallocated/unreserved Crown land	MDBA	Drop structure (downstream of regulator N2) and inundation area

The location of land parcels affected by the project and associated tenure is shown in **Attachment 15 – Land Tenure Map**.

Intended land tenure (tenure over or access to project land):

The project does not propose any changes to current land tenure.

Other interests in affected land (eg. easements, native title claims):

A search of the National Native Title Tribunal online register and maps shows:

- No current native title applications under the *Native Title Act 1993* apply over the investigation area
- No previous native title claims have been determined under the *Native Title Act 1993* (Cwth) in relation to land within or adjacent to the investigation area
- No current applications or registered agreements under the *Traditional Owner Settlement Act 2010* (Vic) apply over land within the investigation area
- Two Indigenous Land Use Agreement (ILUA) cover the investigation and inundation area (VI2004/010, VI2011/001)

The ILUA's are registered for exploration and include the traditional owners of the Wamba Wamba, Barapa Barapa and Wadi Wadi Peoples. These ILUAs cover a wide area south of the Murray River extending from north of Nyah to the Gannawarra/Cohuna area and inland.

Other Interests

The Nyah-Vinifera Park and the Murray River in this region support other land use and activities as described below.

- The Torrumbarry Irrigation Area (TIA) lies directly to the west of the project inundation area. The TIA is part of the largest irrigation system in Victoria – the Goulburn-Murray Irrigation District (GMID). The GMID accounts for more than 70% of water storages and some 90% of water used in irrigation across the state. Approximately 2000 landowners rely on this system for farming within the area.
- Current public data indicates the location of four apiary sites located within the Nyah-Vinifera Park and another four sites within 10 km of the investigation area. Although bees rely on an adequate water source to thrive, further investigation into possible effects of inundation of apiary sites would be required to identify measures to manage any potential impacts.
- The project is within the Murray Darling and Swan Hill wine region of Victoria. The industry of the region spans from Lake Charm near Kerang in the southeast all the way to Piangil in northwest Victoria, and across the border to Toolybuc in southern NSW. Almost all vineyards in the Swan Hill area are irrigated from the Murray River or its tributaries.

10. Required approvals

State and Commonwealth approvals required for project components (if known):

The following State and Commonwealth approvals are likely to be required for the project:

Commonwealth

- Referral to the Minister for the Environment under the EPBC Act to determine whether the project is a controlled action requiring formal assessment and approval under the Act (concurrent to this referral)
- Notification of a 'future act' under the *Native Title Act 1993* for activities on Crown land that may affect native title rights and interests

Victoria

- Referral (this document) to the Minister for Planning (via DELWP) under the *Environment Effects Act 1978* to determine whether or not an Environment Effects Statement is required for the project
- A planning scheme amendment or planning permit under the Swan Hill Planning Scheme, pursuant to the *Planning and Environment Act 1987*
- A Cultural Heritage Management Plan approved by Aboriginal Victoria (there is no Registered Aboriginal Party) under the *Aboriginal Heritage Act 2006* and *Aboriginal Heritage Regulations 2018*
- Approval from Parks Victoria / Minister for Environment, Energy and Climate Change under section 27 of the *National Parks Act 1975*
- Licence to take and use water (s51) and licence to construct works (s67) to take water from Lower Murray Water under section 51 of the *Water Act 1989*
- Works on waterways permit from Mallee CMA of the *Water Act 1989*
- Permit to take protected flora on Crown land from DELWP under the *Flora and Fauna*

Guarantee Act 1988

- Consent from Heritage Victoria to remove, disturb or destroy an archaeological site (whether recorded on the Victorian Heritage Inventory or not) under *Heritage Act 2017*

Other legislation

Other environmental legislation of potential relevance to the project includes, but is not limited to:

Commonwealth

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Water Act 2007*

Victorian

- *Catchment and Land Protection Act 1994*
- *Crown Land (Reserves) Act 1978*
- *Environment Protection Act 1970 (or Environment Protection Act 2017* post 1 July 2020)
- *Fisheries Act 1995*
- *Land Act 1958*
- *Roads Management Act 2006*
- *Wildlife Act 1975*

NSW

- *Biodiversity Conservation Act 2013*
- *Environmental Planning and Assessment Act 1979*
- *Local Land Services Act 2013*
- *Maritime Safety Act 1998*
- *NSW Vegetation SEPP*
- *Water Management Act 2000*

Have any applications for approval been lodged?

☒ No ☐ Yes If yes, please provide details.

No applications for approval of the project have been lodged to date.

Approval agency consultation (agencies with whom the proposal has been discussed):

The VMFRP is managed by a partnership team comprised of LMW, GMW, North Central CMA, Mallee CMA and Parks Victoria. Each of these agencies are represented on the VMFRP Program Control Group, but also have a separate regulatory approvals function for the VMFRP projects. DELWP Water is the Program Owner. DELWP also has a separate regulatory approvals function for the VMFRP projects.

As part of broad stakeholder engagement activities undertaken between 2012 and 2014 to

support the Nyah Floodplain Management SDL Project Business Case, Mallee CMA also consulted with Swan Hill Rural City Council, GMW and Parks Victoria.

During 2015 to 2017, engagement activities were undertaken in the form of monthly Steering Committee meetings with Mallee CMA, Murray-Darling Basin Authority, Parks Victoria, GMW and DELWP.

The VMFRP has since established a Technical Advisory Group – Regulatory Approvals Committee (Approvals TAG) to advise on regulatory approval requirements through the planning and design of the project. In addition to the partnership agencies, regulatory approval agencies currently represented on the Technical Advisory Group include:

- DELWP (Impact Assessment Unit, Planning, Regional)
- Parks Victoria
- Aboriginal Victoria
- Department of Agriculture, Water and the Environment (DAWE)

An overview of the Project was presented to the TAG at a meeting held on 8 August 2019.

The Approvals TAG meets regularly to discuss the project / program. In addition, a Design TAG operates concurrently which has representation from the following:

- VMFRP
- GMW
- Parks Victoria
- North Central CMA
- Murray-Darling Basin Authority
- DELWP
- LMW
- SA Water
- Mallee CMA

PART 2 POTENTIAL ENVIRONMENTAL EFFECTS

11. Potentially significant environmental effects

Overview of potentially significant environmental effects (identify key potential effects and comment on their significance and likelihood, as well as key uncertainties):

An assessment of the potential construction and operational impacts of the Project has been undertaken and is detailed in Parts 12 – 16 of this referral form. **Table 15** provides a summary of these impacts against the referral criteria for potentially significant effects as outlined under *Ministerial guidelines for assessment of environment effects under the Environment Effects Act 1978* (Department of Sustainability and Environment, 2006) and identifies at a high level, the key mitigation measures that would be implemented to mitigate these impacts. Further detail on mitigation measures is provided in Section 18.

As outlined in **Table 15**, considering both individual and a combination of potential effects, the project is not expected to have a significant adverse impact on the environment.

Table 15 Summary of review of project impacts against the EE Act referral criteria

EE Act referral criteria	Extent and description of impact
Individual potential environmental effects	
Potential clearing of 10 ha or more of native vegetation from an area that: • is of an Ecological Vegetation Class identified as endangered by the Department of Environment, Land, Water and Planning; or • is, or is likely to be, of very high conservation significance; and • is not authorised under an approved Forest Management Plan or Fire Protection Plan.	The project would require the removal of approximately 7.42 ha of native vegetation (of which 2.42 ha is access tracks). This includes the following: • 0.030 ha of Semi-Arid Woodland (EVC 97) – Vulnerable – Trimming along tracks only • 0.079 ha of Riverine Chenopod Woodland (EVC 103) – Endangered – Trimming along tracks only • 2.116 ha of Grassy Riverine Forest (EVC 106) - Depleted • 0.269 ha of Floating Aquatic Herbland (EVC 810) – Depleted • 0.919 ha of Riverine Grassy Woodland (EVC 295) - Vulnerable • 3.505 ha of Riverine Swamp Forest (EVC 814) – Depleted • 0.450 ha of Sedgy Riverine Forest (EVC 816) - Depleted
Potential long-term loss of a significant proportion (e.g. 1 to 5 per cent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.	The project would not require the removal of known remaining habitat or a population of a threatened species within Victoria.

Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'	The project is not likely to have a significance adverse effect on any wetlands listed under the Ramsar Convention or A Directory of Important Wetlands in Australia. The following Ramsar Wetlands are downstream of the project area: • Hattah-Kulkyne National Park (approximately 300 km downstream) • Banrock Station Wetland Complex (approximately 900 km downstream) • Riverland and the Cooranong (1200 km downstream) • Lakes Alexndrina and Albert Wetland (1200 km downstream) A Construction Environmental Management Plan (CEMP) will be developed and implemented that identifies potential environmental risks and defines mitigation strategies to avoid or minimise these risks. Any impacts are expected to be localised and site rehabilitation will occur following completion. The EMP will set out specific measures that will be employed to minimise impacts during construction. The project is not expected to cause a long term change to the ecological character any of the above listed Ramsar Wetlands.
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	Potential major and long-term effects on the health and biodiversity of aquatic ecosystems associated with the project are expected to be mostly positive as defined through the specific ecological objectives and targets for the project set out in **Table 1** of this referral. The key environmental objectives of the Nyah project are to restore the environmental functions of the Nyah-Vinifera Park, and to restore key indigenous species, communities and habitats through construction of hydrological environments (Mallee, 2014). Specifically, the business case for the Nyah Floodplain Management Project (Mallee, 2014) defines proposed ecological benefits as: • Restore the structure of wetland plant communities. • Restore resident populations of frogs and small fish. • Providing seasonal feeding and reproductive opportunities for riverine fish species. • Provide reliable breeding habitat for waterbirds, including colonial nesting species. • Restoring floodplain productivity to maintain resident populations of vertebrate fauna including carpet python, sugar glider and grey-crowned babbler. • Contribute to the carbon requirements of the River Murray channel ecosystem.

Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	The nearest resident is approximately 100 m from the northern end of the construction footprint. Any impacts will be would be temporary and limited to the construction period. A small number of residences that are close to the project area (approximately 100m) may experience some additional noise, dust and traffic during construction. However, these effects would be temporary, limited to the construction period, and are not likely to be significant. There would be no hazardous emissions created during the construction or implementation of the project. Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences are not expected.
Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the facility.	The estimated GHG emissions are significantly less than the 200,000 t CO2-e per annum. The estimated Scope 1 GHG emissions for each pump event are approximately 240 t CO2-e. These emissions are expected to occur over a single 2-3 month period in a year, and no more than once in a year.
A combination of potential environmental effects	
Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan	The project is proposing to clear 7.42 ha of native vegetation, which is not under an approved Forest Management Plan or Fire Protection Plan.

Matters listed under the *Flora and Fauna Guarantee Act 1988*: • Potential loss of a significant area of a listed ecological community • Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or • Potential loss of critical habitat; • Potential significant effects on habitat values of a wetland supporting migratory bird species.	Vegetation mapped or modelled within the construction footprint or inundation area has been assessed and is not consistent with any of the FFG Act-listed threatened ecological communities. No EPBC-listed flora species are considered likely to occur or be impacted by either the construction works or proposed inundation. No FFG Act listed species are considered likely to occur or be impacted by either the construction works or proposed inundation. Loss of genetically important populations or critical habitat is not expected. Eighteen species listed as migratory under the EPBC Act are predicted to occur or were previously recorded from a VBA/PMST search, however none of these species were considered as likely to occur within the construction footprint. Fourteen EPBC Act listed Migratory Species were predicted to occur within the inundation areas and the broader 10 km area. Long-term effects on the habitat of aquatic ecosystems associated with the project are expected to be mostly positive as defined through the specific ecological objectives and targets for the project.
Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*.	The project would involve some removal of native vegetation and alteration of landforms within areas supporting state and regional landscape values, specifically the Nyah-Vinifera Park. The extent of vegetation removal and landform alteration would be limited to less than 3.6 ha of construction footprint, within the 913 ha Nyah Park. Through the construction of new infrastructure and the modification of existing infrastructure, the Nyah Floodplain Management Project aims to restore a more natural inundation regime across approximately 488 ha (refer **Attachment 3 - Managed Inundation Area**) of high-ecological-value Murray River floodplain within the Nyah-Vinifera Park, supporting maintenance of the park's landscape values. The proposed works will flood over half of the forest and provide inundation-dependant habitat with a water level of 63.2 m AHD, replicating the flood extent of the Murray River of up to 25,000 ML/day (Mallee CMA, 2014). Noting the context above, the project is not expected to have a significant adverse effect on landscape values of state or regional importance.

Potential extensive or major effects on land stability, acid sulfate soils or highly erodible soils over the short or long term.	The project is not likely to have significant adverse effects on land stability, acid sulphate soils or highly erodible soils. Some potential exists for works to involve disturbance of highly erodible soils (e.g. Parilla Sands) and dispersive soils, and possibly potential ASS, as described in Section 14 (Soils). Potentially adverse effects on soils would be managed through standard design and construction measures to minimise risk of significant, long term effects. Recommendations for design of structures in response to geotechnical conditions identified at the site, including design of scour protection, conditioning of dispersive fill material, seepage barriers etc, are contained in **Attachment 16 – Geotechnical Investigation Report** and were considered in the detailed design of the project. Prior to commencing works, the contractor would be required to prepare a CEMP outlining measures to identify and avoid or manage disturbance of highly erosive soils and potential ASS (if required).
Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.	The project aims to reinstate a more natural hydrological regime to the Nyah floodplain, which is expected to deliver a range of ecological benefits to floodplain and wetland communities. The project is expected to have a beneficial impact to the use of waterbodies within the Nyah-Vinifera Park by reinstating a more natural frequency and duration of inundation. Water from the forest will be released back into the Murray River at the end of a managed watering event. Discharge of poor quality water to the Murray River during flow recession following a managed watering event may impact on downstream beneficial water uses (e.g. irrigation, contact recreation). Measures to manage these impacts are outlined in the 'mitigation' section below and also Part 2, Section 18 (Environmental management). Specifically this would include implementation of an Environmental Watering Management Plan and an Operations Plan to adaptively manage watering events. The project is not expected to have extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.
Potential extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities.	Temporary restrictions on access and land use activities within the Nyah-Vinifera Park may occur during construction and managed inundation events, however no land use activities would be permanently displaced by the project. The project would not cause potential extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities.
Potential for extensive displacement of residences or severance of residential access to community resources due to infrastructure development.	The project would not displace any residences or sever residential access to community resources as the works are located within discrete sites within the park. Although public access along N1 containment bank would be temporarily closed from the northern entry to the park from the Murray Valley Highway within the construction footprint, and from the southern entry at Byrnes Lane to N5, impacts are only temporary in nature, and access would be reopened to the public following construction.

