Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects

Minister's Assessment under Environment Effects Act 1978

JULY 2023

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.

List of abbreviations

ARI	Arthur Rylah Institute
AOIB	Assessment of overall improvement to biodiversity
CEMP	Construction Environmental Management Plan
CFA	Country Fire Authority
CHMP	Cultural heritage management plan
DBH	Diameter breast height
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
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)
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988* (Vic)
GL	Gigalitres
ha	Hectares
km	Kilometres
LMW	Lower Murray Water
m	Meters
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
Projects	Belsar-Yungera and Hattah Lakes North
PSA	Planning Scheme Amendment
RAP	Registered Aboriginal Party
SIAC	Standing Inquiry and Advisory Committee
TLM	The Living Murray (Program)
TRG	Technical reference group
VMFRP	Victorian Murray Floodplain Restoration Project
WMA	Water management area

Contents

Executive summary

On 6 December 2020, following receipt of a referral from Lower Murray Urban and Rural Water Corporation (Lower Murray Water, LMW), the Minister for Planning decided that a single environment effects statement (EES) was required under the *Environment Effects Act 1978* to cover both the Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects. LMW prepared the EES and a draft planning scheme amendment (PSA), which were exhibited for public comment from 3 October 2022 to 14 November 2022.

On 27 September 2022, 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 draft PSAs. Planning Panels Victoria received 21 submissions on the exhibited EES and held a public hearing from 17 January 2023 to 8 February 2023. The SIAC's report, EES documentation and other material including submissions and documents tabled at the public hearing have informed the preparation of my assessment of the environmental effects of these two projects.

On balance, it is my assessment that while the projects will result in significant impacts during construction, the environmental effects can be acceptably managed, and the projects can achieve an overall improvement to the floodplain environments within the project areas. Construction of the projects will necessitate clearing of native vegetation and disturbance of recorded Aboriginal heritage sites. However, I consider that the environmental management framework (EMF) and environmental delivery standards (EDSs), incorporating amendments recommended by the SIAC and this assessment, will provide appropriate measures to help enable the adverse effects of construction to be minimised and managed to acceptable levels.

Equally, there are environmental risks associated with operations that will require careful management, particularly concerning Aboriginal cultural heritage values and ecological values. The appropriate management of the environmental risks are subject to further detailed analysis and the implementation of an environmental management regime consistent with that endorsed by the SIAC and refined through this assessment. The additional analysis is required to provide greater certainty on the extent of predicted net benefits to floodplain vegetation communities. Further analysis is also needed to understand the implications of floodplain hydraulics for specific floodplain vegetation communities and clarify the preferred and tolerable water regimes for ecological vegetation classes (EVCs) to inform initial operating scenarios and adaptive management. The outcomes of this further analysis (along with other recommendations of this assessment) will need to be considered in relevant project approval decisions and secondary consent matters.

The EMF highlights that the Belsar-Yungera and Hattah Lakes North projects would be undertaken within the adaptive management regime of the existing environmental water planning and delivery framework in Victoria. The principles of adaptive management will allow project operations to respond to varying seasonal conditions and utilise knowledge gained from previous operation events to continuously improve the watering program. Consistent with the SIAC, I consider the effective implementation of this adaptive management approach to be critical to realise many of the key benefits the projects aim to achieve.

While the EES demonstrated the application of avoid and minimise principles in the design and development of the projects and their layouts, further avoidance and minimisation can be achieved, as set out in the EDSs and proposed refinements to EDSs recommended by the SIAC and this assessment. The refinements will help continue to improve environmental outcomes for both projects through further avoidance and minimisation of vegetation clearance, and other impacts, as the projects are designed, constructed and operated.

On 29 September 2020 and 19 May 2020, the Belsar-Yungera and Hattah Lakes North projects (respectively) were each determined to be controlled actions requiring assessment and approval under the *Environment Protection and Biodiversity and Conservation Act 1999* (EPBC Act) because of likely significant impacts on matters of national environmental significance (MNES). The EES process served as the accredited assessment for each project for the purposes of the EPBC Act and my assessment will inform the Commonwealth Government Minister for Environment and Water's decisions about whether and under what conditions to approve the projects under the EPBC Act.

It is my assessment that residual impacts of both projects on EPBC Act-listed species and communities are unlikely to be significant, except for Regent Parrot. The Belsar-Yungera project will likely have a significant impact on Regent Parrot

due to the loss of 27.7 ha of potential breeding habitat and 50.3 ha of potential foraging habitat. Residual impacts on EPBC Act-listed species and communities can be acceptably managed provided that the proposed EDSs are implemented and significant impacts are offset in accordance with EPBC Act Environmental Offsets Policy. I support amendments to EDSs as recommended by the SIAC and further strengthened by my assessment, to ensure appropriate avoidance and minimisation of adverse impacts on MNES as detailed in Appendix A of my assessment.

My assessment includes specific recommendations to inform the proponent and statutory decision-makers responsible for approval decisions under Victorian and Commonwealth law. Decision-makers need to consider this assessment before deciding whether and how the projects should proceed. As a matter of good practice, I also expect decision-makers to write to me to advise how my assessment was considered and applied.

1 Introduction

On 6 March 2020 and 22 June 2020, Lower Murray Urban and Rural Water Corporation (Lower Murray Water, LMW), referred the Belsar-Yungera Floodplain Restoration Project and the Hattah Lakes North Floodplain Restoration Project (respectively) to the Minister for Planning under the *Environment Effects Act 1978*. The Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects are part of the Victorian Murray Floodplain Restoration Project (VMFRP, refer to Section 2.1).

On 6 December 2020, the Minister for Planning decided that a single environment effects statement (EES) was required under the Environment Effects Act to cover both the Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects. The decision to require an EES included procedures and requirements for the EES, in accordance with section 8B(5) of the Environment Effects Act and the *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978*. The procedures and requirements specified that a single EES was to be prepared to assess both projects and that the EES was to document investigations and integrated assessment of the potential environmental effects of the proposed projects. The procedures and requirements went on to say the investigations and assessments were required to include feasible project alternatives and design refinements (e.g., alternative project layouts, siting of infrastructure, management measures, project staging, as well as timing and extent of inundation events) to avoid, minimise and manage effects, particularly for:

a. adverse effects on biodiversity and ecological values within and near the project area, including effects of exacerbated threatening processes, on native vegetation listed threatened ecological communities and species;
b. intended ecological benefits and how they relate to the predicted adverse effects on specific biodiversity values;
c. effects on Aboriginal and historic cultural heritage values;
d. effects on land uses and socioeconomic values;
e. potential effects on water environments and related beneficial uses;
f. effects on groundwater that may result in adverse changes to salinity or groundwater depending ecosystems; and
g. potential cumulative effects on threatened species, surface water and groundwater, with particular consideration of the currently operating, approved or proposed environmental watering projects in the region.

LMW prepared the EES and a draft planning scheme amendment (PSA), which were exhibited for public comment from 3 October 2022 to 14 November 2022.

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.

Planning Panels Victoria, on behalf of the SIAC, received 21 submissions on the exhibited EES and draft PSA for these two projects. The SIAC held a directions hearing on 28 November 2022 and a public hearing for a period of four weeks from 17 January 2023 to 8 February 2023, via videoconference. Parties to the SIAC hearing tabled a total of 191 documents. The SIAC provided its report to me on 24 April 2023. That report, along with the EES, its supporting specialist studies, public submissions, tabled documents and relevant legislation, policy and guidelines have informed my assessment of the environmental effects of both projects. During the public hearing and in the SIAC report the EES and supporting documents were also referred to as 'EES Central' in the context of the wider VMFRP.

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 public hearing, to help understand the issues and perspectives of different parties. I have considered all of the matters relevant to the environmental assessment of the two projects.

1.1 Purpose of this document

This document constitutes my assessment of the environmental effects of each of the Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects under the Environment Effects Act. This assessment represents the final step in the EES process and provides authoritative statutory advice to decision-makers, the proponent and all other stakeholders on the likely environmental effects of each project, their acceptability and how the effects are to be addressed in relevant statutory decisions and the delivery of the projects.

This assessment will inform the decisions required under Victorian law for the proposals to proceed. In addition, because the EES process has been undertaken as an accredited assessment process, purposes of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), it will also be relied upon by the Commonwealth Minister for the Environment and Water for decisions under the EPBC Act, about whether and under what conditions each of the two projects will be approved.

1.2 Structure of the assessment

The structure of my assessment is as follows:

- Section 2 provides a brief description of the projects;
- Section 3 outlines the EES process and statutory approvals required for the projects;
- Section 4 assesses central matters that were the focus for some stakeholders and the SIAC;
- Section 5 summarises the project's proposed planning controls and environmental management framework (EMF);
- Section 6 assesses the environmental effects of the projects in relation to the evaluation objectives by environmental discipline;
- Section 7 presents my conclusions, including responses to the recommendations of the SIAC;
- Appendix A contains the assessment of the Commonwealth matters of national environmental significance; and
- Appendix B contains my recommendations about the environmental delivery standards (EDSs).

2 Project description

2.1 Victorian Murray Floodplain Restoration Project

The Victorian Murray Floodplain Restoration Project (VMFRP) is 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. The Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects are two of the nine projects under the VMFRP.

2.2 Belsar-Yungera

The Belsar-Yungera Floodplain Restoration Project (Belsar-Yungera) is located in north-west Victoria approximately 390 km north-west of Melbourne and 90 km south-east of Mildura. The project proposes to return a more natural flood regime to 2,374 ha of the Belsar-Yungera Floodplain Complex, within the Narcooyia Creek, Bonyaricall Creek and Yungera Creek anabranches of the Murray River. The project is designed to facilitate managed inundation across four water management areas (Figure 2-1):

- Water Management Area 1, comprising 1,540 ha;
- Water Management Area 2, comprising 562 ha;
- Water Management Area 3, comprising 36 ha; and
- Water Management Area 4, comprising 272 ha.

The EES described the project as comprising the following main components (Figure 2-1):

- one very large regulator incorporating a vertical slot fishway (ER1);
- two large regulators (ER3 and S7);
- 14 small regulators;
- two culverts;
- 1.6 km of containment banks with access tracks on top;
- a 2 km low-pressure underground pipeline;
- four permanent hardstands (for temporary pumps to transfer environmental water from the Murray River into the Narcooyia Creek system as required);
- upgrades to existing access tracks (approximately 11.1 km);
- creation of new access tracks (approximately 12.8 km);
- use of existing access tracks, including for maintenance activities during operation (approximately 24.4 km); and,
- decommissioning and removal of the existing block bank on the Narcooyia Creek.

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 for the project is 52 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 such as new and existing regulators, raised tracks and banks, temporary pump stations, hardstands and pipelines. 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 will be the final asset owner of project infrastructure. 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 approximately 18 months to complete.

Operation of the proposed structures within the four water management areas would be coordinated to achieve environmental watering targets. Six 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 areas 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.

The project is described in more detail in Chapter 6 of the EES.

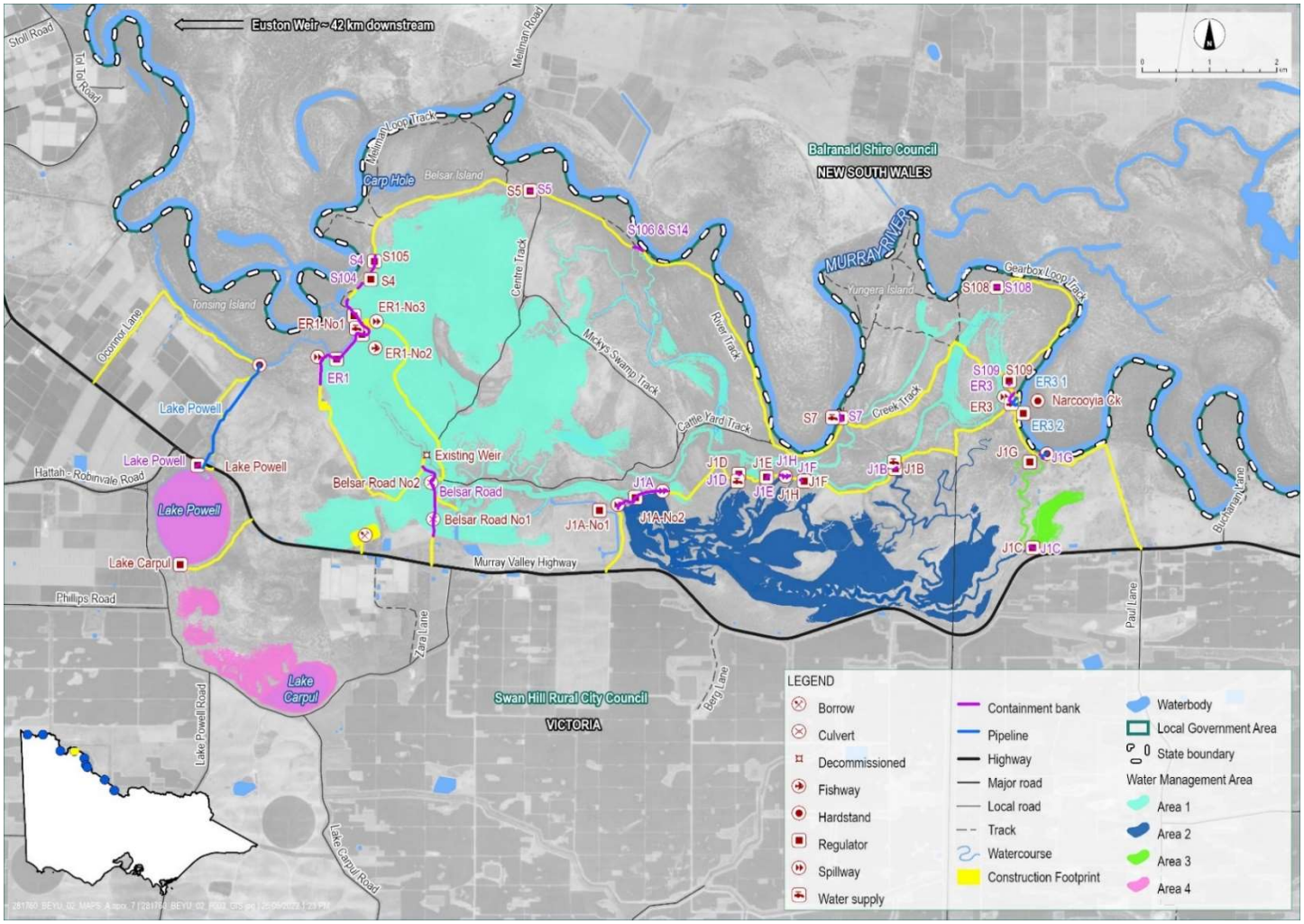


Figure 2-1 Project components map for the Belsar-Yungera Floodplain Restoration project (sourced from EES Chapter 6)

2.3 Hattah Lakes North

The Hattah Lakes North Floodplain Restoration Project (Hattah Lakes North) is located in north-west Victoria, approximately 400 km north-west of Melbourne and 60 km south of Mildura. The project proposes to return a more natural flood regime to 1,130 ha of the Hattah Lakes Floodplains Complex, within Hattah-Kulkyne National Park and Murray-Kulkyne Park.

The project is designed to facilitate managed inundation across two water management areas (Figure 2-2):

- Chalka North Water Management Area (referred to as Kulkyne inundation in Figure 2-2), comprising 417 ha; and,
- Lake Boolca Water Management Area (referred to as Bitterang inundation in Figure 2-2), comprising 713 ha.

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

- one large regulator (K10);
- one small regulator (Bitterang Regulator);
- one containment bank (K10 River Track Containment Bank);
- 1.8 km of containment banks with access tracks on top; and
- use of existing access tracks, including for maintenance activities during construction (approximately 16.9 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 for the project is 31 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 such as new and existing regulators, raised tracks and banks, temporary pump stations, hardstands and pipelines. 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 will be the final asset owner of project infrastructure. 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 approximately 18 months to complete.

The project will leverage high Murray River flows as managed environmental flow events using existing infrastructure from The Living Murray (TLM) project and proposed new infrastructure to deliver environmental water to the two water management areas. Seven potential operational scenarios were developed to deliver environmental water at different frequencies and durations to meet the hydrological requirements of the relevant ecology present. These operating scenarios aim to replicate inundation conditions within the water management areas that would have occurred at various pre-regulation flow thresholds of the Murray River. Mallee CMA will coordinate the environmental watering and the environmental monitoring, evaluation and reporting.

The project is described in more detail in Chapter 6 of the EES.

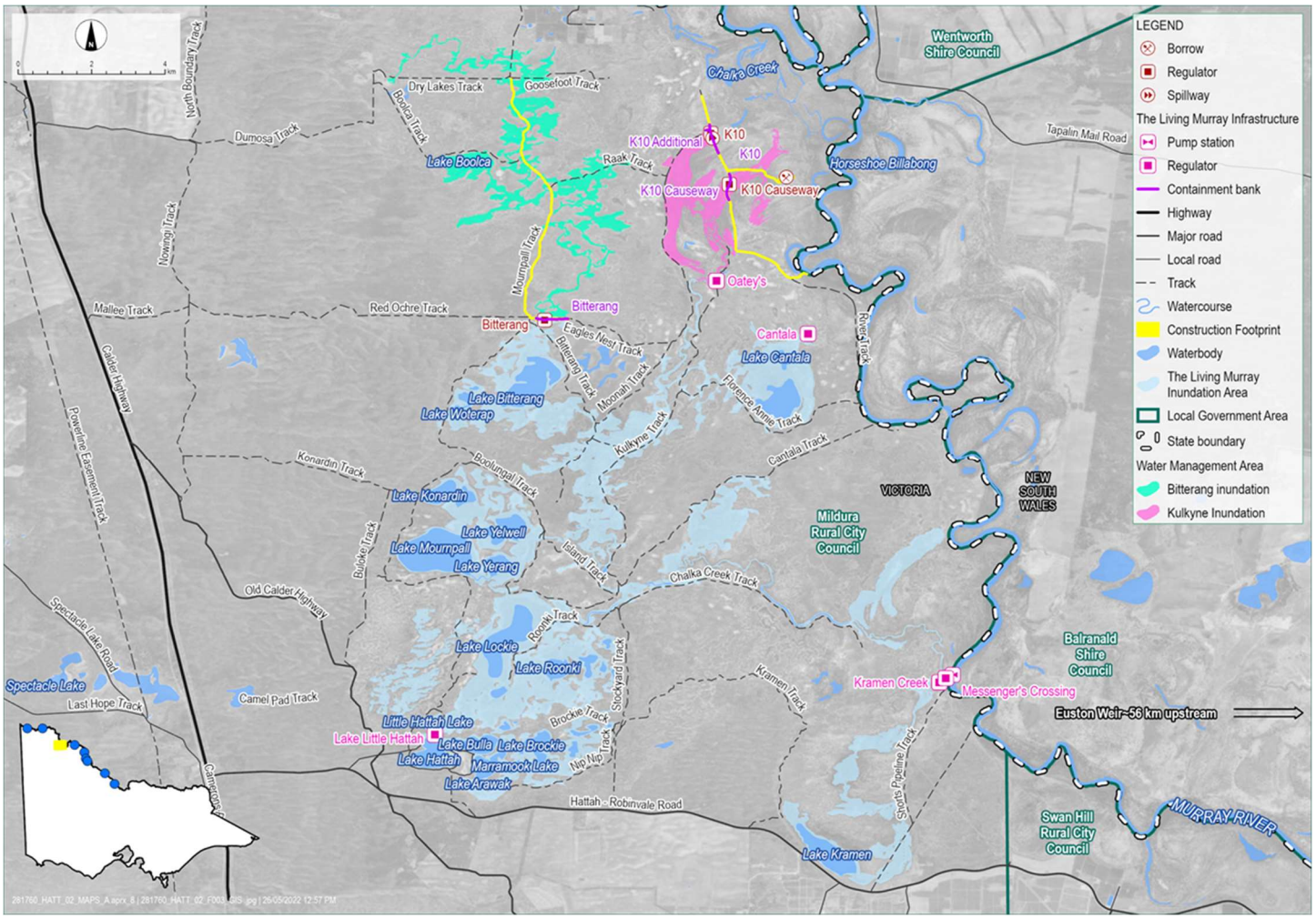


Figure 2-2 Project components map for the Hattah Lakes North Floodplain Restoration project (sourced from EES Chapter 6)

3 Statutory processes

This section refers to key Acts that are relevant to my assessment and delivery of the project. LMW require a variety of statutory approvals under Victorian and Commonwealth law for each project before they can proceed. My assessment under the Environment Effects Act will inform approval decisions, as well as a range of other permits, licences and consents.

The Belsar-Yungera project will require some New South Wales approvals due to a temporary suction line which, during pumping in the operation phase, would be located on the bank of the Murray River within New South Wales. It is the responsibility of the proponent to seek all necessary approvals within New South Wales. It is not the intent of this assessment to explicitly inform decisions beyond those required in Victoria and the Commonwealth. 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 of proposed projects that are capable of significant effect on the environment. Section 8C of the Environment Effects Act provides that approval decisions for the projects may not be made until this assessment is completed and has been considered by the decision-makers who have been given notice.

Following exhibition of draft scoping requirements for public comment in April – May 2021, the Minister for Planning issued final scoping requirements specifying the range of matters to be addressed in the EES for both Belsar-Yungera and Hattah Lakes North projects. The former Department of Environment, Land, Water and Planning (DELWP), now Department of Transport and Planning (DTP), convened a technical reference group (TRG) for the VMFRP projects in accordance with standard EES practice to provide advice to the proponent and DTP on the preparation and adequacy of the EES, as well as coordination with related statutory approval and consent processes.

The EES was prepared by LMW and placed on public exhibition from 3 October 2022 to 14 November 2022. A draft planning scheme amendment (PSA) for the two projects was also exhibited with the EES.

This assessment is the final step under the Environment Effects Act. It summarises the environmental effects of the proposed Belsar-Yungera and Hattah Lakes North projects and provides an assessment of the acceptability of these effects for statutory decision-makers under Victorian law. Decision-makers must consider this assessment before deciding whether and how the proposals should proceed. This assessment will inform approval decisions under the Victorian and Commonwealth legislation outlined below.

3.2 Planning and Environment Act 1987

The *Planning and Environment Act 1987* sets out processes for the consideration of planning permit applications, the amendment of Victorian planning schemes and decision-making about granting or refusing planning permits and planning scheme amendments. The proponent is seeking a single bespoke amendment that covers the projects across the Rural City of Swan Hill and Rural City of Mildura planning schemes. The amendment would introduce planning control for the 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 both of the relevant planning schemes.

The draft PSA and incorporated document relevant to these projects is discussed in Section 5.1.

3.3 Aboriginal Heritage Act 2006

The *Aboriginal Heritage Act 2006* sets out triggers and requirements for the mandatory preparation and approval of cultural heritage management plans (CHMPs). Section 49 of the Aboriginal Heritage Act states that a CHMP is mandatory if an EES is required, the CHMP must be prepared for the area in which the works are to be carried out. Draft CHMPs are in preparation for construction of the Belsar-Yungera (No. 16898) and Hattah Lakes North (No. 14330) projects. The proponent chose to prepare CHMPs which only relate to the works required to construct the projects and

did not encompass the operations phase. The proponent will need to consider their obligations under the Aboriginal Heritage Act, including whether effects and mitigations to minimise these effects in the maximum inundation area will require further CHMPs, or cultural heritage permits (another mechanism of the Aboriginal Heritage Act).

The projects are 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 CHMPs and permit applications 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.

LMW will also require a permit to remove listed flora and fauna from Crown land and handle fish under the FFG Act.

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 these projects 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 both projects, 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 both projects to construct works in, on, under or above any designated waterway (Chalka Creek North and Narcooyia Creek). LMW will also need a licence for works to construct, alter, operate, remove or decommission any works on a waterway.

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 projects 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 Section 27 of the Act, consent is required for permanent works to be carried out in a National Park. The Hattah Lakes North project is located within the Hattah-Kulkyne National Park, a designated park under the Act, and will require the Minister for Environment and Climate Action to execute consents for construction, operation and maintenance of project infrastructure. In executing consents, the Minister will apply conditions 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 Hattah Lakes North 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 Belsar-Yungera project include the Lake Powell and Lake Carpul Nature Conservation Reserve and River Murray Reserve. Crown lands within the Hattah Lakes North project include the Hattah Lakes North National Park. These Crown lands for both projects are managed by Parks Victoria in accordance with the objectives of the National Parks Act and relevant management plans in place.

For the Hattah lakes North project, 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 areas for both projects are 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 will need to be sought from Parks Victoria.

3.8 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[1] that, based on the projects' 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 projects. The duties under the Act, including the general environmental duty, will apply to the projects 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.

My assessment of the projects provided in Sections 5 and 6 of this assessment, takes account, as appropriate the requirements of the Environment Protection Act and regulations.

3.9 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 Belsar-Yungera and Hattah Lakes North projects require extraction of material from nearby small quarry sites (referred to in the EES and hereafter in this assessment as borrow sites). The location of the borrow sites are proposed to be on private land within the project areas, which were identified through a tendering process. On 31 August 2022, a Victorian 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[2]:

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;

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

[2] Victorian Government Gazette No. S 444, Wednesday 31 August 2022 (Dated 25 August 2022). Minister for Resources, Jaala Pulford.

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 sites will need to comply with the requirements of the 5AA(1) exemption and the Earth Resources Regulation Code of Practice for Small Quarries.

3.10 Other Victorian statutory approvals

In addition to those discussed above, the projects are expected to require other Victorian statutory 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*; and
- a permit to disturb an item listed in the Victorian Heritage Inventory under the *Heritage Act 2017*, for unlisted or newly discovered sites.

3.11 Commonwealth statutory approval

EPBC Act

LMW referred the proposed Belsar-Yungera (September 2020) and Hattah Lakes North (April 2020) projects to the Commonwealth Government (referrals 2020/8744 and 2020/8632, respectively) for a determination on whether each project was controlled action under the EPBC Act.

On 29 September 2020 and 19 May 2020, each of the Belsar-Yungera and Hattah Lakes North projects were 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 Belsar-Yungera project are listed as threatened species and communities (Sections 18 and 18A). The relevant controlling provisions for the Hattah Lakes North project are Ramsar wetlands (Sections 16 and 17B) and listed threatened species and communities (Sections 18 and 18A).

The EES is serving as the accredited state assessment for each of the controlled actions (i.e., projects), for the purposes of the EPBC Act, with the commonwealth decisions about whether, and under what conditions, to approve each of the projects to be made after consideration of 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* and the *Water Act 1989* (Vic). The policy basis for the 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.

3.12 New South Wales statutory approvals

The relevant New South Wales legislation under which statutory approvals for the Belsar-Yungera project would likely be required include:

- *Environment Planning and Assessment Act 1979*;
- *Fisheries Management Act 1994*; and
- *National Parks and Wildlife Act 1974*.

It is outside the scope of this assessment to provide recommendation or assessment on these approvals. As per the advice provided by the proponent in Tabled Document 99, the proponent will seek the various approvals independent of the EES process and associated Victorian and Commonwealth approvals.

4 Environmental assessment – key matters

This section examines and provides my assessment on some key and overarching matters listed below:

- project benefits;
- consideration of project alternatives;
- cumulative effects; and
- overall findings.

4.1 Project benefits

The underlying rationale for all the VMFRP projects is to restore and enhance 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, construction of the watering infrastructure, itself, will cause significant impacts to the same values when native vegetation is cleared to construct the projects in these high value environments.

In the consideration of project approvals for the construction and operation, the expected project benefits and associated certainty of those being realised over time, should be weighed against the identified impacts (direct and indirect) of delivering the projects, particularly in the context of the Planning and Environment Act and native vegetation policy. To assist with this, the EES was required to assess and document the projects' intended ecological benefits including how they relate to their predicted adverse effects on specific biodiversity values.

