Burra Creek Floodplain Restoration Project

Minister's Assessment under Environment Effects Act 1978

JANUARY 2024

Acknowledgement


The Victorian Government acknowledges Aboriginal and Torres Strait Islander people as the Traditional Custodians of the land and acknowledges and pays respect to their Elders, past and present.

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List of abbreviations

ARI	Arthur Rylah Institute
AOIB	Assessment of overall improvement to biodiversity
CEMP	Construction environmental management plan
CHMP	Cultural heritage management plan
CMA	Catchment management authority
DBH	Diameter breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water and Planning
DTP	Department of Transport and Planning
EDS	Environmental delivery standard
EES	Environment effects statement
EES Central	EES for the Belsar-Yungera and Hattah Lakes North floodplain restoration projects
EMF	Environmental management framework
EP Act	*Environment Protection Act 2017* (Vic)
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ER	Environment report
ER Central	ER for the Vinifera, Nyah and Burra Creek floodplain restoration projects
EVC	Ecological vegetation class
FFG Act	*Flora and Fauna Guarantee Act 1988* (Vic)
GL	Gigalitres
ha	Hectares
ILUA	Indigenous land use agreement
km	Kilometres
LMW	Lower Murray Urban and Rural Water Corporation
m	Metres
MDBA	Murray Darling Basin Authority
Mg/L	Milligrams per litre
ML/day	Megalitres per day
MNES	Matters of national environmental significance
MRSD Act	*Mineral Resources (Sustainable Development) Act 1990* (Vic)
OEMP	Operations environmental management plan
PSA	Planning Scheme Amendment
RAP	Registered Aboriginal Party
RRC	Reconnecting River Country
SCO	Specific controls overlay
SIAC	Standing Inquiry and Advisory Committee
TPZ	Tree protection zone
TRG	Technical reference group
VEWH	Victorian Environmental Water Holder
VMFRP	Victorian Murray Floodplain Restoration Project

Contents

Executive summary

On 6 September 2020, following receipt of a referral from Lower Murray Urban and Rural Water Corporation (LMW), the Minister for Planning decided under the *Environment Effects Act 1978* that an environment effects statement (EES) was not required for the Burra Creek Floodplain Restoration Project (Burra Creek project), subject to conditions being met. The Minister's decision set out specific conditions requiring appropriate environmental assessment and management, particularly for potentially significant environmental impacts. This included requirements to prepare an environment report (ER), completed to the satisfaction of the Minister for Planning.

The Burra Creek project is also a controlled action requiring assessment and approval under the *Environment Protection and Biodiversity and Conservation Act 1999* (EPBC Act). The accredited state 'environment report' process has encompassed assessment of impacts on matters of national environmental significance (MNES). Therefore, this assessment of the Burra Creek project concludes the accredited state process and will inform the Commonwealth Minister for Environment and Water's approval decision on this project under the EPBC Act.

LMW prepared an ER and a draft planning scheme amendment (PSA) covering the Vinifera, Nyah and Burra Creek projects, which were exhibited for public comment from 30 January 2023 to 10 March 2023. The Minister for Planning appointed the Victorian Murray Floodplain Restoration Project (VMFRP) Standing Inquiry and Advisory Committee (SIAC) to inquire into, and report on, the environmental effects of all the VMFRP projects and associated draft PSAs. Planning Panels Victoria received 14 submissions on the exhibited ER covering the Vinifera, Nyah and Burra Creek projects.

The Burra Creek project was considered in a separate and subsequent roundtable to the Nyah and Vinifera projects, to allow time (at the request of the proponent) for LMW to understand the implications of the 'Wakool effect'. This backwater flooding effect became evident to LMW during the significant Murray River floods in late 2022. In light of this new information about the Wakool effect's influence on Burra Creek flooding, further analysis and documentation was needed from LMW, which was later provided to the SIAC. This included documents updating some of the findings of the ER relating to the Burra Creek project (Addendum Report, Tabled Documents B4A-B4G). The Burra Creek roundtable was held from 11 to 28 August 2023, and the SIAC provided their report to me on 11 October 2023. The SIAC's report, ER documentation, the Addendum Report and other material including submissions and documents tabled at the roundtable have informed the preparation of this assessment of the environmental effects of the Burra Creek project. A separate Minister's assessment of the Nyah and Vinifera Projects was prepared and released in October 2023.

The Burra Creek project is one of nine VMFRP projects located along the Murray River that aim to return a more natural flood regime to a total of approximately 14,000 ha of high-ecological-value Murray River floodplains in Victoria. The engineered, managed flooding is to occur through the modification of existing infrastructure and construction of new infrastructure. The Burra Creek project is located 50 km north-west of Swan Hill adjacent to the Murray River and is one of the smaller VMFRP projects, with a proposed maximum inundation area of only 403 ha. The project would require construction of infrastructure including three regulators, containment banks, a drop structure and access tracks. This infrastructure would allow engineered environmental watering of the floodplains to occur within the project maximum inundation areas, with the stated objective of restoring and enhancing the floodplain environments, their ecosystems, biodiversity values (particularly listed threatened species and communities), water quality, and cultural values.

It is my assessment that this project is not likely to deliver predicted overall benefits for this floodplain's vegetation communities and associated biodiversity values. Further to that, on balance, the project is likely to result in unacceptable environmental effects on native vegetation and biodiversity values in this important floodplain environment, due to significant loss of native vegetation, Large and Very Large old trees, and adverse changes to some floodplain EVCs.

With the understanding of the influence of the Wakool effect on flooding of the Burra Creek, it is now apparent that existing hydrological conditions largely meet the preferred watering needs of the native vegetation communities in the Burra Creek floodplain (i.e., within the proposed maximum inundation area). Further to this, proposed watering/flooding from implementation of the project may result in some vegetation being inundated at greater frequencies and to greater depths than what is recommended for the relevant ecological communities.

The key significant adverse impacts to biodiversity during construction include clearance of up to 21.6 ha of native vegetation (of which 14.68 ha or 68% is located within high value conservation areas), which includes loss of up to 188

Large and Very Large Trees (of which 136 are hollow bearing trees) and direct impacts on habitat of numerous threatened flora and fauna species. Key adverse impacts on biodiversity during proposed operations are expected to include impacts on up to 19 FFG listed flora species which cannot tolerate flooding, as well as additional loss or decline of up to 132 Large and Very Large Trees (which is approximately 12% of canopy trees within the proposed maximum inundation area), due to the proposed changes in inundation regime.

Uncertainty associated with the use of different hydraulic models, primarily related to the hydraulic parameters (velocity, depth, shear stress) that inform the assessment of hydraulic effects during operation, was noted by the SIAC and my assessment. While further modelling may provide greater clarity and confidence on the specific extent and significance of some adverse impacts (such as the magnitude of erosion risks and the precise extent of adverse effects on some vegetation due to overwatering/drowning), it is my view that the outcomes of such additional modelling would not sufficiently change the overall environmental outcomes and conclusions regarding the project. The SIAC recommended that, if I did not support their overall conclusion, and the project was to proceed, additional modelling work would be needed to address these uncertainties. As I support and have adopted the overall conclusion of the SIAC regarding the project and its environmental effects, I do not support the SIAC's recommendations for further hydraulic analysis and therefore do not address any further specific recommendations for changes to EDSs, the EMF or draft PSA.

Should a primary decision-maker not follow the findings and conclusions of this assessment and intends to approve the project, they should consult with me and my department before any further work is scoped, conducted or indeed prior to any decision-making on an approval.

1 Introduction

On 23 May 2020, Lower Murray Urban and Rural Water Corporation (Lower Murray Water, LMW), referred the Burra Creek Floodplain Restoration Project to the Minister for Planning under the *Environment Effects Act 1978*. The Burra Creek Floodplain Restoration Project is one of nine projects that form the Victorian Murray Floodplain Restoration Project (VMFRP, refer to Section 2.1).

On 6 September 2020, the Minister for Planning decided under the Environment Effects Act that an environment effects statement (EES) was not required for the Burra Creek Floodplain Restoration Project (Burra Creek), subject to conditions being met. The decision includes conditions requiring appropriate environmental assessment through an environment report process (in lieu of an EES). This entails preparation of an environment report (ER) in consultation with the Department of Environment, Land, Water and Planning (DELWP), now Department of Transport and Planning (DTP), and relevant agencies and departments, completed to the satisfaction of the Minister for Planning. The environment report process is an accredited state assessment process under the Victorian Bilateral Agreement with the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The conditions specified by the Minister stated what the ER needed to examine and document for both the construction and proposed inundation area:

a. the expected benefits and ecological objectives of the project, with measurable indicators for monitoring and thresholds for action;

b. assessment of project design alternatives to avoid and minimise adverse environmental effects, including options for the project layout and timing on inundations events;

c. assessment of predicted effects on biodiversity values particularly associated with: listed species and communities (under the *Flora and Fauna Guarantee Act 1988* (FFG Act) and EPBC Act), native vegetation including large old trees, and threatening processes (under the FFG Act and EPBC Act);

d. effects on hydrogeology and groundwater quality;

e. potential effects on Aboriginal cultural heritage;

f. potential cumulative effects of the project and other VMFRP projects and other existing or planned projects in the area, particularly in relation to downstream aquatic environments and beneficial water uses;

g. proposed native vegetation offset strategy accounting for the findings of items a to f; and

h. mapping that clearly illustrates the full extent of works and inundation areas, as well as key environmental assets to be avoided (e.g., no-go zones).

In July 2021, DELWP prepared a scoping document, which enabled a single ER to cover all that was required for the Vinifera, Nyah and Burra Creek Floodplain Restoration Projects. The Nyah and Vinifera Floodplain Restoration Projects are also part of the VMFRP. I recently issued my final assessment of these two projects (dated 28 October 2023).

On 27 September 2022, with consent from the Governor in Council, the Minister for Planning appointed the Victorian Murray Floodplain Restoration Project Standing Inquiry and Advisory Committee (SIAC) to inquire into, and report on, the environmental effects of the VMFRP projects and corresponding draft PSAs, in accordance with terms of reference for the SIAC, approved 16 August 2022.

LMW prepared the ER and a draft planning scheme amendment (PSA), which were exhibited for public comment from 30 January 2023 to 10 March 2023. Planning Panels Victoria, on behalf of the SIAC, received 14 submissions on the exhibited ER and draft PSA for these three projects.

The SIAC held a directions hearing on 20 March 2023. On 3 April 2023, LMW requested the Burra Creek project not be included in the roundtable process being held for the ER as LMW had identified that additional work was required for the project to understand the implications of backwater effects (Wakool effect) that emerged during the significant Murray River floods in late 2022. On 6 April 2023, the SIAC provided notice that the roundtable would only consider the Nyah

and Vinifera Floodplain Restoration Projects and that the roundtable would likely be reconvened at some point in future to consider the Burra Creek project, with a separate SIAC report to be prepared for that project.

LMW had identified that during the significant Murray River floods in late 2022 the Burra Creek floodplain became inundated at a lower flow than modelled in the exhibited ER. Further review revealed that, in flood conditions, water levels in the Murray River at the Burra Creek project area are influenced by both upstream flow in the Murray River and interaction with downstream flows entering the Murray River from the Edwards/Wakool system (located ~10 km downstream of the Burra Creek project area). The review identified that flood levels in the vicinity of the Burra Creek floodplain may be higher than expected due to a backwater effect created by the high inflow from the Edwards/Wakool system via the Wakool River entering the Murray River (referred to as the 'Wakool effect'). The Wakool effect occurs when high outflows from the Wakool River enter the Murray River and slow upstream flows down the Murray River, resulting in water backing up at the downstream end of Burra Creek. As a result of the Wakool effect, Burra Creek and the floodplain are inundated more frequently, and for longer durations than that predicted in the exhibited ER. LMW undertook additional hydraulic and hydrological analysis to understand the implications of the Wakool effect for the Burra Creek project.

Following the additional work undertaken, LMW provided the SIAC with addendum documents dated June 2023 updating parts of the ER relating to the Burra Creek project (Addendum Report). The Addendum Report was tabled (Tabled Documents B4A-B4G) and included a summary report, updated project description, updated specialist assessments and updated assessment of overall improvement to biodiversity. The SIAC provided existing submitters the opportunity to make a further submission on the Addendum Report. Planning Panels Victoria, on behalf of the SIAC, received two further submissions on the Addendum Report.

The SIAC held a roundtable on the Burra Creek project for six days across four weeks from 11-28 August 2023, via videoconference. Parties to the SIAC roundtable tabled a total of 57 documents. The SIAC provided its report on the Burra Creek project to me on 11 October 2023 (SIAC Report No. 3)[1]. That report, along with the ER, its supporting specialist studies, the Addendum Report, public submissions, tabled documents and relevant legislation, policy and guidelines have informed my assessment of the environmental effects of the Burra Creek project. During the roundtable and in the SIAC report, the exhibited ER and supporting documents were also referred to as 'ER Central' in the context of the wider VMFRP[2].

I thank the SIAC for its considered report and advice. I also thank everyone who invested their time to make submissions and participate in the roundtable, to help understand the issues and perspectives of different parties. I have considered all of the matters relevant to the environmental assessment of the project.

1.1 Purpose of this document

This document constitutes my assessment of the environmental effects of the Burra Creek project under the Environment Effects Act. This assessment represents the final step in the assessment process and provides authoritative statutory advice to decision-makers, the proponent and all other stakeholders on the likely environmental effects of the project, and their acceptability.

This assessment will inform the decisions required for the project including under the Commonwealth EPBC Act.

1.2 Structure of the assessment

The structure of my assessment is as follows:

- Section 2 provides a brief description of the project;
- Section 3 outlines the assessment process and statutory approvals required for the project;

[1] SIAC Report No. 1 covered EES Central – Belsar-Yungera and Hattah Lakes Floodplain Restoration Projects; SIAC Report No. 2 covered ER Central – Nyah and Vinifera Floodplain Restoration Projects.

[2] Note that the 'ER Central' package, as part of the wider VMFRP, includes three of the nine floodplain restoration projects proposed: Vinifera, Nyah and Burra Creek.

- Section 4 sets out assessment of central matters;
- Section 5 examines the project's proposed planning controls and environmental management framework (EMF);
- Section 6 assesses the environmental effects of the project by environmental discipline;
- Section 7 presents my conclusions, including responses to the recommendations of the SIAC; and
- Appendix A contains the assessment of the Commonwealth matters of national environmental significance.

2 Project description

2.1 Victorian Murray Floodplain Restoration Project

The Burra Creek project is one of the nine projects under the Victorian Murray Floodplain Restoration Project (VMFRP), being implemented as part of Victoria's obligations under the Murray Darling Basin Plan (Basin Plan). The Commonwealth Government amended the Basin Plan in 2018 to include 36 sustainable diversion limit adjustment projects to enable more effective and efficient use of environmental water. The VMFRP is an important component of the agreed package of 36 sustainable diversion limit adjustment projects that will combine to enable a 605 gigalitre (GL) reduction in the water recovery target for the Murray Darling Basin while achieving the same environmental watering objectives. The VMFRP consists of nine discreet projects that aim to return a more natural inundation regime across 14,000 hectares (ha) of high-ecological-value Murray River floodplain in Victoria (Figure 2-1).

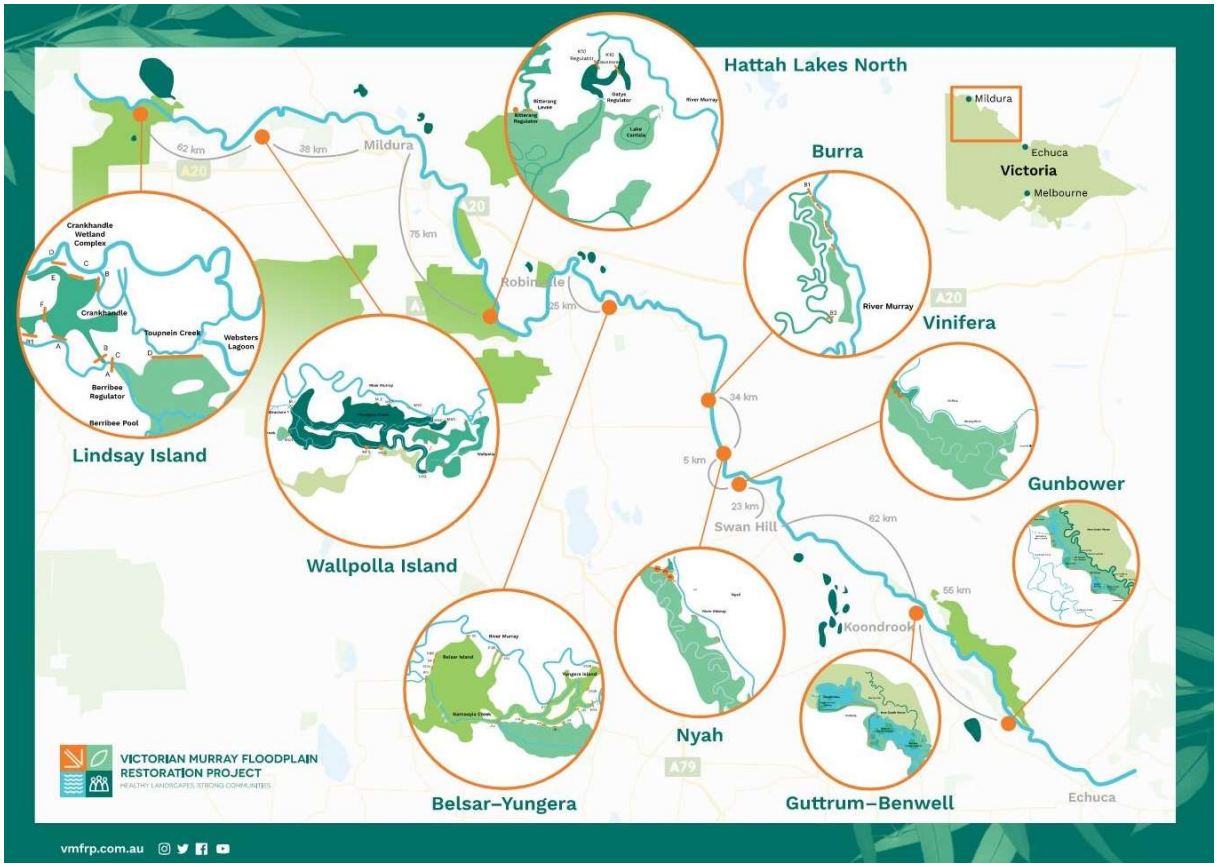

Figure 2-1 VMFRP project overview (Source: ER Chapter 1).

2.2 Burra Creek

In June 2023, the exhibited version of the Burra Creek project description was revised to identify the changes to the operating scenarios that were required to address the implications of the backwater effect of the Wakool River. No changes were made to the design of project infrastructure, the construction footprint or the maximum inundation area for the project. This section reflects the updated project description included in the Addendum Report. The Burra Creek project is described in further detail in Tabled Document B4C: Burra Creek Addendum – Attachment 1 – Updated Project Description, dated June 2023.

The Burra Creek project is located in north-west Victoria approximately 350 km north-west of Melbourne and 25 km north of the township of Nyah, 50 km north-west of Swan Hill and 60 km south-east of Robinvale. The project proposes to

return a more natural flood regime to 403 ha of high ecological value Murray River floodplain. The project is designed to facilitate managed inundation across two water management areas: Burra North and Burra South (Figure 2-2).

The ER described the project as comprising the following main components (Figure 2-2):

- one large regulator (B1);
- one small regulator (B2);
- one pipe culvert regulator (B4);
- containment banks (2.38 km) incorporating four spillways;
- one drop structure to provide erosion control for flows returning from the floodplain to the Murray River;
- two permanent hardstands, for temporary pumps to transfer environmental water as required;
- creation of new access tracks (approximately 3.8 km); and
- use of existing access tracks, including for maintenance activities during operation (approximately 10.5 km).

The project will also establish a borrow site to supply fill material to support construction. There are no permanent pumps proposed as part of the project.

The total construction footprint proposed for the project is 21.6 ha. The construction footprint is the maximum area required for the development of infrastructure necessary to facilitate the operation of the project to deliver and retain water on the floodplain. It also includes all infrastructure and associated activities required during construction such as laydown areas, site compounds, workforce facilities, site access, and borrow sites.

LMW would be the final asset owner of project infrastructure if the project proceeds. LMW would be responsible for wet commissioning, operation and maintenance of infrastructure, such as regulators, containment banks and spillways. Subject to approvals and project financing, works for the project are scheduled to commence in the second half of 2023, with construction taking between 9 to 12 months to complete.

Operation of the proposed structures within the Burra North and Burra South water management areas would be coordinated to achieve environmental watering targets. Four potential operational scenarios were developed to deliver environmental water at different frequencies and durations to meet the hydrological requirements of the floodplain ecosystems. These operating scenarios aim to replicate inundation conditions within the water management area that would have occurred at various pre-regulation flow thresholds of the Murray River. Mallee Catchment Management Authority (Mallee CMA) would coordinate the environmental watering and the environmental monitoring, evaluation and reporting.

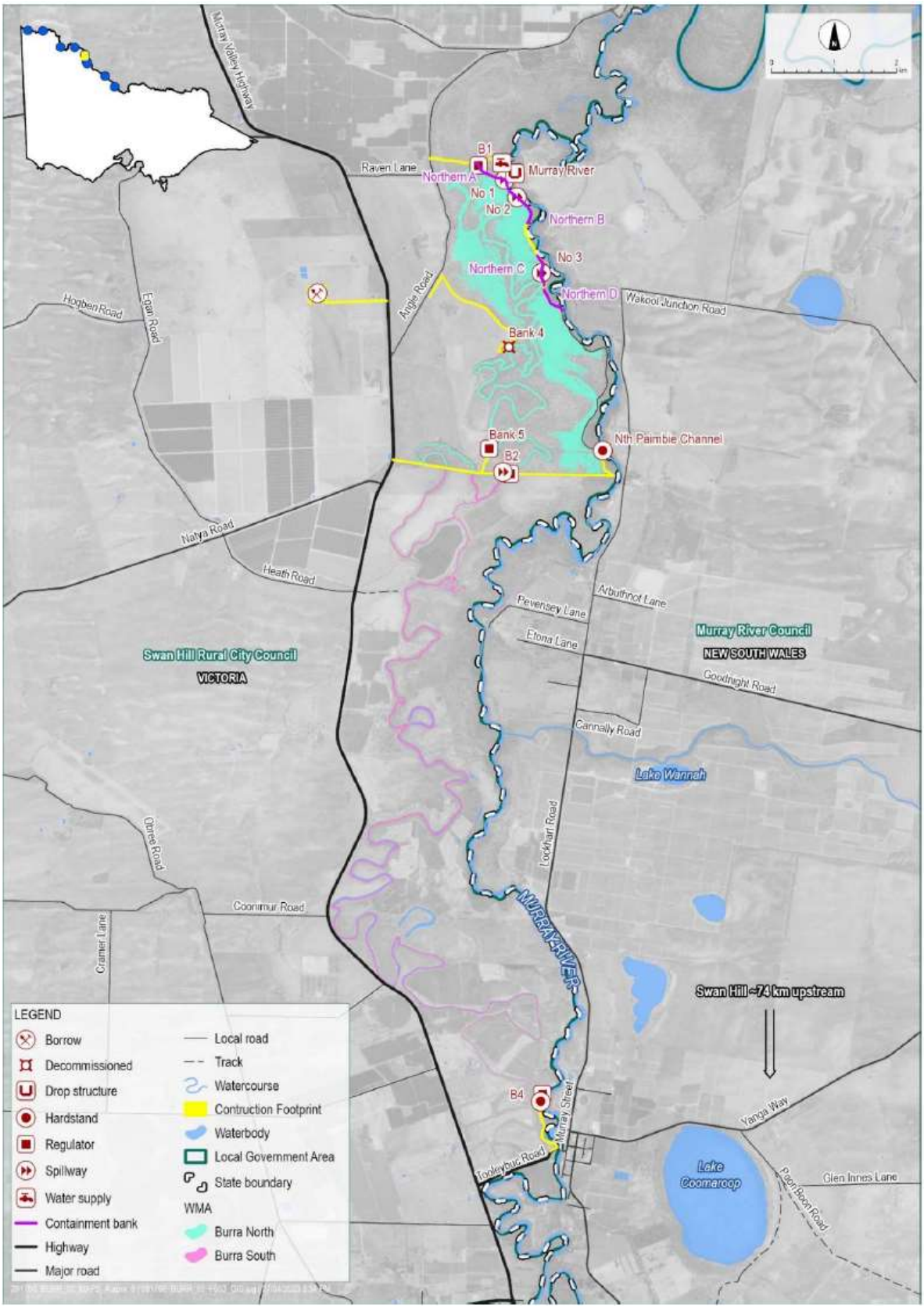

Figure 2-2 Project components map for the Burra Creek Floodplain Restoration Project (Source: Addendum Report).

3 Statutory processes

This section refers to key Acts that are relevant to my assessment and variety of statutory approvals LMW require to deliver the project, under Victorian and Commonwealth law. My assessment under the Environment Effects Act will inform decision-makers.

The Burra Creek project will require some New South Wales approvals due to the location of a drop structure on the banks of the Murray River, which is within New South Wales. It is not the intent of this assessment to explicitly inform decisions beyond those required in Victoria and under the Commonwealth EPBC Act. The use of my assessment in other jurisdictions to inform their approval decisions is at the discretion of those authorities.

3.1 Environment Effects Act

The Environment Effects Act provides for assessment regarding the acceptability and environment management of likely effects of proposed projects that are capable of significant effect on the environment, to inform decisions on such projects. When required under the Act, the assessment can occur via an EES, or an environment report (ER) process set out in conditions in lieu of an EES.

In July 2021, DELWP, now DTP, prepared a scoping document specifying the range of matters to be addressed in the environment report for the Vinifera, Nyah and Burra Creek projects. The core scope of the environment report was included within the conditions set by the Minister in the reason for decision on the EES referrals for the projects. DELWP also convened a single technical reference group (TRG) covering all the nine VMFRP projects, to provide advice to the proponent and the department on the preparation and adequacy of the EESs and ERs, as well as coordination with related statutory approval and consent processes.

A single ER covering the Vinifera, Nyah and Burra Creek projects was prepared by LMW and placed on public exhibition from 30 January 2023 to 10 March 2023. A single draft planning scheme amendment (PSA) for the projects was also exhibited with the environment report.

This assessment examines the environmental effects of the proposed Burra Creek project and provides an assessment of the acceptability of these effects. This assessment will inform statutory decision-making for key approvals and consents under the Victorian and Commonwealth legislation, as outlined below.

3.2 Planning and Environment Act 1987

The *Planning and Environment Act 1987* sets out land-use planning framework for the state, including processes for planning permit applications and the amendment of planning schemes. The proponent is seeking a single bespoke amendment of the Rural City of Swan Hill planning scheme, as the primary planning approval for the projects. The amendment would introduce planning control for the Vinifera, Nyah and Burra Creek projects through an incorporated document and specific controls overlay to facilitate the construction and operation of the projects, rather than multiple planning permits that would be required under various provisions of the planning scheme.

The draft PSA and incorporated document relevant to the Burra Creek project is discussed in Section 5.1.

3.3 Aboriginal Heritage Act 2006

The *Aboriginal Heritage Act 2006* provides a framework for the protection of Aboriginal cultural heritage in Victoria. As defined in the Aboriginal Heritage Regulations 2018, a CHMP is required when a 'high impact activity' is planned in an area of 'cultural heritage sensitivity'. A draft CHMP is in preparation for construction of the Burra Creek project (No. 16902). The proponent chose to prepare a CHMP which only relates to the works required to construct the project and did not encompass the operations phase (i.e., inundations areas). The proponent is also obliged to consider requirements under the Aboriginal Heritage Act in relation to effects in the maximum inundation area, such as potential CHMPs, or cultural heritage permits (another mechanism of the Aboriginal Heritage Act).

The project is located on lands where Traditional Owners have not been appointed as a Registered Aboriginal Party (RAP) under the Aboriginal Heritage Act or formally recognised through a Recognition Settlement Agreement, therefore the CHMP and permit application(s) will be evaluated by First Peoples-State Relations.

3.4 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is a key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. The FFG Act places importance on prevention to ensure that more species do not become threatened in the future. The FFG Act was amended in 2019 through the *Flora and Fauna Guarantee Amendment Act 2019* (the Amendment Act), which came into effect on June 1, 2020. The Amendment Act provides a modern and strengthened framework for the protection of Victoria's biodiversity. Amongst other changes, the amended FFG Act includes an obligation under Section 4B on public authorities and ministers to consider potential biodiversity impacts when exercising their functions. This reflects the Victorian Government's commitment to embed biodiversity consideration in government decision making.

Project works on land owned by a public entity (including Crown land), which may affect protected native plants, will require a protected flora permit under the FFG Act. Works or other activities that involve taking or keeping of protected fish will require a permit to conduct activities under both the FFG Act and under the *Fisheries Act 1995*.

3.5 Water Act 1989

The *Water Act 1989* provides the legal framework for the management of Victoria's water resources, including the regulation and the protection of waterways. The Water Act also defines the rights to water of the Crown, individuals and water corporations as well as entitlements to water issued by the Minister for Water.

The Murray River is a declared water system under the Water Act. Therefore, a licence to take and use water from the Murray River (under Section 51 and Part 4B) for construction of the project is not permitted. Instead, a water-use Registration (under Section 64AR) will be required to authorise use of water for purposes other than irrigation, and LMW will need to hold a water entitlement (temporary or permanent). While water use registration is also expected to be required for operation of the project, it may be possible that operation could be undertaken in accordance with Mallee CMA and LMW's existing environmental water management processes and procedures established under the Water Act.

A works on waterways permit will be required for the project to construct works in, on, under or above any designated waterway (Burra Creek). LMW will also need a licence for works to construct, alter, operate, remove or decommission any works on a waterway. For those works occurring in the River Murray Reserve, a works on waterways licence must not be issued except with the consent of the Minister in accordance with the *Crown Lands Reserves Act 1978*.