Potential significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions.	The nearest resident is approximately 100 m from the northern end of the project. Any impacts will be would be temporary and limited to the construction period. Potential effects (such as increase in noise, dust and traffic associated with transport of fill / spoil) on a relatively small number of residents are typical of construction projects. Effects would be managed through standard controls contained in a CEMP and Traffic Management Plan.
Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport.	The majority of the proposed construction activities are located within the Nyah-Vinifera Park and separated from residential dwellings by at least 100 m. There are no emissions during the project construction or operation that would expose the community to severe or chronic health and hazards.
Potential extensive or major effects on Aboriginal cultural heritage.	A draft CHMP is currently being prepared for the project and is the mechanism for managing impacts to Aboriginal cultural heritage. The Draft CHMP will be finalised in consultation with the identified Traditional Owner (TO) groups for approval by AV and will include specific management conditions for a number of Aboriginal Places along with general management recommendations relating to induction training, salvage methods and stakeholder engagement, and procedures for unexpected 'finds' of potential Aboriginal cultural material.
Potential extensive or major effects on cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995*.	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 proposed construction footprint or proposed inundation area. There are three historical heritage places listed on the Heritage Overlay (HO) of the Swan Hill Planning Scheme within or adjacent to the project area or inundation area. While the boundary of the HO extent for these items is within or within close proximity to the construction and/or inundation areas for the project, further investigation identified the physical location of these sites to be located outside the area of impact. The project would not have any extensive or major effects on cultural heritage places currently listed under the VHR or the Archaeological Inventory under the *Heritage Act 1995.*

12. Native vegetation, flora and fauna

Native vegetation

Is any native vegetation likely to be cleared or otherwise affected by the project?

☐ NYD ☐ No ☒ Yes If yes, answer the following questions and attach details.

What investigation of native vegetation in the project area has been done? (briefly describe)

A review of native vegetation databases and previous studies was undertaken as part of the Flora and Fauna Assessment - Nyah (R8, 2020b) (refer **Attachment 9**) to identify native vegetation with potential to occur in the construction footprint and inundation areas. The review considered previous records and predicted occurrences of vegetation communities.

The following databases and reports were used:

- The Commonwealth EPBC Act 1999 PMST
- Weeds of National Significance database
- The Victorian Biodiversity Atlas (VBA), maintained by the DELWP
- NatureKit. Spatial database maintained by DELWP, for native vegetation (Ecological Vegetation Class) mapping throughout Victoria
- The Native Vegetation Information Management tool (NVIM), maintained by DELWP
- GHD (2013) Flora Census Summary Report- Memorandum prepared by GHD for Mallee CMA

The Flora and Fauna Assessment - Nyah (R8, 2020b) consolidates and summarises ecological information obtained through surveys and desktop analysis reported in 2013 to 2020 (as identified in **Table 18**), refer **Attachment 9 – Flora and Fauna Assessment – Nyah**. This includes newly collected information and findings of targeted surveys completed in October-December 2019 to verify the presence of EVCs and threatened flora and fauna species listed under the Federal EPBC Act and/or Victorian FFG Act within the construction footprint. The report also provides desktop level information for flora and fauna within the inundation area gathered in January 2020.

Refer **Table 18** for further information.

What is the maximum area of native vegetation that may need to be cleared?

☐ NYD Estimated area ……7.42 (hectares)

How much of this clearing would be authorised under a Forest Management Plan or Fire Protection Plan?

☒ N/A …… approx. percent (if applicable)

Which Ecological Vegetation Classes may be affected? (if not authorised as above)

☐ NYD ☒ Preliminary/detailed assessment completed. If assessed, please list.

Construction

Table *16* identifies the EVCs mapped within the construction footprint that would be impacted by the project (all within the Murray Fans Bioregion), being within construction footprint or access tracks. These areas have been ground-truthed during the field surveys undertaken for the construction footprint.

The project will utilise existing access tracks which have been mapped as native vegetation due to overhanging canopies. Some access tracks would require upgrading and/or trimming of adjacent native vegetation to facilitate the proposed construction.

In addition, 167 large old trees have the potential to be impacted by the construction activities proposed.

Table 16 EVCs modelled to occur within the project construction footprint

EVC Name	Area (ha) within construction footprint	Conservation Significance
Floating Aquatic Herbland (EVC 810)	0.269	Depleted
Grassy Riverine Forest (EVC 106)	2.116	Depleted
Riverine Grassy Woodland (EVC 295)	0.919	Vulnerable
Riverine Swamp Forest (EVC 814)	3.505	Depleted
Sedgy Riverine Forest (EVC 816)	0.450	Depleted
Semi-Arid Woodland (EVC 97)	0.03	Vulnerable
Riverine Chenopod Woodland (EVC 103)	0.079	Endangered

Figure 4 in **Attachment 9 – Flora and Fauna Assessment – Nyah** shows the location of the EVCs within the construction footprint and access tracks. While the endangered Riverine Chenopod Woodland (EVC103) and the vulnerable Semi-Arid Woodland (EVC97) are within the project access tracks, the works are likely to involve trimming of overhanging vegetation to facilitate access of machinery. The mitigation measures outlined in Part 2 (Environmental management) of this referral would assist in avoiding impacts on this area.

Inundation

The project would impact on the following EVCs that are modelled to occur within the inundation areas. All EVCs listed below are swampy or wetland vegetation communities that require or are tolerant of inundation and therefore are likely to positively respond to the proposed inundation. No obligate dry-land communities are modelled as occurring within the inundation area that may be adversely impacted by the proposed inundation.

Table 17 EVCs modelled to occur within the inundation areas

EVC Name	Area	Conservation Significance
Floodway Pond Herbland (EVC 810)	6.199	Depleted
Grassy Riverine Forest (EVC 106)	9.892	Depleted
Grassy Riverine Forest/Riverine Swamp Forest Complex (EVC 812)	182.828	Depleted
Riverine Grassy Woodland (EVC 295)	4.466	Vulnerable
Riverine Swamp Forest (EVC 814)	130.760	Depleted
Sedgy Riverine Forest (EVC 816)	36.366	Depleted
Sedgy Riverine Forest/Riverine Swamp Forest Complex (EVC 817)	97.207	Depleted
Spike-sedge Wetland (EVC 819)	16.730	Vulnerable

Have potential vegetation offsets been identified as yet?

☒ NYD ☐ Yes If yes, please briefly describe.

Offsets have been calculated for the project based on the proposed removal of up to approximately 7.42 ha of native vegetation, including 167 large trees, and are described in the flora and fauna assessment in **Attachment 9 – Flora and Fauna Assessment - Nyah**.

Offsets would be sought in accordance with the requirements of the *Guidelines for removal, destruction or lopping of native vegetation* (DELWP 2017b) or through an alternate arrangement agreed with the Secretary to DELWP. The loss of native vegetation due to construction activities is proposed to be offset, at least in part, by the expected improvement in native vegetation quality in the inundation area resulting from environmental watering. The method for confirming this offset would be developed in consultation with DELWP. Any offset requirements that cannot be met through environmental watering would be purchased by the project.
Other information/comments? (eg. accuracy of information)

NYD = not yet determined

Flora and fauna

What investigations of flora and fauna in the project area have been done?
(provide overview here and attach details of method and results of any surveys for the project & describe their accuracy)

A review of available biodiversity databases was undertaken as part of the Flora and Fauna Assessment - Nyah (R8 2020b) to identify terrestrial flora and fauna with potential to occur in the study area.[5] The review considered previous records, predicted occurrences of flora, fauna and vegetation communities, and an assessment of potential habitats from aerial imagery and native vegetation mapping.

The Flora and Fauna Assessment - Nyah (R8, 2020b) consolidates and summarises ecological information obtained through surveys and desktop analysis reported in 2013 to 2020 (as identified in **Table 18**), refer **Attachment 9 – Flora and Fauna Assessment – Nyah**. The report includes and documents newly collected information and findings of targeted surveys completed in October-December 2019 for threatened flora and fauna species listed under the Federal EPBC Act and/or Victorian FFG Act.

The report also provides desktop level information for flora and fauna regarding the inundation area gathered in January 2020.

Table 18 Previous ecological assessments for the study area

Report	Methods- desktop assessment
GHD (2013) *Flora Census Summary Report*- Memorandum prepared by GHD for Mallee CMA	**Desktop review:** VBA (DEPI) Flora Information System (Viridans); Atlas of Living Australian (online database); Biodiversity Interactive Maps (DEPI); and Protected Matters Search Tool (DAWE). **Flora site assessment** (November 2013): Eight Quadrats (30 x 30 m) Cover percentages of litter, logs, bare ground and soil crust; and EVC Full flora species list recorded
ARI (2013) *Terrestrial vertebrate fauna surveys of the Burra Creek and Nyah-Vinifera reserves, northern Victoria.* A report to the Mallee Catchment Management Authority.	**Desktop review:** VBA (DEPI) Atlas of Living Australian (online database); Protected Matters Search Tool (DAWE) Lumsden L., Brown G. & Cheers G. (2007)

[5] For the purposes of the Flora and Fauna Assessment, study area refers to the proposed construction footprint and a 10 km radium around it. The study area provides context for the significance of any ecological features recorded in proximity to the project.

	Floodplain fauna surveys – Macredie Island. A report to the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research, DSE, Heidelberg, Victoria. Mallee CMA and Parks Victoria staff (M. Thompson and J. Cameron pers. comm.). **Fauna site assessment** (November-December 2013) ▪ 20 min, 2 ha bird census (morning and night) ▪ Nocturnal bird call-playback (Powerful Owl, Masked Owl, Barking Owl, Barn Owl , Southern Boobook, Australian Owlet-nightjar, White-throated Nightjar, Spotted Nightjar and Tawny Frogmouth) ▪ Pitfall trapping (and funnel trapping) ▪ Camera traps ▪ Bat detector
Australia Ecosystems (2016) ***Nyah and Vinifera SDL Project - Flora and Fauna assessment***	**Desktop review:** ▪ VBA (DEPI) ▪ Flora and Fauna Information System (Viridans); ▪ Atlas of Living Australian (online database); ▪ Biodiversity Interactive Maps (DEPI); and ▪ Protected Matters Search Tool (DAWE). **Flora site assessment** (November 2015)**:** ▪ Potential footprint traversed ▪ Comprehensive observed flora list recorded ▪ LOT's mapped ▪ Habitat Hectare assessed ▪ EVC's assigned **Fauna site assessmen**t (November 2015) ▪ 20 min bird census ▪ Nocturnal spotlight surveys (arboreal fauna)
WetMAP (2017)	**Fish site assessment** ▪ Parnee Malloo Creek fyke and seine netting and bait traps
R8 (2020b) *Flora and Fauna Assessment - Nyah R8 2020*	**Desktop Review** ▪ VBA (DEPI) ▪ Weeds of National Significance database.

	▪ The Victorian Biodiversity Atlas (VBA), maintained by the DELWP. ▪ NatureKit. Spatial database maintained by DELWP, for native vegetation (Ecological Vegetation Class) mapping throughout Victoria. ▪ The Native Vegetation Information Management tool (NVIM), maintained by DELWP ▪ Protected Matters Search Tool (Commonwealth Department of the Agriculture, Water and Environment). **Flora site assessment** (30 and 31 October 2019): ▪ Walking transects of construction footprint ▪ Targeted surveys for rare or threatened flora ▪ Rare and threatened flora encountered were GPS marked and details recorded. **Fauna site assessment** (25 November and 11 December 2019) ▪ Targeted surveys for nesting habitat and nesting activity for the threatened Regent Parrot GPS position of suspected breeding activity recorded, based on criteria used to confirm an active Regent Parrot nest, as outlined in **Attachment 9 –Flora and Fauna Assessment - Nyah.**

Have any threatened or migratory species or listed communities been recorded from the local area?

☒ NYD ☒ No ☒ Yes If yes, please:

- List species/communities recorded in recent surveys and/or past observations.
- Indicate which of these have been recorded from the project site or nearby.
-

Flora

VBA and PMST searches identified nine FFG and/or EPBC listed threatened flora species that have been recorded or have a possible likelihood of occurrence within 10 km of the construction footprint. A further 41 species listed as rare or threatened on the Advisory list of Rare and Threatened Plants in Victoria (DEPI 2014) were also identified. These species are identified in **Table 19**.

Fauna

VBA and PMST searches identified 30 terrestrial fauna species previously recorded or having the potential to occur within 10 km of the construction footprint, and that are FFG Act listed (30) and/or EPBC Act listed (12). Each of these 30 species was then 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 Nyah study area[6]. Of the 30 terrestrial fauna identified by VBA and PMST as previously recorded or having the potential to occur within 10 km of the project, nine of these are considered possible to occur within the project construction footprint. These species are identified in **Table 21**.

Migratory species

Eighteen species listed as migratory under the EPBC Act are predicted to occur or were previously recorded from a VBA/PMST search. None of these species were considered as likely to occur within the construction footprint during the time of the survey, mostly due to the lack of recent records within the construction footprint and/or a lack of suitable habitat present at the time of the survey.

Fourteen EPBC Act listed Migratory Species were predicted to occur within the inundation area and the broader 10 km area.

The migratory species are listed in Appendix D of the Flora and Fauna Assessment 2020 - Nyah (R8 2020b).

Ecological communities

The PMST identified four EPBC Act-listed threatened ecological communities with potential to occur within 10 km of the construction footprint.

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia
- Natural Grasslands of the Murray Valley Plains
- Weeping Myall Woodlands

None of these communities is consistent with vegetation mapped or modelled within either the construction footprint or inundation area.

If known, what threatening processes affecting these species or communities may be exacerbated by the project? (eg. loss or fragmentation of habitats) Please describe briefly.

Potentially threatening processes are listed in accordance with Section 10 of the FFG Act 1988. Threatening processes that are relevant to the Nyah project that have the potential to be exacerbated by either the construction process or proposed inundation of 488 ha of floodplain and wetlands by:

Construction

- Loss of hollow-bearing trees from Victorian native forests
- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority

Operation

- Predation of native wildlife by the introduced Cat, *Felis catus*

[6] For the purposes of the Flora and Fauna Assessment, study area refers to the proposed construction footprint and a 10 km radium around it. The study area provides context for the significance of any ecological features recorded in proximity to the project.

- Predation of native wildlife by the introduced Red Fox *Vulpes vulpes*
- Soil degradation and reduction of biodiversity through browsing and competition by Feral Goats (*Capra hircus*)

Measures to manage these impacts are outlined in the 'mitigation' section below and also Part 2, Section 18 (Environmental management).

Are any threatened or migratory species, other species of conservation significance or listed communities potentially affected by the project?

☐ NYD ☒ No ☐ Yes If yes, please:

- List these species/communities:
- Indicate which species or communities could be subject to a major or extensive impact (including the loss of a genetically important population of a species listed or nominated for listing) Comment on likelihood of effects and associated uncertainties, if practicable.