Overall improvement (benefits) to biodiversity

In its assessment of the projects' benefits and impacts, the proponent sought to examine whether each project meets the criteria[3] required to seek an exemption from needing native vegetation offsets (i.e., for conservation works) under the Victorian native vegetation policy. Formal application (and decision-making) on this alternative arrangement will be defined in the PSA incorporated document. My assessment and recommendations regarding specific biodiversity effects is provided in Sections 6.3, 6.4 and Appendix A, and associated planning controls are discussed in Section 5.1.

The EES' assessments for Belsar-Yungera and Hattah Lakes North (EES Attachments V and VI) both concluded that the projects would deliver an overall improvement to biodiversity, achieved by better aligning the frequency, duration and timing of inundation/watering within the floodplains to pre-regulated hydrology. The assessments concluded this would improve ecosystem function, threatened species' habitat, and improvement of native vegetation communities within the inundation area. The assessments did however note that one species – Murray Hardyhead (*Craterocephalus fluviatilis*) – was predicted, by the EnSym NVR tool for the Belsar-Yungera site, to suffer a greater impact than benefit. The EES' assessment concluded, however, that the species is highly unlikely to be present, and therefore the predicted impact is unlikely to reflect actual ecological outcomes for the Murray Hardyhead from the project.

Although not presented in the EES, the proponent commissioned an independent expert elicitation by Arthur Rylah Institute (ARI) to assist in predicting likely responses of the floodplain vegetation communities (ecological vegetation classes, EVCs) under various watering regimes. 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 expert elicitation report was provided by the proponent for all parties to view prior to the inquiry and tabled prior to the hearing (Tabled Document 73). The report concluded that four of the EVCs would not receive benefit from the projects' proposed watering regime.

To contextualise the expert elicitation results for the Belsar-Yungera environment, the proponent published a technical note (TN03, Tabled Document 108) which presented further site-specific work for Belsar-Yungera floodplain, carried out

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

by Ecological Associates[4]. The proponent did not provide a site-specific assessment for the Hattah Lakes North floodplain as the necessary hydraulic modelling was not available at the time.

The Ecological Associates report applies the results of hydraulic modelling of the Belsar-Yungera floodplain to evaluate the frequency and duration of inundation of the various EVCs under different scenarios. The scenarios were pre-regulation (i.e., the target scenario), regulated (i.e. existing scenario) and Basin Plan (i.e., accepted baseline scenario). However, I note that the Basin Plan plus VMFRP scenario was not addressed in the Ecological Associates report. This scenario represents the most likely post-VMFRP regime, which is what the projects would seek to implement. I recommend this scenario is included in the update of the assessment of overall biodiversity improvement (as recommended under EDS SW4).

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 (TN03), 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.

The SIAC concluded that while there is reasonable expectation of overall benefit to biodiversity values in the long-term, the EES did not demonstrate that all the native vegetation within the floodplains would benefit from the projects. The SIAC recommended additional work to address specific uncertainties relating to floodplain hydraulics and floodplain ecology, with the results of this work to be used to confirm the extent of benefits (see Section 6.1). The SIAC also recommended the findings of this further work should then be used to update the assessment of overall biodiversity improvement, prior to final decision-making on the alternative arrangement to offsets included in the proposed incorporated document. I support these findings and recommendations and consider it important this work is undertaken to satisfactorily clarify the likely benefits (and residual risks) for the vegetation communities of the floodplains for both projects, prior to native vegetation related decision-making. Sections 6.3 and 6.4 examine the projects' effects (and benefits) on biodiversity values and sets out all of my associated recommendations.

While the expected ecological and biodiversity benefits of each project are likely to be significant, they will take some time to realise. However, I am confident the projects are likely to result in improvement to ecology and biodiversity in these important floodplain environments. That said, the success of each project will rely on effective risk mitigation through implementation of the recommendations of the SIAC and this assessment and effective adaptive management. The resourcing and sustained commitment of project partners is also key to adaptively and effectively managing long term outcomes for these floodplain environments.

Other project benefits

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

The EES 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 EES also presented the projects as 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, discussed further in Section 6.5. However, I support the findings of the SIAC that these potential effects can be managed to an acceptable level and there will be benefits. Detailed assessment and my recommendations regarding effects on Aboriginal cultural heritage values are provided in Section 6.5.

In the case of social and economic considerations, I am similarly confident the projects' benefits will outweigh their disbenefits. The Belsar-Yungera and Hattah Lakes North project areas are highly valued for activities including camping, bushwalking, bird watching, canoeing, trail-bike riding and horse riding. The EES estimated that the project would result in approximately 1,000 additional recreational visitors to the Belsar-Yungera floodplain, which would bring an estimated economic value of $160,000 per year, and approximately 5,000 recreational visitors to Hattah Lakes North wetland

[4] Ecological Associates (2023). Hydrological analysis of Ecological Vegetation Classes in relation to expert elicitation report – Belsar-Yungera Floodplain (Tabled document 108)

system each year, which would bring an estimated economic value of $800,000 per year. Further regional economic benefits are outlined within the EES, including the generation of economic activity during construction of approximately $173 million for Belsar-Yungera and approximately $29 million for Hattah Lakes North. Other likely benefits for the community include improving bushfire resilience of vegetation, improving vegetation growth and improving visual quality of views, improved access through track upgrade and maintenance.

The SIAC concluded the EES assessment of social and economic effects was satisfactory, and the EMF provides a suitable basis for managing the social and economic effects of the project. I note that the SIAC, in providing its advice on the planning framework, acknowledged the net community benefit of the project. These are matters that need to be considered for the subsequent planning approval decision under the Planning and Environment Act (see Section 5.1). My assessment and recommendations on land use, social and economic aspects are provided in Section 6.6.

Residual uncertainties and adaptive environmental management

The additional work recommended by the SIAC, as reflected in this assessment, will assist in confirming aspects of the predicted benefits. Notwithstanding that, the ability of the projects to realise the full extent of predicted benefits needs to take account of some other factors that are essential to achieving short, medium and most importantly, long-term environmental objectives. These essential success factors are:

- that the operations and projected inundations can be sustainably implemented as proposed;
- the monitoring and adaptive management program can be implemented effectively, with timely understanding of ecological conditions and responses to the planned watering, to inform appropriate management actions; and
- practical options for adaptive management exist well into the future, as the understanding of the ecology and floodplain environment evolves, in the context of its responses to watering and other uncontrollable factors such as climate change.

The SIAC and this assessment has proceeded on the basis that sufficient water will be available to the projects through the management of entitlements under the Water Act (Vic) as presented to the SIAC by VEWH[5]. The realisation of benefits is dependent on the sustained and effective implementation of operations, which is conditional on primary and secondary approvals and interactions between these approvals, as discussed in Sections 3 and 5.1. Ultimately, there needs to be sufficient certainty in the implementation of operations before vegetation clearance and/or construction begins.

The EMF says the Belsar-Yungera and Hattah Lakes North projects would be undertaken within the existing environmental water planning and delivery framework in Victoria which utilises an adaptive management cycle. The adaptive management process would include monitoring, evaluation and reporting to continuously review project performance relative to objectives and targets and allow for the watering program to be updated in response. The SIAC's assessment was made on the basis that the EMF, EDSs and associated management plans and processes will be adequately resourced, consistent with their approval. I agree with the SIAC that it is paramount that adequate, sustainable funding and resourcing is allocated in relation to environmental monitoring and adaptive management, to facilitate the realisation of expected benefits and effective management of adverse residual environmental effects and risks.

4.2 Consideration of project alternatives

As set out in the EES scoping requirements and the EES procedures and requirements, the EES 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 EES 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. The implications of the "no project" option also needed to be outlined.

Chapter 4 of the EES outlined project alternatives considered in the early stages of project development (pre-EES referral) and summarises further project refinements conducted during the EES process. The early stages of project development, which the EES indicates have been ongoing since the mid-2000s, included investigations of potential

[5] Tabled Document 115

options to provide water to restore the function and habitat components of floodplain ecosystems along the Murray River. The EES reports that in 2013 the Belsar-Yungera and Hattah Lakes North projects were recommended to proceed to a business case, to be submitted under the Murray-Darling Basin Plan. Further business case development is also described, including selection of a preferred water management option for each project that aimed to minimise environmental impacts. Advanced concept designs where then developed including further refinement of the inundation areas and identification of the structural requirements for each water management area.

A brief outline of policy context and interventions considered as part of the early development of VMFRP are provided in EES Chapter 2, which includes consideration of options such as additional Commonwealth water recovery from consumptive users, alternative approaches for environmental watering within sites and use of alternative sites for watering. The 'no intervention' scenario is also discussed. The SIAC discussed the broader policy context of consideration of alternatives in Section 4 of their report, highlighting that some submitters believed the SIAC should consider alternative projects that would achieve the same environmental outcomes sought by the VMFRP, such as water buybacks and constraints relaxation. The SIAC noted that, consistent with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978*, the EES did not assess alternatives *to* the projects in detail but did consider the implications of the 'do nothing' scenario. I agree that the approach taken in the EES, with the focus on alternatives *for* the projects, was appropriate.

Information on specific alternatives considered during the EES process for siting and layout of project infrastructure was provided in Chapter 4 and Attachment VII of the EES. The process of assessment of alternatives for the project layouts during the EES process initially included a design and constructability review, which allowed the construction and operational requirements of the projects to be better understood including a review of required construction footprints for infrastructure and requirements for access tracks and borrow sites. Based on the outcomes of specialist assessments conducted for the EES, 'significant values' were identified for consideration during further examination of alternatives. Multidisciplinary workshops were held where refinements to the construction footprint were considered to avoid and minimise environmental impacts where possible – there was a particular focus on reducing impacts to biodiversity and cultural heritage values. The selection of design refinements was also informed by stakeholder consultations, including with Traditional Owners. Alternatives associated with project staging and timing and/or extent of inundation events were also considered in the EES.

The process of consideration of alternatives in relation to impacts on native vegetation is further discussed in Section 7.3 of the SIAC report. The SIAC highlighted that several submitters questioned whether sufficient effort had been made to avoid and minimise effects on native vegetation. The SIAC considered that the project design refinements outlined in EES Attachment VII sufficiently explored efforts to avoid and minimise effects from native vegetation loss. I agree that the proponent applied the avoid and minimise principles through the examination and refinement of alternatives. However, the EES also highlights aspects of the project designs and layouts where there are further opportunities to explore avoidance and minimisation of adverse effects to native vegetation through detailed design and construction methods post primary approval. Twenty-one (21) such cases were identified for Belsar-Yungera, with three cases identified for Hattah Lakes North. The SIAC considered that the requirement for further investigation of these cases during detailed design post-approval was not adequately captured in the EMF. Accordingly, the SIAC recommended EDS E1 be amended to require further assessment of identified alternatives through the detailed design process and selection of construction methods with potential to further avoid and minimise impacts to native vegetation (i.e., reducing removal). I support this recommended change to EDS E1. I note that a proposed process for assessment of alternatives during the contractor procurement and construction phase was outlined in Chapter 4 of the EES but was not reflected in the EMF. The process outlined in Chapter 4 includes the following activities:

- shortlisted contractors will be required to recommend alternatives and refinements prior to contract award;
- workshops will be held with shortlisted contractors to discuss design alternatives (previously identified and new alternatives) and constructability within the construction footprint for each project;
- agreed alternatives will then be embedded into the contract specification as scope items and monitored post contract award; and
- VMFRP staff will continue to work closely with the contractor throughout the construction phase to ensure all relevant project knowledge and background assessments are shared as relevant.

Further to the SIAC recommendation to amend EDS E1, I recommend the final EMF includes a process for further assessment of alternatives/refinements to the construction footprint during the contractor procurement and construction phase (generally consistent with the process proposed in EES Chapter 4), to further strengthen the measures to avoid and minimise adverse environmental effects during the detailed design process, particularly for Belsar-Yungera given its greater extent of impacts on native vegetation and associated biodiversity values through construction.

My assessment of effects of the projects is made based on the EES and subsequent documentation tendered to the SIAC. This encompasses the proponent's preferred form of the projects and the alternatives it identified and examined in the EES.

4.3 Cumulative effects

The consideration of cumulative impacts and benefits has formed an important part in the development of each of the nine VMFRP projects. It should be noted that there is uncertainty around the respective timing and implementation of each of the nine VMFRP projects. The scenario considered in this assessment assumes that all nine projects proceed and the Belsar-Yungera and Hattah Lakes North projects are constructed at the same time.

The projects will result in some cumulative effects namely in relation to:

- salt load and dissolved oxygen;
- increased carp abundance;
- impacts to biodiversity and habitats through native vegetation clearance; and
- aboriginal cultural heritage.

The SIAC concluded that while there is the potential for some minor localised cumulative effects, the projects are generally unlikely to result in significant cumulative impacts with implementation of the proposed mitigation measures. I support the conclusion of the SIAC and have provided recommendations to address the management of potential adverse cumulative effects, including in relation to some specific risks for threatened fauna, as discussed in Section 6.3 and Appendix A.

Detailed information on the cumulative effects of different aspects of the projects have been considered in later sections of this assessment including in relation to salt load and dissolved oxygen (Section 6.1), carp (Section 6.4), and potential impacts to biodiversity and habitats (Section 6.3 and Appendix A). The EES states that the accurate assessment of cumulative effects for Aboriginal cultural heritage relies on knowledge of Aboriginal places within the project areas. Therefore, sufficient cumulative assessment of the impacts to Aboriginal cultural heritage will be encompassed in the proposed CHMPs, as required under Regulation 68 of the Aboriginal Heritage Act.

4.4 Overall findings

On balance, it is my assessment that the works proposed for the Belsar-Yungera and Hattah Lakes North projects can both proceed with acceptable environmental effects, but subject to the completion of some specific further detailed analysis and an environmental management regime consistent with that endorsed by the SIAC and as refined through the findings and recommendations of this assessment. This overall conclusion is also predicated on the successful implementation of adaptive environmental management to realise the likely project benefits in these high value floodplain environments.

As further discussed in Section 6, the construction of the projects will result in some significant impacts on environmental values particularly due to the loss of native vegetation during construction, and disturbance of recorded Aboriginal heritage sites in construction areas. As the projects are being implemented in sensitive and significant conservation areas, their operation will require careful management, particularly with respect to Aboriginal cultural heritage values and some ecological values. However, I consider that the proposed EDSs, including amendments recommended by the SIAC and this assessment, will provide appropriate measures to ensure that the adverse effects of both construction and operations are managed to acceptable levels, when also taking account the predicted benefits for these floodplain environments.

Along with the SIAC, I consider the proponent has demonstrated during the EES process that the avoid and minimise principles have been applied in the development of the project layouts and designs (see Section 4.2). However, the proposed refined EDSs for the implementation of the projects include measures to facilitate investigation of further opportunities to avoid and minimise adverse effects (particularly reducing native vegetation removal) during the detailed design and construction phases. I commend these changes and the imperative to continue to improve environmental outcomes for both projects through further avoidance and minimisation of vegetation clearance and other impacts wherever possible, as the projects are designed, constructed and operated.

Consistent with the findings of the SIAC, I consider that both the Belsar-Yungera and Hattah Lakes North projects are likely to result in an overall improvement to biodiversity values of the floodplain over the long-term. However, I note the issues and gaps raised by the SIAC regarding the understanding of some aspects of the likely benefits, including in terms of extent and timeframes. I therefore support SIAC findings regarding the need for further analysis of floodplain hydraulics and its implications for specific floodplain vegetation communities, to help improve the understanding of some aspects of the expected benefits within the floodplains. The key reasons this further analysis is recommended by the SIAC and supported by this assessment are, as further described in Section 6, to:

- provide more detail, particularly spatially, around key hydraulic parameters for each operating scenario, existing conditions and a natural baseline scenario in relation to different floodplain vegetation communities;
- determine whether ponding in parts of the project areas could lead to death of native vegetation by drowning; and
- satisfactorily demonstrate and provide greater certainty that the full extent of predicted net benefits to floodplain vegetation communities will be achieved for each project.

I consider it unlikely that this additional analysis will identify adverse effects not already considered through this assessment and addressed by the EDSs (taking account of recommendations of the SIAC and this assessment). However, this work is expected to result in refinement of the extent of native vegetation to benefit from watering within each of the maximum inundation areas and refined understanding to help realise those benefits. As recommended by the SIAC, the outputs of hydraulic analysis and further work should also be fed into the detailed design of the projects and operational scenarios to provide the opportunity for any issues identified by the modelling to be addressed through design modifications and any necessary refinement of the approach to adaptive environmental management. The outcomes of this further analysis (along with other recommendations of this assessment) will need to be considered in relevant project approval decisions and secondary consent matters. My assessment of planning controls for the projects is provided in Section 5.1 and other approvals are discussed in Section 3.

It is my assessment that residual impacts on EPBC Act-listed species and communities are unlikely to be significant for both the proposed projects, except for Regent Parrot. The Belsar-Yungera project will likely have a significant impact on Regent Parrot due to the loss of 27.7 ha of potential breeding habitat and 50.3 ha of potential foraging habitat. Residual impacts on EPBC Act-listed species and communities can be acceptably managed provided that the proposed EDSs are implemented and significant impacts are offset in accordance with EPBC Act Environmental Offsets Policy. I support amendments to EDSs as recommended by the SIAC and further strengthened by my assessment, to ensure appropriate avoidance and minimisation of adverse impacts on MNES (and maximisation of potential positive outcomes) as detailed in Sections 6.3, 6.4 and Appendices A and B of my assessment.

The projects will have a complex governance framework and their implementation will require coordination and collaboration between numerous government agencies, Traditional Owners and other stakeholders. The proposed EMF and management plans will provide an appropriate framework for the ongoing management of potential adverse effects of the project. The implementation of the proposed monitoring and adaptive management approach during construction and operations will also be critical to successfully mitigating risks and helping ensure the realisation of the positive outcomes that the projects aim to achieve, in both the short and long-term.

Furthermore, continued implementation of consultation and engagement activities will also be critical to ensuring the further development and implementation of the projects consider local community interests and needs, and are able to help facilitate Traditional Owner aspirations for restoration of the floodplain. My recommendations regarding the proposed approach to further consultation and engagement are provided in Section 5 and 6.

5 Planning framework and environmental management

This part of my assessment explains relevant aspects of the regulatory framework and proposed environmental control regime that have informed my assessment. It also sets out my analysis and findings in relation to the proposed planning controls and environmental management framework for the projects.

5.1 Planning controls

The core approval for both projects is proposed to be a planning scheme amendment (PSA) to introduce bespoke controls to facilitate the construction and operation of the projects. A single draft PSA (Amendment GC202 to the Mildura and Swan Hill planning schemes) covering both projects was prepared by the proponent in consultation with relevant agencies and was included in the exhibited EES in Attachment 4. The draft PSA seeks to:

- facilitate approval and delivery of the projects in a timely, coordinated and consistent manner;
- establish a framework to manage environmental effects during construction and operation; and
- ensure the projects can be planned with certainty and commence without delay.

In broad terms, the proponent's draft PSA:

- inserts an incorporated document into the Mildura and Swan Hill Planning Schemes to allow the use and development of the land for the projects in accordance with the specific control in the incorporated document;
- applies the specific controls overlay (SCO) to land required for the projects; and
- makes the Minister for Planning the Responsible Authority for the projects on land subject to the SCO in the Mildura and Swan Hill Planning Schemes.

Amending the planning schemes to insert an SCO and an incorporated document will 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 two local planning schemes, 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 and 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 PSA. In this assessment I have considered the SIAC's recommendations on the proposed PSA in the context of the environmental effects of the proposed works, their acceptability and how those environmental effects might be mitigated. Subsequent consideration of a decision on whether, and on what terms, the planning approval of the projects should proceed, is still required under the Planning and Environment Act. This assessment will form part of those considerations.

Strategic assessment of the draft PSA

The SIAC indicated that the Strategic Assessment Report (EES Attachment 4) addressed the relevant strategic considerations described in Planning Practice Note 46 Strategic Assessment Guidelines. The SIAC concluded that the draft PSA will facilitate the projects' implementation and is strategically justified. The SIAC was satisfied that the implementation of the projects through a draft PSA is likely to result in net community benefit, subject to implementation of their recommendations to successfully mitigate risks, particularly for the EMF and adaptive environmental management. The SIAC recommended some further work to refine the understanding of predicted benefits, as well as changes to the incorporated document and EMF to address important aspects of this. The SIAC acknowledged that achieving overall biodiversity improvements/benefits and net community benefit may take some time to achieve and rely on successful, sustained mitigation of risks.

I consider the draft PSA provides for an appropriate suite of tools to facilitate the project. However, the final form and content of the draft PSA, when submitted to me for a decision under the Planning and Environment Act, will need to address the findings and recommendations of this assessment (including the SIAC recommendations as appropriate), as well as adequately respond to whether the PSA results in a net community benefit. This should be considered in the

context of this assessment and the SIAC report, and include an assessment of the environmental, social and economic effects of the PSA, using the EES documentation as appropriate. It should also include an evaluation of the costs and benefits to businesses and the community, as informed by the EES, arising from any requirement that is proposed to be implemented via the PSA during construction and operation.

Specific Controls Overlay

The SCO is one of the tools available in the Victoria Planning Provisions. It allows land to be used or developed in accordance with a specific control in an incorporated document corresponding to that land.

No issues were raised in submissions about the use of the SCO and associated planning scheme provisions. The SIAC concluded that the use of the SCO and an incorporated document is an appropriate use of the Victoria Planning Provisions for these projects, which I support.

Although not mentioned by the SIAC, I note it is possible that the extent of the land to be included in the SCO will require clarification before a request to approve the proposed PSA is submitted. This relates to the outcomes of further technical assessments (including the hydraulic analysis to refine the floodplain vegetation assessment) and any associated design or operational changes informed by that refined understanding, and for Belsar-Yungera, any reduction in the number of new access tracks.

Incorporated document

The draft incorporated document includes specific conditions, some of which require plans and documents to be prepared and approved (by the Minister for Planning or other authorities) at specified times, but predominantly before construction commences. These are as follows:

- development plans including the construction footprint and infrastructure;
- EMF containing associated EDSs (for approval by the Minister for Planning);
- construction environmental management plan (CEMP, for approval by the Secretary of DEECA);
- operational environmental management plan (OEMP, for approval by the Secretary of DEECA);
- overall biodiversity improvement and native vegetation requirements (for approval by the Secretary of DEECA);
- submission of ongoing monitoring results to evaluate the extent to which an overall improvement for biodiversity has been achieved (for approval by the Secretary of DEECA);
- heritage management plans for local heritage values (if applicable);
- plans of alteration or creation of road access (for approval by the Head, Transport for Victoria);
- floodplain management plans (for approval by the relevant floodplain management authority);
- bushfire emergency response plan (exhibited as for approval by the relevant fire authority); and
- fire access road plan (exhibited as for approval by the relevant fire authority).

The incorporated document also defines preparatory buildings and works that may be undertaken before these plans are approved.

The draft incorporated document was updated by the proponent through the SIAC hearing in response to expert evidence and submissions. The proponent tabled a final day draft version of the incorporated document (Tabled document 178). The SIAC then provided their recommended version of the incorporated document as Appendix F of the SIAC report.

Key changes to the exhibited incorporated document proposed by the proponent in the final day version included removal of all native vegetation conditions (condition 4.5). This was based on the proponent's submission at the hearing that the projects have already established an overall biodiversity benefit and that, on a policy and evidentiary basis, exemption from native vegetation offsets is appropriate.

In response to this matter and the proponent's proposed changes to the exhibited conditions of the incorporated document, the Secretary of DEECA provided a letter to the SIAC (Tabled Document 190), setting out the native vegetation policy context and key considerations for the SIAC and this assessment. The letter supports the retention of condition 4.5 in the exhibited version of the incorporated document and submits "that it is appropriate to have some safeguard mechanism in the incorporated document, against an otherwise unrestrained capacity to remove native vegetation without offsetting. The Secretary is best placed to administer such safeguards to ensure the 'no net loss' objective is met". The Secretary's letter highlights the complexity and high-risk nature of the assessment of benefits and impacts for these projects, and the role secondary consents (in the incorporated document) could play in light of this risk.

The Secretary of DEECA submitted that, regardless of whether the SIAC accepted that an overall improvement to biodiversity is likely to result from each project, it is appropriate for conditions to enable explicit decision-making by the Secretary on the removal of offset requirements for such significant impacts/clearance. The Secretary noted the substantial role already given to the Secretary by the Victoria Planning Provisions for assessing native vegetation and associated biodiversity impacts from development across the state. The Secretary submitted that a secondary consent, tied explicitly to overall net gain/biodiversity improvement and state's native vegetation policy framework, is appropriate given the complexity and significance of this assessment for VMFRP.

The SIAC concluded that while it is likely the projects will achieve overall improvement to biodiversity, some uncertainty remains regarding floodplain hydraulics and the extent of benefits to specific vegetation resulting from inundation (seeSections 6.1 and 6.3). Accordingly, the SIAC recommended the reinstatement of exhibited condition 4.5 Native vegetation (shown as condition 4.6 in the SIAC's recommended version of the draft incorporated document). In accordance with state planning policy to protect and enhance Victoria's biodiversity (clause 12.01-1S) and ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation (clause 12.01-2S), I agree that the incorporated document should retain an appropriate safeguard, such as that in the proposed condition 4.6 (Appendix F in SIAC report). The proposed alternative offset arrangement for the projects is further discussed in Section 6.3.

The final day version of the incorporated document also proposed changes to bushfire protection measures (see condition 4.10) relating to consents, approval and reporting including:

- preparation and submission of the bushfire emergency management plan to the satisfaction of the Secretary of DEECA (as opposed to the relevant fire authority); and
- submission of the Fire Access Road Plan prior to operation to the satisfaction of the Secretary of DEECA (as opposed to submission of the Fire Access Road Plan before the commencement of works on roads and approved by the relevant fire authority).

As indicated in the letter from Secretary of DEECA to the SIAC (Tabled Document 190) the 'relevant fire authority' serves a distinct purpose with respect to clause 44.06-6 Bushfire Management Overlay and reflects the statutory responsibility of fire authorities in accordance with land tenure. The project areas includes both freehold land for which the Country Fire Authority (CFA) is the 'relevant fire authority' and public land for which DEECA is the 'relevant fire authority'. Requiring the bushfire emergency management plan to be 'prepared and submitted to the satisfaction of the secretary' may have the consequence of inferring a statutory obligation on the secretary with respect to freehold land, which is not in accordance with law. The SIAC did not agree with DEECA that the bushfire emergency response plan should be submitted to and approved by the relevant fire authority as originally exhibited. The SIAC considered that having both the secretary and relevant fire authority in approval roles may create inconsistencies and confusion. I understand the general logic of this SIAC recommendation; however I do not support this approach. I recommend that the proponent be required to prepare a bushfire emergency response plan in consultation with and to the satisfaction of the different land managers, emergency management and fire authorities, to ensure a consistent, workable and valid framework. Further, I recommend the bushfire emergency response plan be submitted to and approved by the Minister for Planning, as the responsible authority under the proposed PSA.

In the letter to SIAC, DEECA highlighted that compliance with the access road construction standards is necessary to manage risk and ensure safe access. DEECA, however, did not agree with the timing and approval framework proposed in the changes. In the letter DEECA submitted that the fire access road plan should be required to be submitted 'before the commencement of works on roads' and 'approved by, the relevant fire authority'. The SIAC did not accept DEECA's

suggestions and supported the changes to condition 4.10.2 as it relates to the preparation of a fire access road plan noting that the conditions provide flexibility where required and discretion for the Secretary to approve an exemption if appropriate. I do not support SIAC's recommendation and recommend DEECA's suggestions be considered. Further consideration will be given to this aspect when I am asked to decide on the final form of the PSA.