A licence for construction of groundwater bores for monitoring, dewatering, or aquifer recharge, and for extraction of groundwater, or aquifer reinjection/recharge will also be required.

Further discussion on the governance framework of the project and how it relates to water use and operations is provided in Section 5.2.

3.6 National Parks Act 1975

The *National Parks Act 1975* establishes a network of national parks and other protected areas that are representative of Victoria's diverse natural environments and sets out the legal framework for their protection, use and management. Under the Act, consent is required for permanent works to be carried out in a designated park. The Burra Creek project is predominantly located in natural features reserves which are reserved under the Act, and will require consents for construction, operation and maintenance of project infrastructure. In executing consents, conditions need to be applied to protect the natural and cultural values of the park. The Red Gum Parks Management Plan is the relevant National Parks Management Plan for the Burra Creek project; it provides important context for decisions on approvals sought for works/activities in the park.

3.7 Crown Land Reserves Act 1978

The *Crown Land Reserves Act 1978* provides for the reservation of land for a range of public purposes. Crown lands within the Burra Creek project include regional parks, such as the River Murray Reserve. These natural features reserves form part of the proposed Murray River Park, which is currently managed by Parks Victoria in accordance with the objectives of the National Parks Act and relevant management plans in place.

LMW will need to obtain a licence or a lease from Parks Victoria for all proposed assets to be located on land managed by Parks Victoria.

The maximum inundation area for the project is also located predominantly within Crown lands. LMW will need to consult with licence-holders to ensure any existing rights of licences issued under the Crown Land Reserves Act are not adversely affected by the project. If changes to licences are required, approval would need to be sought from Parks Victoria.

3.8 Traditional Owner Settlement Act 2010

The Traditional Owner Settlement Act (TOS Act) is unique to Victoria and provides an alternative framework for the recognition of Traditional Owner rights, financial and land management packages and settlement of native title claims in Victoria. Under this Act, a recognition and settlement agreement is negotiated by Traditional Owners with the Victorian Government. There are currently no land use activity agreements (LUAA) for the lands on which the Burra Creek project is located. Should there be a recognition and settlement agreement established under the TOS Act then the process for notification will be outlined in the LUAA. Section 3.12 provides discussion on notification requirements under the Commonwealth *Native Title Act 1993*.

3.9 Environment Protection Act 2017

The *Environment Protection Act 2017* came into effect on 1 July 2021. It is supported by the Environment Protection Regulations 2021, and other subordinate instruments and subsidiary documents. It changed the approach to environmental regulation in Victoria, establishing a proactive, duty-based legislative framework for the protection of human health and the environment. The Act imposes a number of duties, including an overarching 'general environmental duty', as well as duties in relation to pollution incidents, contaminated land and waste. The Act and regulations have also resulted in state environment protection policies being largely replaced by environmental reference standards.

The Environment Protection Authority (EPA) advised[3] that, based on the project's material published to date, no permission under the Environment Protection Act is anticipated to be required. Irrespective of permission not being required, the Environment Protection Act is still of relevance to the assessment and implementation of the project. The duties under the Act, including the general environmental duty, will apply to the project independently of, and in addition to, the other proposed project controls. Furthermore, as noted by the EPA, any waste generated as part of the construction and operation of the project, including waste spoil and water must be managed in accordance with the Environment Protection Act and Environment Protection Regulations 2021.

3.10 Mineral Resources (Sustainable Development) Act 1990

The *Mineral Resources (Sustainable Development) Act 1990* (MRSD Act) regulates mineral exploration and economically viable mining and extractive industries in a way that is compatible with the economic, social and environmental objectives of the state. The Burra Creek project requires extraction of material from a nearby small quarry site (referred to in the environment report and hereafter in this assessment as borrow sites). The location of the borrow site is proposed to be on private land within the project area, which was identified through a tendering process. On 31 August 2022, a Victorian

[3] VMFRP SIAC submission no. 7, EPA, page 13.

Government Gazette was issued by the Minister for Resources providing an exemption pursuant to section 5AA(1) of the MRSD Act. The exemption from the provisions of the Act stipulated[3]:

1. the exemption only applies to the MRSD Act and does not remove any requirement associated with any other act;
2. the exemption is for any extraction or removal of raw materials from land undertaken by or on behalf of the VMFRP for the purpose of construction of landforms required to achieve the outcomes of the VMFRP;
3. extraction of raw materials from land is solely for the purpose of the VMFRP project, and cannot be applied to any other private, commercial or industrial purpose;
4. any excavation for the purpose of the VMFRP project will not exceed an area of 6 ha and more than 2.5 m below natural surface in any single location, and will not require blasting;
5. prior to commencement of extraction a formal agreement must be entered into with any landowner stating the required work, any compensation matters and an agreed final rehabilitation status (all areas are to be rehabilitated to a safe, stable and sustainable landform); and
6. the proponent is to adopt industry best practise in undertaking all operational and rehabilitation activities associated with the excavations, including managing hazards and risks to environment, any member of the public, or land, property or infrastructure in the vicinity of the work.

The borrow site would need to comply with the requirements of the 5AA(1) exemption and the Earth Resources Regulation Code of Practice for Small Quarries.

3.11 Other Victorian statutory approvals

In addition to those discussed above, the project is expected to require other Victorian statutory consents and approvals including:

- consent for the use or development of land within a declared under the *Road Management Act 2004*;
- authorisation to create obstructions to fish passage and/or a permit to take fish under the *Fisheries Act 1995*;
- consent for the use or development of land within council owned or managed roads under the *Local Government Act 2020*;
- authorisation to take or handle wildlife under the *Wildlife Act 1975* (e.g., if live capture or relocation of fauna is required); and
- a permit to disturb an item listed in the Victorian Heritage Inventory under the *Heritage Act 2017*, for unlisted or newly discovered sites.

3.12 Commonwealth statutory approval

EPBC Act

LMW referred the proposed Burra Creek project (June 2020) to the Commonwealth Government (referral 2020/8686) for a determination on whether the project was controlled action under the EPBC Act.

On 16 July 2020, the Burra Creek project was determined to be a controlled action requiring assessment and approval under the EPBC Act, due to likely significant impacts on matters of national environmental significance (MNES). The relevant controlling provisions for the Burra Creek project are listed threatened species and communities (Sections 18 and 18A).

The ER process is serving as the accredited state assessment for the controlled action (i.e., project), for the purposes of the EPBC Act, with the Commonwealth decisions about whether, and under what conditions, to approve the project to be informed by this assessment. My consolidated assessment of the impacts on MNES is provided in Appendix A.

Water Act 2007

The *Water Act 2007* provides the legislative framework for regulation of water charge and water market rules across the Murray-Darling Basin. It provided for the establishment of the Murray-Darling Basin Authority (MDBA) with the functions and powers needed to ensure that the basin's water resources are managed in an integrated and sustainable way. VMFRP is being implemented as part of Victoria's obligations under the Basin Plan and would need to operate in accordance with the requirements for environmental watering under the *Water Act 2007* (Cth) and the *Water Act 1989* (Vic). The policy basis for the VMFRP projects being pursued is beyond the scope of this assessment.

LMW will need to notify the MDBA of any proposal(s) that may affect the flow, use, control or quality of any water in the upper Murray River. LMW must also provide all necessary information and data to the MDBA in order to assess the potential impacts on the river before construction commences. The Act does not expressly provide that the approval of the MDBA is required, but states that the MDBA may approve such works subject to conditions.

Native Title Act 1993

The Native Title Act establishes a mechanism for the determination of Native Title claims through the Federal Court of Australia providing for the recognition and protection of Native Title in Australia. The construction footprint of the Burra Creek project is not located on lands for which Native Title has been recognised. However, Indigenous Land Use Agreement (ILUA) (VI2004/010) applies to parts of the Burra Creek project area. This ILUA is registered for exploration and includes the Traditional Owners of the Wamba Wamba, Barapa Barapa and Wadi Wadi Peoples.

3.13 New South Wales statutory approvals

The relevant New South Wales legislation under which statutory approvals for the Burra Creek project would likely be required include:

- *Environment Planning and Assessment Act 1979*; and
- *Fisheries Management Act 1994*.

It is outside the scope of this assessment to provide recommendations on these approvals. The use of my assessment to inform approval decisions in NSW is at the discretion of relevant NSW statutory authorities.

4 Environmental assessment – key matters

This section examines and provides my assessment on:

- project benefits;
- acceptability of the likely impacts and environmental outcomes; and
- consideration of project alternatives.

4.1 Project benefits

The underlying rationale for all the VMFRP projects is to protect and restore high value floodplain environments, their ecosystems, biodiversity values (particularly listed threatened species and communities), water quality, and cultural values, through the implementation of engineered environmental watering. However, when native vegetation is cleared to construct the watering infrastructure this can cause significant impacts to the same values in these high value environments.

The expected project benefits therefore need to be weighed against the identified impacts (direct and indirect) of delivering the projects, particularly in the context of the Planning and Environment Act and Victoria's native vegetation policy of 'no net loss' to biodiversity. To assist with this, the proponent was required to assess and document the projects' intended ecological benefits including how they relate to the project's predicted adverse impacts on specific biodiversity values.

Overall improvement (benefits) to biodiversity

I have examined the proponent's assessment of the project's benefits and impacts which has considered whether the project meets the criteria[4] required for exemption from native vegetation offsets under the Victorian native vegetation policy of 'no net loss' to biodiversity. The proponent sought to do this through demonstrating that the project would achieve an overall improvement to biodiversity (also referred to as benefits).

The SIAC's overall finding was that it was not satisfied that the Burra Creek project will generate the predicted benefits or indeed provide for an overall improvement to the biodiversity values of the Burra Creek floodplain. I support this overall finding, for the reasons set out below.

The proponent's assessment of overall improvement to biodiversity (AOIB) report for Burra Creek included in the ER (Attachment VII) concluded that the project would deliver an overall improvement to biodiversity in these floodplains by improving the current floodplain hydrology (frequency, duration and timing of inundation/watering) to something similar to the pre-regulated hydrology. The ER assessment concluded this would improve ecosystem function as well as threatened species' habitat within the native vegetation communities of the inundation areas.

However, as discussed in detail within Section 6.1, a review of the hydrologic and hydraulic conditions for this project needed to be conducted after the exhibition of the ER, to understand implications of the Wakool effect that was very evident during the 2022 Murray River floods. An addendum report was prepared to assess the environmental effects of the project based on the outcomes of this work. With the Wakool effect, the maximum inundation area was predicted to be inundated more frequently and for longer durations than that predicted in the exhibited ER. The AOIB was updated (Attachment 3 to the addendum report, Tabled Document B4F) taking into account the newly modelled frequency and duration of inundation events. The proponent did not take the opportunity to consider the findings of the expert elicitation report within this update.

The revised AOIB in the Addendum Report stated that there would be a transition of approximately 50 ha of Lignum Swampy Woodland, 4.24 ha of Shrubby Riverine Woodland and 0.24 ha of Riverine Chenopod Woodland to Lignum Swamp due to operational scenarios resulting in inundation at frequencies above the recommended ranges. The ER did

[4] See DELWP (2017) Guidelines for the Removal, Destruction or Lopping of Native Vegetation. Department of Environment, Land, Water and Planning.

not provide such definitive and significant areas of floristic transition, rather stating that some areas will experience some level of floristic change. The addendum report further stated that this shift should be considered a benefit rather than a negative impact or loss of native vegetation, as the EVCs are expected to transition to what is considered by the proponent to be EVCs that would have occurred prior to river regulation. The addendum report stated that the total area with a positive or positive neutral response to flooding is 398.36 ha. The updated AOIB came to the same conclusion as the AOIB included with the ER, that the project would deliver an overall improvement to biodiversity by better aligning the floodplain hydrology (frequency, duration and timing of inundation/watering) to something similar to the pre-regulated hydrology.

The SIAC considered that the project is expected to result in improvement in condition of only approximately 141.77 ha of Floodway Pond Herbland, which is largely along Burra Creek and linked to smaller inundation events as illustrated by the Seasonal Fresh Scenario. The main effects on the remaining 261.23 ha of the maximum inundation area will be subject to the reversal of terrestrialisation and the improvement of health for non-dryland flora species. Unlike the EES Central and Nyah and Vinifera Committees, the SIAC did not consider the reversal of terrestrialisation to be a benefit for biodiversity, noting that for the Burra Creek project this change has the potential to result in the deaths of up to 132 Large and Very Large trees and potential displacement of up to 19 FFG listed threatened flora species in the maximum inundation area. The SIAC also questioned whether this EVC is a result of any terrestrialisation response since river regulation, given the size and age of the large and very large trees, suggesting they were present prior to river regulation.

The earlier understanding of the hydrology of the Burra Creek floodplain (without the Wakool effect) indicated a significant gap between the watering needs of the floodplain EVCs and what was thought to be the existing inundation frequency and duration of the Burra Creek floodplain. However, contrary to this, based on the information in the ER, Addendum report, Dr King's (flora expert for the proponent) evidence and the Ecological Associates report (Tabled Document B24), there is not considered to be a significant gap, rather the known needs of the EVCs appear to be largely met by existing conditions.

The SIAC found that there are significant uncertainties regarding the positive effects of the project on terrestrial vegetation, and that sufficient evidence has not been presented to demonstrate the project is needed. Furthermore, there is not likely to be an overall benefit to the biodiversity values of the floodplain due to both the significant loss of vegetation from construction and the expected loss of native vegetation associated with operations, along with the uncertain and mixed outcomes predicted for some native vegetation as a result of managed inundation (see Section 6.1 and 6.2). This is particularly the case for the two EVCs that represent most of the Burra Creek floodplains, Lignum Swampy Woodland (57%) and Floodway Pond Herbland (41%). For these, the Basin Plan with VMFRP watering regime scenario exceeds the frequency of inundation reflected in both the Frood and Papas 2016 report and the key tolerable range[5] reflected in the expert elicitation report. Consistent with the SIAC conclusion, it is my assessment that the project would not achieve an overall improvement to biodiversity, nor that the project is justified.

Other project benefits

While the key objective of the projects is to protect and restore floodplain ecosystems, other project objectives outlined in the ER include the facilitation of Traditional Owner aspirations for restoration of floodplain ecosystems as well as provision of social and economic benefits through enhancing tourism and recreational opportunities associated with healthy riverine landscapes.

The ER concluded that the projects' delivery of environmental water is expected to increase vegetation cover and, in turn, reduce erosion that would otherwise expose and disturb archaeological sites (and associated Aboriginal cultural heritage) across the landscape. The ER also concluded that the projects are likely to improve the health of living scarred trees and therefore prolong their lifespan. These likely benefits need to be considered alongside potential impacts to Aboriginal cultural heritage values both during construction and operation. Detailed assessment and my recommendations regarding effects on Aboriginal cultural heritage values are provided in Section 6.6.

[5] As defined in the Expert Elicitation report "These shapes define, for a given EVC, an area of consensus (~50 %) with frequency on the vertical axis and duration on the horizontal axis."

The Burra Creek project area is highly valued for activities including camping, bushwalking, bird watching, canoeing, trail-bike riding and horse riding. The ER estimated approximately 1,000 additional recreational visitors to the Burra Creek area, which would bring an estimated economic value of $100,000 per year. Further regional economic benefits are outlined in the ER, including the generation of economic activity during construction of approximately $21.5 million. Other likely benefits for the community include overall positive effects for apiarists through improved vegetation health resulting in healthier hives, improving bushfire resilience of vegetation, improving vegetation growth and improving visual quality of views, improved access through track upgrade and maintenance.

The Burra Creek Committee adopted the Nyah and Vinifera Committee's conclusion that the assessment of social and economic effects in the ER was satisfactory, and the EMF provides a suitable basis for managing the social and economic effects of the project. My assessment of effects and specific recommendations for land use, social and economic aspects are provided in Section 6.7.

I note that benefit to these non-ecological aspects relies heavily on the overall improvement of biodiversity within the floodplain. Without the overall improvement to biodiversity, I consider that the other benefits cannot be achieved by this project.

4.2 Acceptability of likely impacts and environmental outcomes

Following careful consideration of the available information on the Burra Creek project, particularly the SIAC's findings, it is my assessment that the project would not achieve overall benefits for this floodplain environment and associated biodiversity values, and that the project is likely to result in significant adverse effects on biodiversity and habitat values through both native vegetation clearance and changes to floodplain conditions for some EVCs. The information available shows that the watering requirements of most EVCs within the floodplain (maximum inundation area) are already being met by the current conditions and that in some cases implementation of the project will potentially exceed optimal and tolerable conditions.

In considering the likely significant impacts without potential benefits being likely, it is my overall assessment that the Burra Creek project is to have significant and unacceptable environmental effects. I also consider that the potential benefits and overall environmental outcomes of the Burra Creek project would not be sufficiently different if some of the uncertain aspects of the proposed project are addressed.

In making my assessment of the project and its effects, I am mindful of the primary objective and rationale for the project, to protect and restore high value floodplain environments, their ecosystems and biodiversity values (particularly listed threatened species and communities). The Burra Creek project is likely to result in significant adverse impacts to biodiversity during both construction and operation. As described in Section 6.2, key adverse impacts on biodiversity during construction include clearance of up to 21.6 ha of native vegetation (of which 14.68 ha or 68% is located within high value conservation areas), which includes loss of up to 188 Large Trees (of which 136 are hollow bearing trees) and direct impacts on habitat of numerous threatened flora and fauna species. Key adverse impacts on biodiversity during operations are expected to include impacts on up to 19 FFG listed flora species which cannot tolerate flooding, as well as additional loss of up to 132 Large and Very Large trees (which is approximately 12% of canopy trees within the proposed maximum inundation area), from the changes in inundation regime.

In addition to the adverse biodiversity effects, the construction and operation of the project is likely to result in significant unavoidable adverse impacts on other environmental values, including disturbance of Aboriginal cultural heritage sites, as well as impacts on surface water values. As discussed in Section 4.1 and 6.1, factoring in the Wakool effect is essential to understanding the current hydrological conditions. In light of that, the recommended watering requirements of the EVCs in the proposed maximum inundation area are largely met and with implementation of the project the recommended inundation requirements of some EVCs will be exceeded. The SIAC concluded that implementation of the project has the potential to cause further adverse impacts to some biodiversity values of the floodplain during operations.

While EDSs were proposed for the project to manage and mitigate adverse impacts through adaptive environmental management processes, this was not developed in the context of a project very unlikely to meet the primary objective of restoring high value floodplain vegetation communities, their ecosystems and biodiversity values. An approach where the project is built and then minimally operated in the context of the above-mentioned Wakool effect does not satisfactorily

address the primary ecological and conservation objectives for this particular project, given the resulting likely impacts and environmental risks.

The SIAC noted that there was uncertainty associated with the use of the various hydraulic models and that these uncertainties relate primarily to the hydraulic parameters (velocity, depth, shear stress) that inform the assessment of hydraulic effects during operations, such as the magnitude of erosion risks and the precise extent of adverse effects on some vegetation due to overwatering/drowning. Notwithstanding this, the SIAC concluded that the project should not proceed as the case for its overall ecological benefits was not made. The SIAC recommended that, if I did not support their overall conclusion, and the project was to proceed, additional modelling work would need to be completed to address these uncertainties. Therefore, given my adoption of the overall SIAC conclusion and my findings on project's significant and unacceptable environmental effects, I do not support the SIAC's recommendations for further hydraulic analysis. While further modelling may provide greater clarity and confidence in the extent and significance of the adverse impacts, it is my view that the outcomes of such additional modelling would not sufficiently change the overall environmental outcomes. A clear overall improvement to biodiversity is essential to meet the State policy objective of 'no net loss' to biodiversity as a result of the removal, destruction or lopping of native vegetation.

However, should a primary decision-maker not follow the findings and conclusions of this assessment and intends to approve the project, they should consult with me and my department before any further work is conducted or indeed prior to any decision-making on an approval.

4.3 Consideration of project alternatives

As set out in the ER scope, the ER was required to describe and assess effects of relevant alternatives for each project. This included requirements to explain how and why specific alternatives were selected for detailed evaluation within the ER and to document the likely environmental effects of feasible alternatives, particularly where these offered a potential to minimise and/or avoid significant environmental effects whilst meeting the objectives of the project.

Information on specific alternatives considered during the ER process for siting and layout of project infrastructure was provided in Chapter 4 and Attachment VIII of the ER. The process VMFRP followed for assessment of alternatives is covered in my assessment of the Nyah and Vinifera projects.

The process of consideration of alternatives to avoid and minimise impacts on native vegetation for the project was further discussed in Section 5.2 of the SIAC report. The Burra Creek Committee noted that the Nyah and Vinifera Committee discussed general issues relating to minimising native vegetation loss in Chapter 5.2(iv) of Report No. 2. The SIAC adopted that discussion in relation to the Burra Creek project. In relation to the assessment of project alternatives presented in Attachment VIII of the ER, for Nyah and Vinifera the SIAC considered the broad logic of decisions on the relative merit of previous design proposals and specific alternatives is reasonably clear. I consider this is also the case for the Burra Creek project.

In response to Clause 47(d) of the SIAC terms of reference ('provide recommendations for any feasible modifications to the project') the SIAC found it was not in a position to recommend any design modifications to the project. The SIAC did however suggest that if further hydraulic work was completed and ecological assessments revised, minor or major design modifications may result. The SIAC suggested that these may include modifying the project to allow for seasonal fresh events along the Burra Creek, without any infrastructure on the floodplain required for Burra Maximum events.

5 Planning framework and environmental management

This part of my assessment examines and presents findings on relevant aspects of the proposed planning and environmental control regime for the project.

5.1 Planning controls

The primary approval proposed for the Burra Creek project under Victorian legislation is a planning scheme amendment (PSA) to introduce bespoke controls to facilitate the construction and operation of the project. A single draft PSA (Amendment C78 to the Swan Hill planning scheme) covering the Vinifera, Nyah and Burra Creek projects was prepared by the proponent in consultation with relevant agencies and was included in the exhibited ER in Attachment 4. The draft PSA seeks to:

a. facilitate approval and delivery of the projects in a timely, coordinated and consistent manner;

b. establish a framework to manage environmental effects during construction and operation; and

c. ensure the projects can be planned with certainty and commence without delay.

In broad terms, the proponent's draft PSA:

a. inserts an incorporated document into the Swan Hill Planning Scheme to allow the use and development of the land for the projects in accordance with the specific control in the incorporated document;

b. applies the specific controls overlay (SCO) to land required for the projects; and

c. makes the Minister for Planning the Responsible Authority for the projects on land subject to the SCO in the Swan Hill Planning Scheme.

Amending the planning scheme to insert an SCO and an incorporated document would allow the proponent to progress the projects consistently, without the need for a series of individual planning permits required under a range of planning provisions in the local planning scheme, provided conditions in the incorporated document are met.

The SIAC was appointed both as an inquiry under the Environment Effects Act to assess the environmental effects of the projects as well as an advisory committee under the Planning and Environment Act to provide the Minister for Planning with advice as to the merit, strategic justification, content and structure of the draft PSA. As described in Section 1 of this assessment, since exhibition of the draft PSA (for Vinifera, Nyah and Burra Creek) the public hearing process for the Burra Creek project was deferred to allow time for the proponent to undertake further hydraulic analysis.

In this assessment I have considered the SIAC's recommendations in their Report No. 3 on the draft PSA for the Burra Creek Floodplain Restoration Project. This is in the context of the environmental effects of the proposed works and their acceptability and how those environmental effects might be mitigated. My recommendations on the draft PSA relevant to Nyah and Vinifera Floodplain Restoration Projects have been covered by a separate assessment I issued in October 2023.

Strategic assessment of the draft PSA

Unlike the SIAC Reports No. 1 (EES Central) and No. 2 (Nyah and Vinifera projects) which recommended that the draft PSAs associated with these projects were strategically justified and should be approved, there was no such recommendation in the SIAC Report No. 3 regarding justification or approval of the draft PSA for the Burra Creek project. SIAC Report No. 3 does not provide a strategic assessment of the draft PSA in relation to the Burra Creek project, presumably due to the SIAC's primary recommendation that the Burra Creek project should not proceed or be approved.

Ministerial Direction No. 11 (MD No. 11) – *Strategic Assessment of Amendments* requires a planning authority (or proponent) to evaluate and document how an amendment addresses specified strategic considerations. Planning Practice Note 46 (PPN46) – *Strategic Assessment Guidelines* provides a consistent framework for preparing and evaluating a proposed planning scheme amendment consistent with MD No.11. The draft PSA exhibited by the

proponent included an Explanatory Report and Strategic Assessment Report for the Vinifera, Nyah and Burra Creek projects to explain the purpose, effect and strategic basis for the amendment and address the matters set out in MD No. 11. These documents were not updated as part of the Burra Creek Addendum Report and do not consider the Wakool effect for Burra Creek flooding. The SIAC Report No. 3 for Burra Creek did not provide comment on the merit of these documents for strategic justification of the draft PSA.

The SIAC's key findings that the project's predicted benefits to floodplain vegetation and biodiversity values are not expected (in light of the Wakool effect) and that there is clear evidence that the project would result in significant adverse impacts from both construction and operation, suggest that the draft PSA would not meet several of the strategic assessment guidelines detailed in PPN46 as discussed below.

PPN46 directs that in preparing a PSA, a proponent must demonstrate how the amendment implements the objectives of planning in Victoria as set out in section 4(1) and 12(1)(a) of the Planning and Environment Act. This includes objective (b) in section 4(1) to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity. The primary purpose of the Burra Creek project is to benefit the vegetation communities and biodiversity of the Burra Creek floodplains and other associated environmental values by restoring an inundation regime that supports native floodplain vegetation. However, as discussed in Section 6.1, the SIAC concluded that it has not been demonstrated that the project will result in the expected benefits to floodplain vegetation and further, that there is clear evidence the project would result in significant adverse impacts from both construction and operation. Based on this finding, I consider it unlikely that the proposed PSA would implement the objectives of planning in Victoria.

PPN46 directs that a PSA must demonstrate that it adequately addresses any environmental, social and economic effects in accordance with sections 12(2)(b) and (c) of the Planning and Environment Act. This includes assessment of whether the project achieves a net community benefit taking into consideration the environmental, social and economic effects of the draft PSA. It should also include an evaluation of the costs and benefits to businesses and the community informed by the ER, arising from any requirement that is proposed to be implemented via the PSA during construction and operation. Given that the SIAC is not satisfied that the Burra Creek project is likely to achieve acceptable environmental outcomes, I consider it unlikely that the project will result in a net community benefit.

PPN46 also requires a comprehensive evaluation of how the PSA supports or implements the Planning Policy Framework (PPF) and relevant government policies, strategies and plans. The SIAC considered that the information provided for the project did not provide a compelling case that the Burra Creek project would achieve the policy objective of ensuring no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. This biodiversity policy objective detailed in *Protecting Victoria's Environment – Biodiversity 2037 (Department of Environment, Land, Water and Planning, 2017)* is reflected in Clause 12 (Environmental and Landscape Values) of the Swan Hill Planning Scheme, which directs that planning should help to protect the health of ecological systems and the biodiversity they support (including ecosystems, habitats, species and genetic diversity) and conserve areas with identified environmental and landscape values. Specifically, Clause 12.01-1S (Protection of Biodiversity) seeks to protect and enhance Victoria's biodiversity by avoiding impacts of land use and development on important areas of biodiversity, and Clause 12.0-2S (Native Vegetation) seeks to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation.

As discussed in Section 6.2, it is my assessment that implementation of the Burra Creek project will result in significant adverse effects on biodiversity and habitat values. Therefore, I agree with the SIAC that the information provided does not demonstrate that the Burra Creek project supports or implements State policy related to protection of biodiversity and further the draft PSA does not demonstrate how it supports the PPF.

Based on the considerations discussed above and the SIAC's primary recommendation that the Burra Creek project should not proceed or be approved, I am not satisfied that the draft PSA for Burra Creek has demonstrated an adequate level of strategic justification. I recommend that the Burra Creek project is not included in Amendment C78 to the Swan Hill Planning Scheme.

Incorporated document

The SIAC provided its recommended version of the draft incorporated document for Amendment C78 to the Swan Hill Planning Scheme covering the Vinifera, Nyah and Burra Creek projects in Appendix C of SIAC Report No.3. The SIAC made recommended changes to the draft incorporated document specific to the Burra Creek project and explained these changes in Table 9 of SIAC Report No. 3. These changes to the draft incorporated document were recommended by the SIAC in the event that I did not accept their primary recommendation. I have however accepted the primary recommendation of the SIAC and therefore am not providing specific comment on the proposed changes to the draft incorporated document. It is my recommendation that the Burra Creek project is not included in Amendment C78 to the Swan Hill Planning Scheme.

5.2 Environmental management framework

The proponent's Day 1 version of the draft incorporated document states that prior to the commencement of development (excluding preparatory buildings and works), an EMF must be prepared, and then submitted to and approved by the Minister for Planning. It then sets out what the EMF is to include.

It is expected that the 'final' EMF would be based on the EMF exhibited as Chapter 20 of the ER, incorporating recommendations from the SIAC and this assessment. My description of the key aspects of the exhibited EMF in my assessment of the Nyah and Vinifera projects (dated October 2023) is also relevant to this assessment.

The proponent tabled a Day 1 version of the EDS and monitoring requirements (Tabled Document B21) at the commencement of the roundtable for the Burra Creek project. The EDS and monitoring measures were the subject of submissions and focussed consideration throughout the roundtable.

The SIAC discussed the EMF in Section 10.2 of the SIAC report providing a rationale for several proposed changes to EDSs that were recommended if I did not accept the primary recommendation. Appendix D of the SIAC report also provided further recommendations regarding changes to the proponent's EDSs and monitoring requirements from the Day 1 versions. The SIAC also noted in Section 1.9 that, unless otherwise stated, the Committee adopted the Nyah and Vinifera Committee's recommended changes to the EMF in relation to Aboriginal cultural heritage, agriculture, air quality, bushfire, historic heritage, land use, landscape and visual, noise and vibration, social and business, as well as traffic and transport. These recommendations were provided by the SIAC in the event that I did not accept the primary recommendation. I have accepted the primary recommendation of the SIAC and concluded that the project will have unacceptable environmental outcomes, and therefore am not providing further comment on the specifics of recommended changes to EDS or the EMF.