Flora

Species for which habitat was present or that had previously been located within the Nyah-Vinifera Park were targeted during the threatened flora surveys (R8 2020) and are listed in the table below. The survey did not locate any FFG or EPBC Act-listed species within the project area. One FFG listed threatened species – *Acacia oswaldii* – was identified as occurring in previous assessments (Australian Ecosystems 2016) but was not located within the construction footprint.

No EPBC-listed threatened flora species are considered likely to occur or be impacted by either the construction works or proposed inundation.

No FFG Act listed threatened species are considered likely to occur or be impacted by either the construction works or proposed inundation.

Table 19 Likelihood of occurrence for rare or threatened flora and project impacts

Common name	*Scientific Name*	EPBC	FFG	Impacts/reasoning
Acacia loderi	Nealie		L	**Unlikely.** Conspicuous species not recorded in this or previous surveys.
Acacia melvillei	Yarran		L	**Unlikely.** Conspicuous species not recorded in this or previous surveys.
Acacia oswaldii	Umbrella Wattle		L	**Possible.** Previously recorded near N6 regulator. Not located within construction footprint **Impact unlikely.** Not currently known in project area.
Austrostipa metatoris		V		**Unlikely** Not previously recorded in Victoria.
Caladenia tensa	Rigid Spider-orchid	EN		**Unlikely**. Single record located outside construction footprint and in habitat not present within construction footprint.
Maireana cheelii	Chariot Wheels	V	L	**Unlikely**. Lack of habitat in construction footprint.
Nymphoides crenata	Wavy Marshwort		L	**Unlikely**. Lack of habitat in construction footprint.
Solanum	Menindee	V		**Unlikely.** Not previously recorded in

karsense	Nightshade			Victoria**.**
Swainsona murrayana	Slender Darling-pea	V	L	**Unlikely.** Not previously recorded in project area and lack of suitable habitat**.**

KEY

EN **Listed as Endangered under the EPBC Act**

V **Listed as Vulnerable under the EPBC Act**

L **Listed as threatened under the FFG Act**

FFG Act protected flora species include all FFG listed threatened species as well as many families, genera, and species that are generally common including all members of the Asteraceae family and most *Acacia* species. The project is likely to impact on the following protected flora species previously recorded at the site as listed below:

- *Acacia salicina* (common species with potential impact of around 50 throughout the construction footprint)
- *Acacia stenophylla* (common species with potential impact of around 50 throughout the construction footprint)
- *Brachyscome basaltica var. gracilis* (common species with potential impact of around 10 throughout the construction footprint)
- *Calotis scapigera* (common species with potential impact of around 10 throughout the construction footprint)
- *Helichrysum luteoalbum* (common species with potential impact of around 50 throughout the construction footprint)
- *Olearia pimeleoides* (common species with potential impact of around 10 throughout the construction footprint)
- *Picris squarrosa* (rare species previously recorded but not found in the construction footprint. Potential impact only)
- *Rhodanthe spp* (common species with potential impact of around 50 throughout the construction footprint)
- *Senecio cunninghamii var. cunninghamii* (rare species with 9 likely to be impacted)
- *Senecio quadridentatus* (common species with potential impact of around 50 throughout the construction footprint)
- *Senecio runcinifolius* (common species with potential impact of around 50 throughout the construction footprint)
- *Vittadinia cuneata var. cuneata* (common species with potential impact of around 10 throughout the construction footprint)
- *Vittadinia cuneata var. hirsuta* (rare species with 9 likely to be impacted)
- *Xerochrysum bracteatum* (common species with potential impact of around 10 throughout the construction footprint).

Three rare or threatened species listed on the Advisory list of Rare and Threatened Plants in Victoria (DEPI 2014) were located within the construction footprint.

Table 20 Summary species on the Advisory list of Rare and Threatened Plants in Victoria (DEPI 2014) and potential project impacts

Species name	Conservation status	Location(s)
***Dianella porracea* (Riverine Flax-lily)**	DELWP Advisory list – vulnerable	Regulator N1 (12 plants)
***Senecio cunninghamii var. cunninghamii* (Branching Groundsel)**	DELWP Advisory list – rare	Sill 6, N5 ~95 likely to be impacted
***Vittadinia cunneata var. hirsuta* (Fuzzy New Holland Daisy)**	DELWP Advisory list – rare	Regulator N1, N2, Sill 4 9 likely to be impacted

Fauna species

Of the 30 terrestrial fauna identified by VBA and PMST as previously recorded or having the potential to occur within 10 km of the construction footprint and the inundation area, nine of these are considered possible to occur within the construction footprint. Impacts on these species have been assessed as unlikely.

Table 21 Fauna listed on the EPBC Act and/or the FFG Act and considered possible or known to occur in the study area

Common name	*Scientific Name*	EPBC	FFG	Impacts/reasoning
Regent Parrot	*Polytelis anthopeplus*	VU	L	**Impacts unlikely:** Losses to small area (~ 7.42 ha) foraging habitat proposed to be lost, however the species is wide ranging and suitable surrounding habitat widespread.
Black Falcon	*Falco subniger*		L	**Impacts unlikely:** This species is wide ranging and suitable surrounding habitat is widespread.
Ground Cuckoo-shrike	*Coracina maxima*		L	**Impacts unlikely:** as it is a wide ranging species and suitable surrounding habitat is widespread.
Major Mitchell's Cockatoo	*Cacatua leadbeateri*		L	**Impacts unlikely:** as it is a wide ranging species and suitable surrounding habitat is widespread.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		L	**Impacts unlikely:** Species wide ranging and suitable surrounding habitat widespread. Important habitat (breeding habitat) limited within the construction footprint.
Hooded Robin	*Melanodryas cucullata*		L	**Impacts unlikely:** Species wide ranging and suitable surrounding habitat widespread
Carpet Python	*Morelia spilota metcalfei*		L	**Impacts unlikely:** Species wide ranging and suitable surrounding habitat widespread, however direct impacts (injury, stress, mortality) through habitat clearing should be mitigated.

Grey-crowned Babbler	*Pomatostomus temporalis*		L	**Impacts unlikely:** Species wide ranging and suitable surrounding habitat widespread
Yellow-bellied Sheathail Bat	*Saccolaimus flaviventris*		L	**Impacts unlikely:** Impacts are expected to be minimal if direct impacts from removal of roosting habitat (tree hollows and buildings) are checked prior to removal, and supervised during removal, by a suitably experienced ecologist.

KEY

VU **Listed as Vulnerable under the EPBC Act**

L **Listed as threatened under the FFG Act**

The *National Recovery Plan for the Regent Parrot (eastern subspecies) Polytelis anthopeplus monarchoides* (Baker-Gabb and Hurley, 2011) lists a range of threatening processes including disturbance around nesting colonies of the Regent Parrot. However, as identified above, there are no known nesting colonies in the Nyah-Vinifera Park and based on further habitat assessment and survey conducted for this report, there appears to be a continued lack of nesting activity and habitat. Based on current and previous assessment of Regent Parrot habitat in the area of investigation it seems reasonable to suggest that disturbance to known nesting colonies is unlikely.

In addition, recovery plan recognises the importance of environmental watering in supporting River Red Gum habitat and breeding sites for Regent Parrot. The VMFRP project aims to maintain and enhance the condition of River Red Gum habitats and broader floodplain and wetland habitats which are likely to assist with the recovery of the Regent Parrot.

Migratory species

Fourteen migratory species were identified as having the potential to occur within the construction footprint, and fourteen in the proposed inundation area (PMST and VBA). Most of these species are either highly unlikely to occur (e.g. Bar-tailed Godwit, Eastern Curlew) or would very rarely use airspace over these footprints (e.g. White-throated Needletail). It is highly unlikely that the construction footprint supports habitat that would be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species. A current assessment of the EPBC Act significant impact criteria to Migratory listed species from the proposed works for this species is provided in Appendix F of the Flora and Fauna Assessment - Nyah (R8 2020b).

Is mitigation of potential effects on indigenous flora and fauna proposed?

☒ NYD ☒ No ☒ Yes If yes, please briefly describe.

Efforts have been made throughout the planning and design phases for the proposed construction to avoid and minimise impacts to ecological values including native vegetation and fauna habitat, threatened flora, fauna and communities. All areas of native vegetation that are proposed to be impacted are adjacent to existing vehicle tracks and areas of previous disturbance and represent inferior areas of habitat to those which surround them. From a landscape perspective the proposed construction footprints represent a small area within a much large intact area of high quality native vegetation.

The following would be considered as the project's design is refined and through construction, and

implementation of the project:

Design

The following mitigation measures have been implemented during the design phase to minimise and mitigate impacts to threatened flora and fauna identified in previous ecological surveys within the construction footprint (ARI 2013, Australian Ecosystems 2016):

- Avoid where possible mapped rare and threatened flora species. This has proved difficult for the Branching Groundsel however this rare species is considered to be locally common within the construction footprint.
- Micro- siting infrastructure within construction footprints to avoid impacting hollow-bearing trees to reduce impacts to hollow-dependant fauna (such as species within the FFG Act Listed community, VTWBC)
- Refinement of the design and construction methods to further minimise the construction footprints (including access track and laydown areas)

Construction phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values (FFG Act listed threatened species):

- Retain as many Large Trees as practicable in the extended buffer zones, in accordance with the recommendations of Australian Ecosystems (2016) for the original construction footprint area
- Use existing disturbed areas or areas of non-native vegetation for lay-downs and stockpiling
- Where practical, avoid areas of high quality vegetation and vegetation that supports rare or threatened flora (e.g. patches of Branching Groundsel)
- Develop and implement mitigation measures for incorporation into an CEMP to minimise the potential for ecological impacts within and around the site before, during and after the construction process. These may also include:
    - Minimise and adhere to the approved footprint and supervise construction activities to ensure that activities do not encroach on retained native vegetation
    - Standard vehicle hygiene measures to prevent the spread and introduction of weed species, particularly the weeds of national significance and noxious weeds listed under the Catchment and Land Protection Act 1994 (CaLP Act)
    - Standard vehicle hygiene measures to prevent the spread or transmission of Chytrid Fungus as per Murray et al (2011)
    - Management of run-off, spills and sediment to avoid impacts on Parnee Malloo Creek
    - Delineation of areas of remnant native vegetation to be retained from those areas to be removed as no-go zones to avoid encroachment into areas of retained vegetation
- Follow the avoid, minimise protocol in determining the construction works footprint at each site (i.e. make every effort to avoid threatened flora species loss as a high priority)
- Temporary fencing should be erected around ‘sensitive’ areas to indicate areas to avoid during construction

- Establish work zones for each site to avoid 'sensitive' habitats (including areas containing threatened flora). This could be implemented through an initial briefing of construction works crews by a qualified ecologist and subsequent planning of safe work distances and establishment of each site.
- Develop and implement a Flora and Fauna Management Plan to manage impacts to all flora and fauna values and particularly threatened species and the habitat preclearance and clearance process
- Manage the removal of hollow-bearing trees within the construction footprint (if required, based on final footprints and potential impacts to tree root zones from track establishment, setdown areas) where construction may impact habitat trees of native fauna, particularly FFG Act listed fauna species and communities
- Avoiding the breeding season of hollow-dependant species is recommended, however where this is not practical an assessment must include surveys undertaken by a suitably qualified ecologist of the hollow-bearing trees being removed during the breeding season. The survey should also include other native hollow-dependent fauna. A protocol needs to be developed prior to/during construction.
- Where clearing is proposed outside the breeding season, complete pre-clearance surveys for any remnant hollow-bearing trees to be removed. These trees could harbour one or more species of native hollow-dependent fauna. Pre-clearance surveys should be conducted prior to (within 24 hours) the hollow-bearing trees being removed.
- Develop and implement a plan to manage weeds during and after the construction phase (this will be described in an overarching EMP)
- Rehabilitate construction areas, including setting aside topsoil to reinstate when works are complete and compacting to original levels. If native vegetation must be removed, re-spreading of stored topsoil should occur, followed by monitoring to assess germination in the following year. Appropriate weed control measures at the site following the works should be incorporated into the rehabilitation program, as soon as possible. If the site is not naturally recolonised by locally indigenous species, planting of locally indigenous species appropriate to that particular position in the landscape may be undertaken in the following year. Ground debris that is temporarily removed to allow construction activities, should be reinstated.
- Minimise the need to create new tracks and use existing tracks as much as possible

Operation phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values (FFG Act listed threatened species).

- Implement pest animal management and control within the inundation area (and ideally surrounding areas), however this may require Parks Victoria to expand current pest control programs within the park to target these areas during inundation events.

Other information/comments? (eg. accuracy of information)

13. Water environments

Will the project require significant volumes of fresh water (eg. > 1 Gl/yr)?

☒ NYD ☒ No ☒ Yes If yes, indicate approximate volume and likely source.

The project would flood over half of the forest to a water level of 63.2 m AHD, requiring a volume of approximately 2.8 GL/year (Mallee, 2014). This water would be sourced from existing environmental water entitlements[7] via the Victorian Environmental Water Holder. Water use would vary from year to year depending on natural inflows and previous flooding history.

Inflows and outflows to the Nyah floodplain would be measured during managed flood events when the proposed works are utilised. This may be achieved using flow sensors installed at each of the regulators to measure natural inflows and outflows. These measurements are important to inform calculation of the volume of environmental water used in each event and enable accuracy of water accounting.

Will the project discharge waste water or runoff to water environments?

☐ NYD ☐ No ☒ Yes If yes, specify types of discharges and which environments.

The Nyah floodplain is located on the left (west) bank of the Murray River. The Nyah floodplain is understood to generally fill from the downstream end of the floodplain as Murray River levels commence to rise (Ecological Associates, 2006). Flows leave the floodplain through the same connection. The Parnee Malloo Creek is the key creek system in the Nyah floodplain, however it has been highly modified.

Through the construction of new infrastructure and the modification of existing infrastructure, the project aims to provide a natural inundation regime across approximately 488 ha of high-ecological-value Murray River floodplain within the Nyah-Vinifera Park.

Flow will be diverted from the Murray River into Nyah Vinifera Park, which is drained by Parnee Malloo Creek, a seasonal anabranch of the Murray River. This floodplain includes 913 ha of wetland, forest and woodland areas. A proportion of the volume will be returned to the Murray River at the end of the watering event. This may in turn impact on downstream environments, including other project sites without adequate consideration and mitigation.

Are any waterways, wetlands, estuaries or marine environments likely to be affected?

☐ NYD ☐ No ☒ Yes If yes, specify which water environments, answer the following questions and attach any relevant details.