Consultation on the draft PSA

The draft PSA was exhibited with the EES, and 21 submissions were received. Issues related to the incorporated document were raised in submissions, however most submissions related to the EES. I note the SIAC concluded that consultation on draft PSA GC202 was adequate and that no additional consultation need occur in this regard. I support the SIAC recommendation for the proponent to update the Explanatory Report based the EPA's submission in relation to contaminated land and noise.

The SIAC noted that the Swan Hill and Mildura Rural City Councils did not lodge submissions on the EES or draft PSA but is satisfied that they were aware of the projects and the amendment through participation in the TRG and council briefings. The SIAC did not believe the concerns from submitters about Traditional Owner engagement were substantiated and concluded that the proponent has sufficiently demonstrated it is engaging with the Traditional Owners and will continue to do so. Traditional Owner consultation is discussed further in Section 6.5 of this assessment.

5.2 Environmental management framework

I acknowledge that the projects will generate both positive and negative significant environmental effects. A sound regulatory framework and environmental control regime is needed, to ensure appropriate mitigation of effects that were examined through the EES, as well as effective management of key risks and uncertainties that could impinge upon on environmental outcomes. I have considered key elements of the proposed environmental management regime described below when assessing the project's environmental effects. Core to the proposed approach is adaptive environmental management, to enable the environmental watering programs to respond to outcomes of ongoing monitoring and support realisation of the predicted benefits to the floodplains over the medium and long term.

The draft PSA 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 18 of the EES, incorporating recommendations from the SIAC and this assessment.

The proposed EMF, as presented in Chapter 18 of the EES, provides details on the proposed governance framework for the projects including roles and responsibilities, and describes the proposed environmental management documentation to be prepared (Figure 5-1) including review and approval requirements. The proposed approach to performance management and change management is described, including requirements for evaluation and reporting. The EMF also provides a consolidated list of the proposed environmental delivery standards (EDS) which set out the environmental management measures and standards that will apply to the project. Additionally, the EMF outlines a proposed monitoring program for each environmental aspect associated with the project. The EDS and monitoring measures were the subject of submissions and focussed consideration through the SIAC hearing. This led to VMFRP tabling an updated ('final day') version of the EDS and monitoring requirements (Tabled Document 178), with refinements resulting from further consideration of issues raised by submitters, the SIAC and advice from relevant experts.

The EMF highlights that the Belsar-Yungera and Hattah Lakes North projects would be undertaken within the existing environmental water planning and delivery framework in Victoria which utilises an adaptive management approach. The adaptive management process would include monitoring, evaluation and reporting to continuously review project performance relative to objectives and targets and allow for the future seasonal watering programs to be updated in response. The EMF explains that objectives and targets for each project site would be prescribed in the environmental water management plans, and the monitoring programs outlined in the monitoring, evaluation and reporting plans would be specifically designed to support collection of data to analyse whether these objectives and targets are being met (Figure 5-1).

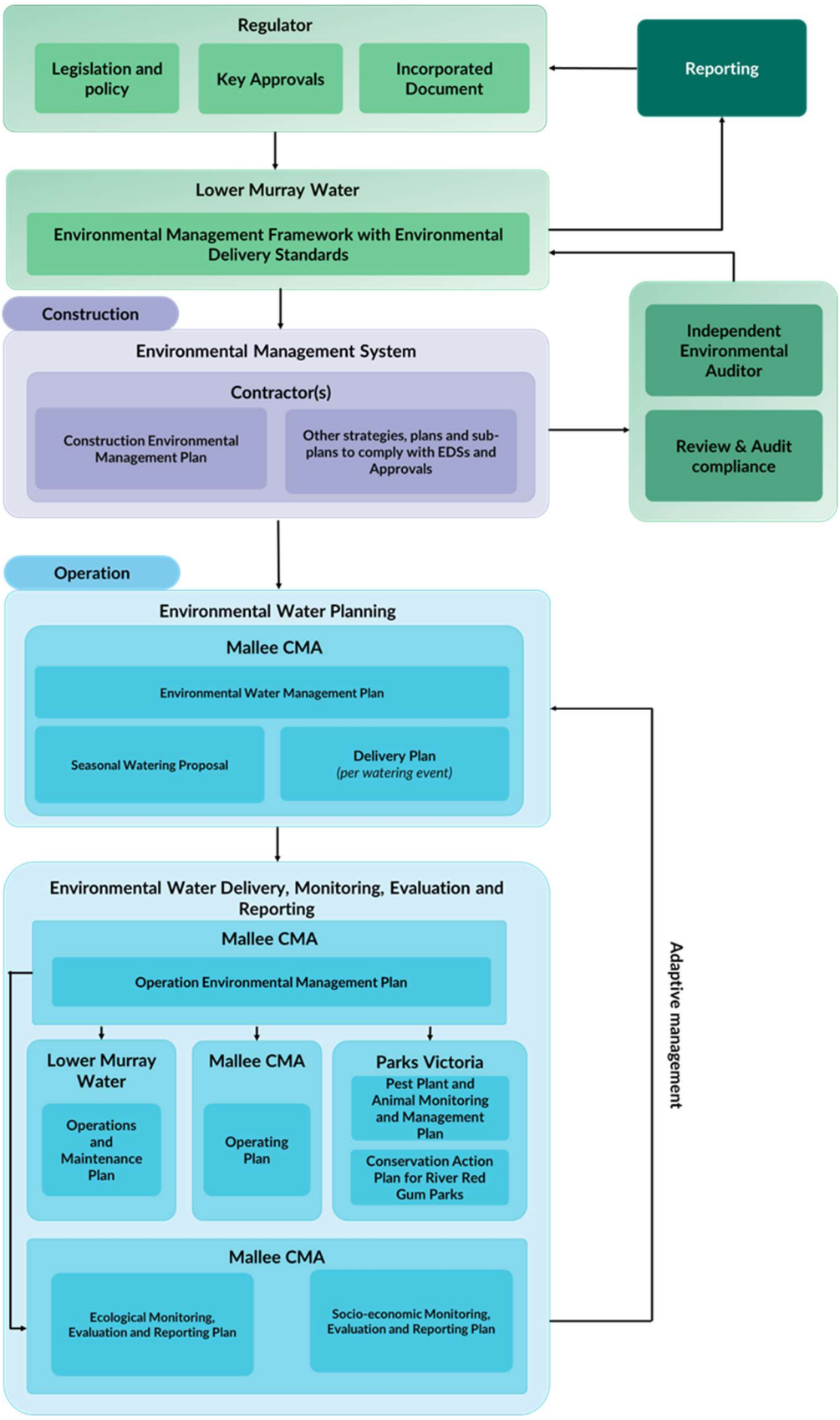


Figure 5-1 Overview of the governance framework of key environmental management documentation (Source: EES Chapter 18)

The use of adaptive management principles will allow project operations to respond to varying seasonal conditions and utilise knowledge gained from previous operation to continuously improve the watering programs. Along with the SIAC, I consider the effective implementation of this adaptive management approach is critical to realise many of the key benefits the projects aim to achieve.

The proposed governance framework for the projects is complex. The VMFRP is a Victorian Government project being delivered by Lower Murray Water (LMW) in collaboration with organisations that have statutory responsibilities for environmental protection, public land management and waterway management which are: LMW, Goulburn-Murray Water (GMW), Mallee Catchment Management Authority (Mallee CMA), North Central CMA, Parks Victoria and the DEECA Water and Catchments Group (DEECA WCG). There are several other roles for statutory authorities and government agencies set out in the EMF as well.

LMW is proposed to be the proponent for the construction phase with the construction works to be completed by construction contractor(s). The EMF includes a commitment to implement a construction phase environmental management system and to enforce contracts that would require contractors to implement this environmental management system, including implementation of the approved CEMP.

At the completion of the construction phase, Mallee CMA is proposed to become the primary agency responsible for the operation of the two projects, including implementation of the EMF and the EDS for operation. Mallee CMA would also be the agency responsible for the preparation and implementation of the approved OEMP (Figure 5-1).

The SIAC addressed overarching aspects of the EMF in Section 20 of the SIAC report. The SIAC also provided several recommendations regarding the EDS and monitoring requirements in Appendix G of the SIAC report. These include recommendations in relation to VMFRP's proposed changes to the EDS and monitoring requirements in the 'final day' versions, as well as additional recommendations made by the SIAC.

Overall, the SIAC considered the proposed exhibited version of the EMF is appropriate, subject to changes recommended by them.

While there were no submissions related to the general structure, content or proposed governance approach set out in the EMF, the EPA submitted the EDS should specify that allowance of sufficient review time, in agreement with relevant stakeholders, be included for the CEMP. As a result, the proponent accepted this recommendation and included changes to EDS EMF2 in its 'final day' version. The SIAC did not agree the EDS is the correct place to specify this requirement and did not consider the change necessary as the incorporated document includes multiple conditions relating to stakeholder consultation. I also note that Table 18.10 of the EMF specifies that consultation with the EPA is required on the CEMP. I agree with the SIAC that the amendment to the EDS is not necessary as the requirement to consult with the EPA in the preparation of the CEMP is covered adequately in the proposed EMF and incorporated document.

The SIAC noted that the EMF will require updating prior to approval to identify any consequential changes resulting from the SIAC's recommendations. It will also be necessary to reflect recent Victorian machinery of government changes. I agree with the SIAC on these matters. I also highlight the importance of considering the recommendations of this assessment, which also need to be addressed in the updated, final EMF provided for approval.

The EMF proposes that LMW would appoint an independent environmental auditor, which would be responsible for auditing the compliance of the construction contractor during the construction phase, which I support. I note that the EMF does not propose a role for the independent environmental auditor during the operational phase of the projects but does propose that an operational environmental performance report would be prepared annually by Mallee CMA, submitted to the Minister for Planning and published on the department's website. This includes reporting against the EDSs for operations and updates on any corrective actions implemented. To further support the project's evaluation and success during operations, in particular the sustained effectiveness of the adaptive management process, I recommend that the independent environmental auditor is retained or a new one engaged to conduct periodic audits of both projects during operations. Independent auditing of operations will be valuable particularly given the complex governance framework proposed for the projects, with responsibilities for environmental management spread across numerous government agencies and authorities. The auditor could also review the CMA's annual reports in the process of reporting to the

relevant Minister or government department. The audit reports should also be published, consistent with the recent approach to other government projects implemented under an approved EMF.

Independent auditing for operations should entail an audit at the commencement of the operations phase, to verify all environmental management and monitoring documentation for operations is appropriately prepared/approved and fit for purpose. Auditing should be at least five-yearly thereafter during operations. I note that, as per condition 4.6 of the exhibited draft incorporated document[6], a report of monitoring results in relation to the extent to which an overall improvement for biodiversity has been achieved must be submitted to the Secretary five years after the first environmental watering and thereafter every ten years. The outcomes of the five-yearly audits can also be used to inform those reporting activities, including identification of any corrective actions to further support achievement of overall improvement for biodiversity.

Similar to the audits proposed in the EMF for the construction phase, I recommend the operations audits should cover:

- compliance with the EMF, EDSs, mitigation measures, environmental management plans and documents;
- responses to non-conformances, incidents and complaints received;
- the environmental effects caused by any non-conformances;
- application of the change management process where relevant;
- effective implementation of monitoring programs;
- previous audit outcomes;
- changes to regulations and environmental standards; and
- compliance with approval conditions.

I recommend the scope and timing of these audits for operations is outlined in further detail in the final EMF. I recommend the selection criteria for the operations independent environmental auditor be the same as set out for construction independent environmental auditor in the EMF, and to help strengthen the transparency and independence of the auditing for operations, the selection and reporting of the auditor should be done in consultation with the Secretary of DEECA[7].

One of the requirements of the EMF, as outlined in the EES Scoping Requirements is to "outline a program for ongoing community consultation, stakeholder engagement and communications for the project, including opportunities for local stakeholders to engage with the proponent and a process for complaints recording and resolution." I note that EES Chapter 7 states that a 'communication and engagement plan' will be prepared for both the construction and operations phases of the projects. The EMF includes a requirement for the proponent to prepare a Communications and Stakeholder Engagement Plan – Construction. However, there is no commitment in the EMF to prepare a similar plan for the operations phase.

I consider development of a communication and engagement plan (or similar) for operations will be important for ensuring project-specific consultation and engagement activities are appropriately planned for project commissioning and ongoing implementation of the two projects' environmental watering activities. I therefore recommend that the final EMF is amended to include a commitment to prepare a communication and engagement plan (or similar) for operations. The scope and requirements for review and approval of the plan should also be specified in the EMF, as per the other environmental management documentation.

Without prejudice to any decisions that may follow with respect to the proposed PSA and secondary consents, I am satisfied that the proposed EMF is generally sound, subject to the recommendations of the SIAC and this assessment, including those set out above. With the recommended changes, it incorporates a clear governance framework and covers the key elements required for environmental management and monitoring for both the construction and operation

[6] This is now Condition 4.7 in SIAC recommended incorporated document; no changes to this condition were proposed by the SIAC.

[7] Secretary to DEECA as constituted under Part 2 of the *Conservation, Forests and Lands Act 1987*

phases. Along with the SIAC, I support the proposed changes to the EDS and monitoring measures included in the final day versions unless otherwise recommended in Section 6 and/or Appendices A and B of this assessment.

6 Assessment of environmental effects

This section details my examination of each project's potential effects on each aspect of the environment in the context of relevant evaluation objectives as set out below.

Assessment evaluation objectives

To provide an integrated structure for assessment of effects in the EES, the SIAC report and this assessment, key aspects of legislation and statutory policy were reflected in evaluation objectives set out in the EES scoping requirements (Table 6-1) at the start of the EES process. These objectives were used by LMW in its framing and completion of assessment of environmental effects within the EES and then by the SIAC to examine the projects and their effects.

Table 6-1 Evaluation objectives and their assessment context.

Evaluation objective	Section
Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.	4, 6.1, 6.2, 6.3, 6.4
Avoid, and where avoidance is not possible, minimise potential adverse effects on native vegetation, species of flora and fauna (particularly listed threatened species and their habitat and listed ecological communities), as well as address offset requirements (if required) consistent with state and Commonwealth policies.	6.3, 6.4, Appendix A
Avoid and, where avoidance is not possible, minimise adverse effects on water quality, hydrology, hydrogeology and beneficial water uses (including for the Ramsar listed wetlands).	6.1, 6.2, Appendix A
Avoid, or minimise where avoidance is not possible, adverse effects on Aboriginal and historic cultural heritage values.	6.5, 6.6
Minimise potential adverse social, economic, amenity and land/waterway use effects, including impacts on existing infrastructure and open space.	6.6

6.1 Surface water

Evaluation objectives

Avoid and, where avoidance is not possible, minimise adverse effects on water quality, hydrology, hydrogeology and beneficial water uses (including for the Ramsar listed wetlands).

Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.

Assessment context

Surface water effects are addressed in the EES, within Chapters 10 and 15 of the main report, as well as in the Surface Water Specialist Study C appended to the EES, and in Section 5 of the SIAC report.

The Belsar-Yungera floodplain complex comprises Belsar and Yungera Islands, formed by anabranches of the Murray River, including Narcooyia, Bonyaricall and Yungera Creeks, and Tonsing Island. The total area of the floodplain complex is about 8,300 ha extending 14 km east to west. The main waterways associated with the Belsar-Yungera project are the Murray River, Narcooyia Creek and Bonyaricall Creek. The Belsar-Yungera project area includes 15 wetlands mapped on the Victorian Wetland Inventory; ten of these are within the managed inundation area, including

three within the construction footprint. There are no Ramsar sites within or adjacent to Belsar-Yungera; the nearest is the Hattah-Kulkyne Lakes Ramsar site, located approximately 100 km downstream. The EES noted that the key environmental values for the Belsar-Yungera project area are water dependent ecosystems and species, irrigation, human consumption of aquatic foods and Traditional Owner cultural values.

The main waterways associated with the Hattah Lakes North Project Area are the Murray River, Chalka Creek, Cantala Creek and Raakjilim Creek. The Hattah Lakes North Project Area contains 41 wetlands mapped on the Victorian Wetland Inventory; thirteen of these are within the managed inundation area of the Lake Boolca Water Management Area and one is within the managed inundation area of the Chalka North Water Management Area. There are no Ramsar sites within Hattah Lakes North, however, twelve of the lakes within the broader Hattah Lakes complex are part of the Hattah-Kulkyne Lakes Ramsar site. The EES noted that the key environmental values for the Hattah Lakes North Project Area are water dependent ecosystems[8] and species and Traditional Owner cultural values.

The EES stated that the flow regime in the projects' areas is influenced by flows in the Murray River and Edward-Wakool system, including the operation of major storages and irrigation offtakes or weirs, and inflows from tributaries. The EES explained that current inundation patterns across the Belsar-Yungera floodplain complex are not sufficient to meet the ecological requirements of flora and fauna within the floodplains, and that the frequency of inundation is expected to decline further. The EES noted that along with seasonal factors (e.g., temperature, dissolved oxygen) inundation frequency influences water quality in surface waters within the floodplain.

The EES examined the potential effects of the projects on surface water quality and the effects of changed surface water quality on environmental values. The EES warned the projects may give rise to the following impact pathways effecting surface water quality during construction:

- erosion and runoff from disturbed 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; and
- discharge of saline groundwater to waterways if dewatering of construction sites is required.

For operation of the projects the EES identified the following impact pathways relevant to surface water:

- erosion around regulating structures;
- discharge of saline groundwater at Belsar-Yungera;
- return flows contributing to nutrient load and algal growth; and
- low dissolved oxygen events.

The EES found there is the 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 construction 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 EES 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. Cumulative adverse effects on water quality in the Murray River due to return flows high in salinity are discussed below.

The EES concluded that with the implementation of the proposed EDSs, the significance of the residual adverse effects on surface water associated with the construction and operation of the projects are insignificant to low.

[8] 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 EES proposed three specific EDSs to manage the adverse effects on surface water:

- SW1, which requires processes and measures to manage adverse effects on surface water during construction;
- SW2, which requires consideration of measures to avoid, minimise or manage adverse surface water effects during operation; and
- SW3, which requires monitoring of volume, duration, frequency and surface water quality during operation.

The EES stated that 16 EDSs from other disciplines would assist in managing adverse effects on surface water. As discussed below, the SIAC recommended amendments to EDSs GS1, GS3 and SW2 and the addition of EDS SW4 to the EMF.

Discussion

The SIAC considered that the key issues associated with surface water relate to: (i) Source Murray Model, (ii) floodplain hydraulics, (iii) blackwater, (iv) waterway salinity, (v) shear stress and erosion, (vi) hydrologic benefits, and (vii) Ramsar sites.

Source Murray Model

To support the assessment of surface water effects, the EES included an analysis of changes in patterns of river flow and floodplain inundation. Amongst other inputs, the EES used MDBA's Source Murray Model (SMM) flow data as input to the hydrological analysis. This analysis included comparisons of flow scenarios in relation to floodplain inundation thresholds, blackwater modelling, and assessment of climate change effects on environmental water availability and deliverability. The EES stated that the model was considered the best available and suitable for the analysis. The EES noted that the SMM was to be updated to include representation of all sustainable diversion limit adjustment projects, which would provide further insights into climate change effects, but that the modelling would not be completed until the end of 2022, after the surface water specialist study was completed (August 2022).

Environment Victoria and the Fenner School of Environment and Society, raised concerns about the use of SMM data, considering the SMM was outdated and unsuitable. Dr Treadwell, surface water expert witness for the proponent, gave evidence that the surface water analysis relied on data provided by the MDBA as the best available at the time. In its Part C submission, the proponent explained that the SMM in its current form is fit for purpose, as confirmed by the Inspector-General of Water Compliance and by an independent review of the SMM from the Fenner School of Environment and Society. The proponent also noted that although modelled flows may differ from future flows, this was not a concern as the projects can respond to changes.

The SIAC noted that the SMM is the hydrological model established by the MDBA for scenario testing, policy development and to assist in river management and operations, and that no alternative model was presented by the proponent or the submitters. The SIAC also noted that while there are some limitations with the SMM being applied to the projects, the modelling is adequate and concluded it was fit for purpose and sufficient to inform modelling flows underpinning the assessment of effects for the two projects. The SIAC also accepted that the proposed adaptive management should enable responsiveness to future conditions not fully accounted for by the SMM. I support the SIAC's finding on the use of the SMM.

Floodplain hydraulics

Managed inundation can result in changes in hydraulic characteristics compared to an unregulated flood as water is held on the floodplain at a particular level and duration. The EES explained this can cause: (i) changes in velocity and shear stress leading to excessive erosion within the inundation area; (ii) physical degradation of habitat and suspended sediments entering the water column and impacting aquatic values (refer to Section 6.4); and (iii) ponding, which can result in differences in inundation depth relative to an unregulated event and which exceeds vegetation tolerances (refer to Section 6.3). The EES analysed the hydraulic characteristics (ponding, shear stress, flow velocity) of the floodplains under current and proposed conditions using floodplain hydraulic modelling completed in 2014 and 2016 as part of the business case for the projects to inform project development and analyse the project outcomes. The model results indicated there may be an increase in erosion upstream and downstream of the ER1 regulator and S109 US regulator

(Belsar-Yungera) and an increase in erosion in the vicinity of and downstream of the K10 regulator and Oateys regulator (Hattah Lakes North) during the unmitigated release of water from the floodplains back to the Murray River following a managed inundation event.

Peer review of the hydraulic modelling determined it was adequate for developing business cases for the projects but advised that a higher level of certainty was required for detailed design. The peer review did not examine whether the modelling was adequate for assessing impacts of the proposed projects, but did make recommendations for improvements, although these were not carried out prior to the completion of the EES. The proponent's surface water specialist determined that the hydraulic models were fit for purpose for the EES, as the modelled uncertainties were unlikely to significantly affect the predicted extents of maximum inundation. They also considered uncertainties in velocity and shear stress were likely to be similar in various scenarios. More detailed modelling of critical areas was proposed for the detailed design stage.

The SIAC considered whether the effects of the projects on floodplain hydraulics were adequately quantified in the EES. Submitters raised concerns that managed inundation under the projects would cause water to pool in areas, resulting in unintended ecological changes and adverse impacts for some vegetation/ecosystems in the floodplains. Mr Frood, a flora expert witness representing himself, gave evidence that artificial impoundment of water and changes to inundation depth regimes on the floodplain presented a significant risk to floodplain vegetation. Dr Treadwell noted holding or ponding water on the floodplain does not fully replicate a natural flood event (where water recedes) and could result in unintended ecological outcomes. Based on the EES modelling, Dr Treadwell considered that during the holding phase of a managed inundation event, depth, velocity and shear stress at Belsar-Yungera would be similar to or lower than existing, and at Hattah Lakes North, these hydraulic parameters would be similar to existing.

In response to questions from the SIAC, Dr Treadwell explained that the analysis of hydraulic effect was based on box plots and mapping of individual scenarios, and that maps showing differences in hydraulic parameters between scenarios (or difference maps) were not prepared. Dr Treadwell also gave evidence that flood modelling had advanced since that used in the EES and that more modern models would enable better understanding of the hydraulic effects of the projects, in finer detail.

After considering the submissions and evidence, the SIAC concluded that there were uncertainties associated with the EES' assessment of the extent and degree of effects of the projects on floodplain hydraulics within the projects' areas. The SIAC noted the box plots provided spatially averaged information about hydraulic effects of the projects based on aggregated data across the WMAs or 'key locations' which are broad areas that do not necessarily cover the whole of the projects' areas. For example, the SIAC was unclear on how the box plots used on the analysis of hydraulic effects account for areas that are dry, specifically whether the dry areas are counted as zero depth or excluded from the data set used for the box plots. The SIAC considered that the box plots do not show the hydraulic effects of the projects with sufficient spatial detail to adequately inform a comprehensive assessment of the projects' ecological effects (particularly in relation to some floodplain vegetation), including determining whether ponding in specific parts of the projects' areas could lead to death of native vegetation by drowning.

The SIAC recommended the addition of EDS SW4 to the EMF, which requires undertaking additional analysis of the effects on floodplain hydraulics in the maximum inundation areas and resulting implications for floodplain vegetation prior to detailed design. The SIAC stated that the additional hydraulic analysis should be undertaken prior to detailed design, to provide the opportunity for any issues identified by the modelling to be addressed by design modifications if necessary and to inform project operations. The SIAC specified that the additional analysis should include mapping of key hydraulic parameters (depth, velocity and shear stress) for each operating scenario, existing conditions and a natural baseline scenario. The analysis should also involve using 'difference maps' in conjunction with mapping of the key hydraulic parameters to determine the locations and magnitude of any changes. The SIAC also specified that the existing hydraulic models of the projects' areas should be reviewed by a suitably qualified expert to determine whether they are suitable for undertaking the analysis required by EDS SW4 and revised or updated as necessary.

I support the SIAC's findings and recommendation regarding the need for further work to refine the understanding of floodplain hydraulics under proposed operating scenarios, and in turn consequences for some native vegetation in the floodplains. I endorse the addition of EDS SW4 to the EMF. Assessment of the effects of floodplain hydraulics on

floodplain vegetation and implications of above issues raised by the SIAC is covered in more detail with respect to ecology and biodiversity values within Section 6.3 of this assessment.

Blackwater

The EES 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 EES noted that blackwater is a natural occurrence and that not all blackwater events result in fish kills.

The EES modelled the potential for extreme cases of low dissolved oxygen blackwater to develop as a result of the projects. It determined that there is potential for low dissolved oxygen conditions to occur during managed inundations for both projects' areas 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 background dissolved oxygen, the operation of the projects would not increase low dissolved oxygen in the river. The EES proposed the preparation of operating plans under EDS SW2 to consider measures to avoid, minimise or 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 EES concluded that with the implementation of EDS SW2, the significance of the residual adverse effect on surface water environmental values is low.

Several submissions raised concerns regarding blackwater effects as a result of the projects, including the potential increase in blackwater events. In giving evidence, Dr Treadwell considered that more frequent inundation, as proposed in the EES, would enable greater decomposition and removal of organic matter which would help mitigate the potential for blackwater during low-level inundation. He also considered that in higher elevation areas with less frequent inundation, organic matter may accumulate, and when these areas are inundated, blackwater is more likely to occur. Dr Treadwell also explained that further work had been undertaken since the EES was finalised that resulted in changes to the nutrient load used in the cumulative assessment but without changes to the outcomes. The SIAC accepted Dr Treadwell's evidence and concluded that effects on dissolved oxygen can be mitigated by maintaining throughflow whenever possible as per EDS SW2. The SIAC recommended expanding on and clarifying a number of the measures relating to project operations under EDS SW2 to avoid and minimise blackwater events. The SIAC concluded that with the application of the revised EDS SW2, the adverse effects relating to blackwater can be acceptably managed. I support the SIAC's findings and recommended revisions to EDS SW2.

EPA recommended an additional point in EDS SB3, relating to a protocol for how community expectations regarding potential adverse effects, in particular adverse anoxic (blackwater) events, will be managed during operations. This recommendation was accepted by the proponent in the final day version of the EDS (Tabled Document 177). I agree with the SIAC and support these changes.

Salinity

The EES described that water quality during construction might be adversely affected due to dewatering of saline groundwater and potential discharge to waterways. The EES also described that during operation the projects are expected to result in additional groundwater recharge from managed inundation with an associated rise in groundwater levels over time. As flows subside and/or floodplain drawdown occurs, the hydraulic gradient may be reversed, causing groundwater to discharge into the waterways as baseflow. The EES stated that the increased groundwater flow into the receiving waterways (as a result of managed events) may have adverse salinity effects due to the mobilisation of salt. Increases in salt load are therefore expected on the Murray River, Narcooyia Creek (Belsar-Yungera), and Chalka Creek (Hattah Lakes North). The EES estimated salt load of the Murray River would increase 64 tonnes per day from Belsar-Yungera and 14 tonnes per day from Hattah Lakes North under a 'seasonal fresh and large events' scenario.