6 Assessment of environmental effects

This section details my examination of the project's potential effects on different aspects of the environment.

6.1 Environmental watering and ecological response

Assessment context

This section sets out my examination of the potential effects of hydrological and hydraulic changes through environmental watering and the ecological response. This draws on information drawn together in the SIAC report and specifically from the specialist studies on terrestrial ecology and surface water and the findings of the assessment of overall improvements to biodiversity. These are addressed in the ER through chapters 17, 18 and 4 of the main report as well as in the Surface Water specialist study C, Terrestrial ecology specialist study B and Attachment VII. The Addendum Report addresses these effects in Attachment 2 and 3 and are covered in in Sections 3, 5 and 7 of the SIAC report.

Key aspects related to environmental watering considered by the SIAC were:

- effects of operation on native vegetation and EVCs;
- potential impacts on threatened flora; and
- modelling and assessment of floodplain hydraulics.

The EMF provides for the management of environmental watering and ecological response through adaptive management as set out in EDS EMF3 and EMF4.

Discussion

Hydrology and floodplain watering

The ER analysed the hydraulic effects (change in depth of inundation, change in flow velocity and bed shear stress) at key locations in the project area for three scenarios: existing conditions, holding (regulators closed) and during release/drawdown (regulators open). It also analysed existing conditions with respect to floodplain inundation thresholds and frequency of inundation. These analyses were undertaken using a hydraulic model developed to inform the business case for the Burra Creek project. This model was developed by Jacobs in 2014 to model natural and existing conditions and was updated in 2017 to model proposed conditions with the implementation of proposed Burra Creek infrastructure (hereafter, the Jacobs Burra model).

Modelling undertaken in the ER using the Jacobs Burra model was based on the relationship between inundation extent at Burra Creek and flow in the Murray River at Swan Hill. The modelling indicated that a flow at Swan Hill of 30,000-35,000 ML/day was required to achieve a water level in the Murray River at Burra Creek sufficient to achieve floodplain inundation. These thresholds were used to determine the frequency of floodplain inundation for the purposes of the Burra Creek project.

Subsequently, an Addendum Report prepared for the Burra Creek project explained that during the 2022 Murray River floods, observations of inundation patterns at the Burra Creek project area indicated that inundation occurred at a flow rate lower than previously determined using the Jacobs Burra model. Review of satellite imagery showed that inundation occurred at a flow at Swan Hill of ~25,000 ML/day. Further review indicated that, in flood conditions, water levels in the Murray River at the Burra Creek project area are influenced by both upstream flow in the Murray River and interaction with downstream flows entering the Murray River from the Edwards/Wakool system (located ~10 km downstream of the Burra Creek project area). The review identified that flood levels in the vicinity of the Burra Creek floodplain may be higher than expected due to a backwater effect created by the high inflow from the Edwards/Wakool system entering the Murray River (hereafter, the 'Wakool effect'). The Wakool effect occurs when high outflows from the Wakool River enter the Murray River and slow upstream flows in the Murray River, resulting in water backing up at the downstream end of Burra Creek. As a result of the Wakool effect, Burra Creek and the floodplain are inundated more frequently, and for longer durations than that predicted in the exhibited ER. The Addendum Report used aerial and satellite imagery to

examine the relationship between measured flow in the Murray River at Swan Hill and downstream of Wakool Junction, and inundation of the Burra North floodplain. The report found that the backwater effect from the Wakool River is minimal at Murray River flows at Swan Hill up to approximately 25,000 ML/day and is present with flows at Swan Hill greater than 25,000 ML/day and flows at Wakool Junction greater than 60,000 ML/day[6]. The SIAC reported that the Jacobs Burra model did not simulate the Wakool effect because the model does not extend downstream to Wakool Junction; the downstream limit of the Jacobs Burra model is less than 1 km downstream of the Burra Creek's confluence with the Murray River.

In addition to these observations during the 2022 floods, following the preparation of the ER, a new Murray River hydraulic model became available: the RRC model. The RRC model was developed by the Murray-Darling Basin Authority in 2022 and has been used to inform assessments of floodplain inundation associated with the Reconnecting River Country project run by the New South Wales Department of Primary Industries. The Addendum Report explained that the RRC model provides an updated representation of existing conditions for the Murray River floodplain, including around the junction of the Murray and Wakool Rivers and the Burra Creek project area. The Addendum Report compared the outputs from the Jacobs Burra model with the RRC model to understand more clearly the nature of the Wakool effect on water levels in the Burra Creek. The review showed that a flow of 55,000 ML/day downstream of Wakool Junction, rather than a flow of 30,000-35,000 ML/day at Swan Hill, results in an inundation extent similar to the proposed maximum inundation area. The Addendum Report analysed the frequency of events that exceed 55,000 ML/day downstream of Wakool Junction and found that flows of this magnitude occur more frequently than a flow at Swan Hill of 30,000 ML/day[7]. For flows downstream of Wakool Junction, events greater than 55,000 ML/day occurred 8.1 times every 10 years under modelled natural (pre-regulation) conditions. In comparison, for flows downstream of Swan Hill, events greater than 30,000 ML/day occurred 3.6 times every 10 years under modelled natural (pre-regulation) conditions. This revised frequency of inundation informed changes in the way the Burra Creek project is proposed to be operated. Operating scenarios and watering objectives (frequency and duration of inundation) for the Burra Creek project were revised in the Addendum Report. Notably, the Burra Intermediate operational scenario was removed and the frequency of occurrence of the Burra Maximum operational scenario through the delivery of additional pumped events was increased.

The SIAC examined the revisions and updates made in the Addendum Report to the floodplain inundation threshold considering the Wakool effect. The floodplain inundation threshold is the flow rate in the Murray River at which the Burra Creek floodplain will be inundated. The SIAC noted that a rating curve was developed for the relationship between water levels at the northern outlet of Burra Creek and flows in the Murray River at Swan Hill and Wakool Junction. The Swan Hill component of the rating curve was based on the Jacobs Burra model and the Wakool Junction component was based on the historical extent of inundation of the Burra North floodplain observed on satellite imagery. The rating curve showed that the inundation threshold equivalent to the proposed top water level was 55,000 ML/day at Wakool Junction, consistent with the RRC model which predicted an inundation threshold of 56,000 ML/day at Wakool Junction.

The SIAC asked Dr Treadwell, a surface water expert witness for the proponent, how the rating curve should be interpreted in a situation where the flow in the Murray River is less than 25,000 ML/day at Swan Hill but around 50,000 ML/day at Wakool Junction, and whether that would result in inundation of the floodplain. Dr Treadwell stated that uncertainties remain in the relationship between Murray River flows at Swan Hill and Wakool Junction and inundation of the Burra Creek floodplain. The SIAC considered that the rating curve does not provide a robust tool for determining the relationship between flow and inundation. However, the SIAC accepted that the general approach to determining the revised inundation threshold for the Burra Creek floodplain (including the use of the rating curve) was adequate for the purposes of informing the revised watering objectives and strategies reflected in the revised project description presented in the Addendum Report. I support this finding.

[6] Refer to Figure 3.8 of Burra Creek Addendum – Attachment 2.

[7] Refer to Table 3.1 of Burra Creek Addendum – Attachment 2.

Ecological responses to environmental watering and hydrological changes

When updated with consideration of the Wakool effect, Attachments 2 and 3 to the Addendum Report noted that the frequency of current inundation regimes experienced by EVCs are closer aligned to the preferred water regimes (Frood and Papas 2016[8]) than previously thought. Table 6-1 below outlines the current and proposed regimes expected for the EVCs recorded in Burra Creek.

Table 6-1 Current and proposed inundation regimes by EVC (Source: Addendum Report Attachment 2 and 3).

EVC	Area (ha)	Recommended watering regime*	Current regime	Proposed regime	Predicted response
Riverine Chenopod Woodland (EVC 103)	0.24	0-3 in 10 years 0-1 month median duration	3.7 in 10 years 0.8 month median duration	7.8 years in 10 1.2 month median duration	Neutral
Lignum Swamp (EVC 104)	1.94	3-7 in 10 years 1-6 month median duration	10 in 10 years 1 month median duration	11 years in 10 2.6 month median duration	Positive-neutral
Grassy Riverine Forest (EVC 106)	2.05	3-10 in 10 years 0-1 month median duration	3.7 in 10 years 0.8 month median duration	7.8 years in 10 1.2 month median duration	Positive
Floodway Pond Herbland (EVC 810)	141.77	0-3 in 10 years 0-1 month median duration	10 in 10 years 1 month median duration	11 years in 10 2.6 month median duration	Positive
Shrubby Riverine Woodland (EVC 818)	4.24	0-3 in 10 years 0-1 month median duration	3.7 in 10 years 0.8 month median duration	7.8 years in 10 1.2 month median duration	Negative
Lignum Swampy Woodland (EVC 823)	252.6	3-7 in 10 years 1-6 month median duration	3.7 in 10 years 0.8 month median duration	7.8 years in 10 1.2 month median duration	Positive-neutral

Source: Recommended watering regime (Frood and Paps, 2016); Current regime, Proposed regime and Predicted response (Addendum Report, Attachment 3).

The Addendum Report stated that the total area with a positive or positive neutral response to flooding is 398.36 ha. However, it is noted that 143.82 ha of this is positive, and 254.54 ha is considered to be positive-neutral, with some uncertainties about the expected response of vegetation in some areas. The Addendum Report did not consider the 0.24 ha of Riverine Chenopod Woodland expected to have a neutral response and 4.24 ha of Shrubby Riverine Woodland expected to have a negative response as a negative impact to the project as the vegetation is expected to transition to other EVCs.

The consideration of the hydrologic requirements of EVCs in terms of frequency, duration and depth was discussed throughout the hearing due to concerns raised by submitters (including from ANU Fenner School, Environment Victoria and Ms Thornton). These submitters questioned the nature of the ecological outcomes, and considered that the

[8] While it is acknowledged that the Frood and Papas 2016 regimes are considered too coarse to determine individual EVC depth preferences, they have been used as a guide for frequency and duration preferences here in consistency with the ER and Addendum Report.

proposed water regimes may not deliver the predicted benefits to floodplain vegetation due to the manner in which they are expected to be delivered. DEECA's submission further noted the importance of considering the level of certainty associated with the AOIB reports within the ER, highlighting the importance of the predicted responses of Lignum Swampy Woodland and Floodway Pond Herbland noting that these communities respectively represent 57% and 41% of the Burra Creek maximum inundation area. Submitter Ms McKay also raised concerns that the proponent modellers were unaware of the backwater (Wakool) effect, despite there being longstanding local understanding of this phenomenon.

The SIAC noted that with the revised assessments based on the Wakool effects, there is doubt about the need for the Burra project, as there is no longer an indication that there is a significant gap between known inundation frequency and the inundation needs of the floodplain vegetation communities. The SIAC further noted that the projects operation will result in some EVCs in the Burra Creek maximum inundation area being inundated at greater frequencies and to greater depths than what is recommended for the extant EVC. I note that for the two largest EVCs represented in the Burra Creek Lignum Swampy Woodland (57%) and Floodway Pond Herbland (41%), the Basin Plan with VMFRP scenario exceeds the frequency of inundation reflected in both the Frood and Papas 2016 report and the key tolerable range[9] reflected in the Expert Elicitation report.

The proponent's flora expert, Dr King, informed the SIAC that with the Wakool effect, the EVCs in Burra Creek are having their known water requirements largely met by existing conditions. He further confirmed that the proposed watering regime under the project's operational stage will exceed the recommended inundation requirements of some EVCs. Due to this change to inundation regimes that may exceed the tolerable duration and frequencies for the communities, the updated AOIB notes that floristic changes are possible for a range of EVCs associated with the Burra Creek project during operation. These changes include:

- Lignum Swampy Woodland may transition to Lignum Swamp or a Lignum Swampy Woodland/Lignum Swamp mosaic in some areas;
- Riverine Chenopod Woodland has the potential for some areas to revert to Lignum Swampy Woodland;
- Lignum Swamp may transition to Floodway Pond Herbland in some areas; and
- Floodplain Pond Herbland is expected to exceed its tolerable inundation regime.

Section 5 of the updated AOIB noted that Lignum Swamp is currently being inundated at 10 years in 10, which is the higher end of the preferred frequency of the EVC, which is stated to be three to seven years in 10. The predicted inundation regime of 11 years in ten is noted to exceed the recommended inundation frequency, however the updated AOIB considered that as the Lignum Swamp at Burra Creek has established and/or persisted under the regulated river conditions which are considered to be outside the range of preferred frequencies and duration, it is expected that the EVC will likely respond positively or remain largely unchanged as a result of the project. Similar to the Frood and Papas report, the Expert Elicitation report notes that the proposed watering regime exceeds the tolerable frequency range for Lignum Swamp. The Ecological Associates report notes that Lignum Swamp was not included in the analysis as the maximum modelled flow of 55,000 ML/day downstream Wakool Junction fails to inundate 80% of the EVC and therefore it was not possible to identify their central distribution in relation to flow.

Drawing upon the information presented within the ER and the Addendum Report, Dr King's evidence, and the Ecological Associates report, the SIAC concluded that the existing hydrological conditions appear to largely meet the known needs of the native vegetation communities in the Burra Creek maximum inundation area. Further to this, the SIAC was concerned that the operational stage of the project may result in some EVCs being inundated at greater frequencies and to greater depths than what is recommended for the relevant communities. The SIAC concluded that there was not a demonstrable basis for the Burra project, as the proposed engineered watering had not been justified given the existing conditions and the recommended inundation requirements for EVCs present on the floodplain. I agree with this conclusion and further note that the proposed inundation regimes may have adverse, rather than beneficial impacts on large areas of native vegetation in the Burra Creek maximum inundation area as further discussed in the following sections.

[9] As defined in the Expert Elicitation report "These shapes define, for a given EVC, an area of consensus (~50 %) with frequency on the vertical axis and duration on the horizontal axis."

Reversal of terrestrialisation

As explained in the ER, terrestrialisation is the process of colonisation of previously inundated areas by terrestrial flora species. The ER stated that terrestrialisation has occurred in some parts of the project areas due to a reduction in flooding frequency, duration and extent post river regulation. The ER further stated that managed inundation under the projects would result in the reversal of terrestrialisation, that is, the transition of terrestrial native flora to more flood-tolerant species that are likely to have been present pre-river regulation. The Addendum Report's Attachment 2 noted that the likelihood of EVC transitions occurring had changed (i.e., become more likely) and there would be a transition of approximately 50 ha of Lignum Swampy Woodland, 4.24 ha of Shrubby Riverine Woodland and 0.24 ha of Riverine Chenopod Woodland to Lignum Swamp due to the operational scenarios resulting in inundation at frequencies above their recommended ranges.

The Addendum Report considered this shift to be a benefit rather than a negative impact or loss of native vegetation, as the EVCs are expected to transition to be what would have occurred prior to river regulation. As part of the predicted change from Lignum Swampy Woodland to Lignum Swamp, the Addendum Report notes that up to 132 Large Trees could die as a result of the change in inundation regime.

The Burra Creek Committee generally agreed with the EES Central committee's conclusions with regard to terrestrialisation, which considered that the reversal of terrestrialisation for the EVCs within the maximum inundation area should generally be considered a project benefit. However, they note that for the Burra Creek project, the transition from Riverine Chenopod Woodland to Lignum Swamp Woodland raised concern as it is a shift from an endangered EVC to a vulnerable EVC, and noted that in principle, this concern could also be applied to the transition of up to 1.94 ha of the vulnerable Lignum Swamp EVC to the depleted Floodway Pond Herbland.

The SIAC also noted that the expected transition of the 50 ha of Lignum Swampy Woodland to Lignum Swamp is a shift between two EVCs listed as vulnerable, but also may result in the loss of up to 132 Large and Very Large Trees. The SIAC held further uncertainty as to whether the presence of this EVC is actually a result of terrestrialisation response given the size of the Large Trees would suggest they were present prior to river regulation, but stated this would require further investigation to verify. The SIAC further noted that the loss of these 132 Large Trees represents approximately 12.4% of the estimated 1,067 canopy trees in the maximum inundation area, and therefore consider the loss to represent a significant proportion of canopy trees within the maximum inundation area. The SIAC stated that the project has not demonstrated that the transition of Lignum Swampy Woodland and the associated loss of trees would provide an overall ecological benefit. I agree with this finding.

The SIAC concluded that the proposed watering regimes will result in some EVCs being inundated to greater frequencies and to greater depths than recommended and that the resultant reversal of terrestrialisation of EVCs does not equate to an overall benefit to native vegetation. I support the SIAC's conclusion that the transition of such EVCs should not be considered as a benefit to native vegetation. I note the SIAC recommended further work should I not accept the primary findings and recommendations, and I have provided commentary in the section below which addresses this.

Hydraulic effects on the floodplain

It is important to understand how the Wakool effect changes the way the floodplain inundates in terms of inundation processes (depth, velocity and shear stress) and flow directions of the Burra Creek floodplain. The Addendum Report sought to do this in the updated specialist assessments through using data from both the Jacobs Burra and RRC hydraulic models.

As mentioned above, submitter Ms McKay raised concerns that the proponent modellers were unaware of the backwater (Wakool) effect. Other submitters raised general concerns regarding the modelling for all three of the projects covered in the ER however no further submissions raised concerns in relation to the hydraulic modelling for Burra Creek, including the RRC modelling.

The SIAC noted that the Jacobs Burra model does not accurately reflect the hydraulic conditions of the Burra Creek floodplain because it does not simulate the Wakool effect. The SIAC highlighted that the Jacobs Burra model remained uncalibrated despite strong advice from a peer reviewer and the authors of the model that calibration would significantly

improve confidence in the model. The SIAC stated that "given the project is fundamentally about altering hydraulic conditions on the floodplain, a hydraulic model that is properly calibrated, and accurately represents the hydraulics of the project area, is essential for underpinning an accurate assessment of the project's effects and benefits". Regarding the RRC model, the SIAC reported that the RRC model has been calibrated and validated using 2016 event data, and also includes representation of the Wakool effect. However, the RRC model is a broader-scale model than the Jacobs Burra model extending from Swan Hill to Boundary Bend and does not include project infrastructure, such as smaller flood runners and structures including culverts under existing block banks in Burra Creek.

At the roundtable, Dr Treadwell confirmed that while it does not account for the Wakool effect, hydraulic information from the Jacobs Burra model was still used in the updates to surface water and terrestrial ecology assessments and the revised AOIB presented in the Addendum Report. Dr Treadwell stated that it was not possible with the proponent's timeframe to use the depth, velocity and bed shear stress outputs from the RRC model as the basis for the revised assessments, instead of the Jacobs Burra model outputs. He did not rule out the possibility of modifying the RRC model to enable it to be used to assess the project but was unable to identify the extent of additional work required for this. Rather, for these assessments, the flow event representing the Burra Maximum operational scenario in the Jacobs Burra model was chosen based on having a similar inundation extent to a flow of 55,000 ML/day at Wakool Junction, even though it was known that other hydraulic parameters such as depth and velocity would not be accurately represented (given the Jacobs Burra model does not account for the Wakool effect).

The SIAC examined whether the effects of the project on hydraulic parameters, depth, velocity and shear stress, were adequately assessed. The Addendum Report presented outputs in relation to depth, velocity and bed shear stress from the Jacobs Burra model compared to outputs from the RRC model. It also presented the Jacobs Burra model outputs for these hydraulic parameters under existing conditions compared to those in an unmanaged event with project infrastructure in place, but with regulators left open (i.e., inundation without and with infrastructure). The same comparison was not done using RRC model outputs as the Addendum Report stated that the Wakool effect is not relevant for a pumped inundation event equivalent to the Burra Maximum scenario, because it is assumed that the floodplain would be dry. The SIAC noted however, that while during the filling and holding phases in a pumped event the velocity would be close to zero as the water would be held back behind the B1 regulator, there is potential for higher velocities and bed shear stress during the drawdown/release phase. The SIAC examined the model predictions for an inundation event equivalent to the Burra Maximum operational scenario under existing conditions. The Wakool effect is relevant for this scenario, where the floodplain is inundated. The SIAC noted that each of the models generated different depths on the floodplain, particularly at the downstream end of Burra Creek where they are likely to be higher than modelled by the Jacobs Burra model because of the higher downstream water level. Differences in depth in other parts of the floodplain were not as great, but still pronounced. The SIAC also noted that there were some modelled differences in velocity, however, overall velocities are still relatively low. The SIAC also noted that in both existing conditions and an unmanaged event, velocities are expected to be lower than predicted by the Jacobs Burra model because of the slowing effect of backwater from the Wakool effect. For both models, bed shear stresses were predicted to be low.

The SIAC considered that the assessment of the Burra Maximum operational scenario presented in the Addendum Report is inadequate. The SIAC stressed that the updated information for these parameters was produced by the Jacobs Burra model, which has not been updated to take account of the Wakool effect. The SIAC did not consider that the effects of the project on depth, velocity and shear stress are able to be adequately assessed without a properly calibrated site-specific hydraulic model.

The SIAC noted that the Jacobs Burra model assumed that the Burra Creek floodplain is inundated from south (upstream) to north (downstream). In response to a question by the SIAC, the proponent confirmed that the Wakool effect results in inundation from the north (downstream) end of Burra Creek. Given the revised understanding of inundation processes, the SIAC sought to understand how the project infrastructure (including containment banks and spillways) would alter the inundation process. In Tabled Document B48, the proponent stated that the modelling data obtained from the RRC model and the Jacobs Burra model does not include the direction of flows in and out of the floodplain. The SIAC considered that uncertainties remain regarding the effects of project infrastructure on inundation processes, including (i) whether containment banks and raised spillways at the northern end of the Burra Creek floodplain would impede the entry of floodwaters into the Burra North floodplain during unmanaged events, and (ii) whether flood inflows into this northern part of the floodplain would cause erosion within the maximum inundation area in the vicinity of structures such as regulators and spillways.

The Burra Creek Committee shared the concerns of the EES Central Committee and the Nyah and Vinifera Committee regarding the adequacy of the hydraulic analysis underpinning the environmental assessments for the VMFRP projects and considered that the concerns are amplified in the Burra Creek Project given the Jacobs Burra model has shown to be inaccurate. The Burra Creek Committee adopted the commentary of the EES Central Committee and the Nyah and Vinifera Committee that while the hydraulic modelling was adequate to enable a general assessment of ecological consequences and erosion risks, further hydraulic analysis using a properly calibrated model prior to detailed design and implementation is required. The SIAC recommended that if the project were to proceed, the addition of a new EDS SW4 requiring further assessment of floodplain hydraulics (depth, velocity, shear stress and flow) and implications for floodplain vegetation prior to detailed design, similar to what was recommended by the EES Central Committee and the Nyah and Vinifera Committee. I do not support this recommendation for Burra Creek, it is my view that the further hydraulic modelling will not change the understanding of the key benefits and impacts nor the acceptability of the environmental outcomes.

Assessment

It is my assessment that the hydraulic modelling as presented in the ER and Addendum Report was adequate for the use of understanding hydrological processes (i.e., frequency and duration of inundation) at the Burra Creek floodplain and conclude that the information provided demonstrates that the known watering needs of the EVCs in the maximum inundation area are largely being met by existing conditions. Consistent with the SIAC conclusion, it is my assessment that the project would not achieve an overall improvement to this floodplain environment and biodiversity values and that the operational phase of the Burra Creek project may result in significant adverse effects on biodiversity and habitat values particularly due to:

- the predicted transition of approximately 50 ha of Lignum Swampy Woodland EVC to Lignum Swamp EVC, and the associated loss or decline of approximately 132 Large and Very Large Trees and displacement of approximately 19 FFG listed threatened flora species in the maximum inundation area; and

- the proposed watering regime is expected to exceed the tolerable inundation requirements for some EVCs, including the two largest EVCs represented in the Burra Creek Lignum Swampy Woodland (57% of maximum inundation area) and Floodway Pond Herbland (41% of maximum inundation area).

As noted by the SIAC, the predicted benefits associated with the Burra Creek project are also less certain than those assessed by the Nyah and Vinifera Committee for a range of reasons, including the demonstrated inaccuracies with the hydraulic model used as the basis for the specialist assessments in understanding depth of inundation. While uncertainties around the hydraulic modelling remain, I do not support the recommendation for further work through the addition of EDS SW4. It is my assessment that the further hydraulic modelling will not contribute to the understanding of floodplain hydrology nor achievement of benefits, which underwrite the acceptability of the project's environmental outcomes.

6.2 Terrestrial ecology

Assessment context

Terrestrial ecology effects are addressed in chapter 17 of the ER and the terrestrial ecology specialist study B appended to the ER. Further information on terrestrial ecology effects were provided in the Burra Creek Addendum documents, Attachment 2 – Specialist Assessment and Attachment 3 – Assessment of overall improvement for biodiversity. Sections 5 and 7 of the SIAC's report discusses the SIAC's findings in relation to terrestrial ecology.

The Burra Creek project area is located primarily within the Murray River Reserve and supports a range of threatened flora and fauna which are listed under the FFG Act and the EPBC Act. The Murray River Reserve is known to provide important connectivity throughout the landscape for a range of native species, including significant species such as the Regent Parrot.

The potential impacts and key issues related to terrestrial biodiversity values that were examined by the ER and SIAC were:

- loss or degradation of native vegetation and/or habitat for terrestrial fauna and flora species, due to clearance of significant amounts of native vegetation;
- direct and indirect impacts on threatened communities and species listed under the EPBC Act and FFG Act;
- impacts on non-threatened fauna, including potential disturbance effects from construction (e.g., noise, impacts on fauna movement and vehicle collisions); and
- disturbance effects from changes in hydrology (including surface and groundwater changes), water quality, contaminants and pollutants, environmental weeds, pathogens and pest animals.

The ER considered the potential impact pathways to terrestrial species and communities including impacts from the direct removal of native vegetation, particularly hollow-bearing trees, and habitat during construction and the potential for weeds and pest species to increase due to environmental watering and improved conditions.

The EMF included 11 EDSs specifically addressing potential effects on ecological values and some of these have been the subject of recommendations by the SIAC. Key measures included in the EDSs include the need to minimise disturbance of vegetation within the construction footprint (EDS E1), and the requirement to develop and implement a native flora and fauna management sub-plan as a sub-plan of the CEMP (EDS E2a). Minor changes were also made to the Day 1 EDSs to update them from the exhibited versions in response to issues raised during the public review process, including changes to EDS E2d to define that terrestrial and aquatic weeds will be managed, and EDS E2e to include the requirement for weed monitoring and management for rehabilitation following construction.

Effects associated with aquatic ecology values are discussed in Section 6.3.

Discussion

Native vegetation clearance during construction

The ER identified that the construction stage of the project would result in impacts to 21.6 ha of native vegetation and 188 Large Trees (112 Large Trees and 76 Very Large Trees). The addendum documents for Burra Creek did not include any changes to the impacts predicted from the construction stage of the project, and therefore the findings from the ER are discussed below.

The ER assessed the significance of the residual effect ranging from extreme (for permanent vegetation removal and Large Tree removal) to medium (for the removal of specific threatened flora species). The ER noted that the majority of the native vegetation that will be directly or indirectly impacted is within conservation reserves for the project as the project is mostly located within the River Murray Reserve, with the rest of the project area located on private land (17% non-covenanted land, less than 1% under a Trust for Nature Covenant)

The ER calculated overall impacts to Large Trees as those that would be physically removed, have encroachment of tree protection zones (TPZ) or any removal of canopy. Physical removal and encroachment of TPZ were then calculated as a permanent loss/removal (see Tables 6-2 and 6-3). The figures presented in Table 6-2 and Table 6-3 provide a worst-case scenario of native vegetation impacts, due to the extent of vegetation and Large Trees to be impacted.

Table 6-2 Impacts to native vegetation (ER Chapter 17)

Native vegetation (ha) removed	Large Trees impacted	Hollow bearing trees impacted
21.6	188	136

Table 6-3 Breakdown of impacts to native vegetation (source: ER specialist study B)

Construction footprint (ha)	Borrow site (ha)	Large Trees direct removal	Large Trees considered lost
14.8	6.8	92	96

During the development of the ER documents, the native vegetation impacts were updated from those provided in the EES referrals submitted by the proponent earlier in the assessment process (see Section 1), as the construction footprint was further refined, and the assessment of impacts was revised to consider impacts on tree canopy driplines. As a result of these changes the area of impact for native vegetation and number of Large Trees impacted increased for the project. At Burra Creek, the predicted area of impact for native vegetation increased from 12.95 ha to 21.6 ha, while impacts to Large Trees to be impacted increased from 105 to 188 (as shown in Table 6-4).

Table 6-4 Breakdown of impacts to native vegetation at referral stage and ER submission (source: EES referral and ER)

Native vegetation impact at referral stage (ha)	Native vegetation impact at Addendum Report submission (ha)	Large Trees impacted at referral stage	Large Trees impacted at ER submission
12.95	21.6	105	188

As noted in my assessment of the Nyah and Vinifera projects, the proponent considered project alternatives and refinements to reduce vegetation loss while developing the ER for these projects. For Burra Creek, the ER stated that the alternatives assessment resulted in the adoption of eight alternatives which avoid or minimise adverse effects on significant terrestrial ecological values. These alternatives included the retention of an additional 34 Large and 27 Very Large canopy trees.