If not managed appropriately, aquatic ecosystems may experience adverse impacts from potential low dissolved oxygen (DO) concentrations and poor water quality as a result of water manipulation (salinity, suspended solids, organic matter) however, downstream impacts are yet to be fully assessed.

Salt inflow to the Murray River in the Mallee tract (that is, downstream of Swan Hill) is a major source of salt load in the river. Accordingly, there is considerable concern about the soil and shallow groundwater salinity in the vicinity of the VMFRP sites and salinity risk is an area that should be considered. Soil and groundwater salinity at the site are at low to moderate levels.

Potential impact pathways are listed below.

<u>Potential impacts of the project during construction</u>

- Erosion and loss of topsoil causing water quality impacts
- Construction works and structures causing bed and bank erosion and instability

[7] Includes environmental water entitlements already held by the Murray Darling Basin Authority, The Living Murray Program, the Commonwealth Environmental Water Holder and the Victorian Environmental Water Holder.

- Rainfall and flood events causing a pollution event and runoff
- Discharging/dewatering poor quality water into receiving water waters (high turbidity, EC).
- Spills, leaks, poor handling of fuels, oils and other chemicals causing soil/water contamination
- A coffer dam may be required for the construction of the rock mattress extending into the bed of the Murray River (to prevent erosion) which will be likely to locally/temporarily affect river conditions

Potential impacts of the project during operation

- Blackwater may eventuate from environmental water after a dry period or warm water and excessive litter, which compromises foraging habitat and kills wetland biota
- Potential for poor quality as a result of high organic matter, warm temperatures, low DO and anoxic conditions, particularly if water stagnates in areas which would naturally have moving water
- Possible processes such as blackwater, algae blooms, high loads of organic matter etc. can cause low DO concentrations impacting the health of aquatic species and communities
- Suspended solids, turbidity, organic matter may cause poor water quality impacting the health of aquatic species and communities, also waterbird species
- The release of poor quality water into the Murray River may impact water quality downstream
- Inability to release poor quality water back to the Murray River may impact floodplain health and vegetation
- Discharge of saline groundwater may increase the salinity of the water in the river and breach Basin Salinity Management Strategy requirements
- Shallow saline groundwater can impact on floodplain health and vegetation, at site and downstream
- Carp will breed in response to floods within the forest, excessive numbers of carp can adversely affect aquatic ecosystems

Measures to manage these impacts are outlined in the 'mitigation' section below and also Part 2, Section 18 (Environmental management).

Are any of these water environments likely to support threatened or migratory species?

☒ NYD ☒ No ☒ Yes If yes, specify which water environments.

The Murray River, Nyah-Vinifera Park, surrounding floodplain communities and nearby significant wetlands are likely to at least intermittently support listed threatened and migratory species. These species are generally expected to benefit from the anticipated improvements in ecological condition of floodplain vegetation and associated habitats that the project aims to deliver through the proposed reinstatement of a more natural hydrological regime. Refer to Part 2, Section 12 (Native vegetation, flora and fauna) and **Attachment 9 – Fauna and Flora Assessment - Nyah** of this referral.

The Nyah project has the potential to provide a number of water regime classes that would benefit native fish at a local scale. Surveys carried out as part of DELWP's 2017 Wetland Monitoring and Assessment Program (WetMAP) provide an understanding of fish likely to inhabit Nyah-Vinifera

Park. The 2017 survey indicated that only two native fish - Carp gudgeon (Hypseleotris spp.) and Australian smelt (Retropinna semoni) and two exotic fish species - gambusia (Gambusia holbrooki) and carp (Cyprinus carpio) currently inhabit Nyah.

Table 22 Species likely to occur in Nyah-Vinifera Park (source - Attachment 11 - Fish Management Plan)

Common name	Scientific name	EPBC Act status	FFG Act status	DELWP advisory	Likelihood of occurrence
Flathead galaxias	*Galaxias rostratus*	CR	N	V	Unlikely
Freshwater catfish	*Tandanus tandanus*	-	L	EN	Possible
Golden perch	*Macquaria ambigua*	-	L	NT	Likely
Macquarie perch	*Macquaria australasica*	EN	L	EN	Unlikely
Murray cod	*Maccullocella peelii*	VU	L	V	Likely
Murray hardyhead	*Craterocephalus fluviatilis*	EN	L	CR	Unlikely
Murray-Darling rainbowfish	*Melanotaenia fluviatilis*	-	L	V	Possible
Silver perch	*Bidyanus bidyanus*	CR	L	V	Likely
Unspecked hardyhead	*Craterocephalus stercusmuscarum fulvus*	-	-	-	Likely
Carp gudgeon	*Hypseleotris klunzingeri*	-	-	-	Certain
Bony herring	*Nematalosa erebi*	-	-	-	Likely
Flathead gudgeon	*Philypnodon grandiceps*	-	-	-	Likely
Dwarf flat-headed gudgeon	*Philypnodon macrostomus*	-	-	-	Likely
Australian smelt	*Retropinna semoni*	-	-	-	Certain

Key

CR **Listed as Critically Endangered under the EPBC Act**

EN **Listed as Endangered under the EPBC Act**

VU **Listed as Vulnerable under the EPBC Act**

N **Nominated under the FFG Act**

L **Listed under the FFG Act**

V **Listed as Vulnerable under the DELWP Advisory List**

CR **Listed as Critically Endangered under the DELWP Advisory List**

EN **Listed as Endangered under the DELWP Advisory List**

NT **Listed as Near Threatened under the DELWP Advisory List**

Are any potentially affected wetlands listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'?

☐ NYD ☒ No ☐ Yes If yes, please specify.

The Ramsar Wetland Hattah-Kulkyne National Park is located approximately 300 km downstream of the project. It is unlikely that the project would negatively impact on the character of the Ramsar site given the distance to this Ramsar site and a CEMP would be prepared and implemented to address potential environmental risks (such as sediment runoff)

An additional three Ramsar Wetlands were identified 900 - 1200 km downstream of the Nyah-Vinifera Park (Banrock Station Wetland Complex, Riverland and the Cooranong, and Lakes Alexndrina and Albert Wetland, but these are not expected to be affected by the project.

Could the project affect streamflows?

☐ NYD ☐ No ☒ Yes If yes, briefly describe implications for streamflows.

The purpose of the project is to reinstate a more natural hydrological regime to the Nyah floodplain. It is intended that this would be achieved in part, by installing a regulating structure to regulate the flow of water to and from the Murray River. Flows in Murray River downstream would therefore be affected, mainly through a decrease in the frequency of flows downstream as the Nyah floodplain is inundated.

Potential effects on Murray River flows would be assessed and managed through existing environmental water accounting frameworks under the Basin Plan, with which the current project would need to comply. These frameworks require that any water pumped from the Murray River is debited against environmental watering accounts, along with any additional evaporation and seepage losses caused by impounding natural inflows on the floodplain beyond the peak of floodwaters passing. To minimise potential effects, the project is designed to utilise natural flood inflows and to re-use water released from the TLM works, rather than additional pumping of water directly from the Murray River.

Could regional groundwater resources be affected by the project?

☐ NYD ☐ No ☒ Yes If yes, describe in what way.

A desktop groundwater assessment has been prepared and is provided in **Attachment 17 – Desktop Groundwater Assessment – Nyah.**

There are no licenced groundwater users and no registered stock and domestic bores in the vicinity of the project area. This is because of the generally saline nature (approximately 500 mg/L to 3,500 mg/L) of the regional aquifer, the proximity to fresh water from the Murray River and limited access to floodplain aquifers by private landowners. The primary use of groundwater within the Nyah floodplain is environmental use associated with floodplain vegetation and ecosystems.

The Nyah project is located in the Murray Geological Basin A series of aquifer layers are present at the site, to a depth of approximately 300m below ground. Of these layers, only the upper layers are relevant.

The shallow groundwater hydrogeological conditions at the site are described in Thorne et al. (1990). The key hydrogeological features of this area are described below:

- Adjacent to the Murray River there is a shallow alluvial sequence of limited extent
- The alluvial sediments are hydraulically connected to the river
- Underlying the shallow alluvial sediments near the river is the regional aquifer
- The regional aquifer has direct or near direct connection to the alluvial sediments in this area
- The groundwater levels very close to the river level in the alluvial sediments, but groundwater is lower in the regional sediments further inland from the river

The potential groundwater effects of the proposed construction and operation of the works are:

- Temporary and limited drawdown of groundwater levels during construction
- Increased groundwater level as a result of flood recharge
- Reduced groundwater salinity immediately following flood events
- Modified groundwater quality of the watertable during and after flood events

Construction of the project works may require groundwater dewatering and disposal of pumped groundwater. It this is the case then minor impacts on adjacent vegetation and ecosystems are possible. This can be mitigated by planning construction to minimise dewatering and to provide watering for any ecosystems that may experience lowered groundwater levels.

Operation of the proposed works will results in elevated groundwater levels, wetting of soils and potentially mobilised salt from the unsaturated soil store. This may result in displacement of salt to the Murray River and increased evapotranspiration of water from the floodplain, potentially concentrating salts in the soil. Given the very low salt store in the project area and the generally fresh groundwater these are regarded as being very low risk. Monitoring of flooding patterns and adaptive management of flooding to minimise waterlogging would reduce this risk.

Could environmental values (beneficial uses) of water environments be affected?

☒ NYD ☒ No ☒ Yes If yes, identify waterways/water bodies and beneficial uses (as recognised by State Environment Protection Policies)

The waterways and water bodies within the project area are located with the State Environment Protection Policy (Waters) (SEPP (Waters)) Murray and Western Plains surface water segment. Wetlands within the project area are located within the SEPP (Waters) Lakes and Swamps surface water segment. Schedule 2, Table 3 of SEPP (Waters) identifies beneficial uses of inland waters within the Murray and Western Plains and the Lakes and Swamps segments as including:

- Water dependent ecosystems and species that are slightly to moderately modified
- Human consumption after appropriate treatment where water is sourced for supply in accordance with the special water supply catchments area set out in Schedule 5 of the *Catchment and Land Protection Act 1994* or the *Safe Drinking Water Act 2003*
- Agriculture and irrigation
- Human consumption of aquatic foods
- Aquaculture where the environmental quality is suitable and an aquaculture licence has been approved in accordance with the *Fisheries Act 1995*
- Industrial and commercial (applies to the Murray and Western Plains segment only)

- Water-based recreation (primary, secondary contact and aesthetic enjoyment)
- Traditional Owner cultural values
- Cultural and spiritual values

Potential effects on surface water environments are discussed in the following sections.

The SEPP(Waters) identifies beneficial uses of groundwater based on Total Dissolved Solids concentrations. As noted above, regional groundwater is highly saline. Potential effects on regional groundwater are discussed in the preceding section.

Could aquatic, estuarine or marine ecosystems be affected by the project?

☐ NYD ☐ No ☒ Yes If yes, describe in what way.

The project aims to reinstate a more natural hydrological regime to the Nyah floodplain, which is expected to deliver a range of ecological benefits to floodplain and wetland communities. The project is designed to have the operational flexibility to vary the timing, depth, duration and extent of inundation so that individual managed events are able to target specific ecological outcomes.

However, if not managed appropriately, the project also has the potential to adversely affect aquatic ecosystems in the vicinity. To identify and assess these risks during project development, a comprehensive and rigorous risk assessment was completed (Lloyd Environmental, 2014). This involved identifying potential undesirable outcomes, determining their root causes, assessing likely consequences and significance; and developing relevant mitigation measures to reduce any residual risk to an acceptable level (very low to moderate). Experience gained from previous works and measures, and environmental watering projects of similar scale and complexity, including TLM Program, informed this process.

The risk assessment by Lloyd Environmental (2014) identified the following potential threats to aquatic ecosystems:

- Water manipulations may lead to suspension of sediments and / or organic matter causing elevated nutrients, high turbidity and / or low dissolved oxygen (DO) levels, which may reduce food sources and result in toxic algal blooms impacting on wetland community health, threatened species, fish and other aquatic fauna communities, and waterbird communities
- Inability to discharge water of poor water quality during a managed flow event, due to downstream impacts (e.g. increases in instream salinity), could result in impacts on floodplain vegetation (due to extended inundation) or formation of blackwater / algal blooms
- Low DO concentrations created through processes such as blackwater events, algal and cyanobacterial blooms, high organic matter loadings and stratification, can impact aquatic fauna and the health of wetland communities
- Development of saline mounds under wetlands and displacement of saline groundwater to surface waters, including the Murray River. Shallow saline groundwater can also impact on the health of floodplain vegetation and wetland communities.
- Increased carp populations through more frequent flooding that creates enhanced carp recruitment conditions, potentially impacting the health and diversity of wetland vegetation, affecting native fish and other aquatic fauna
- Stranding and isolation of fish on floodplains can occur through sudden changes in water levels and/or new barriers preventing native fish from escaping drying areas during flood

recessions, which may result in the death of a portion of the native fish population

- Installation of regulators in waterways and wetlands creates barriers to the movement of fish and other aquatic fauna, which can reduce access to feeding and breeding habitat, and limit migration or spawning opportunities

Planning and design of the project continues to address these identified risks, including through design of regulating structures to satisfy fish passage requirements including those described in **Attachment 11 - Fish Management Plan** to mitigate the potential effects of creating barriers to fish movement. Other measures to reduce the threats identified above are outlined in the 'mitigation' section below and also Part 2, Section 18 (Environmental management).

Is there a potential for extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term?

☒ No ☐ Yes If yes, please describe. Comment on likelihood of effects and associated uncertainties, if practicable.

Major and long-term effects on the health and biodiversity of aquatic ecosystems associated with the project are expected to be mostly positive as defined through the specific ecological objectives and targets for the project set out in **Table 1** of this referral. The project is designed to have the operational flexibility to vary the timing, depth, duration and extent of inundation so that individual managed events are able to target specific ecological outcomes.

Is mitigation of potential effects on water environments proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Construction

The following mitigation measures are proposed to minimise and avoid impacts on water environments during construction of the project:

- Develop and implement a CEMP, including erosion and sediment control plans, dewatering and water quality management plans, weed and pest hygiene protocols to minimise potential impacts on wetlands and other aquatic ecosystems
- Rehabilitate construction areas following completion of works to the satisfaction of Parks Victoria
- Minimise the total volume and rate of groundwater extracted for construction purposes

Operation

The following mitigation measures are proposed to minimise and avoid impacts on water environments during operation of the project:

- Continue to undertake water quality monitoring before, during and after watering events to inform adaptive management strategies and real-time operational decision making.
- Commence watering as early as possible to move organic matter off the floodplain while temperatures are low. Maintain a through-flow where possible in other areas to maximise exchange rates and movement of organic material. Monitor dissolved oxygen and water temperature to identify hypoxic areas to inform consequence management.
- Schedule watering events to make use of dilution flows where possible and optimise timing of releases. Ensure dilution of low DO water by managing outflow rates and river flows:

delay outflows if river flows are too low; dispose of hypoxic water by pumping to higher wetlands where possible; agitate water using infrastructure to increase aeration.