The EES stated that potential cumulative adverse effects on water quality in the Murray River, due to return flows high in salinity, could arise if managed inundations across all VMFRP projects occur at the same time, with increased

concentrations of up to 10 percent at the South Australian border. However, the EES 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 EES noted potential salinity effects would require accounting for under the Basin Salinity Management 2030 Strategy under the Murray-Darling Basin Agreement.

Friends of Nyah Vinifera Park raised concerns in their submission about the potential for increased salinity with the implementation of the projects. Dr Treadwell gave evidence that, at a conservative river flow of 7,500 mega litres per day, the predicted increase in salinity following an inundation event is less than 10 milligrams per litre at Belsar-Yungera and less than 3 milligrams per litre at Hattah Lakes North. Dr Treadwell explained this is relative to background salinity in the Murray River of 100-200 milligrams per litre. Dr Treadwell considered increases in salinity would not exceed water quality objectives for the protection of environmental values even under maximum inundation extent and low river flows. Mr Hoxley, a groundwater expert witness, gave evidence that the predicted average salt load from all VMFRP projects is considered to have negligible risk to the health of the Murray River, riparian vegetation and downstream values.

After considering the submission and evidence, the SIAC found that the effects of waterway salinity in the projects' areas and the Murray River downstream of the projects' areas had been appropriately assessed and are acceptable with the application of the proposed EDS SW3 and monitoring regime under M SW2. I support the SIAC's finding.

Shear stress and erosion

The EES stated that the inundation of the floodplains could lead to erosion, increasing the turbidity of the water column and affecting surface water environmental values. The EES explained that when bed shear stress reaches a critical point, sediments are removed and transported downstream. The EES stated there is a low potential for erosion across the floodplains during operation but determined there was potential for high shear stresses downstream of regulators ER1 and S109 (Belsar-Yungera) and K10 (Hattah Lakes North). The EES proposed to avoid and minimise this effect through appropriate design of structures (EDS GS1), adjustment of release flows during drawdown to avoid high downstream shear stresses (EDS SW2), and ongoing monitoring of erosion and sedimentation (EDS GS3). The EES assessed the significance of the residual adverse effect of erosion, sedimentation, and land instability as low.

The SIAC considered evidence from Dr Treadwell in which he agreed there is potential for elevated shear stress downstream of regulator ER1 along Narcooyia Creek and Bonyaricall Creek (Belsar-Yungera) and regulator K10 along Chalka Creek (Hattah Lakes North) and considered the impacts can be managed by controlling regulator release rates and ensuring appropriate design and downstream scour protection, as proposed in EDS GS1, SW2 and GS3.

In response to questions from the SIAC, Dr Treadwell clarified that regulator ER1 would discharge into the backwater of the Euston Weir pool, mitigating effects on shear stress if the weir pool is at the normal operating level. However, if the weir pool is below normal level, releases from ER1 may need to be adjusted based on the rules of the operating plan.

Dr Treadwell also provided further information about erosion risks in Chalka Creek downstream of the K10 regulator. He referred to observations by Mallee CMA staff that existing TLM watering at Hattah Lakes shows that release rates from the Oateys Regulator can be manipulated to avoid high velocity and shear stress downstream of the regulator. He reported that the release conditions from the K10 regulator are expected to be the same as releases from the Oateys Regulator and that there would be no additional erosion risks relative to existing conditions during Hattah TLM managed releases. The SIAC did not agree that management of erosion risks at the Oateys regulator can necessarily be extrapolated to the K10 regulator and considered that further assessment needs to be undertaken to determine whether erosion risks in Chalka Creek and downstream of the K10 regulator can be resolved through operating strategies, or whether design modifications are required.

The SIAC found the projects have the potential to increase erosion risks in Narcooyia Creek and Bonyaricall Creek (Belsar-Yungera) and Chalka Creek (Hattah Lakes North) downstream of the projects' areas, and recommended revisions to EDS to acceptably manage these risks. I support the recommendations of the SIAC to amend EDSs, as set out below:

- EDS GS1, to require that (i) the hydraulic assessment of floodplain and waterway erosion risks should be confirmed based on the velocity and shear stress mapping required by EDS SW4 to ensure that all areas with

elevated erosion risks are identified, and (ii) the design of the projects have regard to hydraulic effects to minimise the potential for erosion, and with consideration of the operational objectives in EDS SW2;

- EDS GS3, to require monitoring of bank and bed erosion to inform adaptive management;
- monitoring requirement M GSC1, to include specific areas for monitoring along waterways;
- EDS SW2, to include a provision in the operating rules for regulator ER1 that releases from the ER1 regulator are adjusted based on the water level in the Euston Weir pool; and
- EDS E1, to require footprint and soil disturbance also be considered near waterways during detailed design and construction planning.

Hydrologic benefits

The EES explained that the condition of individual waterways and wetlands in the Belsar-Yungera project area ranged from poor to good, and the condition of individual waterways in the Hattah Lakes North project area ranged from very poor to poor. The EES noted that the current condition of the waterways and wetlands has been influenced by changes in the Murray River hydrology, due to reduced catchment runoff from water resource development, river regulation since the mid-1930s and the effects of climate change. The EES used hydrological modelling to demonstrate that the projects could increase the frequency and duration of inundation, bringing it closer to the pre-development/ regulation inundation regime within the maximum inundation areas.

Several submitters raised concern regarding the extent to which potential climate change impacts had been considered under the Basin Plan, SDLAM and the EES, particularly in relation to water availability. The SIAC noted that the broader policy context, including the Basin Plan and SDLAM, were outside the scope of the SIAC's considerations and proceeded on the basis that sufficient water will be available for the projects.

Regarding the EES, the proponent noted that part of the rationale for the VMFRP was to address potential climate change impacts and submitted that they were adequately dealt with in the EES and evidence of Dr Treadwell. Dr Treadwell gave evidence that climate change is likely to further reduce the frequency and duration of overbank flows, resulting in managed events being required more often. The SIAC accepted that the projects are likely to increase resilience to climate change by enabling and enhancing floodplain inundation.

The proponent submitted that the projects were designed to provide a high degree of operational flexibility regarding environmental watering of the floodplains in the maximum inundation areas. The SIAC found that the projects are expected to have benefits for floodplain hydrology in the maximum inundation areas in terms of inundation frequency and duration. I support the findings of the SIAC on this matter.

Ramsar sites[9]

The EES determined Belsar-Yungera would not impact the Hattah-Kulkyne Lakes Ramsar site. The EES also determined there would be no change in the water quality of the Ramsar site as surface water flows would not be significantly changed due to Hattah Lakes North.

Several submissions raised concerns about potential impacts on Ramsar sites, particularly those nearby and downstream of the project areas. Dr Treadwell gave evidence that none of the lakes from the Hattah-Kulkyne Lakes Ramsar site are located within the construction footprint or the proposed maximum inundation area of Hattah Lakes North and that lakes of the Ramsar site currently receive managed inundation as part of TLM. Dr Treadwell explained that there would be no effect on the water regime or quality of the Ramsar site given (i) there would be no change to how water is delivered to the Ramsar site, (ii) there are no changes to existing infrastructure delivering water to the Ramsar site, (iii) planning and delivery of the project and TLM would be coordinated, prioritising the needs of the Ramsar site according to environmental watering procedures, and (iv) delivery of water to the project would not alter the preferred timing, frequency and duration of inundation of the Ramsar site.

[9] Refer to 'Appendix A Matters of national environmental significance' for further discussion of Ramsar sites.

As for potential effects on Ramsar sites downstream of the projects' areas, Dr Treadwell explained the sites are greater than 400 km downstream of the Hattah Lakes North project area and that environmental water planning and delivery processes will consider the watering requirements for all sites and prioritise sites based on conservation significance, placing priority on Ramsar sites.

The SIAC accepted the evidence that there would be no effect on the water regime or quality of the Hattah-Kulkyne Lakes Ramsar site. I support the findings of the SIAC that impacts of surface water effects on Ramsar sites have been adequately assessed and that potential surface water adverse effects on Ramsar sites are low and acceptable.

Assessment

It is my assessment for both projects that the adverse effects on surface water associated with the projects are likely to be acceptable, subject to the additional analysis of the effects on floodplain hydraulics recommended by the SIAC under EDS SW4 and the implementation of the revised EDSs recommended by the SIAC and supported by this assessment.

I support the recommendations for amendment to EDSs made by the SIAC, as outlined below:

- Revision of EDS GS1 to require that projects' design have regard to hydraulic effects to minimise the potential for erosion, and with consideration of the operational objectives in EDS SW2.
- Revision of EDS GS3 to require monitoring of bank and bed erosion to inform adaptive management.
- Revision of monitoring requirement M GSC1, to include specific areas for monitoring along waterways.
- Revision of EDS SW2 regarding the timing of inundation events to reduce the risk of hypoxic or anoxic blackwater events.
- Revision of EDS SW2 to include a provision in the operating rules for regulator ER1 that releases from the ER1 regulator are adjusted based on the water level in the Euston Weir pool.
- Addition of EDS SW4, which requires further analysis of the effects on floodplain hydraulics prior to detailed design, including (i) mapping of key hydraulic parameters for each operating scenario, existing conditions and a natural baseline scenario, and (ii) using 'difference maps' in conjunction with mapping of the key hydraulic parameters to determine the locations and magnitude of any changes.

6.2 Groundwater

Evaluation objectives

Avoid and, where avoidance is not possible, minimise adverse effects on water quality, hydrology, hydrogeology and beneficial water uses (including for the Ramsar listed wetlands).

Assessment context

Groundwater effects are addressed in the EES, within Chapters 10 and 15 of the main report, as well as in the Groundwater specialist study D appended to the EES, and in Section 6 of the SIAC report.

The EES detailed that groundwater is present across both projects' areas in a shallow aquifer, typically less than 20 m below ground, which is connected to the Murray River and anabranches. The EES stated that groundwater is also present in deeper aquifers, but these are not affected by the projects due to a clay aquitard layer beneath the shallow aquifer. The EES noted that groundwater salinity in the aquifer across both projects' areas ranges widely, from fresh water (less than 1,200 mg/L total dissolved solids) to very saline (over 35,000 mg/L total dissolved solids). Fresh water occurs adjacent to the Murray River due to the higher amount of recharge, while saltier water is found further inland.

The EES identified environmental values associated with groundwater for both projects including water-dependent vegetation, which is expected across parts of the projects' areas where groundwater is fresh and shallow enough for

vegetation use. The EES noted that there are currently no licenced groundwater users within 5 km of the projects that may be affected. Existing groundwater bores in the study areas are groundwater observation and investigation bores.

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

The EES stated that potential residual adverse effects of the projects include: (i) land and soil salinisation in localised areas during operation due to intermittent shallow groundwater levels, and (ii) for Belsar-Yungera, adverse effect on water-dependent vegetation due to localised groundwater drawdown during construction of the ER1 regulator and fishway structure.

The EES explained that land and soil salinisation could occur in localised areas due to intermittent shallow groundwater levels (in topographical low points) during operation, but that there is negligible potential for land and soil salinisation resulting from increased groundwater levels in the Belsar-Yungera project area and minor potential in the Hattah Lakes North project area. Some low-lying areas south of the Hattah Lakes North project area were modelled as having small, localised areas with higher potential for adverse salinity effects.

The EES proposed two specific EDSs to manage the adverse effects on groundwater: GW1, which requires measures to manage adverse effects on groundwater during construction; and GW2, which requires monitoring of groundwater and surface water levels, flow and salinity during operation. Three monitoring requirements were also proposed for groundwater (M GW1 to M GW3). The SIAC recommended amendments to EDS GW2 and monitoring requirements M GW1 and M GW2.

The EES concluded that with the implementation of the proposed EDSs and monitoring requirements, the significance of the residual adverse effects on groundwater associated with the construction and operation of the projects is low.

Discussion

The SIAC considered whether the EES appropriately assessed groundwater effects and whether the proposed groundwater monitoring requirements are appropriate. The SIAC was satisfied that the potential effects on groundwater had been adequately considered but focused on the potential effects of salinity on tree health (refer to Section 6.3 for further discussion) and monitoring of salinity.

Submitters Fiona and Phil Murdoch, landholders of the Raakajlim property, raised groundwater-related concerns, including the likelihood and consequence of elevated groundwater in low-lying areas presenting on their property. In response, Mr Hoxley, a groundwater expert witness for the proponent, explained that increased soil salinity risk may occur if groundwater levels become shallow for extended periods of time. In response to a request for information by the SIAC, Mr Hoxley explained that potential contingency measures are available to minimise increased salinity risk from elevated groundwater levels and how contingency measures may be applied if groundwater is found to be adversely affected by managed inundation.

The SIAC noted that the locations of existing monitoring bores, and the proposed infrastructure monitoring sites, are generally external to the proposed maximum inundation areas. The existing monitoring bores are predominantly nearer the Murray River (where salinity levels are expected to be lower than sites to the south of the maximum inundation areas).

The SIAC considered that the three-yearly monitoring of tree condition under monitoring requirement M TE9 should be accompanied by more frequent monitoring of groundwater levels and salinity in the same area to provide an indicator of increased risk to the trees from rising saline groundwater. The SIAC recommended revisions to EDS GW2 to require groundwater monitoring including wells or bores within the projects' areas, with a sufficient number to detect and interpret changes to water levels and salinity, and review operations if increasing salinity is identified. The SIAC recommended that these monitoring sites are to be located within the maximum inundation areas of both projects, including at the proposed tree condition monitoring sites for M TE9 and in targeted areas predicted to be most sensitive to groundwater rise, particularly where there is high groundwater salinity. The SIAC also recommended revisions to monitoring

requirements M GW1 and M GW2 to monitor changes to groundwater depth and elevation (M GW1) and quality (specifically salinity) (M GW2). I support these recommendations.

The SIAC concluded that the EES appropriately assessed groundwater effects and that the proposed EDSs and monitoring requirements (M GW1 and M GW2) are satisfactory provided they are amended in accordance with the SIAC's recommendations. I support the SIAC's findings and recommendations.

Assessment

It is my assessment for both projects that with the implementation of the revised EDS GW2 and monitoring requirements M GW1 and M GW2 as recommended by the SIAC and supported by me, the adverse effects on groundwater associated with the projects are expected to the low and can be acceptably managed.

I support the changes to the EDSs and monitoring requirements recommended by the SIAC, as outlined below:

- Revision of EDS GW2 to require groundwater monitoring including wells or bores within the projects' areas, with a sufficient number to detect and interpret changes to water levels and salinity, and review operations if increasing salinity is identified.
- Revision of monitoring requirement M GW1 to require new groundwater monitoring sites to monitor changes to groundwater depth and elevation.
- Revision of monitoring requirement M GW2 to require new groundwater monitoring sites to monitor changes to groundwater quality.

6.3 Terrestrial ecology

Evaluation objectives

Avoid, and where avoidance is not possible, minimise potential adverse effects on native vegetation, species of flora and fauna (particularly listed threatened species and their habitat and listed ecological communities), as well as address offset requirements (if required) consistent with state and Commonwealth policies.

Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.

Assessment context

Terrestrial ecology effects are addressed in chapters 9 and 14 of the EES and the terrestrial ecology specialist study B appended to the EES. Chapter 7 of the SIAC's report discusses the IAC's findings in relation to terrestrial ecology.

The EMF included 11 EDS 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 final day EDSs include preparation of a Native Flora and Fauna Management Sub-Plan and Pest Plant and Animal Management Plan.

A number of potential impacts of the projects for terrestrial biodiversity values were examined through the EES and inquiry process, in particular:

- 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);
- disturbance effects from changes in hydrology (including surface and groundwater changes), water quality, contaminants and pollutants, environmental weeds, pathogens and pest animals.

The EES states that, despite the above impacts, each project is expected to generate overall benefits to terrestrial biodiversity values. This is to occur by improving the health, structure and regeneration of canopy species including hollow-bearing trees (over time) and increasing the diversity and abundance of floodplain dependent understorey species, providing positive effects for fauna species which utilise floodplain habitats within the inundation areas. The EES states that Belsar-Yungera project and the Hattah Lakes North project will reinstate a wetting and drying regime which is better aligned with the natural conditions of the Murray River prior to regulation, improving the condition of native vegetation and habitats through the delivery of environmental water. The expected biodiversity benefits for each of the projects, as presented in the EES, are discussed in Section 4.1 of my assessment.

The EES considers 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 includes monitoring and control measures to address potential impacts to threatened terrestrial species and communities, and a number of these have been subject to recommendations by the SIAC as discussed below.

Key aspects related to terrestrial ecology considered by the SIAC were:

- clearance and impacts to native vegetation from construction;
- impacts to threatened flora and fauna from construction and operation;
- operational effects on vegetation from terrestrialisation and groundwater salinity;
- hydraulic and water regime effects on floodplain vegetation; and
- benefits to floodplain ecology from operation of the projects.

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

Discussion

Native vegetation impacts from construction

The EES identified that 50.3 ha of native vegetation and 692 large trees would be impacted at Belsar-Yungera (366 large trees and 319 very large trees). The EES assessed the significance of the residual effect ranging from high (for temporary vegetation removal, such as understory vegetation expected to grow back) to extreme (for permanent vegetation removal and large tree removal). The EES notes that for Belsar-Yungera approximately 69.6% (35.01 ha) of the native vegetation that will be directly or indirectly impacted is within conservation reserves.

For Hattah Lakes North, the EES identified that 18.9 ha of native vegetation and 150 large trees would be impacted (including 55 large trees and 95 very large trees), with the significance of the residual effect being high. For Hattah Lakes North, approximately 81.99% (15.5 ha) is located within conservation reserves.

The EES 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 6-3 and 6-4).

Table 6-2 Impacts to native vegetation (EES Chapters 9 and 14)

Project site	Native vegetation (ha) removed	Large trees impacted	Hollow bearing trees impacted
Belsar-Yungera	50.3	692	527
Hattah Lakes North	18.9	150	77
Totals	**69.2**	**842**	**604**

Table 6-3 Breakdown of impacts to native vegetation (EES Chapters 9 and 14)

Project site	Construction footprint (ha)	Borrow site (ha)	Large trees direct removal	Large trees considered lost
Belsar-Yungera	42.888 (25.523 ha of access tracks)	7.417	300	392
Hattah Lakes North	15.388	3.512	119	31
Totals	**58.276**	**10.569**	**419**	**423**

The native vegetation impacts from the Belsar-Yungera and Hattah Lakes projects have also been assessed in terms of cumulative impacts, in combination with the other seven proposed VMFRP projects. At the time of developing the EES, the cumulative impact figures presented in the EES identified that the nine VMFRP projects would impact a total of 373.2 ha of native vegetation and 4,512 large trees. It is however expected that the cumulative impact totals will be revised down as the later projects progress and design refinement are made. The EES notes that the removal of the native vegetation and large trees from Belsar-Yungera and Hattah Lakes North is significant, especially when considered in combination with the impacts at the other project sites. However, the EES also concluded that the combined benefits from the nine projects are expected to significantly outweigh the impacts, with expected benefits to the combined maximum inundation areas totalling 14,107 ha, which supports an estimated 79,862 large trees. I note that while the nine VMFRP projects have the potential to provide an overall benefit in the longer term, there will be significant cumulative impacts to native vegetation in the interim. Detailed assessment of the cumulative effects in relation to MNES is provided in Appendix A.

The SIAC noted submitters' concerns regarding the extent of native vegetation being impacted and whether the proponent has sufficiently considered the avoid and minimise principles. Parks Victoria submitted that the construction phase of the projects needs to focus on the avoidance and minimisation of vegetation removal given the long lead times for both restoration of ecosystem function of floodplain communities and the recruitment of large trees. The Victorian National Parks Association (VNPA) noted that the projects would result in the loss of a significant amount of native vegetation in conservation areas.

During the preparation of the EES, the proponent considered project alternatives and refinements to reduce vegetation loss. Multidisciplinary workshops were held where a number of refinements to the construction footprint were considered to avoid and minimise environmental impacts where possible. There was a focus on reducing impacts to biodiversity and cultural heritage values (see Section 4.2). Because construction is within conservation reserves, options to avoid impacts to high quality native vegetation are limited. In some instances, impacts to biodiversity values could not be reduced as avoidance of impacts to cultural heritage values were prioritised. The focus for biodiversity was on prioritising works away from higher priority habitat values, and aligning works within areas of existing disturbance where possible to reduce footprints. Both projects sought to avoid impacts to native vegetation that has a bioregional conservation status of endangered and reduce overall impacts to native vegetation and large trees.

Through this process of examining alternatives, the area of impact for native vegetation and number of large trees impacted were reduced for both projects. At Belsar-Yungera, the predicted area of impact for native vegetation was reduced from 68.80 ha to 50.3 ha, while impacts to large trees to be impacted was reduced from 817 to 692 (as shown in Table 6-3). For Hattah Lakes North, the predicted area of impact for native vegetation was reduced from 19.41 ha to 18.9 ha, while impacts to large trees was reduced from 154 to 150 (as shown in Table 6-3). Further avoidance measures are proposed through EDSs, including EDS E1 Native vegetation and habitat design minimisation and EDS E2b Construction vegetation management.

The SIAC requested clarification on the Belsar-Yungera project description with regard to the extent of new access tracks required within WMA1. The proponent responded (Tabled Documents 171 and 189) noting that the EES incorrectly presented the extent of new access tracks required in WMA1 and corrected the error reducing the extent of new access

tracks required within WMA1 from 12.8 km to 0.8 km. Any possible changes to the extent of native vegetation removal as result of this correction were not presented.

The EES also highlights aspects of the project designs and layouts where there are further opportunities to explore avoidance and minimisation of adverse effects to native vegetation through detailed design and construction methods, post primary approval. Twenty-one (21) such cases were identified for Belsar-Yungera, with three cases identified for Hattah Lakes North. The SIAC recommended changes to EDS E1 to specifically require these identified alternatives for design refinements to be further investigated, and the revision of native vegetation calculations for Belsar-Yungera in light of errors noted within the EES regarding inclusion of vegetation removal for new access tracks in WMA1. With the inclusion of these changes, which helps ensure further opportunities to avoid and minimise loss of native vegetation (including large trees) is capitalised before construction, the SIAC was satisfied that the project design refinements explored to date were soundly applying the avoid and minimise principles. The SIAC considered that with the further reduction in clearance to be considered through EDS E1, the projects will appropriately avoid and minimise impacts on native vegetation from construction. I agree that the EES has appropriately explored opportunities to avoid and minimise clearance of native vegetation and support the SIAC's view that further reduction in native vegetation needs to be explored before construction proceeds. I recommend adjusting the SIAC's requirement for further avoidance and minimisation of vegetation clearance in EDS E1 to encompass both identified alternatives and any others wherever possible, explored through detailed design, and then construction.

Although the figures presented in Table 6-3 and Table 6-4provide a worst-case scenario of native vegetation impacts, due to the extent of vegetation and large trees to be impacted in these significant environments, I emphasise the importance of the detailed design stage of both projects focusing on further reducing these impacts. I agree with the SIAC's recommended changes to EDS E1 and have made further recommendations to strengthen the EMF outlining the process by which identified alternatives for design refinements will be further investigated (see Section 4.2). Given the projects are about improving the environment and associated biodiversity values in significant and sensitive environments, there is an additional imperative for the minimisation of impacts to these same environments and values during from the construction phase of the projects.

The SIAC noted that, with the recommendation for additional groundwater monitoring bores (EDS GW2, as discussed in Section 6.2 of this report), there may be further minor vegetation loss if impacts of bore installation cannot be located within the construction footprint. Any additional loss of native vegetation from the impact would need to be included in the review of impact figures recommended in EDS E1 and considered in the additional analysis of impacts to vegetation discussed in the Consideration of overall improvement to biodiversity sub-section below, to ensure all impacts associated with the projects are adequately considered. I agree with the SIAC's assumption that any loss of native vegetation from monitoring bore installation could be accommodated in the current worst-case figures (as presented in Table 6-3 and Table 6-4) as it should be accounted for by the reductions sought in detailed design.

The SIAC found that the EES had satisfactorily assessed impacts on native vegetation from construction. However, it noted the significant extent of clearance/ impacts and the potential for the projects to further avoid and reduce impacts to native vegetation through the detailed design phase. The SIAC did also note that even with the potential reduction of impacts to native vegetation through the detailed design phase, the overall significance of the residual impacts of High (Hattah Lakes North) and Extreme (Belsar-Yungera) are unlikely to change. I agree with the SIAC's findings and note the importance of further reducing these 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] [11]. As noted in the EES, when near a reliable water source mature trees tend to become very large and often have hollows, including large hollows. This is particularly the case with River Red Gums. These hollows provide shelter and breeding opportunities for a range of fauna, including parrots, woodland birds, reptiles

[10] 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.

[11] 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.

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 EES 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*, Major Mitchell's Cockatoo *Lophocroa leadbeateri*, Carpet Python *Morelia spilota metcalfei.*

The EES describes that the projects would result in impacts to approximately 604 hollow bearing trees, both living and dead, during the construction phase (527 for Belsar-Yungera and 77 for Hattah Lakes North). Impacts to hollow bearing trees was a concern of a number of submitters, who highlighted that a number of species found or expected to occur within the project areas may be impacted by impacts to bearing trees during the construction phase. They highlighted the loss of hollow-bearing trees being a key threat to conservation, as set out under the FFG Act. Concerns were raised in submissions regarding potential impacts on a number of hollow dependent threatened species including the South-eastern Long-eared Bat, Carpet Python, Regent Parrot, Major Mitchell's Cockatoo and Lace Monitor.

The EES notes there is a significant residual effect due to the clearance/ impacts on a large number of large hollow bearing trees, particularly given the time is takes for new large trees to grow. I agree that the proposed impacts to hollow bearing trees from construction constitutes a significant impact on biodiversity values. The EES concludes that the operational phase of the projects 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. These potential positive outcomes to floodplain vegetation are discussed further in the sections below.

Of the recorded trees assessed within the area of investigation (i.e., a smaller area than the proposed extent of inundation) there were 1,102 hollow bearing trees observed at Belsar-Yungera and 222 hollow bearing trees observed at Hattah Lakes North, with the majority of live trees at both project areas assessed for health recorded as being of moderate condition (consisting of 30 – 70% live canopy).

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 EES that hollows may regenerate naturally (this being a predicted period of 15 years); and
- mitigation and contingency measures, able to respond to monitoring success and/ or failures.

The VNPA submission supported the DEECA position, stating that compensation is needed to make up for the lag effect in hollow creation which can take up to 150 years for very large trees. Additional concerns regarding the loss of habitat for hollow dependent species was noted in the submissions of Mr Frood, Environment Victoria and FoNVP.

Mr Holmes, the proponent's expert witness for terrestrial ecology (fauna), submitted that a hollow replacement plan was not warranted due to the surrounding context of the project, specifically that there is no shortage of hollows. Mr Holmes noted that he was not opposed to a hollow replacement plan, however provided commentary on issues with previous hollow replacement plans within the Living Murray project and noted that if a hollow replacement plan was to be required, there should be careful consideration of appropriate compensation for the full range of hollow dependent fauna species and suitable designs, noting that a 1:1 ratio is not achievable as each tree could have many hollows, cracks, and/or fissures. The SIAC agreed that a hollow replacement plan was not required as they considered that the remaining landscape provides ample tree hollows.