The native vegetation impacts from the project have also been assessed in terms of cumulative impacts, in combination with the other eight proposed VMFRP projects. At the time of developing the ER, the cumulative impact figures presented in the ER identified that the nine VMFRP projects would impact a total of 351.1 ha of native vegetation and 4,305 Large Trees. It is, however, expected that the cumulative impact totals will be revised down as the later projects progress and design refinements are made. The ER noted that the removal of the native vegetation and Large Trees from Burra Creek is significant, especially when considered in combination with the impacts at the other project sites. The ER also concluded that the combined benefits to biodiversity from the nine projects are expected to significantly outweigh the impacts, with benefits expected to the combined maximum inundation areas totalling 14,107 ha, which supports an estimated 79,862 Large Trees. While the nine VMFRP projects conclude they have the potential to provide an overall benefit in the longer term, there will be significant cumulative impacts to native vegetation in the interim. I note however, that the cumulation of benefit versus impact was not considered for the assessment of overall improvement to biodiversity for each of the projects. The method for the assessment of overall improvement to biodiversity in the ER in terms of meeting State policy of 'no net loss' was assessed at an individual project level, which is appropriate. Detailed assessment of the cumulative effects in relation to MNES is provided in Appendix A.

The submissions from Environment Victoria and FoNVP raised concerns regarding the extent of loss of native vegetation that will occur, particularly hollow-bearing trees and the subsequent impacts to biodiversity from this loss. The SIAC highlighted evidence from the proponent's flora expert, Dr King, in which he explained that a larger extent of native vegetation removal is proposed for the Burra Creek project compared to the Nyah and Vinifera projects due to the presence of narrower existing access tracks bordered by denser vegetation, a dedicated borrow site, wider proposed containment banks, and a less advanced project design. The SIAC also highlighted that construction risks for native vegetation EVCs were rated as 'high' for the Nyah and Vinifera projects due to the permanent loss of vegetation, but were rated as 'extreme' for the Burra Creek project due to the permanent removal of up to 7.778 ha of an endangered EVC (EVC 103 Riverine Chenopod Woodland).

The SIAC made further recommendations to amend EDS E1 to help protect endangered EVC 103 Riverine Chenopod Woodland. The SIAC noted that this recommendation follows the same principle as was recommended in my

assessment of the EES Central projects for the endangered Plains Grassland EVC. The SIAC's recommendation is for EDS E1 to include the need to further consider reducing impacts on endangered EVC 103 Riverine Chenopod Woodland during detailed design. While in principle I support the proposed amendments to EDS E1, to help minimise impacts on this the endangered vegetation community, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on the EDSs.

I find that the impacts of the project on native vegetation are significant and consider the loss of and impacts to native vegetation in these conservation areas to be unacceptable in the absence of ecological and biodiversity benefits from this project that clearly outweigh the adverse impacts.

Hollow-bearing trees

Hollow-bearing trees are critical for breeding and shelter for much of the vertebrate fauna of many temperate Australian forests, including River Red Gum forests[10]. As noted in the ER, when near a reliable water source mature trees tend to become very large and often have hollows, including large hollows, particularly for River Red Gums. These hollows provide shelter and breeding opportunities for a range of fauna, including parrots, woodland birds, reptiles and mammals. Large hollow-bearing trees are an important aspect of the ecosystem and conservation values retained within the Murray River floodplains. The loss of hollow-bearing trees from Victorian native forests is a key threatening process declared under the FFG Act. The ER identified that within the project areas these trees provide potential nesting and roosting habitat for the threatened Regent Parrot (*Polytelis anthopeplus monarchoides*), South-eastern Long-eared Bat (*Nyctophilus corbeni*), Barking Owl (*Ninox connivens*), Major Mitchell's Cockatoo (*Lophocroa leadbeateri)*, Carpet Python (*Morelia spilota metcalfei*).

The ER and Addendum Report note that the Burra Creek project would result in impacts to approximately 136 hollow-bearing trees, both living and dead, during the construction phase. Of the recorded trees assessed within the area of investigation (i.e., the construction footprint plus a buffer, which is a smaller area than the proposed maximum inundation area) there were 378 hollow-bearing trees observed, with most live trees assessed for health recorded as being of moderate condition (consisting of more than 30-70% live canopy). The ER stated that extrapolation of the proportion of hollow-bearing trees detected within the area of investigation indicates that there are approximately 598 hollow-bearing trees within the maximum inundation area at Burra Creek. The ER noted there is a high residual effect for the project due to the proposed removal of a significant proportion of large hollow-bearing trees, particularly given the considerable time is takes for new Large Trees to grow. The ER concluded that the operational phase of the project would support the long-term survival and health of many Large Trees within the maximum inundation areas and therefore the long-term residual impact is less significant. However, as discussed in Section 6.1, the SIAC found benefits of this extent are unlikely to manifest and there is potential for additional losses/ impacts to Large and Very Large Trees in the maximum inundation area during the operational phase of the project.

A number of submitters raised concern regarding impacts to hollow-bearing trees, highlighting that a number of species found or expected to occur within the project area may be affected by impacts to hollow-bearing trees during the construction phase. They highlighted the loss of hollow-bearing trees is considered a key threat to conservation, as set out under the FFG Act. Concerns were also raised in submissions regarding potential impacts on a number of hollow-dependent threatened species including the Major Mitchell's Cockatoo and Lace Monitor. The DEECA submission recommended that a Hollow Replacement Plan is developed and implemented as part of the project, which should include:

- the number and type of hollow (i.e., carved hollows, nest-boxes);
- characteristics suitable for a range of hollow-dependent fauna (avian, arboreal mammals and reptiles);
- a 1:1 loss: replacement ratio;
- monitoring measures to determine successes/ failures for the period in which it has been suggested within the ER that hollows may regenerate naturally (this being a predicted period of 15 years); and

[10] For example see Bennett, A. F., L. F. Lumsden, and A. O. Nicholls (1994), Tree hollows as a resource for wildlife in remnant woodlands: Spatial and temporal patterns across the northern plains of Victoria, Australia, Pac. Conserv. Biol., 1, 222– 235 and Gibbons, P., D. B. Lindenmayer, S. C. Barry, and M. T. Tanton (2002), Hollow selection by vertebrate fauna in forests of southeastern Australia and implications for forest management, Biol. Conserv., 103, 1– 12.

- mitigation and contingency measures, able to respond to monitoring success and/ or failures.

The proponent's expert witness for terrestrial ecology (fauna), Mr Watson, considered that a hollow replacement plan would not provide effective mitigation and considered it unnecessary for the Burra Creek project. Mr Watson highlighted a number of issues with the success of previous hollow replacement programs and noted that, if it was implemented it would need to carefully consider the target species and hollow characteristics required and ensure that the most appropriate natural or artificial hollows are installed and properly monitored. The SIAC acknowledged the complexity of issues that need to be addressed in designing an effective hollow replacement program.

During the roundtable, Mr Watson agreed it was possible that Regent Parrot could potentially breed in the Burra Creek project area. His evidence also supported the presence of other hollow-dependent species in the project area including other threatened species such as Carpet Python, as well as more common species such as Yellow Rosella, Red-rumped Parrot, Galah, Little Corella, Sulphur-crested Cockatoo, Australian Wood Duck, and Grey Teal.

The SIAC recommended that the EMF include a new EDS E5 that requires a hollow replacement plan to be prepared. The SIAC stated that having a hollow replacement plan is arguably more important for the Burra Creek project than the Nyah and Vinifera and EES Central projects, due to the relatively large number of trees that will be affected by construction and relatively small number of trees in the Burra Creek maximum inundation area. The SIAC recommended that the hollow replacement plan needs to:

- define target species (some or all of the hollow-dependent species present in the Burra Creek project area);
- be based on a clear understanding of the hollow characteristics required by those species; and
- ensure appropriate natural or artificial hollows are properly installed and adequately monitored.

The SIAC also highlighted that risks such as over-heating and utilisation by pest species should be addressed in the design and implementation of the program. The SIAC emphasised my findings from the EES Central assessment that the replacement of lost hollows is important for a number of ecosystem functions and uses, including:

- A large number of Large Trees are predicted to be cleared/impacted during construction, yet it will take a considerable time (up to 150 years) for new trees to become hollow-bearing Large Trees in this high conservation significant landscape.
- Each species has its own requirements for type of hollow, and various habitat and social needs determine the density of hollows that may be most useful to that species[11].
- *Action Statement No 192 Loss of hollow-bearing trees from Victorian native forests and woodlands*[12] identifies that some species need multiple hollows in close proximity in order to support a social community, provide a choice of hollow for different circumstances and to allow regular movements for hygiene and to avoid ectoparasites.
- The demand for hollows changes throughout the year, increasing greatly during the spring breeding season. There is substantial evidence to indicate that hollows are a limiting resource, particularly for threatened hollow-dependent fauna. The National Recovery Plan for the Regent Parrot (eastern subspecies)[13] notes competition for nest hollows as a key threat, with the species competing for nest sites with other birds (including feral bird species) and feral European bees.
- Many hollow-dependent species are strongly territorial and defend their hollow site and the area around it (Gibbons and Lindenmayer, 2002)[14], so many individual fauna losing their hollows are likely to be prevented from moving into hollows in surrounding areas by competitors which already occupy that territory.

[11] Department of Sustainability and Environment (2003) Action Statement, Flora and Fauna Guarantee Act 1988, No.192. Loss of hollow-bearing trees from Victorian native forest and woodlands. Department of Sustainability and Environment, East Melbourne.

[12] Department of Sustainability and Environment (2003) Action Statement, Flora and Fauna Guarantee Act 1988, No.192. Loss of hollow-bearing trees from Victorian native forest and woodlands. Department of Sustainability and Environment, East Melbourne.

[13] Baker-Gabb, D. and Hurley, V.G. (2011) National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*. Department of Sustainability and Environment, Melbourne.

[14] Gibbons, P. and Lindenmayer, D. (2002) Tree Hollows and Wildlife Conservation in Australia, CSIRO Publishing, Collingwood, Australia

- There is a risk that, following project vegetation clearance during construction, some displaced hollow-dependent fauna may move into hollows suitable for threatened hollow-dependent species, reducing the number available for use by those threatened species.

While in principle I support the SIAC's recommendation to include EDS E5 to help mitigate the loss of tree hollows from vegetation clearance, particularly given the expected impacts on a large number of hollow-bearing trees and diversity of hollow dependent fauna present in the area which includes threatened species, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on the EDSs.

Threatened flora

The flora surveys for the ER recorded 143 native flora species in the Burra Creek project area of investigation, while the Victorian Biodiversity Atlas (VBA) contains records of 443 flora species within the project area, including 339 native species and 104 introduced species. Noting that flora surveys for the Burra Creek project area of investigation only covered the construction footprint plus a buffer and limited parts of the maximum inundation area. The VBA identified 70 species of conservation significance (listed under the EPBC Act and/or FFG Act) as present or possibly occurring within the project area (ER specialist study B). The key listed threatened flora species recorded (through flora surveys) or with potential habitat considered present (as identified in the VBA) in the project area are summarised in Table 6-5. Key potential impacts on threatened flora identified in the ER include permanent and temporary loss of vegetation and habitat during construction, and direct and indirect effects from inundation. The ER identified that the construction of the project would result in the removal of two threatened and 32 protected flora species listed under the FFG Act. The ER also noted that the FFG Act listed Semi-arid Shrubby Pine-Buloke Woodland ecological community occurs in the area of investigation. The ER concluded that there is an overall residual effect of medium for threatened flora.

The ER identified that construction would result in adverse effects on FFG listed species that have been recorded in the construction footprint area. For Burra Creek, the following species were recorded within the area of investigation:

- two individuals of the critically endangered Umbrella Wattle *Acacia oswaldii;*
- three individuals of the critically endangered Pale Flax-lily *Dianella longifolia var. grandis;*
- 25-50 individuals of the Wimmera Woodruff *Asperula wimmerana;*
- less than ten individuals of the Squat Picris *Picris squarrosa;*
- 12 individuals of the endangered Branching Groundsel *Senecio cunninghamii var. cunninghamii* (two individuals predicted to be impacted within construction footprint);
- 200-300 individuals of the endangered Twiggy Sida *Sida intricata*;
- less than ten individuals of the endangered Fuzzy New Holland Daisy *Vittadinia cuneata var. hirsuta (*one individual predicted to be impacted within the construction footprint).

The ER specialist study noted that most populations of threatened flora could be avoided through minor design changes.

Table 6-5 Key listed threatened flora recorded or with potential habitat present in the study area (source: ER chapter 17)

Species	EPBC Act status	FFG Act status	Presence in area of investigation	Presence in maximum inundation area
Angular Saltbush		Critically endangered	Possible	Possible
Blue Burr-daisy		Endangered	Possible	Possible
Branching Groundsel		Endangered	Present	Present
Bristly Love-grass		Endangered	Possible	Possible
Bush Minuria		Vulnerable	Possible	Possible
Cactus Bossiaea		Endangered	Possible	Highly unlikely
Cane Grass		Endangered	Possible	Possible
Cotton Sneezeweed		Endangered	Possible	Possible
Doubah		Endangered	Possible	Possible
Dwarf Amaranth		Endangered	Possible	Possible
Dwarf Flat-sedge		Endangered	Possible	Possible
Fuzzy New Holland Daisy (var. hirsuta)		Endangered	Present	Present
Fuzzy New Holland Daisy (var. morrisii)		Endangered	Possible	Possible
Goat Head		Vulnerable	Possible	Possible
Mallee Annual-bluebell		Endangered	Possible	Possible
Mallee Cucumber		Endangered	Possible	Possible
Pale Flax-lily		Critically endangered	Present	Possible
Pin Sida		Endangered	Possible	Possible
Pop saltbush		Endangered	Possible	Possible
Riverina Bitter-cress		Endangered	Possible	Present
Riverine Flax-lily		Critically endangered	Possible	Possible
Sand Sida		Endangered	Possible	Highly unlikely
Sarcozona		Endangered	Possible	Highly unlikely
Silver Cassia		Critically endangered	Possible	Possible
Silver Saltbush		Endangered	Possible	Possible

Species	EPBC Act status	FFG Act status	Presence in area of investigation	Presence in maximum inundation area
Slender Water-ribbons		Endangered	Unlikely	Possible
Slit-wing Bluebush		Critically endangered	Possible	Possible
Small Monkey-flower		Endangered	Unlikely	Possible
Spear-fruit Copperburr		Endangered	Present	Unlikely
Spreading Emu-bush		Vulnerable	Possible	Present
Spreading Saltbush		Endangered	Possible	Possible
Squat Picris		Endangered	Present	Possible
Twiggy Sida		Endangered	Present	Unlikely
Twin-leaf Bedstraw		Endangered	Possible	Possible
Umbrella Wattle		Critically endangered	Present	Possible
Wimmera Woodruff		Endangered	Present	Present
Winged New Holland Daisy		Endangered	Possible	Possible
Winged Peppercress	Endangered	Endangered	Possible	Possible
Woolly Scurf-pea		Endangered	Possible	Unlikely
Yakka Grass		Endangered	Possible	Possible
Yarran		Critically endangered	Unlikely	Possible
Yellow Burr-daisy		Endangered	Possible	Possible

There were no submissions made which raised concerns regarding the impacts of construction on listed flora species and communities specific to Burra Creek, and submissions tended to be general in nature and relate to the three projects associated with the ER Central package (Nyah, Vinifera and Burra Creek). DEECA submitted that the projects did not pose an unacceptable risk or consequence to the State-wide population of any FFG listed flora, and the SIAC considered that the DEECA submission carried considerable weight with regard to providing confidence that the project would not have unacceptable impacts on FFG listed species of flora.

The SIAC concluded that they were generally satisfied that the potential effects on threatened flora from construction have been appropriately assessed, and the project has made reasonable efforts to avoid and minimise impacts of the construction footprint on threatened flora species. The Burra Creek Committee notes that there is a residual impact on two threatened species (two individuals of Branching Groundsel and one individual of Fuzzy New Holland Daisy), however agreed with the Nyah and Vinifera Committees recommendation that the detailed design process and selection of construction methods should seek to further avoid and minimise impacts on habitats of threatened species; and that the development and implementation of a Native Flora and Fauna Management Sub-Plan (to be approved by the Secretary of DEECA), is an appropriate mechanism to address the further mitigation of impacts on threatened species. The Burra Creek Committee considered the recommended amendments made by the Nyah and Vinifera committee to the EDS and Monitoring Requirements to address the above findings should equally apply to Burra Creek.

The ER stated that the project could result in the potential decline in abundance of 19 FFG Act listed terrestrial dry flora species including Fuzzy New Holland Daisy and Spreading Emu-bush. Specialist Assessment B estimated that there are approximately 27 individual Fuzzy New Holland Daisy and 4,648 individuals of Spreading Emu-bush within the maximum inundation area. The habitat requirements for the terrestrial dry species indicate they are not tolerant to flooding, and therefore the prolonged inundation which would occur through the operational phase of the project is likely to result in the area being unsuitable for these species. The ER and Addendum Report noted that the terrestrial dryland flora habitat areas will likely transition to more flood-tolerant vegetation types. The ER and Addendum Report concluded that as the effects on terrestrial dryland species are predicted to be almost certain to occur, the significance of the residual adverse effect is medium.

The SIAC noted that the proponent's flora expert, Dr King, considered that the project would benefit most of the threatened flora species present in the maximum inundation area, but noted that there would be a medium residual risk to threatened flora species and communities due to the possible changes in habitat extents for some more terrestrial species as a result of the increased frequency of inundation. In response to this, the SIAC recommended the inclusion of similar conditions to what was included in my assessment of EES Central and Nyah and Vinifera projects. This recommendation was for the inclusion of a new EDS E6 and changes to monitoring requirements M TE2 and MTAE2 which required additional targeted surveys are undertaken in previously recorded locations for threatened terrestrial dry species in the inundation areas prior to operations, with requirements for mitigation measures for the species to be covered by the OEMP should they be recorded.

I consider the impacts to threatened flora will be significant due to the impacts to the 19 FFG Act listed species considered to be "terrestrial dry flora" which will be negatively impacted by the project's operational phase. While in principle I support the implementation and recommended refinement of the relevant EDSs (e.g., EDS E2a, E2b, and E2e) and the inclusion of EDS E6, I have however adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDSs, OEMP and the EMF.

Pest plants and animals

The ER noted that pest plants and animals are an existing threatening process in the project area that could be intensified by construction and environmental watering. The ER identified ten weeds which are listed as restricted and regionally controlled under the *Catchment and Land Protection Act 1994* (Winged Slender-thistle *Carduus tenuiflorus,* Skeleton Weed *Chondrilla juncea*, Spear Thistle *Cirsium vulgare*, Field Dodder *Cuscuta campestris,* African Box-thorn *Lycium ferocissimum*, Horehound *Marrubium vulgare*, Wheel Cactus *Opuntia robusta*, Common Prickly-pear *Opuntia stricta*, Golden Thistle *Scolymus hispanicus*, and Bathurst Burr *Xanthium spinosum*) occurring within the area of investigation at Burra Creek. Spear Thistle, Horehound and Golden Thistle were also recorded within the maximum inundation area.

The Burra Creek Committee supported the recommendations made by the Nyah and Vinifera Committee, which stated that a high level of rigour should be applied during the construction period to monitor and manage environmental weeds. The Burra Creek Committee note that this level of rigour should be applied to the operational phase as well, and recommended amendments to EDSs E2d and E3. As noted above, in principle I support these amendments, but have adopted the SIAC's primary recommendation and am therefore not addressing specific EDSs.

Threatened fauna

The fauna surveys for the ER recorded 91 native fauna species in the Burra Creek study area, including six FFG listed species. Table 6-6 below outlines the key threatened fauna species considered in the Burra Creek section of the ER.

The ER identified that the Victorian Temperate Woodland Bird Community (VTWBC) and the Victorian Mallee Bird Community (VMBC) fauna communities listed as threatened under the FFG Act have the potential to occur within the project areas and noted that the VMBC corresponds in part with the Mallee Bird Community of the Murray Darling Depression Bioregion. The VMBC was listed in December 2021 as endangered on the threatened ecological communities list under the EPBC Act, however as the listing occurred after DCCEEW's 'controlled action' decisions for the project, the community is not required to be considered in the decisions on the approval of the controlled actions under the EPBC Act by the Minister for the Environment and Water. The ER noted it is still recognised by the project as an EPBC Act-listed Threatened Ecological Community. No other EPBC Act-listed threatened fauna communities known

from within the study area were observed during site assessments or are considered to have the potential to occur in the area.

A number of species which are either present or possibly present within the project area have been listed as threatened under the EPBC Act since the original referral decision for the project. As the referral decision pre-dated the listing of these species and communities, they will not be a consideration for the Australian Government Minister in making approval decisions on the controlled actions under the EPBC Act. The ER documentation contains references to most of these species, but limited assessment was completed on the presence or potential impacts to these species. I note that a number of these species are considered to either be a part of the VTWBC and/or VMBC communities discussed above, or, are referred to in the ER specialist study B as "bush birds" which are noted to generally be uncommon to rare within the construction footprints and maximum inundation areas. ER specialist study B noted that for "bush birds" there is almost certain permanent and temporary loss of small areas of habitat with minor consequences, resulting in a medium overall adverse effect. The report concluded that as there is extensive habitat availability across the landscapes, the reductions in habitat are unlikely to affect the ecology of the species.

The Grey Snake (*Hemiaspis damelii*) is not discussed in the ER specialist study B, however the published conservation advice for the Grey Snake[15] notes that the species is associated with floodplain areas with cracking clays and are often found foraging for frogs within 30m of the waters' edge, and not in adjacent woodland or shrubland vegetation. While not considered within the ER, the distribution map in the conservation advice shows that the species and/or its habitat may occur within the project area, with known or likely habitat located nearby on the NSW side of the Murray River.

Table 6-6 Listed threatened terrestrial fauna recorded or with potential habitat present in the study areas (source: ER Chapter 17)

Species	EPBC Act status	FFG Act status	Presence in project study area
Apostlebird		Vulnerable	Possible
Australasian Bittern		Critically endangered	Possible
Australasian Shoveler		Vulnerable	Possible
Australian Gull-billed Tern	Migratory	Endangered	Possible
Australian Painted Snipe	Endangered	Critically endangered	Possible
Barking Owl		Critically endangered	Possible
Black Falcon		Critically endangered	Possible
Blue-billed Duck		Vulnerable	Possible
Bearded Dragon		Vulnerable	Possible
Bush Stone-curlew		Critically endangered	Possible
Carpet Python		Endangered	Present
Caspian Tern	Migratory	Vulnerable	Possible
Common Greenshank		Endangered	Possible
Crested Bellbird		Endangered	Possible
Diamond Dove		Vulnerable	Possible

[15] Department of Climate Change, Energy, the Environment and Water (2022) Conservation Advice for *Hemiaspis damelii* (grey snake)

Species	EPBC Act status	FFG Act status	Presence in project study area
Diamond Firetail	Vulnerable	Vulnerable	Present
Eastern Great Egret		Vulnerable	Possible
Fork-tailed Swift	Migratory		Possible
Grey-crowned Babbler		Vulnerable	Present
Grey Falcon		Vulnerable	Possible
Ground Cuckoo-shrike		Endangered	Possible
Growling Grass Frog	Vulnerable	Vulnerable	Possible
Hardhead		Vulnerable	Possible
Hooded Robin		Vulnerable	Possible
Lace Monitor		Endangered	Present
Lathams Snipe	Migratory		Possible
Little Eagle		Vulnerable	Possible
Little Egret		Endangered	Possible
Major Mitchell's Cockatoo	Endangered	Critically endangered	Possible
Painted Honeyeater	Vulnerable	Vulnerable	Possible
Regent Parrot	Vulnerable	Vulnerable	Present
Sharp-tailed Sandpiper	Migratory		Possible
South-eastern Long-eared Bat	Vulnerable	Endangered	Possible
Square-tailed Kite		Vulnerable	Possible
White-bellied Sea-Eagle		Endangered	Possible

Key impacts to threatened fauna identified within the ER include a loss of habitat through vegetation clearance, degradation of native riparian vegetation along Victorian rivers and streams, and direct and indirect effects from inundation. The ER identified that the permanent and temporary loss of habitat as a result of the project would have a medium residual effect on woodland fauna, noting that this has the potential to impact 21 FFG Act listed species and three EPBC-listed species including the Regent Parrot, Painted Honeyeater and South-eastern Long-eared Bat. The ER also noted that surveys recorded the presence of the FFG Act listed Grey-crowned Babbler, Diamond Firetail, and Lace Monitor. The ER considered that, with the implementation of environmental watering and application of the relevant EDS, the project would generally provide a benefit to these threatened fauna species through improved habitat condition in the long term. However, as concluded by the SIAC and discussed in Section 6.1 of this assessment, it is not likely the Burra Creek project would result in an overall improvement to biodiversity, and therefore benefits to the FFG Act listed species would not be achieved.

In the absence of the predicted medium to long term benefits for these floodplain ecosystems, a number of state and federally listed threatened species would be directly and significantly impacted from the significant amount of vegetation clearance required for the construction of the project. I consider that the potential impacts on these species and fauna habitat from construction are significant and not outweighed by the likely outcomes of watering, noting the conclusions of

the SIAC and this assessment that there no longer seems to be a significant gap between known inundation frequency and the inundation needs of the floodplain EVCs.

The SIAC noted that the submissions from Environment Victoria and FoNVP raised concerns for the construction phase of the project on threatened fauna, including the extent of permanent and temporary loss of suitable habitat and loss of habitat connectivity, with particular concerns raised about for Regent Parrot, Painted Honeyeater, Carpet Python and Lace Monitor due to hollow-bearing tree loss.

Overall, the Burra Creek Committee found that the ER adequately considered the impacts to threated fauna from construction, concluding that should the project proceed they considered that impacts on fauna species could be acceptably managed subject to recommended changes to some EDSs. The Burra Committee supported the changes recommended by the Nyah and Vinifera Committee in relation to terrestrial fauna for EDS E2e, however provided changes in EDS E5 relating to the hollow replacement plan. I generally support these conclusions, with the exception of Regent Parrot for which I consider further mitigation is required as discussed below and in Appendix A.

I note that further survey efforts and monitoring could have identified the presence of additional threatened species in this floodplain environment. An example of additional, potentially relevant, species is provided in the "Wetland Monitoring and Assessment Program for environmental water – Stage 3 Final Report" from the Arthur Rylah Institute[16], which identified the presence of the EPBC and FFG listed Sloane's Froglet in several VMFRP project locations, including Burra Creek. While these discoveries were not made in time to be considered in the development of the ER, their presence cannot be discounted when considering impacts from the project.

Regent Parrot (eastern)

The Regent Parrot is listed as vulnerable under both the EPBC Act and the FFG Act. The species was recorded during the targeted surveys conducted in the Burra Creek project area, indicating that a population of this species is present within this area. The ER described that the species is highly mobile, and notes they typically nest within suitable hollows in River Red-gums and feed mostly on the ground in mallee woodland, with some foraging occurring in mallee trees, vineyards, orchards, cereal crops and riparian woodlands. ER specialist study B noted that the entire project area represents potential foraging habitat. Potential breeding habitat also occurs within the project area, but in more isolated patches. This species tends to breed in very large River Red-gum trees (i.e., with mean DBH of 160 cm) within 120 m of water.

The ER described that the construction of the Burra Creek project would lead to the following habitat impacts for Regent Parrot:

- removal of up to 22 ha of potential foraging habitat;
- removal of up to 6 ha of potential breeding habitat, which is within 120 m of water; and
- impacts to 26 trees identified as potential breeding trees (with a DBH>160 cm).

The ER stated that there are no breeding records of Regent Parrot within the Burra Creek project area, with the closest breeding records being 23 km to the north at Boundary Bend. The ER also stated that whilst potential foraging habitat for the species occurs within the Burra Creek project area, the habitat in the area it is not mallee woodland which is the favoured foraging habitat for the species. The ER further noted that the potential foraging habitat in the construction footprint is more likely to be used by the species for dispersal, occasional perching or non-preferred foraging.

The ER noted that the native vegetation impacts from the project represents 1.25% of potential breeding habitat and 1.25% of the potential nesting trees in Victoria within 2km of the project area. During the hearing Mr Watson, the proponent's expert witness for native fauna, stated that while the species are not known to currently breed within the

[16] Papas, P., Hale, R., Amtstaetter, F., Clunie, P., Rogers, D., Brown, G, Brooks, J., Cornell, G., Stamation, K., Downe, J., Vivian, L., Sparrow, A., Frood, D., Sim, L., West, M., Purdey, D., Bayes, E., Caffrey, L., Clarke-Wood, B. and Plenderleith, L. (2021). *Wetland Monitoring and Assessment Program for environmental water: Stage 3 Final Report*. Arthur Rylah Institute for Environmental Research Technical Report Series No. 322. Department of Environment, Land, Water and Planning, Heidelberg, Victoria

project area, there is potential for shifts in population distribution as a result of climate change, and the species could potentially utilise the Burra Creek area for breeding in the future.

The population of Regent Parrot present at Burra Creek is, however considered an 'important population' as it belongs to the Mid-Murray Victorian sub-population of breeding pairs nominated in the EPBC Act Regent Parrot Recovery Plan[17]. The proposed clearance of native vegetation for the project would reduce the area of occupancy of this population due to the loss of up to 6 ha of potential breeding habitat and 22 ha of potential foraging habitat during construction.

The SIAC noted that the project may result in the transition of approximately 50 ha of Lignum Swampy Woodland EVC to Lignum Swamp EVC, potentially resulting in the loss or decline of up to 132 Large and Very Large Trees, which has not been considered elsewhere in the ER. The SIAC noted that these trees represent approximately 12.4% of the estimated 1,067 canopy trees within the project area (i.e., proposed maximum inundation area), and considered that this EVC shift would give rise to adverse impacts on existing habitat. I do note that the addendum documents[18] provided for Burra Creek Project do not provide detail on how this figure has been calculated, to fully consider the impacts this may have on Regent Parrot. While the additional 50 ha area impacted is considered in the ER to be potential foraging habitat for the species, I also note the importance of treed flight corridors outlined in the National Recovery Plan for the Regent Parrot, and therefore consider that an additional loss of tree canopy of up to 50 ha would reduce the area of occupancy of this important population.