- Integrate water management with other sites in seasonal water planning process. Maintain good relationships with other water managers.
- Tailor watering regimes to provide competitive advantage for native fish over carp. Dry wetlands that contain carp. Manage drawdown following managed events to provide triggers for native fish to move off the floodplain, and where possible, strand carp.
- Monitor the salinity of ground and surface water salinity before, during and after watering events to inform management and ensure sufficient volumes are available for mitigation such as:
  - Diluting saline groundwater discharge with sufficient river flows
  - Diluting saline water on the floodplain by delivering more fresh water to these areas
  - Reduce the frequency and/or extent of planned watering events if sufficient volumes not available

Mitigation measures would be implemented to minimise risks associated with pest plants, including:

- Timing water manipulations to drown seedlings, minimise growth, germination and seed set. Time water manipulations to promote native species.
- Controlling current populations and eradicate/control new infestations via existing management strategies (e.g. Parks Victoria pest management action plans/strategies). Support partner agencies to seek further funding for targeted weed control programs if necessary.

Mitigation measures would be implemented to minimise risks associated with barriers to fish passage, including:

- Design of regulating structures to satisfy fish passage requirements including those described in **Attachment 11 - Fish Management Plan**
- Continuing to build on knowledge and understanding through current studies relating to fish movement in response to environmental watering and cues to further develop and refine a fish exit strategy

Other information/comments? (eg. accuracy of information)

14. Landscape and soils

Landscape

Has a preliminary landscape assessment been prepared?

☒ No ☐ Yes If yes, please attach.

Is the project to be located either within or near an area that is:

- **Subject to a Landscape Significance Overlay or Environmental Significance Overlay?**

☐ NYD ☐ No ☒ Yes If yes, provide plan showing footprint relative to overlay.

As shown in **Attachment 14 – Planning Zones & Overlays Maps,** the eastern extent of the project works, adjacent to the Murray River is located within an Environmental Significance Overlay (ESO1).

The ESO1 affects public and private land in non-urban areas. The ESO1 recognises the *importance of the Murray River and its environs, being of local, regional, state, national and even international significance* and notes that the Murray River is an *important water supply, tourism, recreation, landscape, cultural and environmental asset*.

The purpose of the ESO1, amongst a range of other things, is to protect the scenic landscape qualities of the River environs.

- **Identified as of regional or State significance in a reputable study of landscape values?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

As noted in the response above, the project area is identified as being of Local, Regional, State and National and potentially International significance.

- **Within or adjoining land reserved under the *National Parks Act 1975* ?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

The proposed construction footprint and inundation areas are located within the Nyah-Vinifera Park, which are reserved under the *National Parks Act 1975*. The Nyah-Vinifera Park is managed in accordance with section 18(2)(a) of *National Parks Act 1975*, to:

- *preserve, protect and re-establish indigenous flora and fauna in the park;*
- *preserve and protect features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest;*
- *enable the park to be used by the public for the enjoyment, observation and study of the countryside and its pursuits, its flora and fauna, its ecology and geology and other features; and*
- *control exotic flora and fauna in the park.*

- **Within or adjoining other public land used for conservation or recreational purposes ?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

As shown in **Attachment 14 – Planning Zones & Overlays Maps,** the Murray River runs along the eastern boundary of the Nyah-Vinifera Park and is used for a range of recreational purposes.

Part 2, Section 15 (Social environments) provides further details of the recreational activities undertaken within this area

Is any clearing vegetation or alteration of landforms likely to affect landscape values?
☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The project would involve the removal of approximately 7.42 ha of native vegetation as described in Section 12 (Native vegetation, flora and fauna) and **Attachment 9 – Fauna and Flora Assessment - Nyah,** localised raising of existing access tracks (approx. 1.3 km length) to create regulating structures, and contribute to retention of floodwaters during managed inundation events.

The proposed structures at the northern end of the project would include regulator N2, N1A and

N1B. These structures would be located along existing access tracks to minimise works and vegetation removal beyond areas that have already been modified by the construction of maintenance and access tracks. These structures would be visible by park visitors however, it is expected that visibility would be partly screened by existing retained vegetation with view generally confined to areas in proximity to the structures. **Attachment 18 – Example Regulating Structure Photos** shows examples of similar regulating structures previously installed in similar landscapes along the Murray River floodplain.

Regulator N5, N7 and associated hardstands are proposed at the southern end of the project area and adjacent to the Murray River. These structures would also be located, along a publicly accessible track to minimise works and vegetation removal. These regulating structures would be visible to park visitors (both along the Forest Track and within the Murray River), however it is expected that visibility would be partly screened by existing retained vegetation with views generally confined to areas in proximity to the structures.

The proposed drop structure (gabion cut off beam/weir and rock mattress) would also be visible from park visitors both along the Forest Track and within the Murray River, however this structure would only be exposed when river levels are low and is not expected to be visually intrusive in this environment.

It is not expected that the structures described above would be visible from surrounding dwellings given separation distances (i.e. the closest dwelling being approximately 100 m away from the project) and with screening by existing vegetation between the structures and the dwellings.

The areas of proposed vegetation clearing is minimal when compared to the 488 ha of native vegetation within the proposed inundation areas that would benefit from the project. Overall, the proposed vegetation removal would be offset by the broader improvements to the existing landscape values cross the Nyah-Vinifera Park.

Overall, the project is expected to have a positive effect on the landscape values of the surrounding floodplains and parks. This is expected due to the project's objective of restoring a more natural inundation regime to approximately 488 ha of the Nyah floodplain. For this reason, it is considered that the project is consistent with the management strategies outlined in the Mallee Parks Water Management Plan and the ESO1 and other overlays that affect the project area. These documents recognise the importance of hydrological regimes in protecting the scenic landscapes that maintain the Park's recreational and tourism values. The project is supported by Parks Victoria, which is responsible for management of the Nyah-Vinifera Park.

Is there a potential for effects on landscape values of regional or State importance?

☒ NYD ☒ No ☒ Yes Please briefly explain response.

As described above, the project would involve removal of native vegetation and alteration of constructed landforms within areas supporting state and regional landscape values, specifically the Nyah-Vinifera Park. The extent of vegetation removal and landform alteration, will be limited to approximately 7.42 ha and generally within areas that have been modified by the construction and use of trails and tracks. On balance, the proposed areas of disturbance and vegetation removal when measured against the 488 ha of floodplain vegetation communities that are expected to benefit from the project, it is considered that the project would not have a significant adverse effect on landscape values of state or regional importance.

Further, it is recognised that the project seeks to restore a more natural inundation regime consistent with the management strategies outlined in the Mallee Parks Management Plan, which recognise that ensuring appropriate hydrological regimes is critical to protecting the scenic landscapes that maintain the Park's recreational and tourism values.

Is mitigation of potential landscape effects proposed?
☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The following measures are proposed to mitigate potential landscape effects:

Design measures

- Siting of proposed structures primarily along or immediately adjacent to existing access tracks and other previously disturbed areas to minimise the removal of native vegetation and other construction impacts
- Limit the extent of ground disturbance and native vegetation removal, particularly large old trees, to the minimum extent necessary
- Design of proposed structures is to be sympathetic to the surrounding landscape and consistent with Parks Victoria infrastructure design guidelines

Site re-establishment

- Following construction works, soil is to be reinstated to mimic the contours of the site prior to construction, unless the aim of construction was to alter the land profile (e.g. creek bed excavations). The following methods should be followed:
    - Photographs of the site taken prior to works should be consulted
    - Where soil has been compacted due to construction works, and is not required to maintain structural integrity of works, then the soil should be ripped with narrow tynes to a depth of 50 mm. Ripping that involves the mixing of soil profiles is to be avoided
    - Subsoil is to be reinstated first, with separate horizons restored in layers consistent with the surrounding soil profile. Any remaining subsoil should be removed and disposed of off-site, or at a site within the Park under direction from PV / the land manager.
    - Vegetation (through natural regeneration) should be established as soon as possible after soil reinstatement to prevent risks of erosion
- Topsoil shall not be compacted when reinstated. All top soil should be used in site reinstatement

Operation

- During the operational phase, inundation events would be managed in accordance with operational guidelines informed by detailed hydrodynamic modelling and ecological investigations and adapted as required in response to proposed monitoring and evaluation frameworks to support achievement of the identified ecological objectives for the project.

Other information/comments? (eg. accuracy of information)

Note: A preliminary landscape assessment is a specific requirement for a referral of a wind energy facility. This should provide a description of:

- The landscape character of the site and surrounding areas including landform, vegetation types and coverage, water features, any other notable features and current land use

- The location of nearby dwellings, townships, recreation areas, major roads, above-ground utilities, tourist routes and walking tracks
- Views to the site and to the proposed location of wind turbines from key vantage points (including views showing existing nearby dwellings and views from major roads, walking tracks and tourist routes) sufficient to give a sense of the overall site in its setting

Soils

Is there a potential for effects on land stability, acid sulphate soils or highly erodible soils?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

A number of geotechnical investigations have been undertaken for the project area and proposed structure locations, with key findings summarised by Jacobs (2016) (see **Attachment 16 – Geotechnical Investigation Report**) and outlined below. The results of these investigations have informed the detailed design of the project.

Geology and soils of the area

A desktop geological assessment was undertaken by Jacobs (2014), followed by subsequent geotechnical investigations (Jacobs, 2016) which identified that the materials encountered at the Nyah floodplain were generally consistent with the formations identified in the desktop assessment.

Jacobs, 2014 identifies that the Nyah floodplain has formed within the period of European settlement or after the main floodplain silty clay sediment was laid down, within the last few thousand years. The floodplain comprises up to approximately 0.2 m of the Coonambidgal formation as the surface layer. Beneath this lies the Channel Sands, underlain with Basal sands.

Jacobs (2016) has summarised ground conditions at the proposed project infrastructure and determined that:

- Regulator N1a – the soil profile at structure N1a comprises firm to stiff silty clay of medium to high plasticity. A layer of soft clayey silt was encountered at a depth of 1.8 m
- Regulator N1b - the soil profile at structure N1b comprises 0.2 m of uncontrolled fill (road base), overlying firm to stiff silty clay of medium plasticity
- Regulator N2 -the soil profile at structure N2 comprises 0.3 m of uncontrolled fill (road base) overlying, stiff to very stiff silty clay of high plasticity. A layer of clayey sand of dense consistency was encountered at 7.0 m depth
- Regulator N5 - the soil profile at structure N5 comprises 0.9 m depth of uncontrolled fill (road base), overlying very stiff to hard silty clay/ silty sandy clay of low to high plasticity. Borehole refusal was encountered at a depth of 3.8 m at borehole NS-BH01 and this may be indicative of a cemented horizon. Previous geotechnical investigations near to the Regulator N5 structure site, showed a similar ground profile, which overlaid material described as silty clayey sand and sandy silty clay of medium dense and very stiff to hard consistency (Jacobs, 2016).
- Main containment bank - based on the results of the test pit investigations it is expected that the proposed main containment bank for Nyah would be founded on natural clay soils (silty/sandy clays) of high plasticity generally of stiff to very stiff consistency. Access track fill material, typically up to 0.2 m deep, was encountered at several locations. Topsoil material (silty sand), up to 0.2 m deep, was also encountered at several locations (Jacobs,

2016). Large erosion holes were identified during geotechnical investigations, with this being indicative of potentially highly dispersive soils.

- Drop structure – the soil profile generally consists of stiff to very stiff sandy clay of low plasticity, dry to moist. The soil becomes variable below this, varying between soft to stiff silty clay and medium dense silty sand. A laboratory test taken on a geotechnical sample indicates less erodible characteristics (Jacobs, 2016).

Acid sulphate soils

No site-specific acid sulphate soil (ASS) investigations have been undertaken for the project at this stage. A review of CSIRO's Australian Soil Resource Information System (ASRIS) mapping identified that the project is located within an area of 'extremely low probably of occurrence' with a level 4 confidence (provisional classification, inferred from surrogate data with no ground verification) (CSIRO, 2020).

Re-wetting of dried soils (lowering then raising of water tables) or excavation works / soil disturbance within areas of potential ASS could result in the formation of actual ASS. Prior to commencement of construction, the contractor would be required to undertake an ASS investigation and if potential ASS are identified and disturbance cannot be avoided, an ASS management plan will be developed to minimise potential effects on surrounding soils, vegetation and water environments.

Are there geotechnical hazards that may either affect the project or be affected by it?
☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Recommendations for design of structures in response to geotechnical conditions identified at the site are contained in **Attachment 16 – Geotechnical Investigation Report** and were considered in the detailed design of the project.

In addition, prior to commencing works the contractor will be required to prepare a CEMP outlining measures to identify and avoid or manage disturbance of potential ASS, an erosion and sediment control plan and a dewatering management plan (if required).

Other information/comments? (eg. accuracy of information)

15. Social environments

Is the project likely to generate significant volumes of road traffic, during construction or operation?
☒ NYD ☐ No ☐ Yes If yes, provide estimate of traffic volume(s) if practicable.

Construction

An increase in traffic along access roads and park access tracks would occur during construction and is expected to involve:

- Haulage of fill / spoil to the proposed construction sites via existing containment banks and tracks from the Murray Valley Highway.
- Access to Regulator N5 would be by the shortest route, from Murray Valley Highway via Byrnes Lane.

- Delivery and removal of approximately 10-15 pieces of plant as required, including excavators, truck and trailers, graders, rollers and forklifts.
- Workers travelling daily to and from site, anticipated to mostly be from Swan Hill to the north.

During construction, public access along the main track would be closed from the northern park entry through to the intersection of Murray Valley Highway and Byrnes Lane.

Operation

Traffic generated during operation of the project would be minimal and limited to maintenance vehicles (e.g. mostly 4WDs).

Prior to commencement of a temporary pumping event at the N5 regulator, a fuel truck would be required to access the site to deliver the temporary pumps and bunded fuel storage, as access to this site by fuel trucks and other large vehicles would be restricted during a managed inundation event. Access would be via the shortest route, from Murray Valley Highway by Byrnes Lane.

Is there a potential for significant effects on the amenity of residents, due to emissions of dust or odours or changes in visual, noise or traffic conditions?

☒ NYD ☒ No ☒ Yes If yes, briefly describe the nature of the changes in amenity conditions and the possible areas affected.

The proposed regulating structures are proposed within the Nyah-Vinifera Park and are well separated from residential dwellings.

The nearest dwellings to the project are located on rural properties between the Murray Valley Highway western park boundaries, and within the township of Wood Wood at the northern end of the Park. The nearest dwelling to the project is within the township of Wood Wood, within approximately 100 m of the northern extent of the construction footprint (for the N1 containment bank).