On balance, I agree with the DEECA submission that the hollow replacement plan is necessary, considering the importance of replacing the hollows lost for the following reasons:

- A very 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[12].
- *Action Statement No 192 Loss of hollow-bearing trees from Victorian native forests and woodlands*[13] 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 a great amount of 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)[14] 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)[15], 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.
- 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.

The SIAC stated that "while DEECA's original submission was that a hollow replacement plan should be required, it did not suggest this in comments on the final day project documents". I note that the final submission provided by DEECA focused on key concerns raised with the proponents proposed changes to Tabled Document 178 and did not review recommendations on other matters previously raised in their original submission. There is no document or evidence that DEECA withdrew its recommendation for a hollow replacement plan. The issue and rationale were not revisited and remain compelling in light of the information assembled through this EES process.

I support the inclusion of the SIAC's proposed changes to EDS E2e to reuse timber and logs from felled trees on site with habitat improvement uses prioritised, as this will provide benefits for a range of native fauna. However, I note that whilst the projects are expected to result in long-term benefits to hollow-bearing tree species within the maximum inundation areas, hollows will take many decades to form in the regenerating large trees. To support the immediate and short-term welfare of parrots and other hollow-dependent species, I therefore recommend that a new EDS (E8) is added requiring that a hollow replacement plan is to be prepared to the satisfaction of DEECA[16]. I recommend that this EDS states that the hollow replacement plan requires:

- supplementary nesting sites/artificial hollows be installed in adjacent areas prior to the removal of large hollow-bearing trees;
- the number and type of artificial hollows to be installed to be commensurate with the number and type of utilised hollows estimated to be removed, as determined by a qualified zoologist, based on available scientific knowledge;

[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] 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.

[14] 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.

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

[16] Specifically the Regional Director, DEECA Loddon Mallee Region

- the agreed location and specification of artificial hollows to be incorporated into site maps and as a Project GIS layer prior to the commencement of works; and
- monitoring and adaptive mitigation measures to determine and respond to the success/failures of artificial hollows.

I agree with the SIAC's recommendation that, if a hollow replacement plan is mandated, there is a need for careful consideration of designs to appropriately accommodate the range of hollow dependent fauna and ensure appropriate insulation against temperature extremes. This recommendation should be considered in the development of the hollow replacement plan.

Threatened flora

The flora surveys for the EES recorded 435 flora species in the Belsar-Yungera project area, and 301 flora species in the Hattah Lakes North project area. The Victorian Biodiversity Atlas contains records of 595 flora species within the Belsar-Yungera project area and 616 flora species within the Hattah Lakes North project area. Seventy four (74) species of conservation significance (listed under the EPBC Act and/or FFG Act) were identified as present or possibly occurring at Belsar-Yungera, and 87 species of conservation significance were identified as present or possibly occurring at Hattah Lakes North (EES specialist study B)[17]. Key potential impacts on threatened flora identified in the EES include permanent and temporary loss of vegetation and habitat during construction, and direct and indirect effects from inundation. The EES identified that the Belsar-Yungera project will result in the removal of 19 threatened and 44 protected flora species under the FFG Act, with the extent of effect ranging from 20-30 individuals in some locations, to 1,200 individuals at others. For Hattah Lakes North, the EES identified that the project will result in the removal of 15 threatened and 26 protected flora species under the FFG Act, with the extent of effect ranging from 10-20 individuals in some locations, to up to 2,000 individuals at other locations. For both project areas, the EES concludes that there is an overall residual effect ranging from low to medium to threatened flora.

In their submission the VNPA raised concern about the extent of native vegetation clearance, particularly the removal of 0.191 ha of Plains Grassland at Hattah Lakes North. This is an endangered ecological vegetation community (EVC) in the Robinvale bioregion and this clearance accounts for 19 percent of the remaining Plains Grassland EVC in this bioregion. The SIAC identified that the Plains Grassland EVC is also not expected to benefit from the projects, however noted that the Hattah Lakes North project avoids approximately 70% of the EVC recorded in the area of investigation and that EDS E1 includes the requirement to further reduce impacts threatened EVCs. I note that unlike other EVCs to be impacted by the projects, the Plains Grassland EVC is not located within the maximum inundation area and therefore will not receive benefits from the operational phase of the project and therefore consideration must be given to no net loss for this EVC. I recommend that EDS E1 is amended to specifically require further consideration to reduce impacts on Plains Grassland EVC during detailed design and if impacts to Plains Grassland are unavoidable this should be explicitly addressed in the update of the AOIB to inform decisions under condition 4.6 of the proposed incorporated document (as per the SIAC report).

The EES stated that three species are considered likely to be significantly impacted by both Belsar-Yungera and Hattah Lakes North projects: Umbrella Wattle *Acacia oswaldii* (critically endangered); Club-hair New Holland Daisy *Vittadinia condyloides* (endangered); and Frosted Goosefoot *Chenopodium desertorum* (endangered). A very large number of each of these species are predicted to occur within the maximum area of inundation for both projects. These species are considered to be terrestrial dry flora, meaning they are flood intolerant and have life cycles independent of flooding. The EES states that based on the habitat descriptions for these species project operations are expected to result in the loss of individuals present within the maximum inundation areas and a reduction of suitable habitat within the project areas. The SIAC noted that these three terrestrial dry species have likely already been significantly impacted by the 2022 floods and specific actions to mitigate effects of the projects on these species are not warranted. I recommend further survey is undertaken to confirm this conclusion. If the species are found to persist in the maximum inundation area, consideration to mitigating impacts to these species (e.g., seed collection prior to inundation) should be given to minimise overall impacts as a result of the project. I recommend the inclusion of a new EDS (EDS E9) which requires additional targeted

[17] As there are minor inconsistencies in the number of listed flora species presented throughout the EES documentation the number presented here is taken from the likelihood of occurrence table in EES specialist study B, as the original source.

surveys are undertaken in previously recorded locations for Umbrella Wattle, Club-hair New Holland Daisy and Frosted Goosefoot 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.

Winged Peppercress *Lepidium monoplocoides* is listed as endangered under the EPBC Act and FFG Act and was recorded within the area of investigation for both project areas. The SIAC noted the limitations of current knowledge of the impacts of altered hydrology to Winged Peppercress and the concerns of submitters regarding the potential for the projects to have inadvertent negative impacts through inappropriate inundation regimes. Based on this, and the absence of identified individuals in the maximum inundation area, the SIAC noted that the potential response of Winged Peppercress to the project is more likely neutral than a definite benefit for the Belsar-Yungera project. The SIAC concluded that further consideration of the population of Winged Peppercress on Raakajlim is required and recommended the inclusion of a new EDS E5 which seeks to address the uncertainties. The SIAC also concluded that the projects expected benefits for Winged Peppercress are potentially overstated. My detailed assessment of potential effects on this species in relation to its protection under the EPBC Act is provided in Appendix A. With implementation of the proposed EDS, including the inclusion of EDS E5 as recommended the SIAC, I consider the impacts to the Winged Peppercress to be acceptable.

I acknowledge that consideration of alternatives and project refinements during the EES process to avoid and minimise impacts (see Section 4.2) has reduced the potential impacts on threatened flora. Nonetheless, as outlined in the EES, the loss of a significant amount of vegetation removal results in an extreme residual adverse effect at Belsar-Yungera and a high residual adverse effect at Hattah Lakes North (see Native vegetation impacts from construction). As discussed in Section 4.2, there will be further opportunities during the construction phase to reduce direct impacts on threatened flora (e.g. through refinement of locations of project infrastructure) and I have made recommendations to further strengthen this process.

Overall, the SIAC found that the EES satisfactorily assessed the impacts of construction on listed flora species. The EES states that inundation resulting from the projects will, in the long-term, have positive effects on the vast majority of the species that are directly impacted by construction. I consider that the large number of individuals of threatened flora species within the proposed construction footprints for both projects is significant. I note that the temporal and spatial bounds of these impacts and benefits differ, and have considered the potential positive outcomes for native vegetation in the sections below. I support the SIAC's findings that the proposed EDS, with recommended amendments, allow for the impacts to be appropriately managed. The SIAC considered that the operations stage of the projects is unlikely to significantly impact adversely on any listed terrestrial flora species, with the exception of Umbrella Wattle, Club-hair New Holland Daisy and Frosted Goosefoot as discussed above. I agree with this conclusion and consider these impacts to be acceptably managed with implementation of the proposed EDS, including the recommended amendment to EDS E1 and EDS E5.

Terrestrialisation

The EES explains that terrestrialisation is the process of colonisation of previously inundated areas by terrestrial flora species. Terrestrialisation has occurred in some parts of the project areas due to a reduction in flooding frequency, duration and extent post river regulation. The EES 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. For Belsar-Yungera, the EES concluded no EVCs are likely to be substantially negatively impacted by the reversal of terrestrialisation. For Hattah Lakes North, impacts are expected on EVC 102 low chenopod shrubland which has become established on Lake Boolca due to a lack of regular flooding over 50 years. Vegetation at this location is expected to transition back to EVC 107 (Lake Bed Herbland). The EES rated the residual risk for removal or destruction of native vegetation during operation as low for Belsar-Yungera and high for Hattah Lakes North.

The SIAC considered whether the reversal of terrestrialisation is an impact or a benefit and whether it should be accounted for in native vegetation impacts. The VNPA submitted that the conversion of existing vegetation types to new EVCs should be considered removal of native vegetation. The proponent argued that terrestrialisation reversal should be considered a positive outcome of the projects as it is likely to involve gradual transition of certain plant species to more flood-tolerant or dependent ones, without significant loss of native vegetation. After considering submissions and

evidence, the SIAC found that the reversal of terrestrialisation is a legitimate and beneficial objective and outcome of the projects and that changes resulting in a terrestrial EVC converting to a floodplain EVC need not be accounted for in native vegetation impacts/losses. The SIAC was persuaded by several factors including: (i) evidence and submissions that floodplain vegetation would benefit from more frequent environmental watering; and (ii) the lack of threatened terrestrial flora communities recorded or anticipated to occur in the maximum inundation areas. I agree with these findings.

The SIAC also considered whether the biodiversity value of terrestrial species to be affected by inundation is a relevant consideration when considering measures to avoid, minimise and mitigate effects. The proponent submitted that questions regarding terrestrialisation should not attach ecological or biodiversity value to terrestrial species within the maximum inundation areas. Despite these terrestrial species having opportunistically inhabited the floodplain, the SIAC did not agree with the proponent's proposition and noted that if the projects were to result in a significant negative outcome for a vulnerable or endangered terrestrial species, then measures to avoid, minimise and mitigate that outcome warrant consideration in the context of predicted ecosystem benefits. I support the conclusion of the SIAC. This is discussed further in sections below in relation to the Mildura Ogyris butterfly.

Threatened fauna

The fauna surveys for the EES recorded 168 fauna species in the Belsar-Yungera project area, and 163 fauna species in the Hattah Lakes North project area, including 11 species of conservation significance at Belsar-Yungera, and 12 species of conservation significance at Hattah Lakes North.

The EES 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' decision for these projects, the community is not required to be considered under the EPBC Act by the Minister for the Environment and Water. The EES notes it is still recognised by the projects as an EPBC Act listed Threatened Ecological Community. No other EPBC Act listed threatened fauna communities are known from within the study area, were observed during site assessments, or are considered to have the potential to occur in these areas.

Table 6-4 Listed threatened terrestrial fauna recorded or with potential habitat present in the study areas (source: EES)

Species	EPBC Act status	FFG Act status	Presence in project study areas
Regent Parrot	Vulnerable	Vulnerable	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
South-eastern Long-eared bat	Vulnerable	Endangered	Belsar-Yungera (not recorded but habitat present), Hattah Lakes North (not recorded but habitat present)
Glossy Ibis	Migratory	-	Hattah Lakes North (recorded)
Mildura Ogyris Butterfly		Endangered	Hattah Lakes North (recorded)
Carpet Python		Endangered	Belsar-Yungera (recorded), Hattah Lakes North (not recorded but habitat present)
Lace Monitor		Endangered	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
Apostlebird		Vulnerable	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
Australasian Shoveler		Vulnerable	Belsar-Yungera (recorded)
Grey-crowned Babbler		Vulnerable	Belsar-Yungera (recorded)
Hooded Robin		Vulnerable	Belsar-Yungera (recorded), Hattah Lakes North (recorded)

Species	EPBC Act status	FFG Act status	Presence in project study areas
Little Eagle		Vulnerable	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
Major Mitchell's Cockatoo		Critically endangered	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
Square-tailed Kite		Vulnerable	Belsar-Yungera (recorded)
White-bellied Sea-Eagle		Endangered	Belsar-Yungera (recorded), Hattah Lakes North (recorded)
Crested Bellbird		Endangered	Hattah Lakes North (recorded)
Eastern Great Egret		Vulnerable	Hattah Lakes North (recorded)

Key impacts to threatened fauna identified within the EES include a loss of habitat through vegetation clearance, and direct and indirect effects from inundation. The EES identified that the permanent and temporary loss of habitat as a result of the projects would have a medium residual effect on woodland fauna, noting that this has the potential to impact FFG and EPBC-listed species such as the Regent Parrot and South-eastern Long-eared Bat. The EES considered that with the application of the relevant EDS, the projects would generally provide a benefit to threatened fauna species through improved habitat condition. I note however there is a number of state and federally listed threatened species which are expected to be impacted from the significant amount of vegetation clearance required for the projects, and there will be a substantial time lag between impacts to habitat during construction and the realisation potential benefits to habitat from operations. The potential impacts on fauna habit from construction remain significant, even with implementation of the proposed EDSs.

The South-eastern Long-eared bat *Nyctophilus corbeni* is listed as vulnerable under the EPBC Act and endangered under the FFG Act. As discussed in Appendix A, the loss of a significant number of hollow bearing trees has the potential to impact the South-eastern Long-eared bat, particularly at the Belsar-Yungera project. As outlined in the Hollow bearing trees subsection above, it is my recommendation that a hollow replacement plan is required to mitigate against the loss of a significant number of hollow bearing trees. With implementation of the proposed EDS, and other recommended amendments of the SIAC and this assessment, I consider the residual impacts to this species are not insignificant, but acceptable. My assessment of potential effects on these species in relation to their protection under the EPBC Act is provided in Appendix A.

Overall, the SIAC found that the EES satisfactorily assessed the impacts of construction of listed fauna species and the proposed EDS are appropriate, subject to their recommendations. The SIAC considered that the operations stage of the projects is unlikely to significantly impact adversely on any terrestrial fauna species. I generally support these conclusions, as discussed in more detail below with respect to some key species with potential for significant adverse effects.

Mildura Ogyris butterfly

The Mildura Ogyris butterfly (hereafter 'the Ogyris') is listed as endangered under the FFG Act. As outlined in the EES, the species was known to occur in small and fragmented populations in south-eastern South Australia and north-western Victoria, with the largest known population in Victoria found within the Hattah Lakes North project site. The known locations were determined from records on the Victorian Biodiversity Atlas (VBA), and surveys completed for the EES sought to confirm the previously known populations and determine the potential for additional habitat and populations within the project site. The EES identified 370 observations of the species were recorded during the surveys in 2022, with 21% of records occurring within the MIA. Several observations were at previously unrecorded locations across the Hattah North Lakes project area. The EES concluded that with the implementation of the relevant EDS and inundation the temporary loss of habitat would have a low overall adverse effect, however the residual effect to Ogyris from drowning was medium. The Ogyris was not recorded at Belsar-Yungera with no adverse effects on the species expected for that project.

The Ogyris is known to have a dependency on a species of Sugar Ant *Camponotus terebrans* for the larval development and maturation stages of its lifecycle. Surveys for the species were based on the survey protocols for a similar species found in Western Australia (Arid Bronze Azure Butterfly *Ogyris subterrestris petrina*) and, while the 2021 surveys were undertaken using this protocol, the 2022 surveys were amended based on local knowledge of the Ogyris' habitat and characteristics to ensure the surveys sufficiently assessed the potential habitat within and adjacent to the project area.

Submissions noted that the Ogyris is the seventh most endangered butterfly in Australia[18], and raised concerns that the proposed flooding of the maximum inundation area would have negative impacts on the species, and that the risk to the species had been understated in the EES as the post flooding recolonisation time is unknown. Concerns were raised during the hearing that flooding events facilitated by the projects could negatively impact the Sugar Ant, and therefore the ability for the Ogyris to continue to reproduce in the area. The EES terrestrial ecology specialist study notes that a previous population which was recorded in the Mildura Cemetery may have died out as a result of habitat disturbance and possible flooding in 1974. The report also notes that this cycle of colonisation and senescence may be a natural cycle for the similar Western Australian species, with many of the historically recorded sites in WA no longer supporting a population.

The expert witness statement[19] and information provided at the hearing by Dr Murdoch highlighted concerns that the EES assumes all Sugar Ant colonies are the correct host species for Ogyris, noting that in Western Australia there are different species of Sugar Ant that are considered to be either "host" or "non-host" for the Ogyris. The non-host Sugar Ant is also known to co-occur with the host Sugar Ant species, and testing would need to be done to determine which species occur at the Hattah Lakes North project area. Dr Murdoch submitted that there is increased vulnerability to the species after the 2022 floods and recommended that there be a proportionally greater emphasis on the protection of the remaining sites as a result. She also highlighted the importance of monitoring the known oviposition sites (egg laying sites) to understand the response of ants and butterflies to the 2022 flood, particularly the timeframe for recovery. Dr Murdoch agreed with the recommendations in the proponents' expert witness statement for terrestrial fauna[20] regarding the need for further surveys and monitoring of the Ogyris. Dr Murdoch also recommended i should be used to inform the environmental watering regimes.

The EES identified that during construction, the greatest risk to the species is vehicle collisions, and recommended that construction traffic should avoid Mournpall Track during active flight seasons. The SIAC noted that this recommendation was not linked to an EDS to manage the risk and recommended the inclusion of a new EDS (EDS E2h) that requires the construction traffic to avoid the use of Mournpall Track during active Ogyris flying times. In addition, the SIAC recommended that final day EDS E2a be updated to include a reference to the requirement of EDS E2h. I support these recommendations to help minimise project impacts on this species.

The SIAC noted that the requirements of the Ogyris are not well known and recommended the inclusion of a new EDS (EDS E6) which requires a new Mildura Ogyris Butterfly Sub-Plan of the operation environmental management plan. The sub-plan is intended to address appropriate monitoring requirements to determine recovery and recolonisation of the maximum inundation area by the Sugar Ant and butterfly following the 2022 floods and should inform management decisions regarding the extent of inundation events intersecting potential habitat, and implementation of any mitigation or management measures should inundation occur. I support this recommendation.

The SIAC concluded that, subject to implementing the recommended changes to the EDSs, impacts to the Ogyris are likely to be acceptable. I agree with this conclusion and consider the potential effects acceptable with implementation of the amended EDSs.

Regent Parrot (eastern)

The Regent Parrot *Polytelis anthopeplus monarchoides* is listed as vulnerable under both the EPBC Act and the FFG Act. The species was recorded during the field surveys for Belsar-Yungera and Hattah Lakes North, however no known nests were identified within either 100 m (Belsar-Yungera) and 200 m (Hattah Lakes North) of the construction footprint.

[18] Submission 5, Submission 6, Submission 10, Submission 13, Submission 14

[19] Tabled document 137

[20] Tabled document 131

Specialist study A notes that the entire project areas are considered to be potential foraging habitat. Potential breeding habitat also occurs in some locations within the project areas.

The EES describes that the Belsar-Yungera project would lead to the following habitat impacts for Regent Parrot:

- the removal of up to 50.3 ha of potential foraging habitat, including 27.7 ha of potential breeding habitat;
- the removal of up to 8.67 ha of preferred breeding habitat, which is within 120 m of water; and
- impacts to 39 trees identified as potential breeding trees (with a DBH>160cm).

The EES describes that the Hattah Lakes North project would lead to the following habitat impacts for Regent Parrot:

- The removal of 18.9 ha of potential foraging habitat. The EES states that this is not considered to be favoured foraging habitat.
- No clearance and limited disturbance of potential breeding habitat. The 0.11 ha of potential breeding habitat identified an existing access track is proposed to be used for access purposes, with noise and dust impacts predicted but no removal.

The loss of a significant number of hollow bearing trees has the potential to significantly impact the Regent Parrot, particularly from the Belsar-Yungera project. As outlined in the Hollow Bearing Trees subsection above, it is my recommendation that a hollow replacement plan is required to mitigate against the loss of a significant number of hollow bearing trees.

The EES concluded that adverse effects to Regent Parrot are possible but were considered unlikely to be a significant impact under the EPBC Act guidelines. The EES considered that the projects will likely benefit the species by providing water to floodplain habitats used by the species, which would result in greater foraging resources, and a succession of woodland trees that would eventually support suitable nesting hollows. I agree that the Hattah Lakes North project on its own is unlikely to have significant impact on this species with implementation of the proposed EDSs, incorporating amendments from the SIAC and this assessment, as no removal of breeding habitat is proposed. However, I do consider the potential impacts of the proposed vegetation clearance for the Belsar-Yungera project on the species is more significant as it will result in loss of 27.7 ha of breeding habitat (including 8.67 ha of preferred breeding habitat[21]) and 50 ha of foraging habitat.

The SIAC suggested changes to EDS E2g and EDS E2a, and the subsequent deletion of monitoring requirement M TE1 to clarify and simplify monitoring requirements for Regent Parrot. I agree with these amendments however, I recommend that EDS E2g is updated to require further analysis during detailed design, to ensure impacts on Regent Parrot habitat are minimised and documented, particularly for the breeding habitat of the species in the area of the Belsar-Yungera project.

On balance, I consider the Belsar-Yungera project will likely result in a significant impact to Regent Parrot, through the loss of a substantial area of breeding and foraging habitat. The inclusion of the recommended changes to EDS E2g, and the hollow replacement plan required under the recommended new EDS E8 are critical to mitigating against the impacts to Regent Parrots. The SIAC acknowledged the potential effects on this species but concluded that these impacts will be appropriately managed with implementation of the amended EDSs. I support the SIAC's findings and consider that impacts to Regent Parrot are acceptable, provided that the proposed EDSs, including recommended amendments of the SIAC and this assessment, are implemented and significant impacts are offset in accordance with EPBC Act Environmental Offsets Policy.

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.

Pest plants and animals

The EES noted pests and overabundant native species such as kangaroos are an existing threatening process in the project areas that could be intensified by construction and environmental watering. To manage risks from pest plants and animals, the EES proposed EDS E2d that prescribes requirements regarding construction weed and pest management to

[21] Habitat within 120m of water

be included in the Native Flora and Fauna Management Sub-Plan of the CEMP, EDS E2e that prescribes requirements regarding construction rehabilitation management be included in the same sub-plan, and EDS E3 that proposes a Pest Plant and Animal Monitoring and Management Plan be prepared and implemented by Parks Victoria during operations. The EES concluded for both projects that the residual effects from the potential introduction of weeds, pest species or pathogens was high for construction and medium for operations.

The SIAC considered whether the proposed EDS are appropriate to mitigate potential adverse effects of pest plants and animals. During the hearing, Ms Jellie, a flora expert witness for the proponent, recommended amendments to EDS E2d to include biosecurity checks of vehicles as part of construction weed and pest management. Mr Marsden, an aquatic ecology expert witness for the proponent, recommended specifying in EDS E2d that both terrestrial and aquatic weeds should be considered as part of construction weed and pest management. Mr Marsden also recommended amendments to EDS E2e to include weed monitoring and management as part of construction rehabilitation management. The proponent adopted the proposed amendments to EDS E2d and E2e which are captured in the final day EDS. Along with the SIAC, I support these proposed amendments.

The SIAC also considered whether mitigation measures for pest plants and animals should apply equally to private and public land. Parks Victoria supported the approach in EDS E3 regarding the preparation and implementation of a Pest Plant and Animal Monitoring and Management Plan during operations but highlighted the need for investment in this mitigation strategy. Dr Murdoch, landholder of the Raakajlim property, highlighted that no mitigation or monitoring was proposed on private land and was concerned about the additional burden on private landowners for pest plant and animal management. The SIAC accepted that the burden to manage and control pest plants and animals will likely increase because of the projects and considered it appropriate for the proponent to work with landowners to mitigate this risk on private land. The SIAC recommended amendments to EDS E3 to detail suitable approaches and measures in the Pest Plant and Animal Management Plan to assist private landowners with the increased risk of pest plant and animal presence and activity due to operations. The SIAC noted the measures must be implemented in consultation with and subject to discussions with landowners. I agree with these findings and recommendations.

Hydraulic effects on floodplain vegetation

The consideration of the hydrologic requirements of EVCs in terms of frequency, duration and depths was discussed throughout the hearing due to concerns raised by submitters (including from Environment Victoria and Mr Frood). The submitters considered that the proposed water regimes could have unintended effects on native vegetation through changes to depth of inundation and artificial ponding on the floodplain.

Mr Frood, a flora expert witness representing himself, gave evidence that the water regimes in ARI's expert elicitation report[22] characterised the hydrological requirements of EVCs in terms of frequency, duration and depth of inundation. He explained that requirements in terms of frequency and duration of inundation were not intended to be used in instances where the topography and depth of water/inundation would be changed, such as where water may pond behind new structures, without also considering the implications of changes in depth. Mr Frood warned that "any changes to the topography influencing water movement and persistence can have unintended effects" and provided examples of changes to topography and water depth causing tree deaths (for example Avoca Marshes), loss of endangered plant species or displacement of EVCs. Mr Frood considered the projects represented as a "risky experiment" by artificially impounding water which could result in a range of issues including triggering seed germination at the wrong time, and drowning seedlings or mature trees. The SIAC considered that Mr Frood's experience was insightful and that his evidence highlights the credible risk that native vegetation could be drowned in some areas, potentially reducing the extent of project benefits.

Ms Jellie, the proponent's expert witness on terrestrial flora, provided evidence that her assessment of the benefits to floodplain vegetation from the projects were based on the assumption that water during environmental watering events would flow in the same way as natural inundation and there would be no change in water depth as a result of the projects. Ms Jellie concluded that there was no potential for catastrophic changes to vegetation as a result of the managed inundation due to the fact that there was no change to topography and water depths, or ponding proposed. She noted that the main expected instance of potential plant drownings would be that of terrestrial species or communities which

[22] Tabled Document 74.

had opportunistically inhabited the floodplain. Ms Jellie submitted evidence that for previous smaller scale environmental watering projects DEECA (formally DSE) had accepted a similar level of fieldwork and assessment of benefits and noted that for those projects realising benefits relied on the monitoring and adaptive management to ensure watering was appropriate. The SIAC accepted Ms Jellie's evidence regarding the previous smaller scale watering projects, which addressed uncertainty through adaptive management and accepted parameters of inundation and duration can be managed adaptively. However, the SIAC considered it appropriate for further site-specific assessment for the VMFRP projects, to test the working hypothesis, and then follow up with the monitoring and adaptive management process. The SIAC considered that water depth should be considered in the design of the projects to ensure that the design of infrastructure does not result in ponding of water beyond tolerated depths for native vegetation.

As a result of these issues, the SIAC concluded that the EES did not adequately describe the extent and nature of all hydraulic changes due to the project, and the SIAC was unable to determine whether and to what extent the projects may cause drowning of some floodplain vegetation, including large trees. Consistent with the SIAC, I consider that further analysis is required to provide appropriate level of certainty regarding implications for floodplain vegetation and preferred and tolerable water regimes to inform initial operating scenarios and adaptive management.

The SIAC recommended the inclusion of a new EDS, EDS SW4, which requires additional hydraulic analysis to be undertaken to allow the implications of hydraulic effects of the projects for floodplain vegetation to be determined with regard to depth preferences and tolerances of EVCs (as discussed in Section 6.1 of this assessment). The SIAC further recommended the inclusion of EDS E7, which requires preparation of a site-specific hydrological analysis of EVCs for each project area to inform initial operating scenarios and adaptive management to be tested through environmental monitoring of responses to vegetation to watering events. I support these recommendations.