The Regent Parrot Recovery Plan[19] defines all potential Regent Parrot habitat within its current normal range as habitat critical to the survival of the species. All potential habitat within the Burra Creek project area is therefore part of this habitat and is considered critical to the survival of the species. I note that no breeding activity was recorded during the current surveys and the project area is outside areas mapped where breeding is likely to occur in the Recovery Plan's indicative map. However, I consider the ER contains insufficient information to rule out the possibility that potential breeding habitat could be used by the species in the future. Submitters also noted the importance of this habitat due to the potential effects of climate change.

In my previous assessments for EES Central projects and the Nyah and Vinifera projects, I considered there is potential for the Belsar-Yungera, Nyah and Vinifera projects to each result in a significant residual impact to Regent Parrot. As noted above, the Burra Creek project will also result in habitat loss for the species including both potential foraging and possible breeding habitat. Therefore, there is potential, due to additional habitat clearance for the species, for Burra Creek project to add cumulatively to impacts on Regent Parrot in conjunction with these other VMFRP projects. I note that further work regarding cumulative impacts is still being progressed for some of the VMFRP projects. The accredited environmental assessment processes for four of the VMFRP projects are still in preparation and the outcomes of these assessments will assist with the understanding of overall cumulative impacts on key MNES, including the Regent Parrot.

I consider there to be a risk of unacceptable impacts on Regent Parrot from the Burra Creek project due to the proposed removal of habitat.

As I have adopted the overarching conclusions of the SIAC regarding the project and its overall impacts, I am not commenting further on the specific EDSs that the Burra Creek Committee has adopted and/or amended, including measures and recommendations consistent with the Nyah and Vinifera assessments.

Further detail regarding my assessment of potential effects on Regent Parrot and consideration of effects in relation to protection under the EPBC Act are provided in Appendix A.

[17] Baker-Gabb, D. and Hurley, V.G. (2011). National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*, Department of Sustainability and Environment.

[18] Burra Creek Addendum – Attachment 2; Burra Creek Addendum – Attachment 3

[19] Baker-Gabb, D. and Hurley, V.G. (2011). National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*, Department of Sustainability and Environment.

Consideration of overall improvement to biodiversity

As discussed in my preceding assessments of VMFRP projects, the proponent undertook an assessment of overall improvement to biodiversity (AOIB) (ER Central Attachment VII). The AOIB report was intended to demonstrate the expected overall improvement to biodiversity of the project and support the decisions regarding the proposed alternative arrangement to offsets[20]. Based on the findings of the AOIB report, the ER stated that for Burra Creek it is expected that 403 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 20,000 ML/day scenario and that there is the potential to benefit 1,067 Large Trees within the maximum inundation area. The proponent subsequently amended the AOIB following the revision of the project and presented an updated version (Burra Creek Addendum Report – Attachment 3, Tabled Document B4F/G) which included revised information on aspects such as the expected responses of EVCs to the watering regimes in light of the Wakool effect. The AOIB considered multiple lines of evidence to demonstrate an overall improvement to biodiversity, these included:

- assessment of area and depth of managed inundation;
- assessment of threatened species' habitat supported by Habitat Importance Mapping which describes the importance of suitable habitat within the current extent of native vegetation for some species;
- assessment of native vegetation using DELWP's EnSym Native Vegetation Regulations (NVR) tool;
- assessment of ecosystem function against the criteria provided in Schedule 9 of the Basin Plan, as well as objectives for ecological assets and ecosystem functions to support waterway health identified in the Victorian Murray Long-term Watering Plan, supported by a literature review;
- comparison of VMFRP frequency and duration of inundation to Basin Plan and pre-regulation frequency and duration of inundation; and
- integration of the Murray-Darling Basin Authority (MDBA) climate change stress test (MDBA, 2021).

The AOIB report included modelled operating scenarios, which were analysed to determine whether and to what extent preferred inundation depths were achieved for EVCs. For Burra Creek, the ER found that under all scenarios the preferred inundation depths were exceeded at some point for most of the EVC types. To help address these uncertainties the proponent commissioned an independent expert elicitation by the Arthur Rylah Institute to assist in predicting likely responses of the floodplain vegetation communities (ecological vegetation classes, EVCs) under various watering regimes. Due to the timing of the assessment, the Expert Elicitation Report was included as an 'accompanying document' to the ER (Accompanying Document 2). The expert panel was comprised of public and private sector botanists and floodplain ecologists experienced with the vegetation and hydrology of the Murray River floodplain. The panel considered the optimal and tolerable ranges (based on frequency and duration of inundation) of the 24 identified EVCs associated with the broader VMFRP. The report concluded that across VMFRP four of the EVCs would not receive benefit from the proposed watering regimes, none of which were located at Burra Creek.

In response to the Expert Elicitation Report, the proponent also tabled a technical note (TNB1, Tabled Document B23) which presented further site-specific work for the Burra Creek floodplain[21], carried out by Ecological Associates. The Ecological Associates report said the Expert Elicitation Report had limited usefulness when applied to specific sites, due to the generalised nature of the expert elicitation advice on the optimal and tolerable ranges of each EVC. In the covering technical note (TNB1), the proponent noted that neither the expert elicitation report nor the Ecological Associates report considered the full range of factors which will be relevant to achieve the intended ecological and biodiversity benefits of the projects through future environmental water decision-making processes (such as such as hydrology, topography, requirements of some EVCs for a drying phase, the intervals between watering events required to maintain or improve vegetation condition (versus the number of watering per 10 year period as currently applied) and the inter-connectedness and watering trade-offs required across EVCs).

The SIAC raised concern with the reliability of the assessment of the effects and benefits through the assessment of Habitat Importance Maps in the updated AOIB due to the fact that benefit for one species and negative effects for three

[20] The alternate offset arrangement referenced here is referring to the proposal to utilise the Conservation Works Exemption process and are not in accordance with the alternative arrangements for offsets referenced in the 'Guidelines for the removal, destruction or lopping of native vegetation" DELWP 2017.

[21] Ecological Associates (2023). Hydrological analysis of Ecological Vegetation Classes in relation to expert elicitation report – Burra Creek (Tabled Document B24).

species which are not considered to be present within the project area were included (Chariot Wheels *Maireana cheelii*, Blue Mallee *Eucalyptus polybractea* and Baldoo *Atriplex lindleyi subsp. conduplica*ta Samphire Skink *Morethia adelaidensis*). The SIAC further questioned the claimed benefits for Twiggy Sida in the AOIB given it was assessed as being "unlikely" to occur in the maximum inundation area in ER Specialist Assessment B - Terrestrial. Furthermore, I note that Lignum Swamp EVC is not included in some of the information presented in the updated AOIB and specialist assessments (Addendum Report - Attachment 2), which presents challenges in understanding the response of the EVC to the operational phase of the project. For example, Table 8 of the updated AOIB presents a summary of "water regime for each EVC under its relevant operating scenario for the Burra Creek project" and while the other EVCs associated with the project are included, Lignum Swamp is not. I note that the Ecological Associates report for Burra Creek also does not provide site specific information on the Lignum Swamp EVC 104, and further note that the Expert Elicitation Report (Accompanying Document 2 to the ER) indicates that the proposed watering regimes significantly exceed the tolerable and optimal frequency for the EVC, raising concerns that the project will result in further impacts.

Submitter ANU Fenner School (S5) also raised concern with the validity of the assumptions and reasons presented in the ER for the decline in health of the floodplain wetlands due to a lack of empirical evidence (ANU Fenner School, S5). Environment Victoria's submission also highlighted that the residual risk rating for arboriculture (trees) increased as a result of the revised operational scenarios (Environment Victoria, Tabled Document B7).

The SIAC noted that Mr King, the flora expert for the proponent, described the Burra Creek floodplain as a "boom-bust" system, whereby condition of vegetation is known to rapidly change in response to environmental conditions at the time. The SIAC noted that the data collected for the ER was undertaken under dry (or "bust") conditions, and while formal surveys were not undertaken after the December 2023 flood, Mr King reported that upon visiting the site in February 2023 (during "boom" conditions) it was noted that tree health had improved, and other species such as Tangled Lignum had greatly improved in health.

The SIAC concluded that the project will enable the frequency and duration of inundation events equivalent to the Seasonal Fresh and Burra Maximum to be brought closer to the pre-regulation inundation events however there are significant uncertainties regarding the operational effects of the project on terrestrial vegetation. While the SIAC considered that the project is expected to result in improvement in condition of approximately 141.77 ha of Floodway Pond Herbland, this was largely along Burra Creek and is linked to smaller inundation events as illustrated by the Seasonal Fresh Scenario. The effects on the remaining 261.23 ha of the maximum inundation area would be subject to the reversal of terrestrialisation and the improvement of health for non-dryland flora species. The proponent submitted that reversal of terrestrialisation is central to the ecological benefits of the Burra Creek project. However, the SIAC concluded that they do not consider the reversal of terrestrialisation to be an overall benefit for biodiversity in this case, noting that this change may result in the deaths of up to 132 Large and Very Large Trees and potential displacement of up to 19 FFG listed threatened flora species in the maximum inundation area (see above and Section 6.1). These 132 Large and Very Large Trees and 19 FFG listed threatened flora species have not been included in the native vegetation removal calculations for the project. The updated AOIB does not directly address whether the loss of these Large Trees would need to be considered a loss to be 'offset' since if the trees died they would not be physically removed and remain as stags. The SIAC recommended that the potential death of Large and Very Large Trees as a result of project operation should be subject to the same assessment and approvals as the removal of trees from the construction footprint.

Furthermore, the SIAC concluded that sufficient evidence has not been presented to demonstrate the project will provide an overall benefit to the ecology and biodiversity of this floodplain environment. The SIAC considered that the information at hand does not provide justification for the Burra Creek project and that the project would not achieve the 'no net loss' to biodiversity policy objective as a result of the known impacts and ecological risks associated with this project.

As noted by the SIAC and in Section 6.1 of this assessment, I do not consider all the expected EVC changes as a result of reversal of terrestrialisation to be a benefit for the project. I further note, the project documents have raised uncertainties regarding the actual response of EVCs given the watering regimes are considered to already be largely met, and in some instances will be exceeded by project operations. I support the overall finding of the SIAC that the project would not result in a benefit to most of the Burra Creek floodplain's EVCs (i.e., within the proposed Burra Creek maximum inundation area).

The SIAC recommended, that if the project were to proceed the impact of project operations on existing vegetation communities in the proposed maximum inundation area should be reassessed, in light of revised hydraulic modelling. The SIAC also recommends that the AOIB should be updated accordingly after the completion of that work. However, as discussed in Section 6.1, I have accepted the SIAC's primary recommendation and therefore do not support further work or the recommendations for new EDSs or refinement of EDSs.

Alternative arrangement to offsets

The SIAC considered the implications for offset provisions in the project's proposed incorporated document (see further discussion of the draft PSA and associated incorporated document in Section 5.1). In their assessment of the project's benefits and impacts, the proponent sought to meet the criteria required for exemption from native vegetation offsets through an overall improvement to biodiversity (also referred to as overall benefit). As discussed above, the primary finding of the SIAC, and this assessment is that the project would not provide an overall improvement to biodiversity values and is not needed. Therefore, the project is not able to achieve the policy objective of ensuring 'no net loss' to biodiversity as a result of the removal, destruction or lopping of native vegetation. However, the SIAC noted that if the project does proceed, they recommend the adoption of the Nyah and Vinifera Committee's recommendation that the offset arrangements for the project should require the final assessment of offsets to be deferred until there is clear evidence of the benefits of the project being delivered.

As stated in my assessment for the Nyah and Vinifera projects, I do not support the recommendation for a deferred decision on offset requirements, as this approach is not consistent with state planning policy and does not allow sufficient clarity regarding offset requirements and their ability to be secured prior to construction and vegetation clearance occurring. As per the state's Native Vegetation Guidelines[22], for any native vegetation to be removed, any offsets required are to be identified and secured *prior to commencing vegetation removal*. The Native Vegetation Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria. Requiring offsets to be identified and secured prior to native vegetation removal is a precautionary approach that aims to ensure that there is appropriate certainty regarding the availability and implementation of the offset/compensation for any removal of native vegetation that is approved. This policy is intended to provide an appropriate safeguard to achieve the state policy objective of 'no net loss' of biodiversity in Victoria.

I also note that this approach is inconsistent with the specific requirements for a conservation works exemption (CWE), which is the general approach on which the proposed alternative offset arrangement is based on for the project. As noted in the AOIB reports prepared for the ER, the standard CWE is not available to the project as the planning approval for the projects is proposed to be bespoke (via a PSA) rather than a planning permit application. The proponent is thus seeking an alternative offset arrangement[23] which would be the equivalent of a CWE for the projects. The AOIB reports sought to provide the information required for DEECA to consider the suitability of such an alternative offset arrangement. In a submission from DEECA, it was noted the Environment Portfolio had drafted and supplied un-published guidance information[24] specific to the project which aimed to assist the proponent in understanding how the intended benefits of environmental watering could be assessed and documented, including what information was needed to support the proposed alternative offset arrangement. There are key aspects that need to be considered in evaluating applications for large-scale conservation works exemptions / alternative offset arrangements, which are essentially unique at this point, given the unprecedented scale of the VMFRP projects. These key aspects, as noted in the DEECA submission, are:

- *That a clear overall improvement in biodiversity must be demonstrated through a comparison assessment of impacts and benefits, which clearly provides the predicted benefits to biodiversity values.*
- *That methodology and information including data, expert opinion, previous reports for similar projects that have delivered these benefits and published work should be included.*

[22] DELWP (2017) Guidelines for the removal, destruction or lopping of native vegetation.

[23] The alternate offset arrangement referenced here are referring to the proposal to utilise the Conservation Works Exemption process, and are not in accordance with the alternative arrangements for offsets referenced in the 'Guidelines for the removal, destruction or lopping of native vegetation" DELWP 2017

[24] Conservation Work Exemption - Further Guidance (Large and/or Complex Projects) (DELWP Biodiversity Division guidance to VMFRP 2021), as referenced in submission no. 12

- *That proposed monitoring is described and undertaken to ensure the primary objectives of the conservation work are being achieved.*

Conditions included within the draft PSA incorporated document provide scope for the consideration of this approach including:

- Condition 4.6.1 (outlining the requirements for offsets to be acquired prior to the removal destruction or lopping of native vegetation, unless the Secretary of DEECA provides written agreement that the project demonstrates an overall improvement for biodiversity); and
- Condition 4.6.2 (outlining monitoring requirements to evaluate the extent to which an overall improvement to biodiversity has been achieved).

As noted in the DEECA submission, an application for a CWE for large and complex projects must demonstrate a "clear overall improvement in biodiversity through a comparison assessment which clearly provides the predicted benefits to biodiversity values". In light of the conclusions by the SIAC that the project does not demonstrate an overall improvement to biodiversity, I recommend that the project should not proceed. I have therefore refrained from further examination of the EDSs and associated recommendations.

In addition, as discussed in Section 5.1 it is my recommendation that the Burra Creek project is not included in proposed Amendment C78 to the Swan Hill Planning Scheme in the context of my conclusions on this project and its effects.

My assessment in relation to biodiversity offsets under Commonwealth legislation is provided in Appendix A.

Assessment

Consistent with the SIAC conclusion, it is my assessment that the project would not achieve an overall improvement to biodiversity and is therefore not justified. It is also my assessment that construction of the Burra Creek project will result in significant and unacceptable adverse effects on biodiversity and habitat values particularly due to:

- direct clearance of up to 21.6 ha of native vegetation and loss or impacts to 188 Large and Very Large Trees, most of which is occurring on land reserved for conservation;
- loss of fauna habitat due to vegetation clearance, including loss of approximately 136 hollow-bearing trees during the construction phase which provide habitat, including for threatened species of fauna.
- removal of a number of individuals of threatened flora species protected under the FFG Act; and
- potential for cumulative impacts on biodiversity values in conjunction with the construction of other proposed VMFRP projects, including for the FFG Act and EPBC Act-listed Regent Parrot.

As noted in Section 6.1 operation of the project could also result in additional impacts to native vegetation including the predicted transition of approximately 50 ha of Lignum Swampy Woodland EVC to Lignum Swamp EVC, and the associated loss or decline of approximately 132 Large and Very Large Trees and displacement of approximately 19 FFG listed threatened flora species in the maximum inundation area.

As discussed in Section 5.1 it is my recommendation that the Burra Creek project is not included in Amendment C78 to the Swan Hill Planning Scheme in the context of my conclusions on this project and its effects.

My detailed assessment in relation to all relevant MNES for both projects is provided in Appendix A, which includes consideration of potential effects on terrestrial species listed under the EPBC Act.

6.3 Aquatic ecology

Assessment context

Effects on aquatic ecology are addressed in Chapter 17 of the ER, in the Ecology - Aquatic specialist study A appended to the ER, and in Section 4 of the Addendum Report Attachment 2. The SIAC's report discussed their findings in relation to aquatic ecology in Section 6.

The ER defined aquatic ecology as the plants and animals that occur primarily in freshwater waterbodies, including riparian vegetation which consists of large and small trees, shrubs and ground cover plants. The ER described that Burra Creek provides refuge, breeding and foraging areas for native fauna species, including fish, frogs and turtles.

The ER considered potential benefits of the project for aquatic ecology and concluded that the project would result in increased hydrological variation and would create large areas of shallow, still and slow flowing waters that favour small bodied native fish including threatened species such as the Murray-Darling Rainbowfish. The ER also stated that there would be benefits to short-term foraging habitat for medium to large-bodied fish and freshwater turtle species, and that there would be increased breeding habitat for native small-bodied fish, and nursery habitat for large-bodied native fish.

A number of potential impacts of the project on aquatic biodiversity values were examined through the ER, Addendum Report and inquiry process, in particular: loss or degradation of aquatic habitats; effects on threatened aquatic species; pest plant and animal species, including carp; stranding of aquatic species during drawdown; salinity effects and cumulative effects.

The ER examined the potential impact pathways to threatened aquatic species including the potential for aquatic fauna to become stranded on the floodplain during drawdown and the potential of the operational phase of the project to increase food resources for a range of terrestrial fauna, including foxes. The ER concluded that there is potential for fox abundance to increase as a result of the project, which could pose a significant risk to turtle populations. The EMF included monitoring and control measures to address this potential impact on threatened aquatic species, and a number of these measures have been subject to recommendations by the SIAC as discussed below.

The EMF included 11 EDSs specifically addressing potential effects of the project on ecology values, some of which were subject to recommendations by the SIAC. Key measures included in the EDSs for aquatic ecology include preparation of a native flora and fauna management sub-plan (EDS E2). A pest plant and animal monitoring and management plan is also proposed in EDS E3.

Overall, the ER concluded that the project would increase the extent and condition of potentially suitable habitat for EPBC Act and FFG Act listed threatened aquatic fauna species, as well as for floodplain and wetland flora. The Addendum Report concluded that the amended project description for Burra Creek does not result in any changes to the conclusions presented in ER specialist study A Aquatic Ecology. The Addendum Report did note that increased frequency of operation would increase water availability and potentially provide further opportunities for pest terrestrial fauna, however, it concluded that implementation of the management controls would ensure that potential effects to aquatic species remain low. There was no change in the overall assessment of cumulative effects for aquatic ecology.

This section provides my assessment of the acceptability of potential impacts on aquatic ecology, which are closely linked to the effects on surface water as discussed in Section 6.4, as well as other impacts on biodiversity as discussed in Section 6.2. Additional detail on my assessment of effects on aquatic species protected under the EPBC Act is also provided in Appendix A of this assessment.

Discussion

Construction impacts

Chapter 17 of the ER considered a range of potential impacts to aquatic ecosystems from construction of the project including direct impacts, loss of habitat connectivity, degradation of aquatic habitat, spread of weeds, pest species and pathogens, noise and vibration, and light.

Concerns regarding the impacts of construction works on aquatic ecology were not raised in submissions. The SIAC noted that the Wakool effect did not result in any changes to the proposed project infrastructure or the construction methods to be used.

The Burra Creek Committee recommended a change to EDS E2f to explicitly state that construction works are to be undertaken under no-flow conditions and outside fish migration periods should the project proceed, consistent with the recommendations of the EES Central Committee and the Nyah and Vinifera Committee. Mr Benier, an aquatic ecology expert witness for the proponent, did not consider this change was needed for Burra Creek, as construction works for the Burra Creek project are proposed to occur during periods when sites are dry. While in principle I support the SIAC's recommended changes to EDS E2f, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on EDSs.

Further consideration of potential effects on surface water and associated mitigation measures is provided in Section 6.4 of this assessment.

Operational impacts

Aquatic fauna connectivity and fish stranding

The project has the potential to impede passage of aquatic fauna and result in the loss of connectivity through the construction and operation of key project infrastructure such as regulators and containment banks. The ER noted that the residual effect on connectivity and passage for native aquatic species from the operation of the regulators is expected to be low at Burra Creek.

During the hearing, the SIAC explored the question of why a fishway was not proposed as part of the Burra Creek project, as raised in the submission from FoNVP. The FoNVP submission noted that a fishway has recently been constructed in Gunbower Creek. Mr Benier provided justification for why a fishway was not proposed for Burra Creek including that Burra Creek does not have a weir or similar barrier to fish passage, and Burra Creek is not suitable habitat for large-bodied native fish (other than for short-term foraging). The Committee accepted Mr Benier's evidence that a fishway is not required for the Burra Creek project. I agree with this finding.

Consistent with the recommendations of the Nyah and Vinifera Committee, the Burra Creek Committee recommended inclusion of a new EDS SW5 to ensure regulators are designed with suitable flow velocities for target fish species, and that the design of containment banks and spillways should have regard to the facilitation of passage of turtles. The SIAC noted that while the Burra Creek project may not have specific objectives for specific target fish species, it does have a general objective (like the other VMFRP projects) of protecting and restoring floodplain ecosystem biodiversity values, function and habitat components, including for key species and communities. While in principle I support the SIAC's recommended addition of EDS SW5, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on EDSs or the EMF.

The SIAC noted that the updated project description for Burra Creek involves more pumped events but is not expected to significantly increase the risk of fish entrainment or strandings. The SIAC also highlighted the importance of carefully managing the fish exit strategy to ensure drawdowns and releases are appropriately timed to avoid strandings where possible.

The Burra Creek Committee recommended the wording of EDS SW2 and monitoring requirement M AE7 be changed to be consistent with the wording recommended by the Nyah and Vinifera Committee to refer to native fish strandings. The SIAC argued that, should the project proceed, fish strandings should be monitored to ensure impacts on large- and small-bodied native fish (including the Murray-Darling Rainbowfish) are acceptable. While in principle I support this amendment, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on EDSs or the EMF.

Salinity and degradation of aquatic habitat

The potential for the operations phase of the project to result in the degradation of aquatic habitat was considered in the ER, with a focus on potential water quality and water regime changes. The impact pathways assessed were:

- introduction of water to floodplain environment leading to anoxic blackwater events on the floodplains or in receiving waterways that adversely impact aquatic species;
- operation of the project leading to salinity changes that adversely impact aquatic species;
- operation of the project leading to changes in geomorphology and aquatic habitat degradation due to increased erosion/sedimentation;
- operation of the project leading to alteration to the natural flow regimes of rivers and streams, leading to conditions unsuitable for aquatic species; and
- spillage or leaks of toxic substances or litter during refuelling or maintenance of infrastructure such as pumps or from storage facilities entering waterbodies, leading to water quality unsuitable for aquatic species.

Several EDSs were proposed to address the risks of the potential impact pathways including EDS SW2 (Surface Water – Operation) and EDS SW3 (Surface Water – Monitoring, Evaluation and Reporting) which aim to identify and mitigate effects on water quality and potential impacts to biodiversity values. With the implementation of the relevant EDSs, the ER concluded that the significance of the residual effects of the project related to aquatic habitat degradation from changes to water quality or the water regime are low to insignificant.

A number of submitters, including FoNVP and Environment Victoria, were concerned about risks to aquatic ecosystems and biota associated with poor water quality, especially the increased frequency of blackwater events. The key water quality issue considered by the SIAC was the potential for increases in salinity. The SIAC accepted Mr Benier's evidence that the slightly elevated salinity levels predicted as a result of the Wakool effect will still meet relevant water quality standards for aquatic species and should not significantly impact aquatic species in waterways should the project proceed.

The SIAC supported the revisions made to EDS GW2 in the Day 1 version of the EDSs to include groundwater monitoring wells in the parts of the project area that are expected to be the most sensitive to salinity increase, and to review project operations if a significant trend of increasing salinity is identified. The SIAC also recommended amending monitoring requirement M GW1 to add an additional monitoring well in a part of the Burra Creek inundation areas that is susceptible to a shallow groundwater table. While in principle I support these amendments, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on EDSs and the EMF.

Further consideration of potential effects on surface water and associated mitigation measures is provided in Section 6.4 of this assessment.

Carp and other aquatic pest species

The ER examined the potential effects on Common Carp *Cyprinus carpio* (Carp), which are present in the project area. Carp are considered a significant pest in aquatic ecosystems due to their ability to out-compete native species for habitat and food. They are also known to impact native species directly through egg and larvae/tadpole predation and indirectly through an increase in sedimentation which can smother eggs and impact the gills of native fish. The ER stated that the operation of the project is likely to lead to habitat and water quality conditions suitable for breeding or dispersal of Carp, leading to an increased population on the floodplains or in receiving waterways with a medium significance residual effect.

The proposed mitigation measures, including EDS SW2, are intended to minimise the potential effect that Carp may have on threatened species and their habitat. However, the ER noted that even with the implementation of these mitigation measures there is a risk that Carp populations may still increase on the floodplain and in receiving waters such as the Murray River. As noted in ER specialist study A, inundation of the floodplain during spring and summer would provide ideal conditions for Carp breeding. Given the potential for Carp to negatively affect aquatic ecosystem health if they become established within aquatic habitat, the ER concluded that the significance of the residual effect is medium.

The SIAC noted that the Burra Creek project, like all other VMFRP projects, has the potential to result in Carp proliferation. The SIAC noted that, should the project proceed, the EDSs propose to manage and monitor Carp under

E2d, E3 and E4c. The SIAC noted that the Day 1 version of the EDSs included the changes recommended by the Nyah and Vinifera Committee to amend EDS E3 to include a reference to aquatic fauna species, including Carp.

The SIAC also noted that, should the project proceed, the fish monitoring to be conducted as part of the Monitoring, Evaluation and Reporting Plan for the VMFRP projects[25], will further assist in assessing the impacts of the Burra Creek project on Carp (as well as native fish species), and informing the adaptive management of the project's operations. I agree with this finding.

In relation to aquatic weeds, the SIAC noted that some aquatic weeds have the potential to extend their current distribution within the maximum inundation area as a result of the operation of the project. However, the SIAC concluded these impacts are acceptable and can be appropriately managed by the proposed Day 1 EDSs and monitoring requirements. I agree that, with the diligent implementation of these measures, the potential impacts associated with spread of aquatic weeds should be able to be managed to acceptable levels.

Overall, I consider the proposed Day 1 EDSs and monitoring measures, incorporating amendments proposed by the SIAC, are adequate to appropriately manage risks to aquatic ecology associated with Carp and other aquatic pest species, should the project proceed.

Effects on threatened aquatic species

The ER stated that, based on desktop assessment, the project has the potential to impact a number of threatened aquatic fauna listed under the EPBC Act and FFG Act which are considered to be likely or possibly present within the study area (i.e., the area approximately 10 km radius around the construction footprint and the maximum inundation area) (see Table 6-7 below). ER specialist study A also noted that the study area includes the FFG Act listed Lowland Riverine Fish Community of the Southern Murray-Darling Basin and that a number of species that define that community are likely to occur within the study area.

Table 6-7 Listed threatened aquatic fauna considered likely or possibly occurring in the study area in the ER (ER Chapter 17).

Species	EPBC Act status	FFG Act status	Presence in project study area
Freshwater Catfish	-	Endangered	Possible
Murray Cod	Vulnerable	Endangered	Likely
Murray-Darling Rainbowfish	-	Endangered	Present
Silver Perch	Critically endangered	Endangered	Likely
Murray River Turtle	-	Critically endangered	Possible
Broad-shelled turtle	-	Endangered	Possible

The ER identified that the FFG Act listed species Murray-Darling Rainbowfish *Melanotaenia fluviatilis*, Freshwater Catfish *Tandanus tandanus*, Murray River Turtle *Emydura macquarii* and Broad-shelled Turtle *Chelodina expansa* possibly occur within the Burra Creek study area and could be potentially impacted by the project. Chapter 17 of the ER identified that the species are generally expected to positively benefit from the operational phase of the project, through increases in

[25] Sparrow, A., Jones, C., Bennetts, K., Bush, A., Harrow, S., Lumsden, L., Menkhorst, P., Nelson, J., Papas, P., Scroggie, M., Sinclair, S. and White, M. (2021). *Victorian Murray Floodplain Restoration Project: Ecological monitoring, evaluation and reporting plan*. Unpublished Client Report for Mallee and North Central Catchment Management Authorities. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria

habitat availability and habitat connectivity, and an increase in riparian vegetation for shading and bank stabilisation. The ER noted that the operational phase of the project has the potential to result in impacts on threatened aquatic fauna, noting that Carp poses the greatest risk to wetland ecosystems and the project would increase the extent of potential habitat for spawning and recruitment of Carp, potentially leading to an increase in local populations. The ER also noted the potential for the project to lead to anoxic blackwater events which may impact aquatic fauna, and that increased abundances of the Red Fox may result in increased predation on freshwater turtles.

While the ER noted that the FFG listed species Murray Spiny Crayfish *Euastacus armatus* is unlikely to occur in the project area, several submitters raised concerns that the operation of the project would pose a risk to the species through water quality changes and degradation of aquatic habitat. The submission from DEECA states that DEECA does not consider the project to pose an unacceptable risk or consequence to the State-wide population of any aquatic FFG listed fauna species.

The ER included a range of EDSs to mitigate potential impacts on aquatic ecology including pest animal control to minimise impacts of turtle predation by foxes (EDS E2d), monitoring of water quality (EDS SW2 and SW3) and mitigation measures to minimise the potential effect that Carp may have on threatened species and their habitat (EDS SW2).