A number of dwellings are located on the eastern side of the Murray River within New South Wales. The nearest dwelling within NSW to the proposed project is approximately 500 m to the east.

Construction

A small number of dwellings along the Murray Valley Highway and within NSW, and a number of small businesses within the township of Wood Wood (caravan park, general store), may experience some additional noise, dust and traffic during construction, particularly during construction haulage of fill and spoil along the Murray Valley Highway, and for the construction of the N1 containment bank. These effects would be temporary and limited to the construction period.

Potential effects on the relatively small number of residents are typical of construction projects. As such, potential effects are well understood and able to be managed through standard controls contained in a CEMP and Traffic Management Plan. In addition, it is expected that construction would only be undertaken during the day time period, which would avoid night time construction noise impacts.

It is not expected that vibration would be a significant impact during construction of the project as all assessed sensitive receivers are greater than 50 m from the construction activities. The most likely areas where significant vibration impacts may occur would be during the construction of any road base or concrete stand areas for the project.

Operation

Temporary pumping would be required approximately one year in 10 years, over a period of several weeks, but could occur for up to 2-3 months. The temporary pump would be located adjacent to Regulator N5. Preliminary noise modelling was undertaken using Computer Aided Noise Abatement (CadnaA) Version 2019-MR2 noise modelling software to predict the effects of operational related noise from the pumping site. Findings are provided below:

- Predicted noise levels from the proposed pump operation at the nearest sensitive receiver locations are predicted to comply with the strictest noise criteria under the relevant noise standards (*Noise from Industry in Regional Victoria (NIRV): Recommended maximum noise levels from commerce, industry and trade premises in regional Victoria* (EPA Victoria, 2011) of 32 dB(A) (for sensitive land uses in the rural land zoning during the night) at all sensitive receiver locations, except for eight receiver locations southwest of the site along the Murray Valley Highway. These eight receivers are all predicted to exceed by 1 dB(A).
- Measures to avoid exceedance of the noise criteria would be employed during pumping (such as adjusting the equipment used).

Is there a potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the hazards and possible implications.

The proposed construction activities are located within the Nyah-Vinifera Park and at a minimum of approximately 100 m away from residential dwellings. Potential adverse effects on local communities during the construction phase would most likely be limited to increases in noise, dust and traffic associated with transport of fill / spoil between the Murray Valley Highway and the construction areas.

A Traffic Management Plan would be developed to minimise potential risks to communities along haulage routes associated with a temporary increase in heavy vehicle traffic during construction. Stakeholder engagement activities will also continue through the construction phase to manage any issues raised by local communities.

Is there a potential for displacement of residences or severance of residential access to community resources due to the proposed development?

☐ NYD ☒ No ☐ Yes If yes, briefly describe potential effects.

The project would not displace any residences or sever residential access to community resources as the works are located within discrete sites within the park. Although public access along N1 containment bank would be temporarily closed from the northern entry to the park from the Murray Valley Highway within the construction sites, impacts are only temporary in nature, and access would be reopened to the public following construction. Access via Bynes Lane to regulator N5 would likely only be for a few weeks and this section of the park would be re-opened following completion.

Are non-residential land use activities likely to be displaced as a result of the project?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the likely effects.

The Nyah-Vinifera Park is managed for multi-use values, including conservation, recreation, apiary and indigenous values. Recreational uses include dispersed camping (including camp fires and associated firewood collection), fishing, boating, four wheel driving, horse riding, trail bike riding and walking. The Parnee Malloo Creek and wetlands provide high value low impact activities including sightseeing, walking, hiking and cycling (Mallee, 2014).

There are also active community groups, including Friends, Field Naturalists, residents and the

indigenous community advocating to protect and restore the ecology of the Parnee Malloo Creek system (Mallee, 2014).

No land use activities would be permanently displaced by the project. Camping and picnic areas would be used for operator parking or lay down areas during construction. Impacts at these locations would be temporary only, and would be rehabilitated following construction in accordance management measures outlined in the project CEMP.

Temporary restrictions on access and land use activities within the Nyah Vinifera Park may occur during construction and managed inundation events as described in the following section.

Do any expected changes in non-residential land use activities have a potential to cause adverse effects on local residents/communities, social groups or industries?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the potential effects.

Temporary disruptions to access and activities within the Nyah-Vinifera Park are likely to occur during construction and inundation events, including:

- Access along the N1 regulator containment bank would be closed to the public during construction
- Access along some park access tracks would also be closed to the public during managed inundation events. This may reduce opportunities for active and passive recreation, and possibly tourism

The project would not involve any permanent closure of park access tracks, camping areas or other facilities that are currently available for public use.

Although temporary disruptions to access and activities within the Nyah-Vinifera Park would likely occur during construction and managed inundation events, implementation of the project is expected to improve the condition of vegetation communities and associated habitats within the proposed inundation areas, which would contribute to improved park user experiences in the longer term.

Is mitigation of potential social effects proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The constructing authority (LMW) would work closely with Parks Victoria and other interested groups to minimise disruption to park users and commercial operations during construction and managed inundation events. A stakeholder and community engagement strategy would be developed and implemented during the construction and operation phases to disseminate information regarding proposed road, track or park facility closures in a timely and readily available manner to interested parties to minimise disruption.

In addition, the following mitigation measures will apply to the project:

Design measures

- Provision for infrastructure (e.g. gates) where suitable to facilitate temporary restrictions on public access along certain access tracks during higher risk periods (e.g. flooding) and to provide Parks Victoria with operational flexibility to restrict access to parts of the national parks where deemed necessary to provide rest and recovery from visitation.

Traffic management plan

- A Traffic Management Plan must be prepared and approved in accordance with the Road

Management Act 2004 and implemented. The plan must be prepared by a suitably qualified and experienced traffic engineer.

- The Contractor must liaise with the land manager and the relevant Council in the preparation of the Traffic Management Plan. Evidence of this consultation must form part of the plan.
- Site access points and roads are to be located so as to minimise the impact on nearby residences, cultural heritage sites and flora and fauna habitat
- All vehicles and plant must only operate on existing tracks and in areas marked as parking areas or construction zones
- Deliveries to the site are to be scheduled to minimise disruptions to local amenity and traffic

Nearby residents and landholder notifications

- Notify affected residents and landholders of changes to traffic conditions and access to property for duration of the works. Nearby residents are to be notified at least seven days in advance of works commencing of the nature, duration, and hours of work if they are likely to be impacted by construction activities (i.e., due to noise, vibration, access, traffic).

Noise management plan

- Prepare and implement a Noise Management Plan as part of the CEMP to show how construction will be carried out to minimise the impact of noise from operations on adjacent properties. This could include operational controls such as:
    - Substituting noisy activities with an alternative process where available;
    - Restricting times when noisy work is carried out; and
    - Consultation with affected residents

    Notify the land owner/manager and nearby residences of any planned and unavoidable out of hours works at least five days in advance.

Noise mitigation measures

- Implement appropriate measures to minimise noise consistent with EPA publications; Noise Control Guidelines (EPA Publication 1254,) and Environmental Guidelines for Major Construction Sites (EPA Publication 480) and AS 2436 Guide to Noise Control on Construction Maintenance and Demolition Sites
- All construction plant and equipment used on the works must, in addition to other requirements, be:
    - Fitted with properly maintained noise suppression devices in accordance with the manufacturer's recommendations
    - Be maintained and operated in accordance with manufacturer's recommendations
    - Switched off when not in use
    - Advise local residents when unavoidable out-of-hours work will occur
    - Schedule deliveries to the site so that disruption to local amenity is minimised
- All noise and vibration complaints are to be investigated and corrective actions

implemented as required

Temporary pumping

- Measures to avoid exceedance of the noise criteria would be employed during pumping (such as adjusting the equipment used) to achieve compliance with the criteria in *Noise from Industry in Regional Victoria (NIRV): Recommended maximum noise levels from commerce, industry and trade premises in regional Victoria* (EPA Victoria, 2011)

Other information/comments? (eg. accuracy of information)

Cultural heritage

Have relevant Indigenous organisations been consulted on the occurrence of Aboriginal cultural heritage within the project area?

☐ No If no, list any organisations that it is proposed to consult.
☒ Yes If yes, list the organisations so far consulted.

Consultation to date with Traditional Owner (TO) groups has included engagement with the following groups:

- Wadi Wadi
- Wemba Wemba
- Latji Latji

There is no Registered Aboriginal Party (RAP) for the project area. A Cultural Heritage Management Plan (CHMP) is currently being prepared for the project in consultation with the above TO groups.

What investigations of cultural heritage in the project area have been done?
(attach details of method and results of any surveys for the project & describe their accuracy)

The following cultural heritage investigations and studies have been undertaken for the project to date:

- Assessment to determine the requirement of a Cultural Heritage Management Plan for the project, including:
    - Desktop assessment of Aboriginal cultural heritage values within and in proximity to the project
    - There have been few cultural heritage investigations within the geographic region, with no previous CHMPs covering any part of the project activity area. However, several archaeological studies have been completed that intersect with the project area
    - A review of the Victorian Aboriginal Heritage Register (VAHR) identified 30 Aboriginal Places totalling 33 individual components located within or in proximity to the project area.
    - A CHMP is required as the proposed activity is a high impact activity (utility installation) within an area of cultural heritage sensitivity
- Victorian Murray Floodplain Restoration Project, Nyah Draft Complex Cultural Heritage Management Plan No. 16900 (in preparation by R8)

- A Notice of Intent (NOI) to prepare a CHMP was lodged with Aboriginal Victoria on 24 October 2019
- There is no Registered Aboriginal Party (RAP) for the activity area.
- The following Aboriginal stakeholder groups were consulted with during the field assessment and will be further consulted with in information sessions prior to submitting the CHMP for approval:
  - TO groups: Wadi Wadi, Wemba Wemba, Latji Latji
  - Aboriginal Victoria (as part of the project's Technical Advisory Group)
- The CHMP is scheduled to be completed in mid-2020

- Victorian Murray Floodplain Restoration Project, Nyah Historical Heritage Desktop Assessment (2020) prepared by R8.
  - Assessment of historic archaeological values within 50 m of the construction footprint and 10 m of access tracks at the Nyah State Forest
  - Few historical heritage investigations undertaken in proximity to the project area The desktop review identified the following heritage places within or immediately adjacent to the project area:
    - Former Church (HO201)
    - State School No. 3353 (HO202)
    - Coach Route and *Schinus molle* (Peppercorn trees) (HO203)
    - Canoe Tree (HO205)
  - There is moderate potential for previously unidentified historical heritage to be present within the project area
  - Recommended that a Heritage Impact Assessment should be undertaken for the project which should include field survey to identify further historical archaeological sites and any unidentified historical heritage places

Is any Aboriginal cultural heritage known from the project area?

☒ NYD ☒ No ☒ Yes If yes, briefly describe:

- Any sites listed on the AAV Site Register
- Sites or areas of sensitivity recorded in recent surveys from the project site or nearby
- Sites or areas of sensitivity identified by representatives of Indigenous organisations

The floodplain of the Murray River has significant cultural heritage values for the local indigenous communities. It is well recognised as a traditional meeting place providing water, food and materials for medicines, shelter, clothing and tools. The area contains numerous scar trees, middens, mounds, burial sites, surface scatters and other artefacts (Mallee CMA, 2018).

A Native Title Claim by the Wamba Wamba, Barapa Barapa and Wadi Wadi people takes in parcels of land from Nyah to Boundary Bend. Earthen ovens and middens are listed on the Register of the National Estate and some cultural sites have been documented and records are held by Aboriginal Affairs Victoria. As is the case for most of the Murray River floodplain and beyond, it is recognised that waterways and floodplains are highly significant for the indigenous culture but the true extent of the number and types of sites present is still unknown (Mallee CMA,

2018).

A desktop review of the relevant registers provided the following findings:

- Aboriginal Place components identified within or in proximity to the CHMP activity area[8], comprising 23 earth features, nine scarred trees, and one shell midden (refer **Table 23)**.
- A total of 12 Aboriginal Places with 14 individual components within or in proximity to the CHMP activity area
- Aboriginal Places located within or in proximity to the CHMP activity area are characterised by:
    - Earth features: Typically mounds cover hearths (piles of burnt clay balls), which are the remains of a hearth or oven site
    - Scarred trees: Scarred trees generally occur on River Red Gums and Black Box species. They are usually found less than 500 m from a water source. Red Gums are confined to the wetlands of the present floodplain, while Black Box stands occurring on both the low-lying and higher floodplain.
    - Shell middens: Shell middens (or deposits) occur along the courses of the major waterways. These include both present and relict watercourses and bodies.
- There is a moderate-high potential for Aboriginal cultural heritage to be present in the CHMP activity area

Table 23 Aboriginal Places located within or within close proximity to the project

Aboriginal Place name	VAHR and component number	Aboriginal Place type	Within or in proximity to the CHMP activity area
Parne Milloo 48	7527-0004-1	Earth Feature (Mound)	Outside, but in proximity
Parne Milloo 41A	7527-0006-1	Scarred Tree	Outside, but in proximity
Nyah Forest 1	7527-0012-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 3	7527-0014-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 4	7527-0015-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 5	7527-0016-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 18	7527-0065-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 19	7527-0066-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 20	7527-0067-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 21	7527-0068-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 25	7527-0072-1	Earth Feature (Mound)	Outside, but in proximity
Parne Milloo 43	7527-0096-1	Scarred Tree	Outside, but in proximity
Parne Milloo Plain 3	7527-0099-1	Scarred Tree	Outside, but in proximity
Murray 1	7527-0100-1	Scarred Tree	Outside, but in proximity
Murray 2	7527-0101-1	Earth Feature (Mound)	Outside, but in proximity
Murray 3	7527-0102-1	Earth Feature (Mound)	Outside, but in proximity

[8] The CHMP activity area is the same extent as the project construction footprint.

Murray 4	7527-0103-1	Earth Feature (Mound)	Outside, but in proximity
Murray 5	7527-0104-1	Scarred Tree	Outside, but in proximity
Nyah Forest 2A	7527-0112-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 3A	7527-0113-1	Earth Feature (Mound)	Within the CHMP activity area
Murray 8	7527-0181-1	Scarred Tree	Outside, but in proximity
Murray 17	7527-0190-1	Earth Feature (Mound)	Outside, but in proximity
N-M-3	7527-0343-1	Earth Feature (Mound)	Outside, but in proximity
N-M-5	7527-0345-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 3-17	7527-0348-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 2-5	7527-0351-1	Scarred Tree	Outside, but in proximity
Nyah Forest 3-5	7527-0353-2	Earth Feature (Hearth)	Outside, but in proximity
Nyah Forest 3-5	7527-0353-1	Earth Feature (Mound)	Outside, but in proximity
Nyah Forest 3-10	7527-0354-1	Scarred Tree	Outside, but in proximity
Nyah Forest 3-19	7527-0356-1	Scarred Tree	Outside, but in proximity
Nyah State Forest	7527-0359-3	Earth Feature (Hearth)	Outside, but in proximity
Nyah State Forest	7527-0359-2	Earth Feature (Mound)	Outside, but in proximity
Nyah State Forest	7527-0359-1	Shell Midden	Outside, but in proximity

The CHMP currently being prepared for the project is the mechanism for managing impacts to Aboriginal cultural heritage. As a part of the CHMP process, consultation with the traditional owner groups is ongoing. The CHMP involves desktop assessment, standard assessment (field survey) and complex assessment (sub-surface testing).