Consideration of overall improvement to biodiversity

As noted in Section 4.2, the proponent undertook an Assessment of Overall Improvement to Biodiversity (AOIB) for each project (EES Attachments V and VI). The AOIB reports were intended to demonstrate the expected benefits of each project and support the decisions regarding the proposed alternative arrangement to offsets. Based on the findings of the AOIBs, the EES stated that for Belsar-Yungera it is expected that 1,436 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 100,000 megalitres per day (ML/day) scenario and that there is the potential to benefit 11,862 Large trees within the maximum inundation area. At Hattah Lakes North it is expected that 716 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 140,000 ML/day scenario at Lake Boolca Water Management Area and 318 ha would receive improved frequency and duration of inundation under the 120,000 ML/day scenario at Chalka North Water Management Area. It is also expected that 8,759 Large trees may benefit within the Hattah lakes North maximum inundation area.

EES Attachments V and VI included modelled operating scenarios, which were analysed to determine whether and to what extent preferred inundation depths were achieved for EVCs. For both project areas it was 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 process, undertaken by ARI. The expert elicitation involved a panel of botanical and floodplain ecosystem experts (from government and private sector) with experience in the vegetation and hydrology of the Murray River floodplain. These experts provided judgements on the optimal and tolerable ranges (based on frequency and duration of inundation water regimes) of the identified EVCs. A report outlining the tolerable and optimal water regimes for 24 EVCs associated with the broader VMFRP was prepared and this report concluded that four EVCs would not receive benefit from any of the proposed watering regime. The timing of ARI's preparation of the expert elicitation report meant it was not considered explicitly in the preparation of the exhibited EES but was able to be tabled by the proponent prior to the public hearing (Tabled Document 73).

In response to the tabled expert elicitation report, the proponent also tabled a technical note[23] which presented further work carried out by Ecological Associates[24], entailing a site-specific assessment to contextualise the expert elicitation results for the Belsar-Yungera floodplain and relevant EVCs. The proponent did not provide a site-specific assessment

[23] Tabled Document 108.

[24] Ecological Associates (2023). Hydrological analysis of Ecological Vegetation Classes in relation to expert elicitation report – Belsar-Yungera Floodplain

for Hattah Lakes North, as the hydraulic modelling for the entirety of the Hattah Lakes floodplain (beyond the maximum inundation area) was not yet available.

The Ecological Associates report asserted that the expert elicitation report had limited usefulness when applied in isolation to specific sites, due to the generalised nature of the ARI advice for EVCs, and that site-specific hydrological and spatial data is required to guide environmental watering decisions. In the cover letter to the Ecological Associates report the proponent noted that both ARI's expert elicitation report and the Ecological Associates report do not consider the full range of factors which will be relevant to achieve the intended benefits of the projects through future environmental water decision-making processes.

As noted in the AOIB reports, the standard conservation works exemption (CWE) is not available to the projects as the planning approval for the projects is proposed to be bespoke (via a PSA) rather than planning permit applications. The proponent is thus seeking an alternative offset arrangement 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[25] it was noted the Environment Portfolio had drafted and supplied un-published guidance information[26] specific to the projects 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.*
- *That proposed monitoring is described and undertaken to ensure the primary objectives of the conservation work are being achieved.*

The SIAC concluded that while there is reasonable expectation of overall benefit to biodiversity values in the long-term from both projects, the EES did not demonstrate that all the native vegetation within the floodplains would benefit from the projects. As discussed earlier in my assessment, the SIAC recommended additional work to address specific uncertainties relating to floodplain hydraulics and floodplain ecology, with the results of this work to be used to confirm the extent of benefits. Specifically, the SIAC recommended the addition of EDS SW4 which requires an updated assessment of overall improvements to biodiversity to address the uncertainty surrounding the implications of hydraulic effects for floodplain vegetation. The SIAC further recommended changes to EDS E7 to require assessment to provide an appropriate level of certainty regarding preferred and tolerable water regimes to inform initial operating scenarios and adaptive management.

The SIAC also recommended the findings of this further work required by EDS SW4 and E7 should then be used to update the assessment of overall biodiversity improvement, prior to final decision-making on the alternative arrangement to offsets of the proposed incorporated document. I note in the EES AOIB attachments (Attachment V and Attachment VI) there is reference to the modelling of four different water regimes (pre-regulation, regulated river, Basin plan (without VMFRP), and VMFRP (with Basin Plan). However, the hydrological analysis, which was only provided for Belsar-Yungera, provides the assessment of EVC responses against only the pre-regulation, regulated river and Basin Plan models. The VMFRP (with Basin Plan) scenario represents the post-VMFRP regime, which is what the projects would implement to achieve targets. I recommend that the updated analysis for both projects presents findings against this scenario to demonstrate the expected responses of EVCs to the water regime proposed to be implemented. I support the SIACs findings and recommendations and consider it important this work is undertaken to satisfactorily clarify

[25] VMFRP SIAC submission no. 18, DEECA, p.13-14

[26] Conservation Work Exemption - Further Guidance (Large and/or Complex Projects) (DELWP Biodiversity Division guidance to VMFRP 2021), as referenced in submission no. 18

the likely benefits (and residual risks) for the vegetation communities of the floodplains, prior to native vegetation related decision-making.

Alternative arrangement to offsets

In their final day submissions, the proponent submitted a final day version of the incorporated document[27] which removed Condition 4.5 relating to native vegetation requirements and offsets, as they considered offsets to be inappropriate as the projects concluded the overall improvements to biodiversity were sufficient to meet the requirements of the alternative offset arrangement. As outlined in the SIAC report, the exhibited incorporated document (condition 4.5) provides for:

- information about the native vegetation to be removed to be submitted to and approved by the Secretary prior to native vegetation removal;
- offsets to be provided prior to native vegetation removal, unless written agreement is obtained from the Secretary stating it has been demonstrated the removal of native vegetation necessary to enable the use and development provides for an overall improvement to biodiversity; and
- any secured offsets to be reconciled within six months of the completion of construction, and evidence provided that offsets have been secured.

Correspondence from the Secretary of DEECA submitted to the SIAC (Tabled Document 190) provided comments on the proponents 'final day' incorporated document. The submission notes that the consequence of deleting the native vegetation conditions from the incorporated document is that the projects will be unconstrained by the planning scheme in its capacity to remove native vegetation. If removed, no permit or offsets will be required and the actual native vegetation to be removed would then be primarily controlled by the content of the approved EMF under condition 4.4 and the development plans approved under condition 4.3. The DEECA letter submits that it is appropriate to have safeguard mechanisms in the incorporated document, against an otherwise unrestrained capacity to remove native vegetation without offsetting. As part of the justification for this, the letter highlights the complexity, technicality and high-risk nature of the assessment of benefits and impacts for these projects, and the role secondary consents (in the incorporated document) could play to mitigate risks and improve outcomes. The submission notes that providing a requirement for a secondary consent by the Secretary would:

- allow the incorporated document to respond to the complexity in risk and assessment, including scenarios/conditions where removal without offsetting may or may not be appropriate based on overall biodiversity benefit; and
- allow conditions around operation and management actions for the purpose of achieving 'no net loss' – common under the conservation works exemption and plausible here – to be administered by the Secretary.

The Secretary of DEECA's letter concludes that secondary consent tied to the objective of overall biodiversity benefit, and administered by the Secretary, is an appropriate mechanism. The submission also considered information about native vegetation removal should still be required for other purposes, such as providing data for regional and State-wide monitoring and reporting on the 'no net loss' objective.

The SIAC found that the alternative offset arrangement proposed (equivalent of a CWE) is generally acceptable, subject to the recommendations of the SIAC to undertake further analysis and subsequently update the AOIB. The SIAC noted that the recommended update of the AOIB reports should include an update of the assessment of whether offsets might be required, before seeking agreement from the Secretary of DEECA for the removal of native vegetation. As such, the SIAC recommended that condition 4.5 in the exhibited incorporated document (now 4.6 in the SIAC report) is retained. I support this recommendation given that further analysis is required to satisfactorily clarify the likely benefits (and residual risks) for native vegetation and confirm that offsets are not required under Victorian native vegetation policy and guidelines. Consistent with the DEECA submission, I consider the inclusion of this secondary consent in the incorporated document will provide an appropriate safeguard mechanism for decision making on native vegetation removal and allow decisions to appropriately take into account the findings of the additional analysis conducted. I also note that condition 4.5 specifies the need to provide information about native vegetation removal which is required by DEECA for reporting and data collection purposes regardless of whether offsets are required or not.

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

[27] Tabled Document 178

Assessment

It is my assessment that construction of the Belsar-Yungera and Hattah Lakes North projects will each result in significant adverse effects on biodiversity and habitat values particularly due to:

- direct clearance of up to 50.3 ha of native vegetation and 692 Large trees for Belsar-Yungera and 18.9 ha of native vegetation and 150 Large trees for Hattah Lakes North to facilitate construction of the projects, much of which is occurring on land reserved for conservation;
- loss of fauna habitat due to vegetation clearance, including loss of approximately 604 hollow bearing trees during the construction phase which provide fauna habitat (527 for Belsar-Yungera and 77 for Hattah Lakes North);
- removal of a very high number of individuals of threatened flora species protected under the FFG Act for both projects; and
- potential for cumulative impacts on biodiversity values in conjunction with the construction of other proposed VMFRP projects.

I support SIAC's recommendations on the relevant EDSs to mitigate and manage these impacts, and I have recommended further amendment to EDSs E1, E2e and E7 (see Appendix B) as well of addition of EDS E8 and E9.

I consider the Belsar-Yungera project will likely result in a significant impact to Regent Parrot, through the loss of a substantial area of breeding and foraging habitat. The inclusion of the recommended changes to EDS E2g, and the hollow replacement plan required under the recommended new EDS E8 will be critical to mitigating against this impact. It is my assessment that this significant impact to Regent Parrot is acceptable, provided that the proposed EDSs, including recommended amendments of the SIAC and this assessment, are implemented and significant residual impacts are offset in accordance with EPBC Act Environmental Offsets Policy.

Further it is my assessment that the proponent needs to improve short term biodiversity outcomes for both projects through further avoidance and minimisation of vegetation clearance and other impacts wherever possible, through the detailed design, construction and operational phases of the projects. I have made further recommendations in Section 4.2 regarding investigation of opportunities to further avoid and minimise adverse effects (including reducing the removal of large hollow bearing trees) during the detailed design and construction phases.

Consistent with the findings of the SIAC, I consider that there is a reasonable expectation that both the Belsar-Yungera and Hattah Lakes North projects can result in an overall improvement to terrestrial biodiversity values within their respective maximum inundation areas over the long-term. However, along with the SIAC I support the need for some further analysis of floodplain hydraulics and its implications for specific floodplain vegetation communities, to provide appropriate level of certainty regarding benefits, as well as preferred and tolerable water regimes to inform initial operating scenarios and adaptive management. Key aspects of this in relation to terrestrial biodiversity, as outlined in EDS SW4, include:

- the need to update of the assessment of overall biodiversity improvement reports for both the projects to take account of the further analysis conducted; and
- consideration of the outcomes of this further analysis and report updates in relevant project approval decisions and secondary consents, including those related to native vegetation removal and the proposed alternative offset arrangement.

It is my assessment that conditions in the incorporated document will provide an appropriate safeguard mechanism for decision making on native vegetation removal and the alternative offset arrangement, allowing decisions to appropriately take into account the findings of the additional analysis.

While the residual effects of the construction of the projects will be significant, it is my overall assessment that these effects on terrestrial biodiversity are acceptable when taking into account the predicted positive effects for these floodplain environments from the projects over the long-term, with the successful implementation of the proposed EDSs and adaptive management (subject to amendments set out in SIAC recommendations and this assessment).

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.

6.4 Aquatic ecology

Evaluation objectives

Avoid, and where avoidance is not possible, minimise potential adverse effects on native vegetation, species of flora and fauna (particularly listed threatened species and their habitat and listed ecological communities), as well as address offset requirements (if required) consistent with state and Commonwealth policies.

Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.

Assessment context

Aquatic Ecology impacts are addressed in Chapters 9 and 14 of the EES in the Ecology - Aquatic specialist study A appended to the EES. Chapter 8 of the SIAC's report discusses the SIAC's findings in relation to aquatic ecology.

The EMF included 21 EDSs specifically addressing potential effects on ecology values and some of these have been the subject of recommendations by the SIAC. Key measures included in the EDS include preparation of a native flora and fauna management sub-plan.

A number of potential impacts of the projects for aquatic biodiversity values were examined through the EES 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; and cumulative effects.

The EES states that the projects are expected to benefit aquatic flora through improving the health, structure and regeneration of canopy species, and increasing the diversity and abundance of floodplain dependent understorey species. The EES also notes that there are expected increases in riparian vegetation which would assist in stabilising banks, providing habitat, reducing algal blooms through shading and further contributing carbon sources to waterways. The EES concludes that the projects are expected to benefit aquatic fauna through increasing connectivity between the floodplain and waterways, with the expectation that the environmental watering would create breeding habitat in the inundated floodplain for small-bodied fish as well as providing nursery habitat for large-bodied fish.

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

Discussion

Effects on threatened aquatic species

The EES states that the projects have the potential to impact a number of listed threatened aquatic fauna which have been recorded in the study areas (see Table 6-5 below). The EES undertook an assessment of potential impacts to listed species from the construction and operational phases of the projects and developed key mitigation measures to reduce potential impacts to these species.

Table 6-5 Listed aquatic fauna recorded as present in the study areas during EES surveys

Species	EPBC Act status	FFG Act status	Presence in project study areas
Murray Cod	Vulnerable	Endangered	Belsar-Yungera, Hattah Lakes North
Silver Perch	Critically Endangered	Endangered	Belsar-Yungera, Hattah Lakes North
Southern Pygmy Perch	Endangered	Vulnerable	Hattah Lakes North
Murray-Darling Rainbowfish	-	Endangered	Belsar-Yungera, Hattah Lakes North
Murray River Turtle	-	Endangered	Belsar-Yungera, Hattah Lakes North
Broad-shelled Turtle	-	Endangered	Belsar-Yungera, Hattah Lakes North
Freshwater Catfish	-	Endangered	Belsar-Yungera

In addition to the species listed in Table 6-5 above, EES Specialist Study A noted that the study area of each project includes a number of species that comprise the FFG Act listed Lowland Riverine Fish Community of the Southern Murray-Darling Basin.

The EES identified the presence of the Murray-Darling Rainbowfish *Melanotaenia fluviatilis,* and Freshwater Catfish *Tandanus tandanus,* Murray River Turtle *Emydura macquarii* and Broad-shelled Turtle *Chelodina expansa*. Chapters 9 and 14 of the EES identify that the species are generally expected to positively benefit from the operational phase of the project, through increases in habitat availability and habitat connectivity, and an increase in riparian vegetation for shading and bank stabilisation. The EES noted that it is possible that anoxic blackwater events may occur during operation and if they are to occur there may be an impact to threatened turtles present on the floodplain. However, turtles are able to tolerate poor water quality and low dissolved oxygen conditions, so the EES concluded that impacts are likely to be minor.

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

The EES identified the presence of Murray Cod *Maccullochella peelii* (vulnerable under the EPBC Act and endangered under the FFG Act), Silver Perch *Bidyanus bidyanus* (critically endangered under the EPBC Act and endangered under the FFG Act), and Southern Pygmy Perch (Murray-Darling lineage) *Nannoperca australis* (vulnerable under the EPBC Act and the FFG Act). My consolidated assessment of the potential impacts of the projects on EPBC Act matters is in Appendix A of this assessment.

The EES identified that Murray Cod is present within the Belsar-Yungera project area, having been recorded in Narcooyia Creek and in the Murray River downstream of the site. The waterways within the vicinity of the project are not considered to support an important population, however an important population occurs within the Murray River, downstream of the project area. The Murray River in the Belsar area is known to be a spawning hotspot for Murray Cod (EES Attachment IX). Murray Cod is also present within the Hattah Lakes North project area, having been recorded from Chalka Creek, and Lakes Bulla, Little Hattah and Mournpall in the National Park. The species was recorded during monitoring of the Hattah Lakes and study area undertaken between 2006 and 2020 for the Living Murray project. The waterways intersected by the construction of the Hattah Lakes North project are not considered to support an important population of the species, however an important population is present within the Murray River, downstream of the project area (EES Attachment X).

The EES identified that Silver Perch is present within the Belsar-Yungera project area, having been recorded at Narcooyia Creek. The Murray River in the Belsar area is known to be a spawning hotspot for Silver Perch (Attachment IX). Silver Perch is also present within the Hattah Lakes North project area, having been recorded at Chalka Creek South, the Murray River and the Lakes Yerang and Hattah. The species was recorded during monitoring of Wallpolla Creek and Dedmans Creek undertaken between 2006 and 2018 for the Living Murray project (Attachment X).

The EES identified that the Southern Pygmy Perch has not been recorded within the Belsar-Yungera project area and is considered unlikely to occur, however is present within the Hattah Lakes North project area, having been recorded form Lakes Bulla and Bitterang during the targeted surveys. The EES states that no important populations of this species have been defined. As the population recorded from Lakes Bitterang and Bulla is isolated from other populations of the species, it is considered in the EES that this is an important population.

The EES identified that the project had the potential to impact on these species through a range of effect pathways including the potential restriction of access to spawning areas and sedimentation during construction, and potential stranding on the floodplain or potential water quality impacts through anoxic blackwater events during operations. The risk of increased predation, competition, and habitat degradation from a potential increase in Carp was a key focus of the assessment of impacts to threated fish. The EES considered that the projects are expected to result in a minor overall improvement in populations from benefits to these species through enhanced fish passage and habitats, and short-term increased opportunistic foraging potential when the floodplain is inundated under most operating scenarios. The EES concluded that the EDS adequately addressed potential effects, and there would be no significant impacts to these species.

Cumulative effects of the Belsar-Yungera and Hattah Lakes North projects in relation to the other seven 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, Silver Perch and Southern Pygmy Perch were assessed in Tabled Document D113. The assessment concluded there are unlikely to be cumulative adverse effects on Murray Cod. I agree that the projects are unlikely to have significant cumulative impacts on the species, provided that the proposed EDS are effectively implemented which include measures to manage impacts of weeds, pest and pathogens, return woody debris habitat following construction and provide for fish passage at regulating structures during operation.

The SIAC concluded that that the effects of the project on threatened aquatic fauna are likely to be low and acceptable, subject to effective implementation of the recommended EDS, including amendments proposed by the SIAC. I agree with this conclusion and support the EDS amendments.

Construction impacts

Chapters 9 and 14 of the EES consider a range of potential impacts to aquatic ecosystems from the projects including direct impacts, loss of habitat connectivity, degradation of aquatic habitat, spread of weeds, pest species and pathogens, noise and vibration, and light.

While the proposed EDSs generally address the potential adverse effects of construction, the EES noted that the construction of the ER1 regulator within Narcooyia Creek within the Belsar-Yungera project requires a cofferdam, which will result in a temporary loss of connectivity and impeded passage impacting aquatic species. As there is the potential for a reduction in free passage for aquatic species such as turtles and fish, the EES concludes there is a medium residual effect. The EES considers that the creation of a barrier may restrict the ability of Murray Cod and Silver Perch to exit the system to access spawning habitat in other areas of the Murray-Darling Basin, and temporarily reduce habitat availability for all species in Narcooyia Creek, however is not expected to affect the spawning of fish. The proposed EDS include requirements for monitoring and management of the water quality and water level within the restricted reach as outlined in EDS E2f.

The EES states that the Hattah Lakes North project potential adverse effects due to construction have an insignificant or low effect to aquatic ecology values. While construction is expected to be undertaken in locations that are dry, mitigation measures are outlined in EDS E2f in case a coffer dam is required which completely blocks a waterway.

The SIAC noted that the construction of the ER1 regulator and fishway at Belsar-Yungera resulted in a medium initial and residual risk rating due to impacts on connectivity and impeded fish passage for native species. The SIAC recommended that EDS E2f should be amended to include a requirement for the timing of works for the ER1 regulator and fishway to avoid construction at times when fish migrate, and a reference to E2f should also be included in EDS E2a to ensure aquatic fauna management is take into consideration in the Native Flora and Fauna Management Sub-Plan of the CEMP. I agree with these recommendations to assist in minimising potential adverse impacts on aquatic values from construction.

Overall, the SIAC concluded that the construction effects on aquatic ecology could be acceptably managed, subject to the inclusion of the recommended changes to EDSs E2f and E2a. I support this conclusion.

Operational impacts

Aquatic fauna connectivity (operations)

The projects have the potential to impede passage of aquatic fauna and result in the loss of connectivity through the construction of key project infrastructure such as regulators and containment banks. The EES notes that the residual effect on connectivity and passage for native aquatic species from the operation of the fishway and regulators is expected to be medium at Belsar-Yungera and low at Hattah Lakes North, and a low residual effect in terms of fragmentation of habitat for turtle species.

An impact pathway noted in the EES is the potential for fish to become stranded on the floodplain during drawdown events where environmental water held on the floodplain is returned to the Murray River. The EES concluded that the residual effect for Belsar-Yungera is medium, however it notes that it is unlikely that the project will result in stranding of aquatic species on the floodplain. The justification for this provided in EES specialist study A was that it is considered unlikely that large numbers of Murray Cod, Silver Perch or Southern Pygmy Perch would colonise inundated habitat on the floodplain, noting that for Southern Pygmy Perch the reduced likelihood of stranding is due to their rarity in the region. The EES proposes a native fish exit strategy protocol will be developed under EDS SW2, which is intended to allow native fish to migrate from the floodplain, and a supporting measure in EDS EMF4 which looks to monitor fish population responses to inundation and drawdown events and allow for adaptive monitoring for future watering events.

The SIAC recommended changes to the EMF to include revisions to EDS SW2 and addition of a new monitoring requirement (M AE7) to require monitoring and reporting on fish strandings to support adaptive management and concluded that, with the recommended changes, the fish stranding effects of the projects can be acceptably managed. I agree with these recommendations and conclusions.

The EES notes that the operation of the ER1 regulator and fishway on Narcooyia Creek in the Belsar-Yungera complex may result in a loss of connectivity and impeded passage for aquatic species. The proposed design of the fishway is intended to allow passage for a range of listed and non-threatened native fish species such as Murray Cod, Silver Perch, and Murray-Darling Rainbowfish. The EES concluded there is expected to be medium residual effects to freshwater turtles during the operation phase, as the ER1 fishway has not been designed to accommodate freshwater turtle passage and there is uncertainty regarding the potential for the fishway to reduce access to suitable breeding areas and other habitats. The EES proposes monitoring to assess the need for freshwater turtle passage during operation.

To strengthen measures for aquatic fauna passage, the SIAC recommended that the EMF should be amended to include a new EDS (EDS SW5) which contains the design of regulators and the passage of native fish and the design of containment banks and spillways and the passage of turtles.

The SIAC concluded that the effects of the projects on aquatic fauna connectivity can be acceptably managed through the EDS and monitoring requirements, subject to the recommended amendments to EDSs. I support the conclusions and recommendations of the SIAC.

Degradation of aquatic habitat (operations)

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

- introduction of water to floodplain environment leads to anoxic blackwater events on the floodplain or in receiving waterways that adversely impact aquatic species;
- operation of project leads to salinity changes that adversely impact aquatic species;
- operation of project leads to changes in geomorphology and aquatic habitat degradation due to increased erosion/sedimentation; and
- operation of project leads to alteration to the natural flow regimes of rivers and streams, leading to conditions unsuitable for aquatic species.

Several EDS were identified 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 EDS, the EES concluded that the significance of the residual effects of the projects related to aquatic habitat degradation were low.

A number of submitters, including Friends of Nyah Vinifera Park and Environment Victoria, were concerned about risks to aquatic ecosystems and biota associated with poor water quality, especially increased frequency of blackwater events. Mr Marsden, an expert witness for the proponent, provided advice during the hearing that it is preferable to avoid inundation in late spring and summer when water temperatures are high, and hypoxia or anoxia are more likely to occur, and that the time interval between inundation events has been shown to influence the severity of hypoxic or anoxic blackwater events. The SIAC noted this advice and recommended that EDS SW2 be amended to clarify the purpose of the requirement to factor in seasonal implications in the timing of filling and drawdown. I support this recommendation to help ensure risks to aquatic ecology associated with blackwater events are minimised.

The SIAC concluded that the effects on aquatic habitat degradation through water quality changes should be low and can be acceptably managed with the recommended change to EDS SW2. I agree with this conclusion.

Aquatic weeds (operations)

The EES states that the projects have the potential to transfer aquatic weeds into wetland habitats, and that the proposed floodplain inundation scenarios would greatly increase the extent and quality of potential habitat suitable for aquatic weed species within the project areas. A number of high and very high-risk aquatic weeds have been recorded within and upstream of the project areas including the very high-risk Lesser Reed-mace *Typha latifolia* (which has been recorded within the Belsar-Yungera project area, and upstream of the Hattah Lakes North project area) and Water Hyacinth *Eichhornia crassipes* (upstream of the Belsar-Yungera project area, and downstream of Hattah Lakes North).

The EMF includes EDS3 which required the monitoring, reporting and auditing of aquatic and terrestrial weeds, and, with the application of this mitigation measure, the EES concluded that the potential adverse effects from pest aquatic plants would have a low residual effect. During the hearing, the proponent suggested changes to EDS E2d in response to a comment made by Mr Marsden that the EMF did not include specific monitoring requirements for aquatic weeds and recommended this be included using the same methodology to be implemented for terrestrial weeds. Along with the SIAC, I support the proponent's proposed changes to EDS E2d.

In addition to this, the SIAC recommended that EDS E3 should be modified to require inclusion of 'terrestrial and aquatic' species in the Pest Plant and Animal Monitoring and Management Plan to help ensure aquatic weeds are addressed during operation. The SIAC also recommended monitoring measure M TE3 should be modified to require aquatic as well as terrestrial weeds be monitored during operation. I support these recommendations.

The SIAC concluded that aquatic weed growth effects can be acceptably managed with the proponent's proposed changes to EDS E2d and the recommended changes to EDS E3. I agree with this conclusion.

Carp

The EES considered the potential effects on Common Carp as the species is 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 in which can smother eggs and impact the gills of native fish. The EES states that the operation of the projects 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 high residual effect at Belsar-Yungera and medium residual effect at Hattah Lakes North.

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 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. Given the potential for Carp to negatively affect aquatic ecosystem health if they become established within aquatic habitat, the EES concludes that the significance of the residual effect is medium at Hattah Lakes North and high at Belsar-Yungera.

The SIAC raised concerns with some of the monitoring requirements in the EMF due to the lack of specific references to Carp and highlighted the importance of monitoring the abundance of Carp and the effects of the proposed EDS to control Carp. Similar to the conclusions of the EES, the SIAC concluded that the projects will have a moderate (Hattah Lakes North) or major (Belsar-Yungera) residual effects in terms of increases in carp populations. However, the SIAC noted that the existing presence of Carp in the project areas and Murray River, along with the likely current boom in Carp populations following the 2022 floods, means that the significance of the effects of the projects on Carp is reduced in that context.

The SIAC recommended changes to EDS SW2, EDS E3 and monitoring requirement M AE3, and also provided recommended revisions to Section 18.8.3.5 of the EMF (description of the Operating Plans) to include further references to monitoring and assessment of Carp during the operational phase of the project. I support these recommendations.