The SIAC specifically considered potential impacts on turtles in their report, noting that they accept Mr Benier's evidence that the project poses low risk to turtles. The Committee recommended that containment banks and spillways should be designed having regard to turtle passage should the project proceed however noted that this is addressed by the Day 1 EDSs for Burra Creek in EDS SW5.

I consider that the potential adverse impacts on FFG Act listed species potentially occurring in the area including the Murray-Darling Rainbowfish, Freshwater Catfish, Murray River Turtle and Broad-shelled Turtle can be acceptably managed through the implementation and recommended refinement of the proposed EDSs and monitoring requirements.

The ER also identified that EPBC Act listed Murray Cod *Maccullochella peelii* (listed as vulnerable under the EPBC Act and as endangered under the FFG Act) and Silver Perch *Bidyanus bidyanus* (listed as critically endangered under the EPBC Act and as endangered under the FFG Act) are both likely to occur in the project area, as suitable habitat is present in the Murray River adjacent to the project area and both species have been regularly recorded upstream and downstream of the area.

The ER found that Murray Cod is unlikely to be significantly impacted by the project. Residual impacts from invasive species such as Carp, pathogens, potential barriers to movement with the construction and operation of the project, noise, spills and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. The ER also found that Silver Perch is unlikely to be significantly impacted by the project. Residual impacts from Carp, potential barriers to movement with the construction and operation of the project, spills and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. The ER stated that the project is expected to lead to slight improvements in populations of Murray Cod and Silver Perch due to increased foraging opportunities when the floodplains are inundated, increased food availability and improved habitat quality and connectivity.

With the implementation of the EDSs including amendments recommended by the SIAC and this assessment, I agree with the SIAC that the project is unlikely to have a significant adverse impact on Murray Cod and Silver Perch. Cumulative impacts on Murray Cod are discussed further below. My consolidated assessment of the potential impacts of the project on EPBC Act matters is also provided in Appendix A of this assessment.

Cumulative effects on aquatic ecology

The ER considered the potential cumulative effects related to aquatic ecology with the implementation of all VMFRP projects. The following effect pathways were identified in ER specialist study A Ecology – Aquatic and specialist study C Surface Water:

- loss of connectivity and impeded passage for native aquatic species;
- drawing down wetlands strands aquatic species on the floodplains;

- spread of weeds, pest species or pathogens;
- changes in the Murray River flow that could impact river users and environmental values as a result of delivering environmental water to multiple sites; and
- impacts on Murray River water quality due to construction of multiple sites at the same time or during operation due to poor quality of water.

The ER concluded that most of the effect pathways were unlikely to result in significant cumulative impacts, however noted that there was potential for the project to result in increased numbers of invasive terrestrial fauna in the project area due to increased water availability. The ER considered it possible that this increase in terrestrial pest species could result in a cumulative adverse effect within the Murray Darling Basin from impacts on water quality (e.g., due to erosion caused by pigs wallowing), reduction of food sources or direct impacts on turtle nesting habitat.

Submissions from FoNVP and Environment Victoria raised concerns about the cumulative impacts of the VMFRP projects on aquatic ecology, with specific reference to the potential for cumulative salinity impacts.

Cumulative effects of the Burra Creek project in relation to the other eight proposed VMFRP projects, the New South Wales Sustainable Diversion Limit Adjustment Mechanism projects, and The Living Murray projects at Gunbower Forest, Hattah Lakes and Chowilla on Murray Cod were assessed in ER Accompanying Document 1. This report concluded there are unlikely to be cumulative adverse effects on Murray Cod. Based on the information provided in the ER Central documentation I support the view that the project is unlikely to have significant impacts on this species when considered individually, however I note that under the National Recovery Plan for the Murray Cod[26], low level impacts to Murray Cod which may be deemed to be insignificant on their own can be considered significant when the impacts are viewed cumulatively. The Recovery Plan notes that the cumulative impact of many small or low risk threats, including changes to water quality or fish kills, can pose significant impacts to the species.

As discussed in the sections above, the Burra Creek project does have potential to result in an increase in Carp populations in the project area, which is expected to add cumulatively to similar effects for other VMFRP projects, should they proceed. With implementation of the proposed EDSs and monitoring requirements for aquatic ecology including amendments recommended by the SIAC and this assessment, I consider the potential cumulative impacts on aquatic biodiversity, including for the Murray Cod, can be managed acceptably. Further consideration of cumulative impacts in relation to fish species protected under the EPBC Act is provided in Appendix A.

Assessment

It is my assessment that the adverse effects on aquatic ecology values, including potential impacts on FFG Act listed aquatic fauna, associated with the project could be acceptably managed with the implementation of the proposed EDSs and monitoring measures, including amendments recommended by the SIAC. The Burra Creek project may result in increased proliferation of Carp, however, with implementation of the proposed measures to manage and monitor Carp populations, I consider these effects could be acceptably managed. While in principle I support the recommended amendments to EDSs E2f and SW2 and monitoring requirement M AE7, as well as the addition of EDS SW5, I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDSs and EMF.

My assessment of threatened aquatic species listed under the EPBC Act (Murray Cod and Silver Perch) is provided in Appendix A.

2. Clunie and Koehn (2010) National Recovery Plan for the Murray Cod *Maccullochella peelii peelii*[26]. Department of Sustainability and Environment.

6.4 Surface water and groundwater

Assessment context

Effects on surface water and groundwater are addressed in the ER within Chapter 18 of the main report, as well as in the Surface Water specialist study C and Groundwater specialist study D appended to the ER, and in Sections 2 and 3 of the Addendum Report Attachment 2. Surface water and groundwater effects were considered in Section 3 of the SIAC report.

The Burra Creek project is located within the Murray River Reserve managed by Parks Victoria along the floodplain of Burra Creek, on the western bank of the Murray River upstream of the Wakool River. The floodplain between Burra Creek and the Murray River is known as Macreadie Island. The Burra Creek project is focused entirely on the Burra Creek North floodplain, which is the downstream part of Macreadie Island. Burra Creek is an anabranch of the Murray River, originating upstream of the Murray River and Wakool River junction and extending northwards for around 54 km through the Burra Creek floodplain, before re-joining the Murray River upstream of the Major Mitchell Lagoon.

The Burra Creek project contains three wetlands mapped on the Victorian Wetland Inventory; none of these are within the construction footprint and only part of one wetland is within the maximum inundation area. There are no wetlands within or in close proximity to the Burra Creek project that are listed as nationally or internationally important; the nearest is the Heywood Lake, located approximately 11 km northwest (downstream) of the Burra Creek project area.

The ER noted that the environmental values of surface water in the region are water dependent ecosystems[27] and species, irrigation, water-based recreation, livestock drinking water, human consumption of aquatic foods, Traditional Owner cultural values, human consumption after appropriate treatment, and industrial and commercial uses. The ER also noted that there are five licenced water users in the Murray River alongside the Burra Creek floodplain and five licenced water users in Burra Creek, however, there are no water extraction points within the Burra Creek project area.

The ER stated that flow regulation of the Murray River has resulted in a decline in the condition of the floodplain health due to reduced flooding frequency and duration, and that the condition is likely to decline further due to the decreases in frequency and duration of natural inundation expected with climate change. The ER noted that, along with seasonal factors (e.g., temperature, dissolved oxygen), inundation frequency influences water quality in surface waters within the floodplain.

The ER detailed that groundwater is present in a shallow alluvial aquifer, typically less than 5 m below ground close to the Murray River across most of the Burra Creek project area. Further from the river to the west, groundwater depth in the shallow alluvial aquifer increases to around 10-20 m deep. The ER also noted that groundwater salinity in the aquifer across the Burra Creek project area ranges widely, from 3,100 mg/L to 5,400 mg/L total dissolved solids near the Murray River and becoming more saline away from the Murray River (to the west and the east), reaching concentrations of between 13,000 mg/L to 20,000 mg/L total dissolved solids.

The ER identified environmental values associated with groundwater including water dependent vegetation, which occurs across parts of the project area where groundwater is fresh and shallow enough for vegetation use. The ER noted that there are currently no licenced groundwater users that would have their groundwater resources affected by the project. There is one extractive use bore within 15 km of the Burra Creek project area, however, it would not be affected by the project as it is located on the other side of the Murray River, in NSW, hydraulically up-gradient of the project area.

The ER stated that the project is expected to result in increased groundwater recharge, with associated rising groundwater levels around the maximum inundation areas, which would benefit water dependent, deep-rooted vegetation through increased water availability. The ER noted that no change in groundwater quality (not already occurring or possible due to natural inundation events) is expected as a result of the project.

[27] As defined in the EPA environment reference standard as “any water environment from small to large, from pond to ocean, in which plants and animals interact with the chemical and physical features of the environment”.

The ER examined the potential adverse effects of the project on surface water quality. For construction, the ER identified the following potential effects:

- erosion and runoff from disturbed construction areas creating increased turbidity and sedimentation of waterways;
- exposure of contamination or acid sulfate soils during excavation;
- contamination as a result of construction activities and accidental spills;
- discharge of saline groundwater to waterways if dewatering of construction sites is required; and
- clearing of riparian vegetation at construction sites causing localised increases in temperature.

For operation, the ER and Addendum Report identified the following potential effects:

- erosion around regulating structures;
- discharge of saline groundwater into the Murray River;
- return flows contributing to nutrient load and algal growth; and
- low dissolved oxygen events.

The ER also found potential for cumulative adverse effects on downstream water quality during construction if multiple sites are constructed at the same time. This would be due to dewatering and disposal of saline groundwater to waterways or soil disturbance and runoff with high turbidity and/or other contaminants. There are also potential adverse cumulative effects on downstream water quality during operation if managed inundations occur in multiple sites at the same time and return flows low in dissolved oxygen and/or high in salinity occurs. In relation to low dissolved oxygen, the ER found that there are sufficient Murray River passing flows (even during low river flow conditions) to provide mixing and dilution to the extent that any effect of low dissolved oxygen would be rapidly mitigated and not extend downstream. The ER also identified potential cumulative adverse effects on water quality in the Murray River due to return flows high in salinity.

The ER also examined potential adverse effects on groundwater values. For construction, the ER identified the potential for localised groundwater drawdown during construction of the drop structure affecting water dependent vegetation. For operation, the ER identified the potential for a small increase in groundwater return flow to the Murray River with associated modest increase in salt load and the potential for intermittent shallow groundwater levels causing land and soil salinisation in localised areas.

The ER proposed three specific EDSs to manage the adverse effects related to surface water (SW1 to SW3) and two specific EDSs to manage groundwater-related adverse effects (GW1 and GW2). In summary:

- SW1 requires processes and measures to manage adverse effects on surface water during construction to be included in the CEMP;
- SW2 requires consideration of measures to avoid, minimise or manage adverse surface water effects during operation;
- SW3 requires monitoring volume, duration, frequency and surface water quality during operation;
- GW1 requires measures to manage adverse effects on groundwater during construction to be included in the CEMP; and
- GW2 requires the OEMP to include monitoring groundwater and surface water levels, flow and salinity during operation.

Two monitoring requirements for surface water (M SW1 and M SW2) and three for groundwater (M GW1 to M GW3) were also proposed in the EMF.

The ER concluded that with the implementation of the proposed EDSs and monitoring requirements, the significance of the residual adverse effects related to surface water and groundwater is insignificant to low.

Discussion

The SIAC considered that the key issues associated with surface water and groundwater relate to (i) modelling and assessment of floodplain hydraulics (discussed in Section 6.1), (ii) blackwater and algal bloom events, and (iii) groundwater and salinity. Issues (ii) and (iii) are discussed below.

Blackwater and algal bloom events

The ER explained that blackwater can occur in wetlands and floodplains when large amounts of organic material, high in dissolved organic carbon and nutrients, decompose rapidly, consuming dissolved oxygen in the water more quickly than it can be replenished. This can result in water taking on a black appearance and cause hypoxic or anoxic conditions, leading to the death of aquatic organisms. The ER noted that blackwater is a natural occurrence and that not all blackwater events result in fish kills.

The ER modelled the potential for extreme cases of low dissolved oxygen blackwater to develop as a result of the project. It determined that there is potential for low dissolved oxygen conditions to occur during managed inundations and that maintaining throughflow is important to minimise the potential for and duration of low dissolved oxygen. The modelling also showed that during a widescale natural blackwater event where the Murray River has low dissolved oxygen, the operation of the project would not increase the occurrence of low dissolved oxygen in the river. The ER proposed the preparation of operating plans under EDS SW2 to consider measures to avoid, minimise and manage potential adverse effects when planning environmental watering actions, such as maintaining throughflow during managed inundation if appropriate and possible to mitigate anoxic conditions, as well as factoring seasonal implications in the timing of filling and drawdown. Monitoring in relation to blackwater events was also proposed under monitoring requirement M SW2 as part of the EMF's monitoring program. The ER concluded that with the implementation of EDS SW2, the significance of the residual adverse effect on surface water environmental values is low.

The ER identified increased algal blooms as another risk of the project. This risk is increased with the extension of managed inundation events into early summer and associated higher temperatures and light levels. The proposed EDS SW2 also seeks to minimise risks associated with algal bloom development by considering the seasonal implications in the timing of managed inundation events. The Addendum Report did not discuss any changes to the risk of algal blooms.

The Addendum Report presented a revised analysis of blackwater effects under the updated operational scenarios for the project, including remodelling of potential blackwater (low dissolved oxygen) risks due to changed frequency and duration of inundation. Both the modelling presented in the exhibited ER and the remodelling presented in the Addendum Report were undertaken using the method described in the Surface Water specialist study C appended to the ER, which relied on local hydraulic modelling and hydrological river system modelling as well as blackwater models. The blackwater model for the Burra Creek project area assumed the flow direction on the Burra Creek floodplain is from south to north, as represented in the Jacobs Burra model (refer to Section 6.1). The remodelling focused on pumped inundation associated with the Burra Maximum operating scenario. The Addendum Report stated low rates of throughflow (<60 ML/day) may not be sufficient to mitigate low dissolved oxygen and that higher throughflow (approximately 100 ML/day) would be required to flush low dissolved oxygen water. The Addendum Report concluded that the assessment of effects remains unchanged from those documented in the exhibited ER.

At the roundtable, Dr Treadwell gave evidence that variable dissolved oxygen has been observed across the Burra Creek floodplain in unmanaged events and expected this would also be the case for managed events. He confirmed that a throughflow rate of 100 ML/day would be required to mitigate low dissolved oxygen in pumped inundation events, and that this rate was larger than the 40 ML/day capacity of the proposed temporary pumps. Therefore, it is likely that low dissolved oxygen would persist on the floodplain throughout a pumped inundation event. Dr Treadwell also stated that, even if insufficient throughflow is available to re-oxygenate the whole floodplain, small volumes of inflow would be beneficial in terms of providing localised refuges. He added that more frequent inundation would also be beneficial for dissolved oxygen in the longer term by reducing the load of organic matter accumulated on the floodplain.

The SIAC asked Dr Treadwell whether there were any implications for the blackwater modelling of the changed understanding of the floodplain inundation process resulting from the Wakool effect. He considered the Wakool effect was not relevant to the pumped scenario that was modelled but conceded that it is relevant to the existing situation, which

has not been modelled by the proponent. Dr Treadwell was not able to say whether the proposed containment banks and spillways could impact on flow interaction between the Murray River and floodplain in unmanaged events, or whether this could make a difference to the severity of blackwater events. The SIAC considered that the implications for blackwater risks of introducing the proposed project infrastructure in unmanaged inundation events (in view of the Wakool effect and changed understanding of floodplain inundation processes) is not clear without further analysis.

Dr Treadwell also advised that blackwater effects in a flood capture scenario had not been reassessed and were not discussed in the Addendum Report given event duration requirements for floodplain inundation are currently being met and flood capture is no longer required. The SIAC noted that the Wakool effect is potentially relevant to flood capture and considered that, given a high degree of operational flexibility is sought for adaptive management, blackwater implications of flood capture should be considered, unless it is intended to fully exclude this mode of operation.

Submitters raised general concerns regarding blackwater and algal bloom events applicable to the three projects covered in the ER. These are discussed in SIAC Report No. 2 and in my assessment of the Nyah and Vinifera projects. No submissions raised specific concerns regarding blackwater and algal bloom risks for the Burra Creek project.

The Burra Creek Committee adopted the discussion of the Nyah and Vinifera Committee on blackwater and algal bloom issues[28] in relation to the Burra Creek project and agreed with the Nyah and Vinifera Committee's findings that: (i) changes to EDS SW2 are required to clarify the purposes that are to guide the site-specific management of operational risks related to surface water and to refine the measures that are to be applied for the identified purposes; and (ii) it is appropriate to require a protocol under EDS SB3 to manage community expectation regarding blackwater and algal blooms as recommended by EPA. As noted in my assessment of the Nyah and Vinifera projects, I supported the recommended amendments of the Nyah and Vinifera Committee to EDSs SW2 and SB3. While in principle I support the recommended amendments to EDSs SW2 and SB3, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on the EDSs and EMF.

The SIAC found that, if its primary recommendation was not followed and the project were to proceed, there should be further analysis of the implications of the Wakool effect and project infrastructure on blackwater risks, particularly in relation to unmanaged inundation events and flood capture events (if the intention is to have the flexibility to operate the project for flood capture). The SIAC recommended the addition of a new EDS (SW6) to the EMF to require further assessment prior to detailed design of whether and to what extent (i) project infrastructure may contribute to blackwater events in unmanaged inundation events and (ii) flood capture events may contribute to blackwater events. The SIAC specified that the further assessment under EDS SW6 must be based on the further hydraulic analysis and assessment recommended under EDS SW4 and must include consideration of the implications of blackwater effects from the Wakool River. Any further mitigation measures that may be required to minimise the project's impact on blackwater events are also to be determined under EDS SW6.

As detailed in Section 6.1, I do not support the SIAC's recommendation for further hydraulic analysis under EDS SW4 as the further work would not contribute to the understanding of floodplain hydrology, achievement of benefits nor reduction of impacts that are central to the acceptability of the project's environmental outcomes. As the addition of EDS SW6 leans on the outcomes of EDS SW4, I do not support the recommendation by the SIAC that further work should be undertaken to refine the understanding of blackwater risks due to project infrastructure and operation. It is my view that this further work would not help in refining the understanding of the aspects that influence the acceptability of the project's effects.

Groundwater and salinity

The ER identified that construction of the drop structure adjacent to the Murray River is expected to intersect groundwater and that temporary dewatering will potentially be required for a few months during construction. As such, water quality might be adversely affected due to the potential discharge of saline groundwater to waterways. The ER stated that the dewatered groundwater would be low salinity (less than 1,000 mg/L) and of similar quality to the Murray River.

[28] Refer to Section 3.4(iv) of SIAC Report No. 2 – ER Central – Nyah and Vinifera Floodplain Restoration Projects.

Groundwater modelling was undertaken to quantify potential changes to water balance and groundwater levels resulting from project operation. During operation, the project is expected to result in additional groundwater recharge from managed inundation, with an associated increase in groundwater levels around the maximum inundation area before groundwater is used by deep-rooted vegetation. As Murray River flows subside and/or floodplain drawdown occurs, the hydraulic gradient may be reversed, causing groundwater to discharge into the Murray River as baseflow. The ER stated that the increased groundwater flow into the Murray River (as a result of managed events) may have adverse salinity effects due to the mobilisation of salt from saline groundwater. The ER estimated that salt load to the Murray River would increase approximately 2.5 tonnes per day from the Burra Creek project, increasing the salinity of the Murray River by less than 1.5 mg/L. The ER noted that the salinity concentration of the Murray River would remain well under concentrations that would exceed critical water quality objectives.

The Addendum Report indicated a number of changes were made to the model following completion of the Groundwater specialist study D appended to the ER, including changes to: (i) the modelled scenarios to represent the revised project operational scenarios in the updated project description, (ii) evapotranspiration to incorporate information from vegetation mapping completed after the original groundwater assessment, and (iii) the maximum evapotranspiration rate from River Red Gum dominant areas. The updated modelling predicts that the project will result in an average long-term rise in the groundwater table of less than 1 m, around the northern part of the maximum inundation area, associated with a small increase in evapotranspiration from deep-rooted vegetation. The project is also predicted to cause a small increase in the percentage of time that a shallow water table is present in part of the Burra North water management area, resulting in a minor risk of saline groundwater.

The Addendum Report also presented a revised analysis of salinity estimating that salt load to the Murray River would increase approximately 3.1 tonnes per day from the Burra Creek project based on the amended project description. This is an increase from the 2.5 tonnes per day stated in the exhibited ER. The additional contribution from managed inundation at Burra Creek represents approximately 0.73% of the annual salt load in a low flow year and would result in an increase in the salinity of the Murray River of approximately 3 mg/L. The Addendum Report noted that this is approximately 2% of the typical background Murray River salinity of 150 mg/L and that the salinity concentration of the Murray River would remain well under concentrations that would exceed critical water quality objectives. It concluded that the adverse effects of the additional salt load in return flows are insignificant and that the effects remain unchanged from those assessed in the exhibited ER.

The ER stated that potential cumulative adverse effects on water quality in the Murray River, due to return flows high in salinity, could arise if managed inundation across all VMFRP projects occurs at the same time, with increased concentrations of up to 10% at the South Australian border. However, the ER noted that the actual concentration would remain well below critical thresholds for protecting environmental values and that the increase would be lower than modelled, given the unlikelihood of that scenario. The ER also noted that the potential for increased salt load in the Murray River from increased groundwater flow would require consideration under the Basin Salinity Management 2030 strategy under the Murray-Darling Basin Agreement. A broad procedural obligation to comply with the strategy was identified through the proposed EDS GW2.

Submitters raised concerns regarding the cumulative impacts of VMFRP and other sustainable diversion limit adjustment projects, including the Burra Creek project, on salinity in the Murray River. The Burra Creek Committee adopted the discussion of the Nyah and Vinifera Committee on groundwater and salinity issues[29] in relation to the Burra Creek project, with the following qualifications: (i) there are more existing groundwater monitoring wells in and near the Burra Creek project area than for the Nyah and Vinifera projects, providing a better baseline; and (ii) there is no need for specific additional groundwater monitoring to be aligned with proposed monitoring of tree condition in monitoring requirement M TE9. The SIAC accepted the advice of Mr Hoxley, a groundwater expert witness for the proponent, that the Burra Creek project area does not have areas where trees are at heightened risk from saline water.

EPA and Environment Victoria made further submissions on the Addendum Report relating to salinity. EPA noted that there was an inconsistency in the Addendum Report regarding the previously assessed average daily salt load to the Murray River. At the roundtable, both Dr Treadwell and Mr Hoxley gave evidence that the inconsistency in the reporting of the previously assessed average daily salt load was due to a typographical error. They both confirmed that the

[29] Refer to Section 3.5(iv) of SIAC Report No. 2 – ER Central – Nyah and Vinifera Floodplain Restoration Projects.

average daily salt load effect of the updated Burra Creek project will be 3.1 tonnes per day (instead of 1.6 tonnes per day as incorrectly shown in the Addendum Report Attachment 2). The SIAC accepted the evidence that the inconsistency was due to a typographical error.

Environment Victoria argued that further analysis is needed to investigate the cumulative impact of all VMFRP projects on salt loads. EPA also submitted that the proponent should be required to submit further justification of the assessment that the implications of the upward revision of the salt load increase in the Murray River will be minor, including comparison with existing conditions. Mr Hoxley explained that the correct figures indicate a small increase in salinity that is only slightly above the significance threshold for reporting, which was assessed as having no ecological effects. He advised that the project area is in the transition zone to the Mallee, with higher salinity than Nyah and Vinifera but has a smaller maximum inundation area. Mr Hoxley concluded that, on this basis, the project is not a major contributor of salinity to the Murray River. The SIAC noted that the contribution of the Burra Creek project to the total salt load of the Murray River (3.1 tonnes per day) is almost as large as the combined contribution of the Nyah and Vinifera projects (3.2 tonnes per day). However, the SIAC considered that this is still a relatively minor contribution to the cumulative salt loads and salinity levels of the Murray River from the combined VMFRP projects and that it can be satisfactorily managed under the Basin Salinity Management 2030 framework as proposed in the ER.

The SIAC asked Mr Hoxley how the revised groundwater modelling addressed the Wakool effect. Mr Hoxley gave evidence that the groundwater model was not formally calibrated but was checked for response patterns against the general monitoring record. He advised that operational risks relating to groundwater rise and salinity for the Burra Creek project (as for the Nyah and Vinifera projects) would be addressed by the groundwater monitoring proposed in the EMF.

In response to a question from the SIAC, Mr Hoxley agreed that an additional monitoring site targeting the area in the Burra North water management area where shallow groundwater is predicted would provide useful information. He suggested that a temporary (rather than a permanent) monitoring site may be sufficient. The SIAC examined the location of the proposed monitoring wells and noticed that there are no monitoring wells within the area identified in the Addendum Report as being at risk of shallow groundwater table. The SIAC found that, if the project were to proceed, an additional groundwater monitoring site should be included in the part of the Burra North water management area that is at risk of a shallow water table. The SIAC recommended that monitoring requirement M GW1 should be revised to require an additional bore site at such a location. While in principle I support the SIAC's finding and generally support the recommended changes to monitoring requirement M GW1, I have adopted the SIAC primary recommendation on the project and am therefore not addressing specific recommendations on the EMF.

Mr Hoxley advised that annual monitoring of salinity as proposed in the EMF is sufficient to determine if the project has any effects on salinity because groundwater salinity in the project area is relatively stable and does not vary greatly from year to year. Consistent with the Nyah and Vinifera Committee, the Burra Creek Committee considered it would be prudent to monitor salinity monthly instead of the proposed annual frequency. The SIAC recommended changes to monitoring requirement M GW2 to require a monthly frequency for monitoring groundwater salinity. While in principle I support the recommended amendments to monitoring requirement M GW2 for the Burra Creek project, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on the EMF.

Assessment

Although there is uncertainty related to the modelling used and potential risk of blackwater and algae blooms under the new operational scenarios considered, I do not support the inclusion of EDS SW6 for further work. The inclusion of this recommendation does not align with the primary findings and recommendations from the SIAC or myself with regards to likely unacceptable environmental outcomes and the inclusion of EDS SW4, as detailed in Section 6.1. As noted above, I support in principle the recommended amendments to EDSs SW2 and SB3 and monitoring requirements M GW1 and M GW2 to acceptably manage adverse effects of the project on surface water in relation to blackwater and algal bloom events, as well as acceptably manage adverse effects on groundwater. However, I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on the EDSs and EMF.

6.5 Soils and land stability

Assessment context

Effects on soils and land stability are addressed in the ER within Chapter 18 of the main report, as well as in the Surface Water specialist study C and Geology, Soils and Contamination specialist study E appended to the ER, and in Sections 3 and 6 of the Addendum Report Attachment 2. Soils and land stability issues were considered in Section 4 of the SIAC report.

The ER stated that the Burra Creek project area is predominantly underlain by vertosols, a soil type sensitive to erosion, shrink and swell when subject to moisture change, which can affect rates of groundwater recharge and lead to deep cracks. Vertosols may also present areas of weakness within the soil, which may impact stability during excavation. Other soil types present in minor areas include sodosols, which are sensitive to gullying, tunnel erosion and dispersion if the overlying soil is removed or if surface runoff is poorly managed. The ER explained that, based on the soil types present across the Burra Creek project area, there is potential for site-wide erodible, structurally unstable, dispersive, saline and reactive soils, with associated sedimentation.

The ER noted that a high probability for acid sulfate soils was identified along the eastern areas of the construction footprint and maximum inundation area, adjacent to the Murray River.

The ER explained that it is expected that operation of project would improve soil structure in the project area and the ability of soils to support vegetation. This would reduce soil erodibility, which would avoid and reduce processes contributing to land degradation, such as erosion.

The ER analysed potential adverse effects of the project on soils. For construction, the ER identified the following impact pathways:

- excavation, stockpiling, transport, use and/or disposal of contaminated material or acid sulfate soils leading to potential effects on human health and the environment; and
- potential effect of construction activities on landform stability or soils.

For operation, the ER identified the following impact pathways:

- potential contamination, migration of contaminated material or formation and mobilisation of acid sulfate soils during managed inundation events; and
- potential effect of managed inundation events on landform stability or soils.

The ER proposed eight specific EDSs to manage the adverse effects related to soils (CM1a, CM1b, CM1c, CM2, CM3, GS1, GS2 and GS3) and one monitoring requirement (M GSC1). The ER concluded that with the implementation of the proposed EDSs and monitoring, the significance of the residual adverse effects related to soils is insignificant to low.

Discussion

The SIAC considered that the key issues associated with soils relate to assessment of erosion risks and works within riparian corridors.

Assessment of erosion risks

The SIAC examined whether erosion risks were adequately assessed and would be acceptable. The SIAC noted that the Burra Creek geomorphic assessment (included in the Geology, Soils and Contamination specialist study appended to the ER) drew attention to active bank erosion in the Murray River and warned that bank erosion is a risk to project infrastructure, particularly containment banks located in close proximity to the banks of the Murray River. The SIAC also noted that the main operational erosion risks for the Burra Creek project are expected to occur during the opening and release phases of managed inundation events (particularly downstream of the B1 regulator), with residual effects including mobilisation of soil contamination or acid sulfate soils and increased dispersion of sodic soils resulting from

inundation events. The SIAC pointed out that the exhibited ER assessed residual erosion effects as low and that the Addendum Report stated that erosion effects are unlikely to be significantly changed by the Wakool effect.

Submitters raised concerns regarding erosion for all three of the projects covered in the exhibited ER. These concerns were summarised in SIAC Report No. 2 and in my assessment of the Nyah and Vinifera projects. No submissions raised specific concerns in relation to erosion or land stability risks for Burra Creek. As part of the roundtable process, the SIAC inspected key project infrastructure locations for Burra Creek and observed locations along the banks of the Murray River in the Burra Creek project area that are affected by erosion.