The CHMP currently being prepared for the project will identify the impact on the Aboriginal heritage places listed in **Table 23** and others found during the standard and complex investigations.

Are there any cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995* within the project area?

☐ NYD ☒ No ☐ Yes If yes, please list.

A desktop heritage assessment has been prepared and is provided in **Attachment 19 – Nyah Historical Heritage Desktop Assessment.**

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 proposed construction footprint or proposed inundation areas.

There are four historical heritage places listed on the Swan Hill Planning Scheme Heritage Overlay (HO) within or adjacent to the project area or inundation area (refer **Table 24**).

Table 24 Historical heritage places within or adjacent to the area of investigation and/or inundation area

Register Number	Name	Address	Description	Location
HO201	Former Church	Murray Valley	Former church	Intersecting the area

		Highway, Wood Wood		of investigation and inundation area
HO202	State School No. 3353	Murray Valley Highway, Wood Wood	School	Within 12 of the area of investigation
HO203	Coach Route and *Schinus molle* (Peppercorn trees)	Murray Valley Highway, Wood Wood	Historic coach route and trees	Within 8 m of the area of investigation
HO205	Canoe Tree	Murray Valley Highway, Wood Wood	Tree	Immediately adjacent to inundation area

Former Church (HO201)

While the registered heritage boundary of the Former Church (HO201) intersects with the project area, the actual physical location of the church is approximately 65 m to the northwest of the current area of investigation, and 110 m to the north of the inundation area, within allotment 1B\PP3391 of the Kulki Kulki (Northern Rivers) Scout Camp. As such, there would be no impact upon the heritage values (historic and social significance) of the heritage place.

State School No. 3353 (HO202)

The State School No. 3353 (HO202) is correctly mapped and is located 12 m from the area of investigation. The proposed works would not impact upon the historic significance of the former state school.

Coach Route and Schinus molle (Peppercorn trees) (HO203)

While the registered heritage boundary of Coach Route and *Schinus molle* (Peppercorn trees) (HO203) is approximately 8 m from the area of investigation, the physical location of the peppercorn tree stand intersects with the area of investigation when the curtilage described in the *Rural City of Swan Hill Heritage Study Stage II* is implemented, being within road reserve at the southern end of allotment 1A\PP3391 of the Kulki Kulki Scout Camp. The proposed works may impact upon the historic significance of the heritage peppercorn trees, depending on the maximum extension of the peppercorn tree root system.

The coach route itself, while in the title of the HO site, was not mentioned in the significance of this heritage place, nor was it mentioned in the curtilage description. However, the remains of the original coach route through what is now the Nyah State Forest may intersect with the construction footprint of the project along Golf Club Track and at Wood Wood, and it is likely that parts of the former route will be situated within the inundation area. The accessway into the Nyah State Park adjacent to the physical location of HO203 appears to have been part of the coach route to which the historic trees were associated. The former site of the Cobb and Co stables, which is only mentioned once in the history section of the heritage citation of the *Rural City of Swan Hill Heritage Study Stage II* due to its association with the trees, may also be nearby.

The proposed works have the potential to impact surface remains of the coach route and archaeological features associated with the HO-listed site.

Canoe Tree (HO205)

While the heritage boundary of Canoe Tree (HO205) intersects with the inundation area, the physical location of the canoe tree is approximately 90 m to the west of the inundation area near the intersection of Miralie-Cocamba Road and the Murray Valley Highway. As such, there would be no impact upon the historic significance of the canoe tree from the inundation.

The locations of these historical heritage places are shown in the mapping in **Attachment 19 -**

Nyah Historical Heritage Desktop Assessment.

In addition, based on an assessment of aerial imagery and a review of relevant historical heritage assessments, there is moderate potential for previously unidentified historical heritage to be present within the area of investigation, due to the possible coach route. Other site types which may be identified in the area of investigation would be places associated with early agricultural or pastoral activities and water management practices.

Is mitigation of potential cultural heritage effects proposed?

☒ NYD ☒ No ☒ Yes If yes, please briefly describe.

Aboriginal Cultural Heritage

- The Draft CHMP will be finalised in consultation with the identified TO groups for approval by AV and will include specific management conditions for a number of Aboriginal Places along with general management recommendations relating to induction training, salvage methods and stakeholder engagement, and procedures for unexpected 'finds' of potential Aboriginal cultural material.

Historical Heritage

The following high level mitigation measures are proposed, with further detail to be confirmed during a HIA:

- Further historical heritage investigations would be undertaken to identify risks to registered and potentially unrecorded historical heritage features within the project area. A copy of this report (once completed) should be kept onsite and on file with the project records. All contractors and/or project staff should be made aware of the heritage status of the heritage places in the project area prior to works taking place.
- As there is potential for archaeological features associated with Coach Route and Schinus molle (Peppercorn trees) (HO203) directly impacted by Regulator N1a/N1b Containment Bank and Spillway 1 works, the following mitigation measures must be implemented to avoid any adverse impacts where possible to the heritage values of the site:
    - Advice to be sought to determine the maximum extension of tree roots prior to works to identify the required 'no go zone' around the boundary vegetation to avoid impact and therefore the need for a planning permit

Unexpected discoveries of archaeological sites

- All historical archaeological sites in Victoria older than 75 years are protected by the *Heritage Act 2017*, whether they are recorded on the VHI or not. It is an offence to knowingly or negligently deface, damage, or otherwise interfere with an archaeological site without obtaining the appropriate consent from the Executive Director of Heritage Victoria (HV). Under Section 127 of the *Heritage Act 2017*, if an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV. If any unexpected archaeological sites are uncovered during construction works, the following procedure must be followed:

    STOP

    - Stop any activity which may impact on the discovery

- Ensure that other people working in the area are aware of it and have also stopped work in the area
- Protect the artefacts or site by erecting temporary fencing or other suitable barrier

ADVISE

- A supervisor or the cultural heritage consultant must be consulted if they are on site
- Supervisors are to advise HV where the discovery was made and provide a description or photograph of the discovery

MANAGE

- HV, the onsite heritage consultant or supervisor will advise on how to manage the discovery
- Management of the discovery may involve protection, recovery, recording or removal of the artefacts or features and is likely to require Consent to Damage from HV

Heritage induction training

- Historical heritage awareness training should be completed as part of the site induction for all personnel and/or contractors prior to the commencement of construction works to ensure:
  - An understanding of where all heritage places are located within the project area
  - An understanding of the potential heritage places that may be impacted during the project
  - The procedures required to be undertaken in the event of discovery of historical heritage material, features or deposits, or the discovery of human remains
- If an archaeological site is discovered during construction or excavation, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV
- A copy of this report should be kept onsite and on file with the project records. All contractors and/or project staff should be made aware of the heritage status of the heritage places in the project area prior to works taking place.

Other information/comments? (eg. accuracy of information)

16. Energy, wastes & greenhouse gas emissions

What are the main sources of energy that the project facility would consume/generate?

- ☒ Electricity network. If possible, estimate power requirement/output …….
- ☒ Natural gas network. If possible, estimate gas requirement/output ……...
- ☒ Generated on-site. If possible, estimate power capacity/output …….
- ☒ Other. Please describe.

Please add any relevant additional information.

No power is required to operate the proposed environmental watering works, with the exception of

the temporary diesel pumps to be located near Regulator N5, when required.

The frequency and duration of water pumping at each site will depend on actual inundation events and the method to achieve environmental watering targets. It is estimated that pumping may be needed for approximately one year in 10 years over a period of several weeks but could occur for up to 2-3 months.

The estimated water quantities to be transferred for the Nyah project are provided in **Table 25**.

Table 25 Summary of pumping events at Nyah

Pumping parameters	Nyah project
Water quantity to be pumped from the Murray River	2,797 ML
Frequency of pumping events	1 in 10 years
Duration of pumping events	2 – 3 months

Source – Mallee, 2014

What are the main forms of waste that would be generated by the project facility?

- ☒ Wastewater. Describe briefly.
- ☒ Solid chemical wastes. Describe briefly.
- ☒ Excavated material. Describe briefly.
- ☒ Other. Describe briefly.

Please provide relevant further information, including proposed management of wastes.

The main waste streams as a result of the construction works include:

- Excess spoil
- Cleared vegetation
- General building and miscellaneous wastes such as packaging, off cuts, excess materials, and
- Worker's waste such as packaging, containers, food scraps, etc

As part of the CEMP, the contractor would be required to prepare a waste management plan demonstrating compliance with the *Environment Protection Act 1970* (and *Environment Protection Act 2017*) and EPA Publication 480: Environmental Guidelines for Major Construction Sites.

Excavated materials which are unsuitable for use or which are excess to the needs of construction (i.e. spoil) would be disposed of off-site unless otherwise approved by the Superintendent in accordance with the Contract Specifications. Spoil would be temporarily stockpiled at the borrow sites until excavation from the claypit is complete. Spoil would then be placed within the excavation, nominally compacted, shaped and spread with topsoil as per the Contract Specifications to facilitate rehabilitation and provide for adequate drainage.

Subject to approval from Parks Victoria, cleared native vegetation not containing pest plant propagules would be mulched and stockpiled within the designated construction footprint for reuse in rehabilitation of construction or extraction areas. Where directed by Park Victoria, cleared vegetation containing hollows would be salvaged and placed in appropriate locations within the national parks.

No significant volumes of waste would be generated during operation of the project.

What level of greenhouse gas emissions is expected to result directly from operation of the project facility?

- [x] Less than 50,000 tonnes of CO_2 equivalent per annum
- [ ] Between 50,000 and 100,000 tonnes of CO_2 equivalent per annum
- [ ] Between 100,000 and 200,000 tonnes of CO_2 equivalent per annum
- [ ] More than 200,000 tonnes of CO_2 equivalent per annum

Please add any relevant additional information, including any identified mitigation options.

The estimated Scope 1 GHG emissions[9] for each pump event are approximately 240 t CO2-e. These emissions are expected to occur over a single 2-3 month period in a year, and no more than once in a year.

The estimated GHG emissions are significantly less than the 200,000 t CO2-e per annum trigger for a referral under the *Environment Effects Act 1978* as set out in the *Ministerial Guidelines for Assessment of Environment Effects under the Environment Effects Act 1978* (Department of Sustainability and Environment, 2006). The 200,000 t CO2-e per annum trigger are for emissions directly attributable to the Project, i.e. Scope 1 emissions.

The emissions are also significantly less than the NGER annual reporting threshold of 25,000 t CO2-e for individual facilities.

17. Other environmental issues

Are there any other environmental issues arising from the proposed project?

- [x] No
- [ ] Yes If yes, briefly describe.

18. Environmental management

What measures are currently proposed to avoid, minimise or manage the main potential adverse environmental effects? (if not already described above)

- [x] Siting: Please describe briefly
- [x] Design: Please describe briefly
- [x] Environmental management: Please describe briefly.
- [ ] Other: Please describe briefly

Add any relevant additional information.

[9] Any Scope 1 emissions associated with the construction phase of the project (e.g. fuel use from site vehicles) were excluded from this calculation. Similarly, embodied emissions of construction materials; e.g., embodied emissions from the construction of concrete and steel, are Scope 3 emissions and were excluded from the calculation. This section of the referral requires consideration of the potential for the project to exceed the annual NGERs reporting thresholds which incorporate Scope 1 and 2 emissions only.

Environmental Management

A draft Environmental Management Framework (EMF) has been prepared for the VMFRP program containing an overview of:

- Project description – location, environmental context, project objectives, construction and operational activities
- Roles and responsibilities for implementation of environmental management during construction and operation of the program
- An overview of related environmental management documentation and associated approval processes (e.g. CEMP, CHMP, EWMP, Operating Plans, etc)
- An overview of relevant legislation and statutory approval requirements
- The approach to identifying and evaluating potential risks to environmental values during construction and operation of the project
- Environmental management measures to avoid or mitigate environmental impacts
- Monitoring, reporting and auditing requirements to inform adaptive management

A copy of the draft EMF is provided in **Attachment 20 – Draft Environmental Management Framework**. The draft EMF includes the general mitigation measures for construction and operation of the project that would be undertaken to avoid and minimise impacts on the environment. The draft EMF will evolve as the project assessment and approvals processes progresses.

Design and construction

The Project has undergone a comprehensive design process, with a number of design options considered. During this process measures (as identified in **Table 26**) to mitigate impacts on the environmental values of the Nyah floodplain have been integrated into the design process and will continue to be as further design refinements are made.

In addition, to the general mitigation measures outlined in the Draft EMF (**Attachment 20 – Draft Environmental Management Framework)**, key measures applicable to managing the potential impacts in this referral in **Table 26** will also apply to the Nyah project.