The SIAC concluded that the effects of carp for the projects is moderate to high, but can be acceptably managed through the EMF, including the proposed EDS and monitoring requirements, subject to the recommendations made. I agree with this conclusion and recommended changes to the EDSs.

Cumulative effects on aquatic ecology

The EES identified the following pathways relating to aquatic ecology that could result in potential cumulative effects on aquatic ecology:

- loss of connectivity and impeded passage for native aquatic species;
- drawing down wetlands results in stranding of aquatic species on 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 (e.g., resulting in a cumulative turbidity impact) or during operation due to poor quality of water (e.g., low dissolved oxygen or elevated salinity) in return flows resulting in negative effects to water quality in the Murray River that could accumulate if managed inundation occurred at multiple sites at the same time.

The EES considered that the effect pathways in the aquatic ecology assessment and concluded that the residual effects once EDS are implemented would be medium, noting that the projects could potentially result in cumulative effects for aquatic ecology. The EES states that the effect could be positive through the increased inundation frequency and additional habitat created by other projects, also noting negative potential for increase in impacts from Carp.

The effects on Murray River flows and water quality were assessed to have low or insignificant residual effects after the implementation of EDS, with no potential for cumulative effects on aquatic ecology.

The EES identified that the increased inundation frequency and additional aquatic habitat created by other projects could benefit aquatic fauna and considered this to be the main overall positive cumulative effect from the projects. The assessment also considered that the delivery of organic carbon to the Murray River from multiple sites that could benefit riverine food webs may provide a beneficial cumulative effect to river processes.

As discussed above, the EES noted that there is likely to be an increase in Carp abundance and adverse effects both within the project areas and in receiving waterways. However, the assessment concluded that the cumulative effect is unlikely to be significant within the Murray Darling Basin given that Carp are already well established in this riverine system, and they also proliferate following natural flood events. Overall, the EES concluded that it was considered

unlikely that the projects would lead to cumulative adverse effects on aquatic ecology for the majority of adverse effect pathways.

The SIAC concluded that the projects are likely to contribute to cumulative effects in terms of increased carp populations, however it is not expected to have significant cumulative effects in terms of any other potential effect pathways for aquatic ecosystems. I agree with this conclusion.

Assessment

It is my assessment for both the Belsar-Yungera and Hattah Lakes North projects that the proposed EDSs, including amendments recommended by the SIAC and this assessment, will provide appropriate measures to ensure that the adverse effects on aquatic ecology are not significant and managed to acceptable levels, when also taking account the predicted benefits for these floodplain environments. The projects are likely to have adverse cumulative effects in conjunction with other proposed projects in terms of increased Carp populations but will also result in a number of cumulative benefits to aquatic ecology. Consistent with the findings of the SIAC, I consider that both the Belsar-Yungera and Hattah Lakes North projects are likely to result in an overall improvement to aquatic biodiversity values of the relevant floodplains over the long-term.

I support the proposed amendments to the EDS and monitoring measures proposed by the SIAC, which will assist in ensuring aquatic fauna and flora are appropriately managed and monitored.

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

6.5 Aboriginal cultural heritage

Evaluation objectives

Avoid, or minimise where avoidance is not possible, adverse effects on Aboriginal and historic cultural heritage values.

Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.

Assessment context

Effects on Aboriginal cultural heritage are addressed in the EES, within Chapters 11 and 16 of the main report, as well as in the Aboriginal Cultural Heritage specialist study F appended to the EES, and in Section 10 of the SIAC report.

The projects are 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 EES as having an interest in the lands for which the Belsar-Yungera project is located include Dadi Dadi Weki Weki Aboriginal Corporation, Gilbie Aboriginal Corporation, Latji Latji Mumthelang Aboriginal Corporation, Murray Lower Darling Rivers Indigenous Nations (MLDRIN), Murray Valley Aboriginal Cooperative, Tati Tati Aboriginal Corporation, Tati Tati Land and Water Indigenous Corporation and Wadi Wadi Land and Water Indigenous Corporation. The same Traditional Owner groups, with the addition of the Nyeri Nyeri/Wergaia Peoples, were identified by the proponent as having an interest in the lands for which the Hattah Lakes North project site is located.

The projects are located within the greater Murray Basin, which is a highly sensitive region for Aboriginal cultural heritage. The areas where the project sites are located are complex and rich in Aboriginal cultural heritage. Aboriginal place types common to the greater geographic region that are present in the project areas are scarred trees, earth features, artefact scatters, shell middens and ancestral remains.

The EES stated that the assessment of effects on Aboriginal cultural heritage was informed by consultation with Traditional Owner groups and interested parties. Two CHMPs for the construction phase are currently in preparation and will require approval prior to the projects proceeding (refer to EES Section 3.3):

- Belsar-Yungera CHMP No. 16898; and
- Hattah Lakes North CHMP No. 14330.

The 'activity area' for these CHMPs 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 projects (i.e., inundation, watering) are not fully mitigated through the two draft CHMPs. As such obligations under the Aboriginal Heritage Act (see Section 3.3) for effects from operations would need to be addressed separately.

The EES 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 live trees or destabilise dead standing trees.

Specifically, the construction of the projects would have direct impacts on:

- 117 Aboriginal cultural heritage places within the Belsar-Yungera construction footprint (i.e., 35 surface stone artefacts, 39 scarred trees, 41 hearths, and 2 shell middens); and
- 11 Aboriginal cultural heritage places within the Hattah Lakes North construction footprint (i.e., 1 isolated artefact, 2 scarred trees, 7 earth features, and 1 Low Density Artefact Distribution).

The EES documented an extensive process that was undertaken to assess alternatives to project design to avoid and minimise impacts during the construction of the projects, including to Aboriginal cultural heritage values, particularly where known or suspected sites of ancestral remains were identified. Discussion of the assessment of alternatives is provided in Section 4.2.

Impact pathways identified during the operation of the projects that may result in direct and indirect adverse effects on 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 EES 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). Seven other EDSs were proposed that would assist in managing effects on Aboriginal cultural heritage (E3, GS1 to GS3, and SW1 to SW3).

Discussion

The assessment of effects in the EES was informed by the desktop and standard assessments undertaken for the CHMPs, which focuses on the construction footprint. The nature, extent and significance of effects was inferred for areas not subject to field assessment, which included areas adjacent to the construction footprint and 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 EES assessed the significance of residual effects on Aboriginal cultural heritage during construction as generally low, except for ancestral remains, which was assessed as medium. The EES assessed the significance of the residual effects during operations for the four impact pathways as low to medium for both Aboriginal cultural heritage and ancestral

remains. The EES' assessment of significance of the residual effects on ancestral remains used likelihood of occurrence as a key element, however under the Aboriginal Heritage Act any impact to ancestral remains is unacceptable and therefore residual risk of such effects should be mitigated regardless of its likelihood.

Several submissions raised concerns about the adequacy of the assessment and mitigation of adverse effects to Aboriginal cultural heritage, particularly with regard to ancestral remains. For example, Parks Victoria highlighted in their submission that only one percent of the Parks Victoria estate had been formally surveyed and the complex nature and richness of cultural heritage in the project areas should not be underestimated. In particular, the complex dune system at Belsar-Yungera is likely to contain ancestral remains and should be protected in the delivery of environmental water.

The potential for some benefits to Aboriginal cultural heritage values were also noted in the EES. 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 EES also concludes that watering would improve the health and therefore lifespan of living scar trees.

Realisation of the expected ecological improvements to the project areas are also considered as benefits to the cultural heritage values (tangible and intangible) of these floodplain environments, although as noted earlier in this assessment, this is dependent on sustained, effective environmental watering proposed during the operational phase of the project. Achievement of benefits will also be dependent on appropriate management of environmental effects during construction and operation of the project, consistent with my recommendations contained within this assessment. I note that the EES did not ascertain the timeframe for achievement of benefits, instead stating that it would be in the "long-term". My assessment of project benefits is further discussed in Section 4.1.

The SIAC was satisfied that effects on Aboriginal cultural heritage values were appropriately assessed in the EES, and that the EMF and CHMPs will provide appropriate mechanisms to manage residual impacts. The SIAC was supportive of the specific EDSs proposed to manage adverse effects on Aboriginal cultural heritage (ACH1 to ACH3) and the SIAC did not recommend any amendments to these measures. Along with the SIAC, I agree that the proposed EDSs ACH1 to ACH3 are appropriate.

As discussed in relation to surface water effects in Section 6.1, the SIAC recommended the addition of EDS SW4 to the EMF which requires the proponent to undertake further hydraulic analysis to inform the floodplain vegetation assessment and the minimisation of erosion and sedimentation through design and operation. The assessment of effects in the EES relied on hydrological and geomorphological modelling to identify heightened risk of erosion and hydrological change, to determine the significance of the residual effects to Aboriginal cultural heritage and ancestral remains during operations. The significance of the residual effects on ancestral remains was assessed in the EES as low to medium, largely based on the likelihood of the impact occurring being unlikely, given negligible to low erosion risk and depths of water inundating features. While this assessment is reasonable, it does not sufficiently take account of the uncertainties discussed above, therefore I recommend a new EDS (ACH4) to mitigate residual risk to aboriginal heritage associated with operations, particularly for ancestral remains. This recommended EDS (ACH4) requires an update to the assessment of residual effects associated with inundation, based on the outcomes of the further hydraulic analysis required by EDS SW4. This should have particular regard to the potential for indirect impacts associated with erosion and sedimentation as well as increased water availability and fluctuations in moisture content.

Management of potential impacts to Aboriginal cultural heritage, particularly ancestral remains, as a result of altered pest activity during operations is dependent on the implementation of a Pest Plant and Animal Monitoring and Management Plan as detailed in EDS E3 (which is linked to ACH3). The SIAC recommended update to EDS E3 to ensure a consolidated approach to pest plant and animal management between land managers, with the intent to provide support to private landowners. I support this recommendation and, as discussed in Section 4, note the provision of adequate funding and resourcing in relation to monitoring and adaptive management is key to the management of these residual effects.

I support the SIACs findings in relation to project construction and am satisfied that CHMPs 16898 and 14330 will be subject to the requirements and approval of First Peoples-State Relations, before construction of the projects. However, I note that the two CHMPs in preparation only cover construction and do not cover the operations phase of the project. Effects and mitigation of effects associated with the operation of the projects will need to be addressed, in the context of obligations under the Aboriginal Heritage Act. This may require further CHMPs or cultural heritage permits to be prepared

and approved. The approach to meeting obligations under the Aboriginal Heritage Act will need to be determined in consultation with First Peoples-State Relations and should be informed by the outcomes of the updated assessment recommended (EDS ACH4). In conjunction with the EDSs proposed in the EMF including amendments recommended by this assessment, I consider that these mechanisms will be appropriate to ensure environmental effects associated with Aboriginal cultural heritage, including ancestral remains, will be able to be acceptably managed during 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 EES. However, several submissions received from other parties during EES exhibition raised concern about the adequacy of Traditional Owner engagement. Prior to the public hearing, the SIAC sought to invite Traditional Owner groups to participate in the hearing process. During the hearing, MLDRIN sought to be heard and was provided the opportunity to make a submission to the SIAC. MLDRIN's submission (Tabled Document 133) opposed the projects and mainly discussed broader water policy issues (which is outside the scope of this assessment) as well as the VMFRP. In response to MLDRIN's submission, the SIAC received correspondence from four Traditional Owner groups[28] advising that MLDRIN did not represent them in relation to the projects and three of these submissions offered support of the projects. The proponent advised that MLDRIN had been one of the Traditional Owner groups invited to participate in the EES process.

The SIAC acknowledged the complexity in consulting with Traditional Owner groups and interested parties in the absence of a RAP, due to the need to engage multiple Traditional Owner groups who may have differing perspectives or views. The SIAC did not believe concerns raised by other submitters about Traditional Owner engagement had been substantiated. Based on the information provided by the proponent, the SIAC was satisfied that Traditional Owners, including MLDRIN, have had opportunities to be involved in the EES and CHMP processes. I agree with this finding.

The proponent outlined, through a number of submissions, the ongoing involvement Traditional Owners have had in the development of the projects, preparation of the EES and investigations for the CHMPs, and noted that this involvement is planned to continue during detailed design, construction and operation. Based on the proposed measures for ongoing engagement outlined in the EMF, the SIAC was satisfied that Traditional Owners will have a continuing role in the development of the projects. The SIAC identified documents within the EMF where requirements for ongoing consultation will be key to ensuring implementation as follows:

- Environmental Water Management Plan;
- Seasonal Watering Proposal and Plan;
- Delivery Plan and Seasonal Watering Statement;
- Operating Plan;
- Operations and Maintenance Plan;
- Land and Waterway Management;
- Bushfire management during operation;
- Ecological Monitoring, Evaluation and Reporting Plan;
- Socio-economic Monitoring, Evaluation and Reporting Plan;
- EMF monitoring program (M ACH1, ACH2, ACH3, and ACH4); and
- EDS (ACH1, ACH2 and ACH3).

[28] Tabled documents 151, 152, 153 and 154.

I strongly endorse the continued engagement of Traditional Owners through detailed design, construction and operation, and am comfortable that the EMF provides the appropriate framework for this. I note that the EMF requires the Project Control Group (Operation) include an Independent Advisor in relation to Traditional Owner engagement and project management, which I support to help facilitate this ongoing engagement.

Assessment

It is my assessment for both projects that:

- While the construction of the projects will result in direct impacts on a significant number of recorded Aboriginal heritage sites within a highly sensitive cultural landscape, the effects on Aboriginal cultural heritage values from construction of the projects can be acceptably managed through the implementation of the proposed EDSs, which include preparation and approval of a CHMP for each project.
- The management and mitigation of effects on Aboriginal cultural heritage during operations will need to be in accordance with the proponent's obligations under the Aboriginal Heritage Act, which may require further CHMPs or cultural heritage permits (subject to outcomes of further consultations with First Peoples-State Relations).
- Implementation of the projects is likely to result in benefits to Aboriginal cultural heritage values associated with these floodplain environments. However, achievement of these benefits will be dependent on the appropriate management of effects during construction and operation of the projects, for which I have made recommendations throughout this assessment.
- Traditional Owner's have had opportunities to be involved in development of the project, EES and CHMPs and active engagement with Traditional Owners and interested parties should continue during project approvals, detailed design, construction and operation.
- The EMF will provide an appropriate mechanism to ensure continued engagement with Traditional Owners, in addition to their further involvement in the CHMP processes for the two projects.
- A new EDS (ACH4) is needed, to require 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 (see Section 6.1). This should have particular regard to the potential for indirect impacts associated with erosion and sedimentation as well as increased water availability and fluctuations in moisture content.
- The outcomes of the further assessment conducted for ACH4 should inform consultation with First Peoples-State Relations regarding approval requirements and conditions to satisfy obligations under the Aboriginal Heritage Act for the operational phase of the projects.

6.6 Other social and environmental impacts

As noted in the published reasons for requiring an EES and EES scoping requirements, the EES was to largely focus on the potentially significant effects (and benefits) of the projects related to construction and floodplain restoration operations, including biodiversity, water quality and Aboriginal cultural heritage values. However, the EES did also examine other potential effects, associated with soils, historic cultural heritage as well as land use and socioeconomic/amenity issues (including agriculture, air quality, bushfire risk, landscape and visual effects, noise and vibration, social and business, traffic and transport).

Soil issues were discussed in EES Chapter 10 for Belsar-Yungera and 15 for Hattah Lakes North as well as specialist study E appended to the EES. The relevant evaluation objectives for consideration of soil effects are:

> *Avoid and, where avoidance is not possible, minimise adverse effects on water quality, hydrology, hydrogeology and beneficial water uses (including for the Ramsar listed wetlands).*
>
> *Minimise potential adverse social, economic, amenity and land/waterway use effects, including impacts on existing infrastructure and open space.*

Historic heritage issues are discussed in EES Chapter 11 for Belsar-Yungera and Chapter 16 for Hattah Lakes North as well as the Historic Heritage specialist study G appended to the EES. The relevant evaluation objectives for consideration of historic heritage effects are:

Implement environmental watering of floodplains to enhance ecosystem function, biodiversity (particularly listed threatened species and communities), water quality, and cultural values.

Avoid, or minimise where avoidance is not possible, adverse effects on Aboriginal and historic cultural heritage values.

Land use and socioeconomic/amenity issues are discussed in EES Chapter 12 for Belsar-Yungera and Chapter 17 for Hattah Lakes North and were informed by specialist studies H, I, J, K, L, M, N and O which cover agriculture, air quality, bushfire, land use planning, landscape and visual, noise and vibration, social and business and traffic and transport. The relevant evaluation objective for consideration of land use and socioeconomic/amenity effects is:

Minimise potential adverse social, economic, amenity and land/waterway use effects, including impacts on existing infrastructure and open space.

The SIAC discussed these issues in Chapters 11 to 19 of the SIAC report.

Table 6-6 outlines the SIAC's assessment of soils, historic heritage, land use and socioeconomic/amenity effects and discusses the overall significance of these effects, including in the context of the environmental management regime proposed. Generally, I support the findings of the EES and SIAC in relation to these issues. It is my assessment that these effects are relatively low and localised in nature. They should be effectively managed through well-established practices including mitigation measures that would be given statutory effect through the EMF, EDSs, conditions on approvals and associated management plans.

Table 6-6 Assessment of other social and environmental effects

SIAC findings and recommendations	Assessment
Soils	
The SIAC was satisfied with the approach taken in the EES to assess the residual effects to soils and develop mitigation measures to avoid and minimise associated risks. The SIAC accepted the findings of the EES conclusions that residual effects are insignificant to low, and no cumulative effects have been identified. The EES found that the projects are expected to generate benefits to soil and landform stability however there is also potential for adverse effects during operation and construction. The proponent responded to a request for further information from the SIAC[29], regarding dispersive and reactive soils, explaining that soil investigation had been undertaken at borrow sites and project structure locations. The proponent presented that additional geotechnical investigations will be undertaken at these locations to characterise soils and assist with defining any required treatments. The proponent also stated that site-specific stabilisation measures presented in the EES were determined based on outcomes of existing and additional investigations, and currently there are no proposals to use chemical ameliorants to stabilise dispersive soils. In its submission, the EPA proposed amendments to EDS CM1a to change the reference to relevant regulatory publications and reword the clause for clarity regarding chemical and fuel storage measures. These changes were accepted by the proponent in the final day version of the EDSs (Tabled Document 177) and supported by the SIAC.	I support the SIAC's findings and consider that effects on soil can be managed acceptably for both projects with the implementation of the proposed EDSs, subject to the SIAC's amendments. I support the proposed amendment to EDS CM1a in response to EPA's submission and SIAC's amendments to EDS GS1 and EDS CM1c.

[29] Tabled Document 139

SIAC findings and recommendations	Assessment
The EES stated that construction of the projects would require the importation of material (clay/rock) from nearby borrow sites. Establishment of one borrow site is proposed for each project on private land outside of parks reserves. Surplus material would be re-used or disposed of at the original borrow site as part of reinstatement. The Friends of Nyah Vinifera Park expressed concern that the introduction of large volumes of foreign soil to project sites would increase potential biosecurity risks. The proponent provided a response (Tabled Document 139) detailing that soil would be sourced locally, soil will be reused in construction where possible, and soil will be characterised, transported and managed in accordance with the EMF including EDS CM1c and EDS CM2. The SIAC was satisfied that the approach to civil works including mitigation of effects through EDS CM2, EDS GS1 and EDS GS2 are appropriate. The EES found that the main erosion risks are in the opening of large regulators and releasing phases of managed inundation events and during filling and holding phases erosion risks are expected to be minimal. The SIAC was satisfied that, subject to recommendations regarding EDS GS1 and EDS SW2, any shear stress and erosion can be addressed through an adaptive management approach, specifically monitoring infrastructure integrity through EDS GS3 and M GSC1. Assessment of shear stress and erosion is discussed further in Section 6.1. The SIAC noted that specialist study E relied on EDS GS1 and EDS GS2 to mitigate adverse effects associated with saline soils however final day versions of GS1 and GS2 do not mention soil salinity. The SIAC proposed that EDS GS1 be amended to include a description of relevant soil characteristics consistent with 'Specialist Assessment E'. The SIAC also proposed a minor change to EDS CM1c to correct a reference to 'Specialist Assessment E'.	
Historic heritage The SIAC was satisfied that the historic heritage investigations, surveys and methodologies described in the EES specialist study G are appropriate for the purpose of the EES. The SIAC agreed that the impacts are likely to be moderate and that EDS HH1 and EDS HH2 appropriately address management of unexpected finds. The EES noted that there are no known historical heritage places within the Belsar-Yungera study area but there is moderate potential for previously unidentified historical heritage items to be present within the study area. The EES also noted that there are four historical heritage sites that intersect with the Hattah Lakes North study area. The EES identified that the Moonah Track and Wattah Track Charcoal Pits, Brighton's Block and Brighton's Bridge are incorrectly mapped on the Victorian Heritage Inventory (VHI). Heritage Victoria and Mildura Rural City Council have been advised of the mapping discrepancies. Moonah Track and Wattle Track Charcoal Pits (VHI H73280002), though incorrectly mapped, is the only site identified within the maximum inundation area at Hattah Lakes North. The EES also identified a historical archaeological site, Crawford's Home Station/Kulkyne Homestead (unlisted, proposed VHI), near, but outside, the construction	I support the SIAC's findings that the historic heritage effects of both projects can be managed acceptably with the implementation of the proposed EDSs, subject to the SIAC's amendments. I support the addition of EDS HH3.

SIAC findings and recommendations	Assessment
footprint boundary of the Hattah Lakes North project. This site has been referred to Heritage Victoria for inclusion in the VHI. The SIAC agreed with the recommendation in the specialist study that detailed archaeological investigation of one of the Moonah Track and Wattah Track Charcoal Pits should be completed prior to operation, to further understand and create a record of the construction of the site and ensure potential adverse effects from inundation are managed. The exhibited EMF did not include an EDS for this but was subsequently supported by the proponent and included as EDS HH3 in the final day version of the EDSs (Tabled Document 177).	
Agriculture The SIAC was satisfied the methodology used to assess agriculture effects in the EES was appropriate. The SIAC accepted there will be minor, localised impacts during construction, including effects on land capability and farm infrastructure, and potential introduction or spread of weeds, pests or diseases. The SIAC found that this can be adequately managed through the EMF and landowner agreements. Recommendations for the management of pest plants and animals is discussed in Section 6.3 of this assessment. The SIAC report noted impacts on agriculture are likely to be more prevalent for the Belsar-Yungera project compared to the Hattah Lakes North project given the larger area of agricultural land that could be inundated, but impacts would still be relatively minor in the broader regional context. The SIAC noted landowner agreements and consultation will be particularly important to minimise operational impacts given the nature and extent of inundation will be dependent upon timing, volume, duration and frequency of inundation events. The SIAC acknowledged there may be benefits to agricultural landholders through upgraded tracks and inundation may increase productivity due to replenished soil moisture.	I support the SIAC's findings. I note the nature and extent of inundation of agricultural land will be dependent on timing, volume, duration and frequency of events during operation. For both projects, I am satisfied the EMF and landowner agreements will provide a suitable mechanism for managing agriculture effects during construction and operation.
Air quality The SIAC found the relevant elements of the EMF provide a suitable basis for managing air quality effects. The proponent tabled a change to EDS AQ1 in the final day version of the hearing (Tabled Document 177) to include *visual observations of nuisance dust*. This was not based on recommendations by SIAC or raised in submissions but was the result of ongoing consultation between the proponent and EPA. SIAC supported this amendment to EDS AQ1. The SIAC was satisfied that residual effects for operation and construction are likely to be insignificant and the expected increase in vegetation cover, facilitating dust suppression, in the maximum inundation area will be a benefit.	I accept the findings of SIAC and support the change to EDS AQ1 proposed by the proponent. I consider that effects on air quality can be managed acceptably for both projects with the implementation of the final day EDSs.

SIAC findings and recommendations	Assessment
Bushfire The SIAC accepted the findings and evidence that the risks and adverse effects relating to bushfire are acceptable and there are likely benefits associated with the projects as a result of increased greening of vegetation. The SIAC agreed with evidence presented by expert witness Mick George (GHD), that guidelines for Total Fire Ban days should apply to both construction and operation of the projects. The SIAC supported the proponent's change to EDS BF2 to address operational or maintenance activities on Total Fire Ban days and during the Fire Danger Period. The SIAC further recommended changes to EDS BF2 to include reference to the Joint Fuel Management Plan and cultural burning as existing relevant processes. The SIAC also made recommendations on conditions in the incorporated document relevant to mitigating bushfire risk.	I support the findings and recommendations of the SIAC and agree the risks and adverse effects of bushfire can be acceptably managed for both projects with the implementation of the proposed EDS, EMF and conditions set out in the incorporated document. I accept the proponent's changes to EDS BF2 to address operational or maintenance activities on Total Fire Ban days and during the Fire Danger Period. I support the SIAC's recommendation to include reference to the Joint Fuel Management Plan and cultural burning in EDS BF2. My assessment and recommendations regarding mitigation of bushfire risk via conditions in the incorporated document is provided in Section 5.1.
Land use The SIAC found the assessment of land use effects in the EES was satisfactory, and the potential adverse effects could be minimised by considering the EMF as a basis for managing the effects on land use. The EES stated that the projects are predominantly located on public land and are consistent with the purposes of that land (i.e., primarily conservation). The potential impacts during construction and operation on public land include reducing access to recreational activities (such as bush walking and bird watching) as a result of managed inundation events, and changes to the amenity of existing land uses (such as due to impacts from noise and dust). The project areas on private land are already restricted by a range of planning overlays and controls, including Land Subject to Inundation Overlay (LSIO). The EES found potential impacts on private land use include acquisition and severance of land associated with construction, temporary (during construction) and periodic (inundation) occupation of land and changes to the amenity of existing land uses. Private land to be inundated is typically used for agriculture, nature conservation and rural residential land uses (at Belsar-Yungera) and farming (at Hattah Lakes North). The EES stated that all private and public land where these impacts are expected are encumbered by a range of planning overlays and other controls, including the LSIO.	I support the findings of the SIAC and consider that effects on land use can be managed acceptably for both projects with the implementation of the proposed EDSs and appropriate consultation with landowners. I have provided further assessment of land use planning aspects of the projects and relevant planning controls proposed for the projects in Section 5.1.

The SIAC panel concluded that operation of the projects may result in further restrictions on the use of private land, but these restrictions can be appropriately managed through the relevant EDS (LU1 and LU2), which includes requirements for landowner agreement and consultation and obtaining licenses from public land managers before construction and operation.	
Landscape and visual The SIAC was satisfied that the methodology used to assess landscape and visual effects in the EES was appropriate and the overarching conclusions in the EES are sound. The EES identified three Landscape Character Areas (LCAs) within the Belsar-Yungera project and four LCAs within the Hattah Lakes North study area. It concluded that the projects have the potential to benefit landscape and through improvement to the health of existing vegetation and encouraging new growth. The EES proposed EDS LV1, LV2 and LV3 and noted other EDS (EMF4, E2a, E2e and TT2) to mitigate adverse landscape and visual effects. The SIAC recommended EDS LV3 be amended to require mitigation measures to avoid and minimise lighting impacts on terrestrial and aquatic fauna during construction. The SIAC agreed that, despite localised adverse impacts, the improved floodplain health and future regrowth will contribute to mitigate expected effects once the projects are established and operational. The SIAC is satisfied that the EMF provides a suitable basis for managing landscape and visual effects across the project areas.	I support the findings of the SIAC and consider the landscape and visual effects of both projects can be managed acceptably with the implementation of the EMF and associated EDSs, subject to the SIAC's recommendations. I support the recommendation of the SIAC to amend EDS LV3 to avoid and minimise lighting effects.
Noise and vibration The SIAC was satisfied the EES adequately assessed potential adverse noise and vibration effects and has appropriately sought to avoid, minimise and managed adverse effects. The SIAC was satisfied that operational noise and vibration will be appropriately managed to comply with the *Environment Protection Act 2017.* An EPA submission recommended EDS NV1 be amended to require a framework for justification and approval of out-of-hours works that is established in consultation with relevant stakeholders. This was recommended to meet EPA guidance requirements as well as ensure the determination is independently verified and there has been adequate community consultation in a timely and appropriate manner. The proponent made the appropriate changes in the final day version of the EDS (Tabled Document 177), which were supported by the SIAC. The EPA also recommended the PSA Explanatory Report be updated to resolve an inconsistency in the number of sensitive receivers. The SIAC supported this recommendation. This is discussed further in Section 5.1.	I support the SIAC's findings and the proponent's changes to EDS NV1 in response to EPA's submission and recommend the suggested changes to the PSA Explanatory Report be made. I consider the noise and vibration effects of both projects can be managed acceptably with the implementation of the proposed EDSs, subject to the SIAC's recommendations.