The Burra Creek Committee noted the recommendations made by the Nyah and Vinifera Committee to revise to various EDSs to better characterise and address soils stability, erosion and sedimentation risks. The SIAC considered that these recommendations apply equally to the Burra Creek project. Given that sodic soils are widespread in the Burra Creek project area and are particularly susceptible to erosion, the Burra Creek Committee adopted the Nyah and Vinifera Committee recommendations to revise EDSs CM1c, CM2 and GS1 to better guide the identification and characterisation of risk factors like acid sulfate soils and dispersive soils. Further revisions to EDS CM1c were recommended by the SIAC to require targeted soil sampling at locations subject to soil hazards such as sodic and dispersive soils (rather than just contamination). In principle I support the SIAC's recommended refinement of EDSs CM1c and CM2, however I have adopted the SIAC's primary recommendation for the Burra Creek project and am therefore not addressing specific recommendations on EDSs, and as detailed in Section 6.1 I do not support further work as proposed under recommended EDS SW4.

The SIAC examined bed shear stress and velocity considerations. The SIAC noted that erosion can be caused by high bed shear stress and that bed shear stress is related to velocity and water depth. At the roundtable, Dr Treadwell gave evidence that the Jacobs Burra model predicted very low bed shear stress, resulting in a low erosion risk. As discussed in Section 6.1, the SIAC considered that the effects of the project infrastructure on floodplain inundation processes are not well understood in relation to the Wakool effect. The SIAC noted that this extends to uncertainty regarding how the project infrastructure will impact velocity and shear stress during the ingress and egress of floodwater during unmanaged inundation events.

The SIAC found that given the relatively low velocities and bed shear stress predicted by the modelling to date and the inclusion of a drop structure to mitigate erosion risks in Burra Creek, the erosion and land stability risks at Burra Creek could be acceptably managed. The SIAC recommended revisions to EDS GS1 to require the assessment of hydraulic risks associated with project infrastructure (in addition to project construction and operation). The SIAC recommended that if the project was to proceed, depths, velocities and bed shear stress should be checked and confirmed with the updated hydraulic modelling under the recommended EDS SW4, with a focus on the Burra Creek channel. Other minor revisions to EDS GS1 were recommended by the SIAC to refer to (i) the Nyah and Vinifera borrow pit only (given that the Burra Creek borrow pit is situated away from the Murray River and floodplain and riverine erosion risks are not a consideration) and (ii) risks to the stability of the banks of the Burra Creek (as well as the Murray River). The SIAC also recommended amendments to EDS GS3 to require monitoring of bank stability within the riparian corridor of Burra Creek (as well as the Murray River). In principle I support the recommendations, however I have adopted the SIAC primary recommendation and am therefore not addressing specific recommendations on EDSs.

Works within riparian corridors

The SIAC also examined whether works within the 30 m riparian corridors of the Murray River and Burra Creek are appropriate. The project map book in the exhibited ER indicated that parts of the construction footprint are situated within 30 m of the banks of the Murray River and Burra Creek. The SIAC noted that Clauses 12.03-1S and 14.02-1S of the Swan Hill Planning Scheme are relevant to the Burra Creek project and include specific requirements for activities within the area at least 30 m from the banks of waterway systems. However, the SIAC noted that riparian setbacks were not explicitly considered in the ER by the proponent in the assessment of erosion or native vegetation effects, or in the consideration of site-specific design alternatives to avoid and minimise potential impacts. The SIAC also found that neither the ER nor the Addendum Report included any specific assessments or mitigation in relation to the effects of the project on the riparian corridors.

The proponent prepared Technical Note B4 – Riparian Buffer Areas (Tabled Documents 43 and 44) in response to the SIAC's questions regarding what infrastructure and construction footprints are proposed within 30 m of the Murray River or Burra Creek, and whether it can be moved from those locations. In Technical Note B4, the proponent set out the locations where the project infrastructure or construction footprint overlaps with the riparian zone of the Burra Creek and/or the Murray River. The note defined the riparian zone of Burra Creek based on a 30-metre setback from the centreline of the Burra Creek channel, and the riparian zone of the Murray River based on a 30-metre setback from the border between Victoria and New South Wales. Works within the riparian corridor of Burra Creek include new infrastructure within or near the creek channel, including the B1 and B2 regulators, drop structure, B4 hardstand, access tracks and containment bank. Works within the riparian corridor of the Murray River include the drop structure, two hardstands, upgrades to existing access tracks and containment banks. The note stated that infrastructure has often been sited in existing disturbed areas, such as where there are existing access tracks. The proponent stated that if project access tracks and containment banks were required to be relocated to avoid the 30 m riparian buffer, this may result in additional impacts to native vegetation.

The SIAC considered that the definitions of the Burra Creek and Murray River riparian zones presented in Technical Note B4 were inadequate. The Burra Creek riparian zone was defined in relation to the channel centreline rather than top of bank and the Murray River riparian zone was defined in relation to the Victoria and New South Wales border, even though in some locations the current riverbank is situated south of the border. This means that, for a range of infrastructure proposed within the riparian corridors of the Burra Creek and the Murray River, the construction footprints extend even further into the 30 m riparian zone.

In response to questions from the SIAC, Dr King and Mr Watson (ecology expert witnesses for the proponent) gave evidence confirming that riparian corridors had not been specifically examined in the terrestrial ecology assessments. The SIAC highlighted that riparian corridors (defined as 30 m from the banks of a waterway) are sensitive and important environments, often containing high quality vegetation and habitat for both aquatic and terrestrial species. Works within riparian corridors can damage these ecologically sensitive areas and increase erosion risks, which can cause bank recession and loss of vegetation as well as additional sediment in the waterways. These risks can occur during both construction and operation.

The Burra Creek Committee agreed with the Nyah and Vinifera Committee that if the project were to proceed, there should be further assessment of opportunities to relocate project infrastructure outside the riparian corridors to further reduce erosion risks, water quality risks (from increased sediment), and ecological risks of the project. However, this would need to be balanced against potentially greater impacts on native vegetation or Aboriginal cultural heritage outside the riparian corridors. The Burra Creek Committee adopted the Nyah and Vinifera Committee recommended revisions to EDS E1 and to the requirements of the Incorporated Document Clause 4.4.2 to require further assessment of relevant alternatives through the detailed design process, with particular attention to avoiding and minimising impacts within 30 m of the Murray River bank. The SIAC recommended that this should be further extended to Burra Creek and that the further assessment of works within the riparian corridors should include a review of the location of the waterway banks to ensure all proposed works within 30 m of the current location of the top of bank of the waterways are assessed. Consideration of opportunities to reduce impacts on riparian areas would also need to ensure that trade-offs between environmental values are transparently considered, in consultation with relevant agencies, stakeholders and experts. As noted in my assessment of the Nyah and Vinifera projects, I support these recommendations for those projects. However, I have supported the primary recommendation of the SIAC for the Burra Creek project, so these proposed changes to EDS E1 and work under EDS SW4 are not supported for the Burra Creek project.

Assessment

It is my assessment that soil stability, sedimentation and erosion risks of the Burra Creek project could be acceptably managed, with the implementation of the amended EDSs. However, I have adopted the SIAC's primary recommendation on the Burra Creek project and its effects and am therefore not addressing specific recommendations on the EDSs.

6.6 Aboriginal cultural heritage

Assessment context

Effects on Aboriginal cultural heritage are addressed in the:

- ER within Chapter 19 of the main report;
- Aboriginal Cultural Heritage specialist study F, appended to the environment report; and
- Addendum Report, Attachment 2, Section 7 (Tabled Document B4E).

The Burra Creek Committee does not discuss Aboriginal cultural heritage further in SIAC Report No. 3, Burra Creek. Rather the Committee directly adopted the findings and recommendations of the Nyah and Vinifera Committee in SIAC Report No. 2. The Addendum Report identified that there was no change required to the assessment of effects on Aboriginal cultural heritage, proposed EDSs or monitoring based on the changes to the project description. This was based on the potential effects of the impact pathways being unchanged. The Addendum Report found that there may be some increase in beneficial effects to the health of living scar trees because of increased frequency of inundation. This increased frequency of inundation may also accelerate effects on particular types of Aboriginal cultural heritage, such as dead scarred trees and hearths, and this would be subject to the monitoring proposed in EDS ACH3. On this basis, my assessment will focus predominantly on the findings of the ER.

The project is located in areas where Traditional Owners and interested parties and/or organisations have not been formally recognised under relevant legislation, either as a Registered Aboriginal Party (RAP) or through a Recognition Settlement Agreement. Traditional Owner groups identified by the proponent in the environment report as having an interest in the lands on which the Burra Creek project is located include Dadi Dadi Weki Weki Aboriginal Corporation, Tati Tati Aboriginal Corporation, Tati Tati Land and Water Indigenous Corporation, Wadi Wadi Land and Water Indigenous Corporation and Wadi Wadi Wemba Wemba Barapa Barapa First Nations Aboriginal Corporation.

The project is located within the greater Murray Basin, which is a highly sensitive region for Aboriginal cultural heritage. The area where the project site is located is complex and rich in Aboriginal cultural heritage. Aboriginal place types and values common to the greater geographic region that are present in the project area are scarred trees, earth features, shell middens and ancestral remains. The ER's analysis of Aboriginal place patterning across the greater Murray Basin identified that the Aboriginal cultural heritage (excluding scarred trees) within the geographic region is more likely to occur on high drier landforms within the greater floodplain rather than the low-lying floodplain.

The ER stated that the assessment of effects on Aboriginal cultural heritage was informed by consultation with Traditional Owner groups and interested parties. A CHMP (No. 16902) for the construction phase of the project is under preparation and would require approval for the project to proceed (refer to Section 3.3).

The 'activity area' defined for this CHMP generally correlates with the construction footprint and does not cover the proposed maximum inundation area (except where the construction footprint overlaps with the maximum inundation area). Therefore, effects on Aboriginal cultural heritage from operation of the project (i.e., inundation, watering) are not addressed and fully mitigated through the draft CHMP. As such, obligations under the Aboriginal Heritage Act (see Section 3.3) for effects from proposed operations would need to be addressed separately to the CHMPs.

The ER identified the following potential adverse effects of project construction on Aboriginal cultural heritage:

- permanent damage or removal of heritage such as stone artefacts, earth features (hearths and mounds), shell middens (both surface and subsurface deposits), scarred trees and Ancestral Remains; and
- impact to the root protection zone of scarred trees, which could kill trees and destabilise dead standing trees.

Specifically, the construction of the project would have direct impacts on nine known Aboriginal cultural heritage components: three surface stone artefacts and six scarred trees.

Impact pathways identified during operation of the project that may result in direct and indirect adverse effects Aboriginal cultural heritage (including ancestral remains) include: (i) erosion and sedimentation, (ii) increased water availability and fluctuations in moisture content, (iii) altered pest animal activity, and (iv) changes in visitation and tourism activities.

The ER documented an extensive process that was undertaken to assess alternatives to project design to avoid and minimise impacts during the construction of the project, including to Aboriginal cultural heritage values, particularly where there were known or suspected sites of ancestral remains. Discussion of the assessment of alternatives is provided in Section 4.3.

The ER proposed three specific EDSs to manage adverse effects on Aboriginal cultural heritage (ACH1 to ACH3). These EDSs would manage cultural heritage impacts during construction and operation through compliance with the CHMPs (ACH1), continued engagement with traditional owners (ACH2) and processes for management and monitoring of risks in operation through Environmental Watering Management Plans, Watering Proposals and Delivery Plans (ACH3). Other relevant EDSs to assist in managing effects on Aboriginal cultural heritage included E3, GS1 to GS3, and SW1 to SW3.

Discussion

The assessment of effects documented in the ER was informed by the desktop and standard assessments undertaken for the CHMPs which focussed on the construction footprint. The nature, extent and significance of effects for other areas not subject to field assessment was inferred. This included the majority of the maximum inundation area. To inform the specialist study, an inundation assessment was undertaken to identify the potential for Aboriginal cultural heritage values within the maximum inundation area and assess the nature and magnitude of potential direct and indirect effects of inundation.

The ER assessed the significance of residual effects on Aboriginal cultural heritage places during construction and operations as low, noting that any impact on Ancestral remains during construction or operation of the project would be of extreme significance. The ER stated that the likelihood of impacts occurring to Ancestral remains during construction was rare with a high degree of confidence. This conclusion was due to both extensive fieldwork conducted and consultation with Traditional Owners to identify both potential and actual locations of Ancestral remains in areas of proposed construction. Any locations identified were treated as ‘no-go zones’ and have been avoided by project design.

The ER identified that there is potential for adverse effects to Ancestral remains from pets or overabundant native species or human activity during operation. The ER proposed EDS ACH3 and M ACH1 to M ACH3 to monitor and manage potential impacts to Ancestral remains as a result of pest animal and visitor activity. Under the Aboriginal Heritage Act any impact to Ancestral remains is unacceptable and therefore residual risk of such effects should be eliminated or mitigated regardless of its likelihood.

No additional submissions were submitted on Aboriginal cultural heritage specific to the Burra Creek project updates. Submissions, which covered all three projects in the exhibited ER, were considered relevant to the Burra Creek project. A number of submitters raised the issue of Aboriginal cultural heritage, although most submissions were focussed on the adequacy of Traditional Owner Engagement. FoNVP highlighted the importance of the floodplain for Aboriginal cultural heritage and raised that there is a significant lack of knowledge about Aboriginal cultural heritage in the project area and it is likely that some significant sites remain unreported.

As detailed in SIAC Report No. 2 the Committee was satisfied that effects on Aboriginal cultural heritage values were appropriately assessed in the ER, and that the EMF and CHMPs will provide appropriate mechanisms to manage residual risks. The SIAC was supportive of the specific EDSs proposed to manage adverse effects on Aboriginal cultural heritage (ACH1 to ACH3) and did not recommend any amendments to these measures. In SIAC Report No. 3 the Burra Creek Committee recommended the addition of EDS ACH4 in line with that recommended in my assessments for Belsar-Yungera and Hattah Lakes North projects and Nyah and Vinifera projects. As detailed in my assessment for those projects, I support this recommendation in principle, however for the Burra Creek project I have accepted the SIAC’s primary recommendation and therefore further hydraulic analysis and assessments under EDS SW4 is not recommended.

The potential for some benefits to Aboriginal cultural heritage values were also noted in the ER. These benefits include potential reduction in erosion through watering of dryer parts of the floodplain, that would otherwise see erosion expose and potentially distribute archaeological sites across the landscape. The ER also concludes that watering would improve the health and therefore lifespan of living scar trees. Realisation of the expected ecological improvements to the project area were also considered as benefits to the cultural heritage values (tangible and intangible) of these floodplain environments.

As discussed in Sections 4 and 6.1, evidence provided by Dr King, expert witness on terrestrial ecology, confirmed that with the Wakool effect, the known water requirements of the EVCs in the maximum inundation area are already largely met by existing hydrological conditions. The SIAC also found that with the potential reversal of terrestrialisation within the Lignum Swamp Woodland EVC there is the potential for the death of up to 132 Large and Very Large Trees during project operations as a result of watering, which is in addition to the removal of up to 188 Large Trees for construction. Since the maximum inundation area remains largely unsurveyed for Aboriginal cultural heritage values the potential presence of living scar trees within the Lignum Swamp Woodland EVC is unknown. If the project was to proceed, it is unlikely that there will be benefit to the EVCs in the maximum inundation area and there remains the potential for further impacts on Aboriginal cultural heritage values as a result of operations.

Traditional owner engagement

One of the VMFRP project objectives is to facilitate Traditional Owner aspirations for restoration of floodplain ecosystems by:

- engaging and collaborating with Traditional Owners to integrate their knowledge into the planning, delivery and evaluation of VMFRP; and
- creating opportunities for enhancing and sharing cultural connections to Country.

No submissions were received from Traditional Owner groups during exhibition of the ER. A number of submitters from other parties raised concern regarding Traditional Owner engagement. Prior to the roundtable, the SIAC sought the assistance of the proponent and Mallee CMA to invite Traditional Owner groups to participate in the roundtable. Traditional Owners were in attendance for most days of the roundtable either observing or as participants.

No Traditional Owners or First Nations people participated in the Burra Creek roundtable. The issues raised during the Nyah and Vinifera roundtable related to all three of the ER Central projects, and in some cases the VMFRP projects more broadly. The issues raised were equally relevant to the Burra Creek Project as the Nyah and Vinifera projects. A session was also held on day 5 of the Nyah and Vinifera roundtable specifically for Traditional Owners to attend to discuss First Peoples' issues and concerns with the projects. A brief confidential session on Aboriginal cultural heritage was also held with one person on request. The Burra Creek Committee listened to the recording of the Traditional Owners session at the Nyah and Vinifera roundtable and has accepted the discussion and findings regarding Traditional Owner engagement, set out in Chapter 8 of SIAC Report No. 2. As detailed in my assessment of the Nyah and Vinifera projects I agree with these findings.

Assessment

It is my assessment for the Burra Creek project that:

- The effects on Aboriginal cultural heritage values from construction of the project can be acceptably managed through the implementation of the proposed EDSs, which include the preparation and approval of a CHMP for the project.
- Benefit to Aboriginal cultural heritage values through improvement to the floodplain environment are not likely, as the watering requirements of the EVCs are essentially being met already. Further to that, implementation of the project may result in additional impacts to Aboriginal cultural heritage values during operations within the proposed inundation areas.

- Implementation of the project may result in impacts to Aboriginal cultural heritage values and sites within the maximum inundation area in addition to those predicted within the ER as a result of the potential death of living scar trees caused by overwatering of Lignum Swamp Woodland EVC.
- In principle I support the inclusion of EDS ACH4, however I have adopted the SIAC primary recommendation and therefore will not address specific recommendations on the EDSs.

6.7 Other social and environmental impacts

As noted in the conditions issued by the Minister for Planning in the decision to require an ER (in lieu of an EES), as well as in the scope for the ER, the ER was to largely focus on the potentially significant effects of the project related to the floodplain restoration to enhance ecosystem function, biodiversity, water quality and Aboriginal cultural heritage values. The ER also considered historic heritage issues in Chapter 19 of the main report, as well as in the Historic Heritage specialist study G appended to the ER.

The main report of the ER did not cover land use and agriculture, air quality, bushfire, landscape and visual, noise and vibration, social and business, or traffic and transport issues in detail as these were not included in the required scope of the ER. These were however, covered by specialist studies H, I, J, K, L and M appended to the ER, and land use and agriculture were covered in the strategic assessment report for the draft PSA attached to the ER.

The implications of the Wakool effect were reviewed and considered by each of these specialist areas and presented in the Addendum Report Attachment 2. For the aspects presented in this section, the Addendum Report did not find any changes to the findings of the impact assessments presented in the exhibited specialist studies in response to the amended project description.

The SIAC did not discuss these issues in the Burra Creek report. Rather, the Burra Creek Committee adopted the findings and recommendations of the Nyah and Vinifera Committee, with some minor adjustments to the EDSs and EMF as presented in Table 10 and Appendix D of the Burra Creek report. Any changes that the Nyah and Vinifera Committee made that were not included in the proponent's Day 1 version of the Incorporated Document and EMF for Burra Creek were provided as tracked changes in Appendices C and D of the Burra Creek report along with any further changes recommended by the Burra Creek Committee.

Generally, I support the findings of the ER, the Addendum Report and the SIAC in relation to these other issues. It is my assessment that these effects are indeed localised and can be effectively managed through well-established practices including mitigation measures that would be given statutory effect through the EMF, conditions of approval and associated management plans. While in principle I support the recommendations made in my assessment of the Nyah and Vinifera projects in relation to these aspects, I am not addressing specific recommendations on related EDSs in this assessment, as I have adopted the SIAC's primary recommendation.

7 Conclusions

This assessment has considered the likely environmental effects and likely overall environmental outcomes of the Burra Creek project. The Burra Creek project is intended to restore and enhance the floodplain environment, its ecosystems, biodiversity values (particularly for listed threatened species and communities), water quality, and cultural values, through the implementation of engineered environmental watering. However, implementation of this particular project is likely to result in unacceptable environmental outcomes and adverse impacts, primarily in sensitive, conservation areas.

My overall conclusion is that the project is not likely to deliver overall benefits for floodplain vegetation communities and associated biodiversity values, and further that the project will result in significant unacceptable adverse environmental effects and therefore should not proceed. The unacceptable effects relate primarily to effects on native vegetation and associated values (including important habitats) via clearance during construction and through changes to floodplain conditions for some EVCs during proposed operations. As highlighted by the SIAC, when considering the Wakool effect, the existing hydrological conditions appear to largely meet the preferred hydrological needs of the native vegetation communities within the Burra Creek floodplain (i.e., proposed maximum inundation area). Further to this, implementation of the project may result in some EVCs being inundated at greater frequencies and to greater depths than what is recommended for the relevant vegetation communities. Therefore, it is the view of the SIAC and the conclusion of this assessment that there is not a demonstrable basis for the Burra Creek project, and further that the proposed inundation regimes are likely to result in some significant adverse impacts on some large areas of native vegetation and their values in the proposed maximum inundation area.

Uncertainty associated with the use of the various hydraulic models has been examined and noted and while further modelling may provide greater clarity and confidence in the specific extent and significance of the some effects, my assessment concludes that the outcomes of such additional modelling would not sufficiently change the project's likely overall environmental outcomes and would not change my findings regarding the significant unacceptable adverse environmental effects of this project.

The SIAC made several recommendations, should I not agree with their primary finding about the project not proceeding. My assessment supports the SIAC's primary finding and therefore I have not addressed specific recommendations on EDSs, the EMF or the draft PSA. Should a primary decision-maker not follow the findings and conclusions of this assessment they should consult with me and my department before any further work is conducted or indeed prior to any decision-making on an approval.

Table 7-1 sets out a summary of my responses to the SIAC's recommendations. As I have accepted the SIAC's primary recommendation I have not provided a summary of responses to the SIAC's detailed recommendations on the EDSs and monitoring requirements as I am not commenting further on these recommendations.

Table 7-1 Response to SIAC's recommendations and additional recommendations.

SIAC recommendations	Minister's responses and recommendations	Section
Planning controls		
Changes to the draft incorporated document as shown in Table 9.	I have adopted the SIAC's primary recommendation and am therefore not providing specific comment on the proposed changes to the draft incorporated document. It is my recommendation that the Burra Creek project is not included in Amendment C78 to the Swan Hill Planning Scheme.	5.1
Surface water and groundwater		
If the project proceeds, revise Environmental Delivery Standard SW4 as shown in Appendix D to include additional requirements for the Burra Creek Project that must be undertaken before the further hydraulic analysis required under SW4 is undertaken, including: a) developing an accurate and properly calibrated hydraulic model for the Burra Creek project area b) obtaining an independent peer review of the hydraulic model, and making any revisions recommended by the peer reviewer to the peer reviewer's satisfaction c) using the new/revised hydraulic model to: • assess the effects of the proposed Project infrastructure on inundation processes in the Burra Creek project area during unmanaged inundation events • assess all relevant cases for each operational scenario, including 'holding' and 'drawdown/release'.	Not supported.	6.1
If the Project proceeds, insert a new Environmental Delivery Standard SW6 as shown in Appendix D to include additional requirements for the Burra Creek Project to further assess: a) the effects of Project infrastructure on blackwater risks in unmanaged inundation events b) the effects of flood capture events on blackwater risks c) further mitigation measures that may be required to minimise the impact of blackwater events.	Not supported.	6.4
If the Project proceeds, revise Monitoring Requirement M GW1 as shown in Appendix D to require an additional bore site to monitor groundwater in the part of the Burra North Water Management Area that is at risk of a shallow water table.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.4

SIAC recommendations	Minister's responses and recommendations	Section
Recommendation adopted from the Nyah and Vinifera Committee's recommendations, with changes: • Revised EDS SW2 in relation to: ○ the purposes that are to guide the site-specific management of operational risks related to surface water ○ the timing and management of inundation events, as well as the management of organic matter loads, to reduce the risk of hypoxic or anoxic blackwater events. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.4
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • A provision in EDS SB3 for protocol be developed and implemented for communicating with the community and stakeholders regarding: ○ the risk of occurrence of blackwater events ○ intended responses for different stages of specific managed inundation events. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.4
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Revised EDS GW2 to address requirements for additional groundwater monitoring and local adaptive management responses. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.4
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Revised Monitoring Requirement M GW2 to require a monthly frequency for monitoring groundwater salinity. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.4
Soils		
If the Project proceeds: a) revise Environmental Delivery Standard SW4 as shown in Appendix D to require further assessment of erosion risks of the Burra Creek Project	Not supported.	6.5
b) revise Environmental Delivery Standard CM1c as shown in Appendix D to require targeted soil sampling at locations identified to be subject to other soil hazards (as well as contamination)	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific	6.5

SIAC recommendations	Minister's responses and recommendations	Section
	recommendations on the EDS or the EMF.	
c) revise Environmental Delivery Standard GS1 as shown in Appendix D to refer to: • the Nyah and Vinifera borrow pit only • risks to the stability of the banks of Burra Creek (as well as the Murray River) • the hydraulic risks of Project infrastructure	Updates to EDS GS1 that do not relate to EDS SW4 are supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF. Updates to EDS GS1 that relate to EDS SW4 are not supported.	6.5
d) revise Environmental Delivery Standard GS3 as shown in Appendix D to require monitoring of bank stability within the riparian corridor of Burra Creek (as well as the Murray River).	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.5
If the Project proceeds, revise clause 4.4.2 of the Incorporated Document as shown in Appendix C, and Environmental Delivery Standard E1 as shown in Appendix D, to refer to works within 30 metres of the banks of Burra Creek (as well as the banks of the Murray River).	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.5
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Revised EDS GS3 and M GSC 1 to require monitoring of waterway erosion within the project area. The changes are shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.5
Recommendation adopted from the Nyah and Vinifera Committee's recommendations, with changes: • Revise the Environmental Delivery Standards to make minor changes to EDS CM1c, CM2 and GS1 in relation to soil characterisation and mapping. The changes are shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.5
Terrestrial ecology		
If the Project proceeds: a) revise Environmental Delivery Standard EDS E1 as shown in Appendix D, to reflect the recommendations in the Minister's Assessment for EES Central	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2

SIAC recommendations	Minister's responses and recommendations	Section
b) include a new Environmental Delivery Standard E5 as shown in Appendix D that requires a hollow replacement plan to be prepared.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
If the Project proceeds: c) include a new Environmental Delivery Standard E6 as shown in Appendix D requiring further surveys of threatened dryland species in the Maximum Inundation Area	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
d) revise Environmental Delivery Standards E2d and E3 as shown in Appendix D to include additional requirements for managing weeds and pest species.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Amend EDS E2e to require monitoring of rehabilitation outcomes including vegetation cover. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Adjust the terrestrial ecology monitoring requirement M TE2 to specify monitoring of the cover and quality of rehabilitation of indigenous vegetation, where consistent with any obligation established by a consent or agreement for the project under the *National Parks Act 1975*. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Revise the Monitoring Requirement M TAE2 'Terrestrial and aquatic' to require transect surveys following inundation events to detect any presence of threatened flora species either within or adjoining the inundated area. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.2
Update of AOIB after completion of further work required under EDS SW4.	Not supported.	6.2
If the project were to proceed, the proposed arrangement to compensate for loss of native vegetation should be modified such that determination of the final assessment of offsets:	Not supported.	6.2

SIAC recommendations	Minister's responses and recommendations	Section
• is deferred until there is clear evidence the benefits of the Project have been delivered • includes losses of large trees resulting from operation (as well as native vegetation and large trees lost due to construction).		
Aquatic ecology		

Recommendation adopted from the Nyah and Vinifera Committee's recommendations, with changes:
• Include a new EDS SW5 in relation to:
  ○ the design of regulators and the passage of native fish
  ○ the design of containment banks and spillways and the passage of turtles.
The change is shown in Appendix D.
	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.3

Recommendation adopted from the Nyah and Vinifera Committee's recommendations, with changes:
• Revise EDS SW2 in relation to:
  ○ timing of inundation events to reduce carp breeding
  ○ clarifying the purpose of the requirement to factor seasonal implications in the timing of filling and drawdown.
The change is shown in Appendix D.
	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.3

Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • Revise M AE7 to include monitoring and evaluation of fish strandings associated with the Project. The change is shown in Appendix D.	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.3
Recommendation adopted from the EES Central Committee's recommendations, with changes: • Revised EDS E2f that requires construction works are to be undertaken under no-flow conditions and outside fish migration periods. The change is shown in Appendix D	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.3
Aboriginal cultural heritage		
Recommendation based on the Minister's Assessment recommendations for EES Central: • Add a new EDS (ACH4) requiring review and update of the assessment of residual effects on Aboriginal cultural heritage associated with inundation, based on the outcomes of the further hydraulic analysis required by EDS SW4 and EDS GS1. This should have particular regard to the potential for indirect impact associated with erosion and sedimentation as	Supported in principle, however I have adopted the SIAC's primary recommendation and am therefore not addressing specific recommendations on the EDS or the EMF.	6.6

SIAC recommendations	Minister's responses and recommendations	Section
well as increased water availability and fluctuations in moisture content. The change is shown in Appendix D.		
Other approvals		
Recommendation adopted from the Nyah and Vinifera Committee's recommendations: • The Minister for Planning should ask the Minister for Water to consider, in relation to any approval for a licence for works on a waterway under section 67 of the *Water Act 1989*, applying a condition or conditions requiring the design, construction, operation and maintenance of project works on the Burra Creek floodplain to: a) Be informed by an assessment of geomorphic and hydraulic risks, including of waterway erosion or other instability over the long-term, to the satisfaction of the Minister. b) Provide for timely action to monitor and address risks or evidence of waterway erosion or other instability either attributable to or affecting the project works to the extent necessary to protect waterway values. c) Coordinate assessments of risks and implementation of any relevant requirements relating to the Murray River with the responsible authorities in New South Wales.	Supported in principle, however I have adopted the SIAC's primary recommendation regarding the Burra Creek project and am therefore not addressing specific recommendations such as this one.	3.5

HON SONYA KILKENNY MP

Minister for Planning

7/1/24

Appendix A Matters of national environmental significance

The environment report (ER) and this assessment examine the likely impacts on matters of national environmental significance (MNES), relevant to the controlling provisions identified in the Commonwealth EPBC Act controlled action decision for the project (i.e., listed threatened species and communities (sections 18 and 18A)).