In accordance with the draft EMF, the contractor will be required to prepare a CEMP for the project, including:

- The project's environmental management system, procedures and processes, including all project forms and registers
- A project environmental risk assessment and control program
- Clear delegation of responsibilities (i.e. within the contractor's project team)
- Project legislative requirements
- Details of approvals, permits, agreements and/or licences for the various stages of work
- Relevant environmental procedures and work instructions
- An environmental inspection/monitoring program and inspection checklist
- Worksite specific plans

- A checklist that demonstrates that each requirement of the draft EMF has been addressed in the preparation of the CEMP

Table 26 Environmental mitigation measures – design and construction

Measure	Project phase
General – design measures	
Siting of proposed structures primarily along or immediately adjacent to existing access tracks and other previously disturbed areas to minimise the removal of native vegetation and other construction impacts.	Design and construction
Designing containment banks and batters in consultation with Parks Victoria to minimise extent of native vegetation removal and other construction impacts.	Design
Provision for infrastructure (e.g. gates) where suitable to facilitate temporary restrictions on public access along certain access tracks during higher risk periods (e.g. flooding) and to provide Parks Victoria with operational flexibility to restrict access to parts of the national parks where deemed necessary to provide rest and recovery from visitation.	Design
Design of structures, containment banks and spillways arranged to minimise the potential for erosion over a broad range of flow and tailwater conditions, by sizing and placing structures and spillways to pass flows in a manner which is consistent with the natural flow distribution and the hydraulic capacity of the multiple flow paths.	Design
Design of proposed structures is to be sympathetic to the surrounding landscape and consistent with Parks Victoria infrastructure design guidelines.	Design
Refinement of the design and construction methods to further minimise the construction footprints (including access track and laydown areas)	Design
Provision for fish passage requirements consistent with the recommendations of the Fish Management Plan (see **Attachment 11 – Fish Management Plan**)	Design
General - construction measures	
The constructing authority (LMW) to work closely with Parks Victoria and other interested groups to minimise disruption to park users and commercial operations during construction.	Construction
Use existing disturbed areas or areas of non-native vegetation for lay-downs and stockpiling	Construction
Flora and fauna mitigation measures	
Develop and implement a Flora and Fauna Management Plan as part of the CEMP that contains requirements to avoid, mitigate and manage impacts to flora and fauna values and particularly threatened species and describing the habitat preclearance and clearance process.	Construction
Avoid where practical, the removal of hollow bearing trees and large old trees within the construction footprint.	Design and Construction
Avoid where possible, areas of native vegetation that support rare and threatened flora species	Design and Construction
Threatened flora species listed under the FFG Act and EPBC Act not permitted to be removed, must be fenced off with temporary 1 metre high orange barrier mesh medium-heavy weight prior to construction commencing.	Construction
If any threatened flora species additional to those already identified in site plans (i.e. listed as threatened under the EPBC Act, or the FFG Act) are found within the construction area the Project Ecologist will be notified. The number and location of individuals will be recorded and DELWP will be advised.	Construction

Heritage mitigation measures	
The Draft CHMP will be finalised in consultation with the identified Traditional Owner groups for approval by AV and will include specific management conditions for a number of Aboriginal Places along with general management recommendations relating to induction training, salvage methods and stakeholder engagement, and procedures for unexpected 'finds' of potential Aboriginal cultural material.	Design and construction
Further historical heritage investigations are to be undertaken to identify risks to registered and potentially unrecorded historical heritage features within the project area. A copy this report (once completed) should be kept onsite and on file with the project records. All contractors and/or project staff should be made aware of the heritage status of the heritage places in the project area prior to works taking place.	Design and construction
As there is potential for archaeological features associated with Coach Route and Schinus molle (Peppercorn trees) (HO203) directly impacted by Regulator N1a/N1b Containment Bank and Spillway 1 works, the following mitigation measures must be implemented to avoid any adverse impacts where possible to the heritage values of the site: *Advice to be sought to determine the maximum extension of tree roots prior to works to identify the required 'no go zone' around the boundary vegetation to avoid impact and therefore the need for a planning permit.*	Design
Under Section 127 of the *Heritage Act 2017*, if an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV. If any unexpected archaeological sites are uncovered during construction works, the following procedure must be followed: <u>STOP</u> • Stop any activity which may impact on the discovery • Ensure that other people working in the area are aware of it and have also stopped work in the area • Protect the artefacts or site by erecting temporary fencing or another suitable barrier <u>ADVISE</u> • A supervisor or the cultural heritage consultant must be consulted if they are on site • Supervisors are to advise HV where the discovery was made and provide a description or photograph of the discovery <u>MANAGE</u> • HV, the onsite heritage consultant or supervisor will advise on how to manage the discovery • Management of the discovery may involve protection, recovery, recording or removal of the artefacts or features and is likely to require Consent to Damage from HV.	Construction
Historical heritage awareness training to be completed as part of the site induction for personnel and/or contractors prior to the commencement of construction works to provide them with: i. an understanding of where heritage places are located within the project area ii. an understanding of the potential heritage places that may be impacted during the project iii. an understanding of the procedures required to be undertaken in the event of discovery of historical heritage material, features or deposits, or the discovery of human remains	Construction

All contractors and/or project staff must be made aware of the heritage status of the heritage places in the project area prior to works taking place. A copy of the Desktop Historical Heritage Assessment report must be kept onsite and on file with the project records.	
Surface and ground water	
Cofferdam size should be no greater than the minimum required to construct the structure.	Design
Minimise the total volume and rate of groundwater extracted for construction purposes	Construction

Operation

The primary environmental management documentation for managing adverse environmental effects and maximising environmental benefits during operation of the project would be the:

- Nyah and Vinifera Environmental Water Management Plan (EWMP)
- Nyah and Vinifera Operating Plan

These are discussed below.

In addition to implementation of these documents and the general mitigation measures outlined in the Draft EMF (**Attachment 20 – Draft Environmental Management Framework)**, **Table 27** summarises the specific measures listed in this referral to be implemented during operation of the project.

Table 27 Environmental mitigation measures – operation

Measure	Project phase
The constructing authority (LMW) to work closely with Parks Victoria and other interested groups to minimise disruption to park users and commercial operations during managed inundation events.	Operation
Undertake water quality monitoring before, during and after watering events to inform adaptive management strategies and real-time operational decision making.	Operation
Commence watering as early as possible to move organic matter off the floodplain while temperatures are low. Maintain a through-flow where possible in other areas to maximise exchange rates and movement of organic material. Monitor dissolved oxygen and water temperature to identify hypoxic areas to inform consequence management.	Operation
Schedule watering events to make use of dilution flows where possible and optimise timing of releases. Ensure dilution of low DO water by managing outflow rates and river flows: delay outflows if river flows are too low; dispose of hypoxic water by pumping to higher wetlands where possible; agitate water using infrastructure to increase aeration.	Operation
Integrate water management with other sites in seasonal water planning process. Maintain good relationships with other water managers.	Operation
Tailor watering regimes to provide competitive advantage for native fish over carp. Dry wetlands that contain carp. Manage drawdown following managed events to provide triggers for native fish to move off the floodplain, and where possible, strand carp.	Operation
Monitor the salinity of ground and surface water salinity before, during and after watering events to inform management and ensure sufficient volumes are available for mitigation such as:	Operation

• Diluting saline groundwater discharge with sufficient river flows. • Diluting saline water on the floodplain by delivering more fresh water to these areas. • Reduce the frequency and/or extent of planned watering events if sufficient volumes not available.	
Timing water manipulations to drown seedlings, minimise growth, germination and seed set. Time water manipulations to promote native species.	Operation

Nyah and Vinifera Environmental Water Plan

The Nyah and Vinifera Environmental Water Plan:

- Aligns with the Environmental Watering Plan prepared by the MDBA in accordance with Chapter 8 of the Murray-Darling Basin Plan
- Provides the framework for water planning, monitoring and consultation processes
- Identifies environmental objectives and targets, water delivery options and regimes
- Has undergone an external review process with key stakeholders including, MDBA, LMW, VEWH, CEWH, GMW, DELWP and Parks Victoria

A copy of the current Nyah and Vinifera Environmental Water Management Plan (MDBA, 2012) and a draft addendum prepared to integrate the proposed Nyah environmental watering works into the current EWMP is provided in **Attachment 10 – Environmental Water Management Plan**.

Nyah Operating Plan

The Operating Plan provides the framework for operation of the Nyah water management structures to meet key ecological objectives and comply with relevant legislative requirements (e.g. *Water Act 2007* (Cth), s52-54 of Murray-Darling Basin Agreement), and outlines:

- Governance arrangements for managed inundation activities
- Roles and responsibilities of partner agencies
- Decision-making protocols for prior to, during, and after watering events
- Operational risks and mitigation strategies
- Water measurement arrangements
- Communication and consultation requirements
- Links to related documents
- Has undergone an external review process with key stakeholders including, MDBA, LMW, VEWH, CEWH, GMW, DELWP and Parks Victoria.

A copy of the current Nyah Operating Plan (MCMA, 2020) is provided **in Attachment 21 – Draft Operating Plan.**

19. Other activities

Are there any other activities in the vicinity of the proposed project that have a potential for cumulative effects?

☐ NYD ☐ No ☒ Yes If yes, briefly describe.

The project has some potential for cumulative effects in relation to other VMFRP projects. The potential for cumulative effects is generally associated with:

- Salinity impacts associated with saline water discharge to the Murray River and compliance with the Basin Salinity Management Strategy targets
- Removal of large, hollow-bearing trees and associated habitat for threatened species such as Regent Parrot, Carpet Python, and Lace Monitor from river red gum and black box communities along the Murray River floodplain
- Removal of native vegetation and associated habitat from similar EVCs across multiple sites due to the need to locate proposed infrastructure at certain elevations on the floodplain and potential impacts on bioregional conservation status of particular EVCs

Further assessment of potential cumulative effects will be ongoing as design development and environmental investigations are advanced at other VMFRP sites.

20. Investigation program

Study program

Have any environmental studies not referred to above been conducted for the project?

☐ No ☒ Yes If yes, please list here and attach if relevant.

A list of environmental investigations completed for the project (not already discussed in Part 2 of this referral) to date is included in **Attachment 22 – List of Project Investigations.**

Has a program for future environmental studies been developed?

☐ No ☒ Yes If yes, briefly describe.

The effectiveness of the proposed supply measure and its operation would primarily be monitored and reported on through the Mallee CMA's well-established monitoring, evaluation and reporting (MER) strategies and protocols. These strategies and protocols build upon experience and lessons learned through the ongoing, long-term ecological monitoring programs undertaken within the SDL project area, including the Living Murray (TLM) program, which provides watering of approximately 6,000 ha of the central and southern Hattah Lakes floodplain. The Mallee CMA has been implementing and coordinating the local, annual TLM Monitoring, Evaluation and Reporting Framework process since 2006.

These strategies and protocols provide a routine process to:

- Establish a robust program logic to define the correlation between works and other inputs and identified outputs and ecosystem outcomes. This provides the basis for a suite of quantifiable ecological targets that are relevant to the specific site.
- Monitor progress against those targets on a regular basis
- Evaluate the implications of the results for the operational parameters of the scheme
- Amend and adjust the operational arrangements to optimise performance and outcomes

- Utilise monitoring data to plan watering events, optimise water delivery, manage risks and refine ecological objectives. The evaluation process involves analysing collected data and improving operations accordingly.

Monitoring and evaluation would focus on the effects of local watering actions and include:

- Evaluating water use
- Measuring ecological outcomes
- Refining conceptual models and improving knowledge
- Managing risks

A detailed monitoring and evaluation plan was previously developed for the project by Ecological Associates (2014b) (see **Attachment 23 – Example Monitoring and Evaluation Plan**). The monitoring and evaluation plan identifies the agencies responsible for commissioning, reviewing and acting on monitoring data. The linkages back to decision-making are described in the detailed plan. A new Monitoring, Evaluation and Reporting Framework is currently being funded by the project and is due to be completed by June 2020. This framework will aim to establish a social, heritage and environmental benchmark and monitoring programme to demonstrate the ongoing benefits of the project.

Initial monitoring will provide a baseline of the existing status of the ecological objectives and outcome monitoring will measure progress towards these objectives and their targets. This information will inform the ongoing operations at the site. Over time, the results of the outcome monitoring will test assumptions and assist with refining conceptual models and ecological objectives. Monitoring data will identify emerging hazards and enable operational decisions to minimise risk through the adaptive management framework incorporated into Operating Plans and Environmental Water Management Plans.

The final Monitoring, Evaluation and Reporting Framework approach for this project will be informed by broader intergovernmental arrangements for Basin-wide monitoring and evaluation under the Basin Plan. This project is expected to contribute to the achievement of outcomes under two key Chapters of the Plan, namely: (i) the delivery of ecological outcomes under Chapter 8; and (ii) meeting the relevant SDLs under Chapter 10, which must be complied with under the relevant State water resource plan/s (WRPs) from 1 July 2019.

Both Chapter 8 and Chapter 10 of the Basin Plan are captured under the MDBA's own monitoring and evaluation framework. Once specific Basin Plan Chapters commence within a State, the State must report to the MDBA on relevant matters. This will include five yearly reporting on the achievement of environmental outcomes at an asset scale in relation to Chapter 8, and annually reporting on WRP compliance in relation to Chapter 10.

VMFRP is satisfied that its participation in the MDBA's reporting and evaluation framework will effectively allow for progress in relation to this project to be monitored, and for success in meeting associated ecological objectives and targets to be assessed.

This approach closely aligns with agreed arrangements under the Basin Plan Implementation Agreement, where implementation tasks are to be as streamlined and as cost-effective as possible.

Consultation program

Has a consultation program conducted to date for the project?

☐ No ☒ Yes If yes, outline the consultation activities and the stakeholder groups or organisations consulted.

The Mallee CMA worked with key stakeholders and interested community groups to develop the concept for the Nyah project over a period from 2012 to current. Consultation activities will continue throughout the duration of the project.

Communication and engagement activities conducted have been undertaken in accordance with VMFRP's Stakeholder Engagement and Commuication Plan included:

- More than 250 face-to-face briefing sessions, meetings, presentations and on-site visits, engaging more than 600 people, which is reflective of the wide range of project stakeholders
- Fact sheets, media releases, electronic communication (website, emails, newsletters), brochures and correspondence

This direct approach to engagement has helped capture the views and local knowledge of key stakeholders and community members to directly integrate these into the project, resulting in broad community support from:

- Materially-affected land managers such as Parks Victoria
- Adjacent private landholders
- Aboriginal stakeholders
- Regional Development Australia, Regional Development Victoria – Loddon Mallee
- Local government (Swan Hill Rural City Council)
- Community groups including Nyah District Lions Club, Friends of Nyah Vinifera (no longer a formal group, but 'unofficial' members still in the community), Swan Hill Rotary Club, Swan Hill Lions Club Inc., Nyah West Landcare Group, Nyah District Men's Shed, Sustainable Living in the Mallee and Kulki Kulki Scout Camp

Broad community support for the project is further evidenced by the sustained interest in the proposal as illustrated by on-going requests from key stakeholders to provide briefings, presentations and updates.

Information regarding the Nyah floodplain project is published on the VMFRP website:

https://www.vmfrp.com.au/wp-content/uploads/2019/07/VMFRP_FactSheet_A4_Nyah_0319_02.pdf

Has a program for future consultation been developed?

☐ NYD ☐ No ☒ Yes If yes, briefly describe.

Targeted, tailored consultation will continue to be conducted in accordance with VMFRP's Stakeholder Engagement and Commuication Plan with key stakeholders throughout the project, aligning to project milestones, assessments and approvals processes where necessary and/or appropriate. This includes further face-to-face briefings, presentations, site visits and regular project updates via mail-outs and newsletters.

Broader engagement via traditional and social media, community events and information displays will also continue.

Authorised person for proponent:

I, ……Josh White……(full name),

…….Project Director……(position), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature 

Date 31 March 2020

Person who prepared this referral:

I, ……Josh White……(full name),

…….Project Director……(position), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature 

Date 31 March 2020

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