This appendix consolidates information on the likely effects of the proposal on relevant MNES protected under the EPBC Act. It draws upon the assessment of specific matters discussed in other sections of my assessment, including assessment findings on terrestrial ecology (Section 6.2), aquatic ecology (Section 6.3), surface water and groundwater (Section 6.4).

Potential impacts on relevant MNES were assessed for the project in ER Attachment 12 Burra Creek Matters of National Environmental Significance Assessment and summarised in Chapter 17 of the ER. Impacts are assessed in detail in the aquatic ecology specialist study A and terrestrial ecology specialist study B appended to the ER. Cumulative Impacts were assessed in the ER Accompanying Document 1 – Assessment of potential cumulative effects on matters of national environmental significance which was exhibited with the Nyah and Vinifera package. The key finding of the exhibited ER was that there is unlikely to be significant impacts on any MNES for the project, and the Addendum Report and its attachments provided for Burra Creek supported this original assessment.

Section 8 of the SIAC report considered the likelihood of impacts on MNES, with further discussion of evidence and submissions related to MNES provided in Chapters 5 to 7 of the SIAC report. The SIAC recommended the refinement and strengthening of several relevant mitigation measures to assist in further reducing the potential impacts to MNES discussed in the following sections of this appendix. The overall finding of the SIAC was that residual impacts on MNES can be acceptably managed through implementation of the recommended mitigation measures.

Species considered in relation to MNES that have a likelihood of occurrence in the project study area with a rating of 'possible' or higher are summarised in Table A1.

Table A1 Species considered in the ER in relation to MNES for the Burra Creek project (with a likelihood of occurrence of 'possible' or higher)

Species	EPBC Status	Presence
Australian Bittern	Endangered	Possible
Australian Painted Snipe	Endangered	Possible
Grey Falcon	Vulnerable	Possible
Growling Grass Frog	Vulnerable	Possible
Murray Cod	Vulnerable	Present
Painted Honeyeater	Vulnerable	Possible
Regent Parrot	Vulnerable	Present
Silver Perch	Critically endangered	Present
South-eastern Long-Eared Bat	Vulnerable	Possible
Winged Peppercress	Endangered	Possible
Australian Gull-billed Tern	Migratory	Possible
Caspian Tern	Migratory	Possible

Species	EPBC Status	Presence
Fork-tailed Swift	Migratory	Possible
Latham's Snipe	Migratory	Possible
Sharp-tailed Sandpiper	Migratory	Possible

A.1 Listed threatened species

Murray Cod

Murray Cod is listed as vulnerable under the EPBC Act. The ER identified that the species is likely to occur in the Burra Creek project area, as suitable habitat is present in the Murray River adjacent to the project area and the species has been recorded upstream and downstream of the project area. The ER described that the species is known to occur in a broad range of flowing and standing waters but favours permanent flowing river reaches and creeks with hydraulic complexity and instream woody habitat. The ER thus concluded that the species is unlikely to be present in Burra Creek or any of the smaller ephemeral or intermittent wetlands present within the Burra Creek study area (ER Attachment XII).

An assessment of the impacts on Murray Cod under the Significant Impact Guidelines 1.1[30] was undertaken for the project and it was determined that the species is unlikely to be significantly impacted (ER specialist study A). Residual impacts from invasive species such as Carp, pathogens, potential barriers to movement in the construction and operation stages, noise, spills and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. I agree with the conclusion that a significant impact on this species is unlikely from this proposed project.

The ER stated that the project is expected to lead to slight improvements in populations of Murray Cod (Table 13-2 ER specialist study A), which is expected due to increased foraging opportunities when the floodplains are inundated, increased food availability and improved habitat quality and connectivity.

Cumulative effects of the Burra Creek project in relation to the other eight proposed VMFRP project, the New South Wales Sustainable Diversion Limit Adjustment Mechanism project, and The Living Murray project at Gunbower Forest, Hattah Lakes and Chowilla on Murray Cod were assessed in ER Accompanying Document 1. The cumulative impact assessment presented in the ER concluded there are unlikely to be cumulative adverse effects on Murray Cod. I agree that based on the information provided in the ER documentation that the Burra Creek project is unlikely to have significant impacts on this species, when considered individually, however I note that under the National Recovery Plan for the Murray Cod[31], low level impacts to Murray Cod which may be deemed to be insignificant on their own can be considered significant when the impacts are viewed cumulatively. The Recovery Plan notes that the cumulative impact of many small or low risk threats, including changes to water quality or fish kills, can pose significant impacts to the species. For the Burra Creek project, the SIAC supported the findings of the Nyah and Vinifera Committee, which concluded that potential fish strandings should be monitored as well as the monitoring of fish populations (EDS SW2 and monitoring requirement AE7). In the Nyah and Vinifera assessment, this measure required the monitoring and reporting on native fish stranding events from managed inundation events, to enable the identification of any recurrent strandings and the implementation of management measures included within EDS SW2. The SIAC supported the inclusion of this measure for Burra Creek. The SIAC also supported the inclusion of EDS SW5 which was included as a recommendation in my assessment of the EES Central projects. EDS SW5 requires regulators to be designed with suitable flow velocities for target fish species. While in principle I support the SIAC's recommended addition of monitoring requirement AE7 and EDS SW2 and SW5, I have adopted the SIAC primary recommendation and therefore am not addressing specific recommendations of EDSs or the EMF.

[30] Department of the Environment (2013) *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance.*

2. Clunie and Koehn (2010) National Recovery Plan for the Murray Cod *Maccullochella peelii peelii*[31]. Department of Sustainability and Environment.

It is uncertain at this stage whether this project in conjunction with the eight other VMFRP projects has the potential to cumulatively result in a significant impact to Murray Cod, as there are assessments still outstanding for some of these controlled actions.

Silver Perch

Silver Perch is listed as critically endangered under the EPBC Act. The ER identified that the species is likely to occur in the Burra Creek project area, as suitable habitat is present in the Murray River adjacent to the project area and the species has been regularly recorded upstream and downstream of the project area. The ER described that the species occurs in a variety of river habitats, ranging from fast flowing river reaches to slower flowing, turbid areas. The species prefers areas of rapid flow and requires perennial flowing water to complete its life cycle. However, the species is thought to rarely utilise floodplain habitats (ER Attachment XII).

An assessment of the impacts of the project on Silver Perch under the Significant Impact Guidelines 1.1 was undertaken for the project and it was determined that the species is unlikely to be significantly impacted (ER specialist study A). Residual impacts from Carp, potential barriers to movement in the construction and operation stages, spills and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. The ER stated that the project is expected to lead to slight improvements in populations of Silver Perch (Table 13-2 ER specialist study A), which is expected due to increased foraging opportunities when the floodplains are inundated, improvements to the food web from nutrient return and improved habitat quality and connectivity. I agree with the SIAC's conclusion that there is unlikely to be a significant impact on this species from the proposed project.

Cumulative effects of the Burra Creek project in relation to the other eight proposed VMFRP projects, the New South Wales Sustainable Diversion Limit Adjustment Mechanism project, and The Living Murray project at Gunbower Forest, Hattah Lakes and Chowilla on Silver Perch were assessed in the ER Accompanying Document 1. The cumulative impact assessment presented in the ER concluded there are unlikely to be cumulative adverse effects on Silver Perch. I agree that based on the SIAC report and information provided in the ER documentation that a significant cumulative impact on this species is unlikely, in the context of proposed EDSs for VMFRP projects being implemented effectively. The SIAC recommended amendments to existing EDSs, inclusion of additional EDSs and additional monitoring requirement (particularly EDS SW2, EDS SW5, and MAE7). These include measures to manage impacts to water quality, and impacts of weeds, pests and pathogens, return woody debris habitat following construction and provide for appropriate fish passage at regulating structures during operation (e.g., EDSs E2d, E2e, SW2, and SW5). While in principle I support the SIAC's recommended changes to the EMF, I have adopted the SIAC primary recommendation and therefore am not addressing specific recommendations of EDSs or the EMF for the Burra Creek project.

South-eastern long-eared bat

South-eastern Long-eared Bat is listed as vulnerable under the EPBC Act. Targeted surveys using a combination of acoustic detection and harp-trapping were undertaken at the Burra Creek project site. Whilst South-eastern Long-eared Bat was not recorded during the surveys and had not been recorded previously, it is considered possible that the species occurs within suitable habitat in the project area. The ER described that the species is known to forage within understory vegetation in a variety of treed vegetation types, including mallee, Buloke and Black box woodland. South-eastern Long-eared Bat is more abundant where vegetation has a distinct canopy and dense cluttered understory layer. The species roosts in tree hollows, crevices and under loose bark and in Victoria is known to roost in mallee eucalypts in long-unburnt vegetation and within Belah trees.

The ER described that within the Burra Creek project area, the species has the potential to occur within the construction footprint and the maximum inundation area. The ER described that the core known range for the species is within old growth mallee and Buloke and Black Box woodlands around the Hattah township and Hattah Kulkyne National Park (over 100 km to the northwest of the Burra Creek project area). The species was recorded during the VMFRP surveys at Gunbower National Park Forest (approximately 100 km southeast of the Burra Creek project area). The ER stated that no important populations of this species have been defined and there is no indication that an important population of the species occurs within the project area.

The ER stated that the species is unlikely to be impacted by occasional flooding of low-lying areas during environmental watering and that the project is likely to have a long-term positive effect on the species through the additional watering of the floodplain habitats used by the species.

The ER discussed that the permanent and temporary loss of small areas of potential habitat for the species may occur as a result of vegetation clearance during construction. It is possible that individuals of the species roosting in tree hollows may be killed during tree clearance. The ER concluded that these impacts are expected to be localised, minor and not ecologically significant. I agree with the findings of the ER that the ecology of the species is unlikely to be significantly impacted by the project, given the small extent of the construction works relative to habitat availability across the broader landscape. The EDSs proposed will also assist in minimising impacts on fauna associated with vegetation clearance through protocols such as staged clearance, pre-clearance surveys and fauna salvage (e.g., EDS E2b). However, I note that the loss of hollow-bearing trees has the potential to impact South-eastern Long-eared bat by removing hollows potentially used for roosting by the species. I also note there is a risk that, with proposed vegetation clearance, some other displaced hollow-dependent fauna species may move into hollows suitable for South-eastern Long-eared bat, reducing the number available for use by this species and increasing competition with other species. As discussed in Section 6.2 of this assessment, the SIAC recommended that, if the project proceeds a hollow replacement plan is required to mitigate this loss. While in principle I support the SIAC's recommendation, I have adopted the SIAC primary recommendation and therefore am not addressing specific recommendations of EDSs or the EMF for the Burra Creek project.

An assessment of the impacts of the project on South-eastern Long-eared Bat under the Significant Impact Guidelines 1.1 was undertaken in the ER and it was determined for the project that, with implementation of the proposed EDSs, the species is unlikely to be significantly impacted (ER specialist study B). The ER stated that the project is likely to have a long-term positive effect on the species through the additional watering of the floodplain habitats used by the species. However, as outlined in Section 6.1 of this assessment the project it is unlikely that such benefits to floodplain vegetation will occur as a result of the project. I agree with the SIAC's conclusion that there is unlikely to be a significant impact on this species from the proposed project, particularly given the small extent of the construction works relative to habitat availability across the broader landscape.

South-eastern Long-eared Bat was not considered in the ER cumulative impact assessment as the species was only detected at one of the other VMPRP project sites: Gunbower. Consequently, it was considered to be unlikely that cumulative adverse effects would occur. I agree that there are unlikely to be significant cumulative impacts on the species associated with the VMFRP projects.

Regent Parrot

The Regent Parrot is listed as Vulnerable under the EPBC Act. The species was recorded during the targeted surveys conducted in the Burra Creek project area. The ER described that the species is highly mobile, and notes they typically nest within suitable hollows in River Red-gums and feed mostly on the ground in mallee woodland, with some foraging occurring in mallee trees, vineyards, orchards, cereal crops and riparian woodlands. ER specialist study B noted that the entire project area represents potential foraging habitat. Potential breeding habitat also occurs within the project area, but in more isolated patches. This species tends to breed in very large River Red-gum trees (i.e., with mean DBH of 160 cm) within 120 m of water.

The ER described that the construction of the Burra Creek project would lead to the following habitat impacts for Regent Parrot:

- removal of up to 22 ha of potential foraging habitat;
- removal of up to 6 ha of potential breeding habitat, which is within 120 m of water; and
- impacts to 26 trees identified as potential breeding trees (with a DBH>160 cm).

The ER stated that there are no breeding records of Regent Parrot within the Burra Creek project area, with the closest breeding records being 23 km to the north at Boundary Bend. The ER also stated that whilst potential foraging habitat for the species occurs within the Burra Creek project area, the habitat in the area it is not mallee woodland which is the

favoured foraging habitat for the species. The ER further noted that the potential foraging habitat in the construction footprint is more likely to be used by the species for dispersal, occasional perching or non-preferred foraging.

The ER noted that the native vegetation impacts from the project represents 1.25% of potential breeding habitat and 1.25% of the potential nesting trees in Victoria within 2 km of the project area. During the hearing Mr Watson, the proponent's expert witness for native fauna, stated that while the species are not known to currently breed within the project area, there is potential for shifts in population distribution as a result of climate change, and the species could potentially utilise the Burra Creek area for breeding in the future.

The ER assessed the impacts of the project on Regent Parrot under the Significant Impact Guidelines 1.1. The ER concluded that adverse impacts to Regent Parrot are possible but were considered unlikely to be a significant impact under the EPBC Act guidelines (ER specialist study B). The ER also concluded that the project will likely benefit the species by providing additional water to floodplain habitats used by the species, which would result in greater foraging resources, and succession of woodland trees that would eventually support suitable nesting hollows.

I note that residual impacts of the Burra Creek project on Regent Parrot could meet two of the criteria to be considered a significant impact under the Significant Impact Guidelines 1.1, which are examined below. These criteria are:

1) reduce the area of occupancy of an important population (criterion B); and
2) adversely affect habitat critical to the survival of the species (criterion D).

The ER contended that Regent Parrot is unlikely to be significantly impacted by the project with implementation of the EDSs proposed. However, I do not consider the EDSs alone to be a sufficient basis for concluding that significant impacts under the Significant Impact Guidelines 1.1 are going to be avoided, or to adequately mitigate against the risk of unacceptable impacts on the species with sufficient certainty, for the reasons outlined below.

The population of Regent Parrot present at Burra Creek is considered an 'important population' as it belongs to the Mid-Murray Victorian sub-population of breeding pairs nominated in the Regent Parrot Recovery Plan[32]. The project will reduce the area of occupancy of this important population due to the loss of up to 6 ha of potential breeding habitat and 22 ha of potential foraging habitat due to vegetation clearance during construction. I further note that the Burra Creek project area is on the eastern edge of the species' area of occupancy and is considered to be important to support the species through potential distribution changes as a result of climate change.

The SIAC noted that the project may result in the transition of approximately 50 ha of Lignum Swampy Woodland Ecological Vegetation Class (EVC) to Lignum Swamp EVC, potentially resulting in the loss or decline of up to 132 Large and Very Large Trees, which has not been considered elsewhere in the ER and not factored into the risk for this species. The SIAC noted that these trees represent approximately 12.4% of the estimated 1,067 canopy trees within the maximum inundation area and considered that this EVC shift would give rise to adverse impacts on existing habitat. I note however that the addendum documents[33] provided for Burra Creek do not provide sufficient detail on how this figure has been calculated to fully consider the impacts this may have on Regent Parrot. While the additional 50 ha area impacted is considered in the ER to be potential foraging habitat for the species, I also note the importance of treed flight corridors outlined in the National Recovery Plan for the Regent Parrot and consider that an additional loss of tree canopy of up to 50 ha would reduce the area of occupancy of this important population.

I further note that the Addendum Document – Attachment 3 stated that approximately 4.24 ha of Shrubby Riverine Woodland is expected to have a negative impact from the project and is expected to transition to Lignum Swampy Woodland. ER Specialist Assessment B Terrestrial Ecology stated that this EVC was predominantly found along less flood-prone (riverine) watercourse fringes, principally on levees and higher sections of point-bar deposits, with River Red Gums, typically closer to the Murray River and taller than the Black Box trees. No information is provided on the potential implications of this shift on River Red Gum or Black Box trees, or on the large trees recorded within the area, however ER notes that River Red Gums may decline in health or die due to more frequent and prolonged inundation. Given these

[32] Baker-Gabb, D. and Hurley, V.G. (2011). National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*, Department of Sustainability and Environment.

[33] Burra Creek Addendum – Attachment 2; Burra Creek Addendum – Attachment 3

River Red Gums likely occur within 120 m of the Murray River, they represent potential breeding habitat for the species. Due to the potentially negative impacts to the River Red Gums, along with the uncertainty of the impacts to the broader EVC, this change may result in an adverse impact to the way Regent Parrots utilise the area, due to the potential loss of canopy coverage and/ or potential foraging and nesting opportunities.

If the full extent of the predicted EVC shifts for Lignum Swampy Woodland and Shrubby Riverine Woodland are realised, the project would result in the loss of up to 54.24 ha of potential foraging habitat and treed flight corridor for the species during operations, in addition to the direct impacts of vegetation clearance for construction. Based on the current information regarding the habitat use for the species and the levels of potential impact on habitat from both construction and operations, I therefore consider significant impact criterion B and D could be met for this project, and therefore the project could result in a significant impact on this species.

The Regent Parrot Recovery Plan[34] defines all potential Regent Parrot habitat within its current normal range, buffer areas, and travel and dispersal routes as habitat critical to the survival of the species. All potential habitat within the Burra Creek project area is therefore considered critical to the survival of the species. I note that no breeding activity was recorded during the current surveys and the project area are outside areas mapped as where breeding is likely to occur in the Recovery Plan's indicative map. However, I consider the ER contains insufficient information to rule out the possibility the potential breeding habitat could be used by the species in the future given that known breeding occurs approximately 23 km away, and the importance that this area plays as a buffer area for potential future breeding.

Cumulative effects of the Burra Creek project in relation to the other eight proposed VMFRP projects, the New South Wales Sustainable Diversion Limit Adjustment Mechanism project, and The Living Murray project at Gunbower Forest, Hattah Lakes and Chowilla on Regent Parrots were assessed in ER Accompanying Document 1.

The cumulative impact assessment noted Regent Parrots are considered present in six of the nine VMFRP project areas (Lindsay Island, Belsar-Yungera, Hattah Lakes North, Vinifera, Nyah and Burra Creek), and breed or may breed at four project areas (Lindsay Island, Belsar-Yungera, Hattah Lakes North and Burra Creek). The assessment stated that given the geographic spread of the project areas where the Regent Parrot occurs (spanning over 550 km of river), different project areas are considered likely to support different Regent Parrot populations. The assessment also noted that, across the project relevant to the Regent Parrot, 273.70 ha of potential foraging habitat (not including non-native vegetation, crops or orchards) and 45.15 ha of potential breeding habitat within 120 m of water would be removed during construction.

I do not support the ER Accompanying Document 1's statement that different areas are likely to support different populations. The Regent Parrot Recovery Plan[19] states that there is a single population in the lower Murray-Darling basin region of South Australia, New South Wales and Victoria. Within this population there are three sub-populations, with all Regent Parrots within the VMFRP project areas belonging to the mid-Murray sub-population. Therefore, any impacts on the mid-Murray sub-population are cumulative.

In my previous assessments for EES Central projects and the Nyah and Vinifera projects, I considered there is potential for the Belsar-Yungera, Nyah and Vinifera projects to each result in a significant residual impact to Regent Parrot. As noted above, the Burra Creek project will also result in habitat loss for the species including both potential foraging and breeding habitat. There is therefore potential for the Burra Creek project to add cumulatively to impacts on Regent Parrot in conjunction with these other VMFRP projects due to additional habitat clearance for the species. I note that further work regarding cumulative impacts is still being progressed for some of the VMFRP projects. The accredited environmental assessment processes for four of the VMFRP projects are underway and the outcomes of these assessments will assist with the understanding of the extent of cumulative impacts on key MNES, including the Regent Parrot.

I consider the Burra Creek project will likely have significant impacts on Regent Parrot due to the proposed removal of habitat critical to the survival of the species.

[34] Baker-Gabb, D. and Hurley, V.G. (2011). National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*, Department of Sustainability and Environment.

As discussed in sections 4.2 and 6.1 of my assessment, it is unlikely the project will result in benefits to the vegetation in the Burra Creek floodplains and the SIAC concluded it should not proceed. It follows that predicted improvements in vegetation health in the inundation areas should not be considered for offsetting impacts on Regent Parrot associated with the project. Any habitat that cannot be avoided as part of project implementation would need to be offset in accordance with federal offset requirements, where relevant.

As discussed in Section 6.2 of this assessment, if the project were to be considered for approval, the SIAC recommended a hollow replacement plan be required under EDS E5, which would assist in mitigating the impacts on the species both from direct impacts of vegetation clearance and the potential for increased competition for hollows from other species that are displaced. As I have adopted the overarching conclusions of the SIAC regarding the project and its overall impacts, I am not commenting further on the specific EDSs or recommendations in relation to those, including measures and recommendations consistent with the Nyah and Vinifera assessments.

Consideration of overall improvement to biodiversity

As discussed in my preceding assessments of VMFRP projects, the proponent undertook an assessment of overall improvement to biodiversity (AOIB) (ER Attachment VII), which was then subsequently updated in light of further hydraulic modelling (Burra Creek Addendum - Attachment 3). The AOIB report is intended to demonstrate the expected benefits of the project and support the decision regarding the proposed alternative arrangement to offsets. Based on the findings of the AOIB reports, the ER stated that for Burra Creek it is expected that 403 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 20,000 ML/day scenario and that there is the potential to benefit 1,067 Large Trees within the maximum inundation area.

The SIAC concluded that the Burra Creek project will not improve the health of most floodplain vegetation in the proposed inundation areas as the watering requirements of most EVCs are currently being met under current flooding regimes, and therefore considers that the project has not sufficiently demonstrated that it will result in an overall improvement to the biodiversity values of the floodplains.

As discussed in sections 6.1 and 6.2 of my assessment, the SIAC recommended that the project not proceed, but that should their primary recommendation not be followed, additional work would be needed to address specific uncertainties relating to floodplain hydraulics and floodplain ecology, with the results of this work to be used to demonstrate the extent of benefits and inform any potential approvals. Specifically, the Burra Creek Committee supported the Nyah and Vinifera Committee's recommended the addition of EDS SW4 and amendments to EDS GS1 which requires further assessment and analysis to address the uncertainties surrounding the implications of hydraulic effects for floodplain vegetation. The intent of this further work is to provide an appropriate level of certainty regarding preferred and tolerable water regimes to inform initial operating scenarios and adaptive management. However, in this assessment, I note that further modelling and analysis is unlikely to change the findings regarding the unacceptability of significant impacts and risks associated with the project proceeding, including in relation to whether or not improvements to biodiversity values could be realised to some extent (see Section 6.1).

Approval decisions under the EPBC Act should, as appropriate, consider my recommendation that the project has significant impacts that are not considered acceptable given the project is not likely to give rise to ecological benefits for EVCs predicted by the proponent and an overall improvement to biodiversity is no longer feasible (given the hydrological conditions in light of the Wakool effect).

Other MNES species

My assessment of other relevant MNES species under the controlling provisions (with a likelihood of occurrence in the project study area with a rating of 'possible' or higher) is provided in Table A2. For all species in this table, potential project effects are considered to be unlikely or low, and significant impacts under the Significant Impact Guidelines 1.1 are considered to be unlikely.

The ER also included an assessment of a number of EPBC-listed species that are unable to be considered under DCCEEW's assessment as they were not triggered as controlling provisions at the time of the referral decision (migratory species) or were listed after the referral decision was made (see EPBC Act s158(A)4). These included:

- Migratory species: including, but not limited to Australian Gull-billed Tern and Fork-tailed Swift; and
- Victorian Mallee Bird Community of the Murray Darling Depression Bioregion.

My assessment of migratory species is provided in Table A3 for those with a likelihood of occurrence in the project area of possible or higher. For all species in this table, impacts from the project are not expected and my assessment is that significant impacts under the Significant Impact Guidelines 1.1 are unlikely.

For the Mallee Bird Community of the Murray Darling Depression Bioregion, the ER outlined that no adverse effects are expected as the community occurs in mallee vegetation which occurs within the broader project area. Little, if any, of the associated mallee vegetation community occurs within the maximum inundation area for the project, and the community is considered unlikely to occur in the construction footprints and therefore is not expected to be impacted by construction.

A number of species and communities which are either present or possibly present within the Burra Creek project have been listed as threatened under the EPBC Act since the original referral decision for the project. As the referral decision pre-dated the listing of these species and communities, they will not be a consideration for the Australian Government Minister in making an approval decision under the EPBC Act. Relevant species and communities include:

- Major Mitchell's Cockatoo *Lophochroa leadbeateri* (endangered)*;*
- Diamond Firetail *Stagonopleura guttata* (vulnerable);
- Hooded Robin *Melanodryas cucullata cucullata* (endangered);
- Brown Treecreeper *Climacteris picumnus victoriae* (endangered);
- Murray Mallee Striated Grasswren *Amytornis striatus howei* (endangered);
- Southern Whiteface *Aphelocephala leucopsis* (endangered);
- Blue-winged Parrot *Neophema chrysostoma* (vulnerable); and
- Grey Snake *Hemiaspis damelii* (endangered).

As these species are also either listed under the FFG Act and/or belong to the FFG Act-listed Victorian Temperate Woodland Bird Community, they are discussed in Section 6.2 of this assessment.

Table A2 Summary of assessment of other MNES species (with a likelihood of occurrence in the project is a rating of possible or higher)

Species	EPBC Status	Potential impacts (ER assessment)	Potential positive effects (ER assessment)	Relevant EDSs	ER assessment of significant effects	Minister's assessment
Australian Bittern	Endangered	Impacts unlikely	Project operation would result in increased habitat availability when environmental water is present.	EMF1; EMF2; EMF3; AQ1, CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E3; GS2; GW1; NV1; RU1; SW1; SW2	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Australian painted snipe	Endangered	Impacts unlikely	Project operation would result in increased habitat availability when environmental water is present.	EMF1; EMF2; EMF3; AQ1, CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; NV1; RU1; SW1; SW2	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Grey Falcon	Vulnerable	Impacts unlikely	Potential benefit from environmental watering.	AQ1; BF2; CM1A; CM1b; CM1C; CM2; E1; E2a; E2b; E2c; E2D; E2e; E3; EMF1; EMF2; EMF3; EMF4; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Growling Grass Frog	Vulnerable	Impacts unlikely	Project operation would result in increased habitat availability, encouraging recolonisation.	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1, E2a; E2b; E2c; E2e; E3; GS2; GW1; NV1; RU1; SW1; SW2	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.

Species	EPBC Status	Potential impacts (ER assessment)	Potential positive effects (ER assessment)	Relevant EDSs	ER assessment of significant effects	Minister's assessment
Painted Honeyeater	Vulnerable	Permanent and temporary loss of localised small areas of foraging and perching habitat from construction.	Potential benefit from environmental watering.	EMF1; EMF3; AQ1; CM2; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; NV1; RU1; SW1; SW2	Impacts unlikely to be significant under the EPBC Act.	Agree with ER that significant impacts on this species are unlikely for the project.
Winged Peppercress	Vulnerable	No impact expected	Project operation is expected to promote growth and recruitment of the species by increasing the extent of suitable habitat available	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; CM2; E1; GS2; RU1; SW1; E2a; E2d; E3; E 15; SW2	Impacts unlikely to be significant under the EPBC Act.	Agree with ER that significant impacts on this species are unlikely for the project.

Table A3 Summary of assessment of EPBC-listed migratory species (with a likelihood of occurrence in the project is a rating of possible or higher)

Species or community	EPBC Status	Potential impacts (ER assessment)	Potential positive effects (ER assessment)	Relevant EDSs	ER assessment of significant effects	Minister's assessment
Australian Gull-billed Tern	Migratory	No impacts expected	Likely to benefit from environmental watering	E2a; E2d; E3	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Caspian Tern	Migratory	No impacts expected	Likely to benefit from environmental watering	E2a; E2d; E3	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Fork-tailed Swift	Migratory	No impacts expected	Project operation may extend and improve the condition of wetland habitat and by increasing the abundance of invertebrate prey	E2a; E2d; E3	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Latham's Snipe	Migratory	No impacts expected	Likely to benefit from environmental watering	E2a; E2d; E3	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.
Sharp-tailed Sandpiper	Migratory	No impacts expected	Likely to benefit from environmental watering	E2a; E2d; E3	Impacts unlikely	Agree with ER that significant impacts on this species are unlikely for the project.

A.2 Assessment

It is my assessment, that taking account of the findings and recommendations included within this assessment, that:

- The project will likely have a significant residual impact on Regent Parrot for the project due to the loss of 6 ha of potential breeding habitat and 22 ha of foraging habitat, with a potential for an additional area of up to 54.24 ha of impacts to foraging habitat, 4.24 ha of which may also be considered potential breeding habitat.
- The Burra Creek project is unlikely to have a significant impact on any other MNES.
- Assessment of cumulative impacts on MNES for the Burra Creek project in conjunction with the eight other VMFRP project has been undertaken to provide an understanding of potential cumulative impacts on MNES. Further work is being progressed to understand cumulative impacts for the four VMFRP projects that are still progressing through accredited environmental assessment processes. DCCEEW will need to determine the extent to which these are helpful in assisting with the understanding of cumulative impacts on key MNES from the Burra Creek project.