SIAC findings and recommendations	Assessment
Traffic and transport The SIAC was satisfied that the methodology used in the EES to assess traffic and transport effects was appropriate and the overarching conclusions of the EES are sound. The residual effects during construction for both project areas were assessed as insignificant to low. These effects include: • increase in traffic on local roads and tracks due to construction vehicles and haulage of materials; and • minor disruptions to access on some tracks within the project areas (e.g., due to temporary track closures for construction work). The EES stated that adverse effects during operation largely relate to access disruptions and residual effects will be insignificant to low. These effects include: • restriction in track accessibility to the public during managed inundation events; • access restrictions for private landholders to their properties (or parts of their properties) during inundation events; and • a small increase in the number of maintenance vehicles accessing the tracks within the project areas as required for regular and routine maintenance activities In relation to cumulative impacts, Belsar-Yungera will be near five projects with similar construction timeframes which may influence movement of traffic in the region. Hattah Lakes North will also interact with the Hattah-Robinvale Road reconstruction however the impacts are expected to be low due to the size and distance from the project area. The EES stated that cumulative impacts would be considered and detailed as part of the construction Traffic Management Plans. The EES contends that there is potential for the projects to provide benefits due to track upgrades and associated improvements in access to campgrounds and recreational facilities. The SIAC found the EMF and incorporated document provide a suitable basis for managing traffic and transport effects. The SIAC recommended changes to EDS TT2 and EDS TT5 to ensure the Traffic Management Plan and track maintenance program are consist with the Fire Access Road Plan conditioned in the incorporated document.	I support the findings and recommendations of the SIAC and consider that traffic and transport effects of both projects can be managed acceptably via the implementation of the proposed EMF and EDSs, including amendments recommended by the SIAC. I support the proposed changes to EDS TT2 and EDS TT5 to ensure consistency with the Fire Access Road Plan conditioned in the incorporated document (condition 4.11.2).
Social and business The EES identified that the potential adverse effects of the projects during construction included restriction or changes to private property access, potential for increased competition for private dwellings for workers, as well as short term visual amenity, noise, vibration and air quality effects. All of these impacts were rated as low significance. The EES concluded the projects have the potential to benefit community and businesses and contribute to an enhanced natural environment benefiting	I support the SIAC's findings that the social and business effects of both the projects can be acceptably managed with implementation of proposed EDSs. The EMF will provide a suitable basis for managing social and economic effects.

users, and construction would deliver direct and indirect employment and associated economic benefits to the region. In response to questions from SIAC regarding the potential for impacts to business and tourism activities, the proponent proposed an amendment to EDS SB3 to assist with transparency in managing potentially adverse social and economic impacts. The proposed change includes the addition of a protocol for how community expectations will be managed in the context of potentially adverse effects, particularly anoxic (blackwater) events (anoxic (blackwater) effects are assessed in Section 6.1). SIAC was satisfied the methodology use to assess social and business effects was appropriate and accepted the proposed changes to EDS SB3.	I support the recommended changes to EDS SB3.

7 Conclusions

Belsar-Yungera and Hattah Lakes North are two of the nine projects forming the wider VMFRP. The underlying rationale for the VMFRP projects is to restore and enhance floodplain environments, their ecosystems, biodiversity values (particularly for listed threatened species and communities), water quality, and cultural values, through the implementation of engineered environmental watering. Implementation of the projects will, however, result in some significant adverse impacts on environmental values particularly due native vegetation clearance and disturbance of recorded Aboriginal heritage sites to facilitate construction of project infrastructure. These impacts (and intended benefits) would occur in sensitive, high value environments, a large proportion of which is reserved for conservation.

Through consideration of project alternatives and the iterative development of mitigation measures as part of the EES process, the proponent has sought to avoid and minimise the potential impacts. Importantly, there will also be opportunities for further reducing residual impacts during design and delivery, particularly for habitat and biodiversity values such as large trees. This will be possible during both the detailed design process and environmental management of construction. These important measures will be strengthened through the recommendations of the SIAC and my assessment.

I note the issues and gaps raised by the SIAC regarding the understanding of some aspects of the likely benefits. I support their findings regarding the need for further analysis relating to floodplain hydraulics and implications for floodplain vegetation, to satisfactorily demonstrate and provide greater certainty regarding the expected biodiversity benefits for each project. Further analysis is also needed to clarify the preferred and tolerable water regimes for EVCs to inform initial operating scenarios and adaptive management.

It is considered unlikely that this additional analysis will identify adverse effects not already considered in this assessment and addressed by the EDSs (also taking account of the recommendations of the SIAC and this assessment). It is however, expected to result in refinement of and increased certainty regarding the extent of native vegetation expected to benefit from watering within each of the maximum inundation areas. The outputs of this hydraulic analysis and further work needs to feed into the detailed design of the projects and operational scenarios, to provide opportunity for any issues to be addressed. This could involve design modifications, as well as any necessary refinement of aspects of the adaptive environmental management.

Given the role that operations plays in mitigating or compensating for significant adverse effects of construction, there should be sufficient certainty in the implementation of effective operations before vegetation clearance and/or construction begins. Further to this, the SIAC's and indeed this assessment's conclusions have been made on the basis that the implementation of the EMF, associated EDSs and adaptive management will be effective and sustained. The realisation of project benefits is dependent on the full implementation of operations, which is conditional on primary and secondary approvals and interactions between these approvals.

While the expected ecological and biodiversity benefits of each project are likely to be significant, they will take some time to realise. The success of each project will rely on effective risk mitigation through implementation of the recommendations of the SIAC and this assessment, including those related to the effectiveness of adaptive management. The resourcing and sustained commitment of project partners is key to adaptively and effectively managing long term outcomes for these floodplain environments.

Continued implementation of consultation and engagement activities will also be critical to ensuring the further development and implementation of the projects consider local community interests and needs and are able to help facilitate Traditional Owner aspirations for restoration of the floodplain.

On balance, it is my assessment that, while the projects result in significant adverse effects during construction, the Belsar-Yungera and Hattah Lakes North projects can achieve an overall improvement to biodiversity in these floodplain environments, subject to further hydraulic analysis and measures in accordance with this assessment. The residual environmental effects can be acceptably managed however, as set out in this assessment, this is subject to the effective implementation of mitigation and an environmental management regime consistent with that endorsed by the SIAC and refined through my assessment.

The Victorian EES process served as the accredited assessment process for the purposes of examining the significant impacts on MNES of these 'controlled actions' under the EPBC Act. My assessment is issued to the Commonwealth Government Minister for Environment and Water to inform the decisions about whether and under what conditions to approve each project under the EPBC Act.

It is my assessment that residual impacts of both proposed projects on EPBC Act-listed species and communities are unlikely to be significant, except for the Regent Parrot, as set out within Appendix A. The Belsar-Yungera project will likely have a significant residual impact on Regent Parrot, due to the loss of 27.7 ha of potential breeding habitat and 50.3 ha of potential foraging habitat. Residual impacts on EPBC Act-listed species and communities can be acceptably managed provided that the proposed EDSs are implemented, and significant impacts are offset in accordance with EPBC Act Environmental Offsets Policy. I support amendments to EDSs as recommended by the SIAC and further strengthened by my assessment, to ensure appropriate avoidance and minimisation of adverse impacts on all MNES during project delivery, as detailed in Appendix A of my assessment.

I am satisfied that the environmental effects of the projects have been sufficiently identified and considered. I am also satisfied in principle the proposed PSA and incorporated document, with changes addressed in this assessment, can establish an appropriate mechanism to facilitate planning controls for the construction and operation of the projects. However, I note that formal decision-making on the PSA and EMF still needs to occur.

My assessment includes specific recommendations to inform the proponent and statutory decision-makers responsible for statutory decisions under Victorian and Commonwealth law. Table 7-1 sets out a summary of my responses to the SIAC's recommendations and any additional recommendations associated with those within this assessment.

A summary of my response to the SIAC's detailed recommendations to the EDS is provided in Appendix B

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

SIAC recommendations		Minister's responses and recommendations	Section
Planning controls			
1	Approve draft Planning Scheme Amendment GC202, subject to the Committee's recommendations including the incorporated document shown in Appendix F of this Report.	Generally supported subject to recommendations below and set out within this assessment, noting that formal decision-making on the PSA still needs to occur.	5.1
2	Preparation and submission of the Bushfire Emergency Management Plan to the satisfaction of the Secretary (as opposed to the relevant fire authority)	Not supported. I recommended that the proponent be required to prepare a Bushfire Emergency Response Plan in consultation with and to the satisfaction of the different land managers, emergency management and fire authorities, in order to ensure a consistent, workable and valid framework. Further, I recommend that the Bushfire Emergency Response Plan be submitted to and approved by the responsible authority under the proposed PSA (Minister for Planning).	5.1
3	Submission of the Fire Access Road Plan prior to operation to the satisfaction of the Secretary (as opposed to submission of the Fire Access Road Plan before the commencement of works on roads and approved by the relevant fire authority).	Not supported, recommend DEECA's suggestions be considered. Further consideration will be given to this aspect when I am asked to decide on the PSA.	5.1

SIAC recommendations		Minister's responses and recommendations	Section
Environmental Management Framework			
4	Approve the Environmental Management Framework, subject to the Committee's recommendations, including: a. Amend Section 18.8.3.5 Operating Plan of the Environmental Management Framework (page 18.34) to state: "The Operating Plans are not intended to prescribe particular watering events. They are a 'living document' that would be further refined and updated over time if legislation changes or operations in the major river systems require it or outcomes of monitoring identify an issue that requires rectification or there are significant advances in science or technology." b. Amend the Environmental Delivery Standards and monitoring register as shown in Appendix G of this Report. c. Review and update the Environmental Management Framework to include any consequential changes associated with the recommended changes to the Environmental Delivery Standards and monitoring register, and to reflect changes to State government departments following Victorian machinery of government changes. d. Revised EDS EMF2 to revert to the exhibited version. These changes are included at Appendix G.	Generally supported subject to recommendations contained within this assessment, and noting that formal decision-making on the EMF still needs to occur.	5.2 & 6
-		Amend the final EMF to specify that the independent environmental auditor is retained or a new one engaged to conduct periodic audits of both projects during the operations phase. Independent auditing should entail an audit at the commencement of the operations phase, to verify all environmental management and monitoring documentation for operations is appropriately prepared/approved and fit for purpose. Auditing should be at least 5-yearly thereafter during operations. The operations audits should have a similar scope to the audits proposed in the EMF for the construction phase. The scope and timing of operation audits should be outlined in the final EMF.	5.2

SIAC recommendations		Minister's responses and recommendations	Section
-		Amend the final EMF to specify that the selection criteria for the independent environmental auditor for operations be the same as set out for the construction independent environmental auditor in the EMF and the selection and reporting of the auditor should be done in consultation with the Secretary of DEECA.	5.2
-		Amend the final EMF to include a commitment to prepare a communication and engagement plan (or similar) for the operation phase. The scope and requirements for review and approval of the plan should also be specified in the EMF, as per the other environmental management documentation.	5.2
-		Amend the final EMF to include a process for further assessment of alternatives/refinements to the construction footprint during the contractor procurement and construction phase (consistent with the process proposed in EES Chapter 4).	5.2
Surface water			
5	Environmental Management Framework Include the following change: a. New EDS SW4 that requires more detailed assessment of the Project's effects on floodplain hydraulics prior to detailed design, including: • mapping of key hydraulic parameters for each operating scenario, existing conditions and a natural baseline scenario • using 'difference maps' in conjunction with mapping of the key hydraulic parameters to determine the locations and magnitude of any changes. This change is included at Appendix G.	Supported, including additions relating to: • Consideration of the outcomes of this further analysis and report updates in relevant project approval decisions and secondary consents, including those related to native vegetation removal and the proposed alternative offset arrangement; and • Inclusion of the 'VMFRP (with Basin Plan)' scenario included in the updated analysis.	6.1
6	Environmental Management Framework Include the following change: a. Revised EDS SW2 in relation to the timing of inundation events to reduce the risk of hypoxic or anoxic blackwater events. This change is included at Appendix G.	Supported.	6.1

SIAC recommendations		Minister's responses and recommendations	Section
7	Environmental Management Framework Include the following changes: a. Revised EDS GS1 that requires: • project design to have regard to hydraulic effects to minimise erosion potential, and with consideration of the operational objectives in EDS SW2 • confirmation of erosion potential based on the velocity and shear stress mapping required by EDS SW4.	Supported.	6.1
	b. Revised EDS GS3 that requires monitoring of bank and bed erosion to inform adaptive management.	Supported.	6.1
	c. Revised monitoring requirement M GSC1 that includes specific areas for monitoring along waterways.	Supported.	6.1
	d. Revised EDS SW2 that includes a requirement for operating rules for regulator ER1 to have regard to water levels in Euston Weir pool.	Supported.	6.1
	e. Revised EDS E1 to require footprint and soil disturbance also be considered near waterways. These changes are included at Appendix G.	Supported.	6.1
Groundwater			
8	Environmental Management Framework Include the following changes: a. Revised EDS GW2 to require groundwater monitoring including wells or bores within the Project areas, with a sufficient number to detect and interpret changes to water levels and salinity, and review of operations if increasing salinity is identified.	Supported, with the vegetation impact from the additional wells or bores to be considered in the updated impact figures required for EDS E1.	6.2
	b. Revised monitoring requirement M GW1 that requires new groundwater monitoring sites to monitor changes to groundwater depth and elevation.	Supported.	6.2
	c. Revised monitoring requirement M GW2 that requires new groundwater monitoring sites to monitor changes to groundwater quality (specifically salinity). These changes are included at Appendix G	Supported.	6.2

SIAC recommendations		Minister's response and recommendation	Section
Terrestrial ecology			
9	Environmental Management Framework - Include the following changes: a. New EDS SW4 that requires: • further assessment to determine implications of hydraulic effects on floodplain vegetation to inform any necessary design or operational changes.	Supported, including additions relating to terrestrial ecology: • Consideration of the outcomes of this further analysis and report updates in relevant project approval decisions and secondary consents, including those related to native vegetation removal and the proposed alternative offset arrangement; and • Inclusion of the 'VMFRP (with Basin Plan)' scenario included in the updated analysis.	6.3
	b. New EDS E7 that requires: • a hydrological analysis of Ecological Vegetation Classes be undertaken for Hattah Lakes North • site-specific hydrological analysis of Ecological Vegetation Classes, expert elicitation and relevant documents to inform initial operating scenarios and adaptive management to be tested during operations. These changes are included at Appendix G.	Generally supported, with the inclusion of the 'VMFRP (with Basin Plan)' scenario in the updated analysis.	6.3
10	Environmental Management Framework Include the following change: a. Revised EDS E1 that requires: • native vegetation removal calculations be reviewed for Belsar-Yungera, in light of errors identified in the Environment Effects Statement • if necessary, amend EDS E1 to reflect the revised calculations • if the revised calculations do not result in less native vegetation removal, review the need for two access tracks in WMA1 • further assessment of identified alternatives through the detailed design process and selection of construction methods with potential to further avoid and minimise impacts to native vegetation removal. This change is included at Appendix G.	Generally supported, with the following recommendations: • Amend first paragraph of EDS (see full EDS wording in Appendix B) to place greater emphasis on further reducing clearance, whilst recognising there is a maximum worst case for total area of native vegetation removal. • Adjust requirement for further avoidance and minimisation of vegetation clearance, to encompass both identified alternatives and any others wherever possible, explored through detailed design, and then construction. • Include requirement for further consideration to reduce impacts on Plains Grassland EVC during detailed design. If impacts to Plains Grassland are unavoidable this should be explicitly addressed in the update of AOIB (recommended in EDS SW4) to inform consents under Condition 4.6 of the incorporated document.	6.3 & 4.2

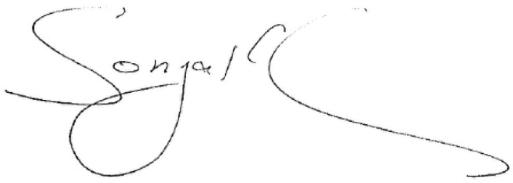
SIAC recommendations		Minister's response and recommendation	Section
		• Revise native vegetation removal calculations to include the native vegetation impacts from the additional wells or bores recommended in EDS GW2. Any additional clearance should be accommodated in the current worst-case figures.	
11	Incorporated Document Include the following change: a. Reinstate exhibited condition 4.5 Native vegetation (shown as condition 4.6 in the Committee recommended version). This change is included at Appendix F.	Supported.	6.3 & 5.1
12	Environmental Management Framework Include the following change: a. New EDS SW4 that requires: • an updated assessment of overall improvements to biodiversity. This change is included at Appendix G.	Supported, with the VMFRP (with Basin Plan) scenario to be included in the updated AOIB reports.	6.3
13	Environmental Management Framework Include the following change: a. Revised EDS E2e to, where possible, ensure appropriate reuse of felled timber and logs. This change is included at Appendix G.	Supported, with the addition of the hollow replacement plan recommended below.	6.3
-		Add a new EDS (E8) requiring preparation of a hollow replacement plan to the satisfaction of DEECA Loddon Mallee Region to support the immediate and short-term welfare of parrots and other hollow-dependent species. This should have particular regard to the consideration of designs to appropriately accommodate the range of hollow dependent fauna and ensure appropriate insulation against temperature extremes	6.3

SIAC recommendations		Minister's response and recommendation	Section
-		Add a new EDS (E9) requiring further targeted surveys are undertaken in previously recorded locations for Umbrella wattle, Club-hair new holland daisy and Frosted goosefoot in the inundation areas prior to operations, with requirements for mitigation measures for the species (e.g., seed collection prior to inundation) to be covered by the OEMP should they be recorded during these additional surveys.	6.3
14	Environmental Management Framework Include the following change: a. Revised monitoring requirement M TE9 to correct a cross-reference for survey locations for trees at risk of hypersaline groundwater. This change is included at Appendix G.	Supported.	6.2 & 6.3
15	Environmental Management Framework Include the following change: a. New EDS E5 that requires a new winged peppercress (Hattah Lakes North) Sub-Plan of the Operation Environmental Management Plan to identify, assess and mitigate any potential effects of inundation on winged peppercress on the Raakajlim property. This change is included at Appendix G.	Supported.	6.3
16	Environmental Management Framework Include the following changes: a. Revised EDS E2g that clarifies and simplifies requirements for monitoring of Regent Parrot nests. b. Delete monitoring requirement M TE1 as fully captured in revised EDS E2g. c. Revised EDS E2a to refer to EDS E2g. These changes are included at Appendix G.	Supported, with recommended update to EDS E2g to require further analysis during detailed design, to ensure impacts on Regent Parrot habitat are minimised and documented, particularly for the breeding habitat of the species in the Belsar-Yungera project area. This analysis should be provided to DCCEEW to consider as appropriate.	6.3 & Appendix A
17	Environmental Management Framework Include the following changes: a. New EDS E2h to schedule construction traffic to avoid the use of Mournpall Track during active Mildura Ogyris Butterfly flying times. b. Revised EDS E2a to refer to EDS 2h. c. New EDS E6 that requires a new Mildura Ogyris Butterfly Sub-Plan of the Operation Environmental Management Plan to be approved by the Department of Energy, Environment and Climate Action. These changes are included at Appendix G.	Supported.	6.3

SIAC recommendations		Minister's response and recommendation	Section
18	Environmental Management Framework Include the following change: a. Revised EDS E3 to include measures to assist private landowners with the increased risk of pest plant and animal presence and activity due to operations. This change is included at Appendix G.	Supported.	6.3
Aquatic ecology			
19	Environmental Management Framework Include the following changes: a. Revised EDS E2f that requires construction of the ER1 regulator and fishway occur during a period of no flow in Narcooyia Creek or outside the periods of time when fish migrate. b. Revised EDS E2a to refer to EDS E2f. These changes are included at Appendix G.	Supported.	6.4
20	Environmental Management Framework Include the following changes: a. Revised EDS SW2 in relation to monitoring and reporting on fish strandings associated with the Project.	Supported.	6.4
	b. New monitoring requirement M AE7 in relation to monitoring and reporting on native fish stranding. These changes are included at Appendix G.	Supported.	6.4
21	Environmental Management Framework Include the following changes: a. Revised EDS SW2 in relation to the timing of inundation events to reduce carp breeding.	Supported.	6.4
	b. Revised EDS E3 that requires the Pest Plant and Animal Monitoring and Management Plan to address both 'terrestrial and aquatic' pests, including carp.	Supported.	6.4
	c. Revised monitoring requirement M AE3 that includes a performance objective and indicator in relation to carp populations.	Supported.	6.4
	d. Amend Section 18.8.3.5 Operating Plan of the Environmental Management Framework (page 18.34) to state: "The Operating Plans are not intended to prescribe particular watering events. They are a 'living document' that would be further refined and updated over time if legislation changes or operations in the major river systems require it or outcomes of	Supported.	6.4

SIAC recommendations		Minister's response and recommendation	Section
	monitoring identify an issue that requires rectification or there are significant advances in science or technology." These changes (except 21d) are included at Appendix G.		
22	Environmental Management Framework Include the following change: 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. This change is included at Appendix G.	Supported.	6.4
23	Environmental Management Framework Include the following change: a. Revised EDS SW2 which clarifies the purpose of the requirement to factor seasonal implications in the timing of filling and drawdown. This change is included at Appendix G.	Supported.	6.4
24	Environmental Management Framework Include the following change: a. Revised EDS E3 that requires consideration of 'terrestrial and aquatic' species in the Pest Plant and Animal Monitoring and Management Plan. This change is included at Appendix G.	Supported.	6.4
Aboriginal cultural heritage			
-		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. This should have particular regard to the potential for indirect impacts associated with erosion and sedimentation as well as increased water availability and fluctuations in moisture content.	6.5

SIAC recommendations		Minister's response and recommendation	Section
Soils			
25	Environmental Management Framework Include the following changes: a. Revised EDS GS1 which includes a description of relevant soil characteristics consistent with Specialist Assessment A and to ensure consideration is given to saline soils. b. Revised EDS CM1c which corrects a reference to Specialist Assessment E. These changes are included at Appendix G.	Supported.	6.6
Bushfire			
26	Environmental Management Framework Include the following change: a. Revised EDS BF2 to include reference to the Joint Fuel Management Program including cultural burning as an 'existing relevant process'. This change is included at Appendix G.	Supported.	6.6
Landscape and visual			
27	Environmental Management Framework Include the following change: a. Revised EDS LV3 to require mitigation measures to avoid and minimising lighting impacts on terrestrial and aquatic fauna. This change is included at Appendix G.	Supported.	6.6
Traffic and transport			
28	Environmental Management Framework Include the following change: a. Revised EDS TT2 and EDS TT5 to require consistency with the Fire Access Road Plan conditioned in the incorporated document. This change is included at Appendix G.	Supported.	6.6



HON SONYA KILKENNY MP

Minister for Planning

1/7/2023

Appendix A Matters of national environmental significance

The EES 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 decisions, i.e., listed threatened species and communities (sections 18 and 18A) for both projects, and Ramsar wetlands (sections 16 and 17B) for Hattah Lakes North.

This appendix details and 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 6.3), aquatic ecology (Section 6.4), surface water (Section 6.1) and groundwater (Section 6.2).

Potential impacts on relevant MNES were assessed for each project in EES Attachment IX Belsar-Yungera MNES Assessment and EES Attachment IX Hattah Lakes North MNES Assessment and summarised in Chapters 9 and 14 of the EES. The key finding of the EES was that there is unlikely to be significant impacts on any MNES for both projects.

Section 20.2 of the SIAC report summarised the likely impacts on MNES, with discussion of evidence and submissions related to MNES provided in Chapters 5 to 8 of the SIAC report. The overall finding of the SIAC was that residual impacts on MNES will be sufficiently avoided or minimised through implementation of the proposed mitigation measures, and that both projects will not have significant residual impacts on any MNES.

Hattah-Kulkyne Lakes Ramsar site is listed under the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (Ramsar, Iran, 1971), commonly referred to as the Ramsar Convention. Hattah-Kulkyne Lakes Ramsar site is located 900 m upstream of the Hattah Lakes North project area and is the key Ramsar site considered in relation to assessment of effects for the Hattah Lakes North project.

Species and communities considered in relation to MNES that have a likelihood of occurrence in either project area of 'possible' or higher are summarised in Table A1.

Table A1 Species and communities considered in the EES in relation to MNES for both Belsar-Yungera and Hattah Lakes North projects (with a likelihood of occurrence of 'possible' or higher in each project area).

Species and communities	EPBC Status	Belsar-Yungera	Hattah Lakes North
Buloke Woodlands of the Riverine and Murray-Darling Depression Bioregions	Endangered		X
Winged peppercress	Endangered	X	X
South-eastern long-eared bat	Vulnerable	X	X
Regent parrot	Vulnerable	X	X
Murray cod	Vulnerable	X	X
Silver perch	Critically endangered	X	X
Southern pygmy perch (Murray-Darling lineage)	Vulnerable		X
Australian painted snipe	Endangered	X	X
Painted Honeyeater	Vulnerable	X	X
Growling grass frog	Vulnerable	X	

Species and communities	EPBC Status	Belsar-Yungera	Hattah Lakes North
Flat-headed Galaxias	Critically endangered	X	X
Glossy Ibis	Migratory	X	X
Fork-tailed Swift	Migratory	X	X
Latham's Snipe	Migratory	X	X
Red-necked Stint	Migratory	X	
Sharp-tailed Sandpiper	Migratory	X	X
Australian Gull-billed Tern	Migratory		X
Caspian Tern	Migratory		X
Marsh Sandpiper	Migratory		X

A.1 Ramsar wetlands

The key Ramsar site considered in the EES is the Hattah-Kulkyne Lakes Ramsar site which is located 900 m upstream of the Hattah Lakes North project area. The EES describes that the Hattah Lakes Floodplain Complex comprises approximately 20 lakes and surrounding woodlands that receive water from the Murray River via Chalka Creek. Twelve of these lakes are included in the Ramsar site, with Lake Bitterang being the closest to the Hattah Lakes North project area.

The EES notes that whilst there are no Ramsar-listed wetlands within or adjacent to the Belsar-Yungera project area, there are several Ramsar sites a substantial distance downstream including Hattah-Kulkyne Lakes, Riverland and Banrock Station Wetland Complex (around 100 km, over 500 km and over 700 km downstream respectively). The EES concluded the Belsar-Yungera project would not have adverse effects on these sites due to the distance from the construction footprint and the implementation of the proposed EDSs to manage water quality and flow effects on the Murray River downstream. The SIAC noted that submitters raised concerns with the potential for the nine projects associated with the VMFRP to result in a significant cumulative impact on Ramsar sites further downstream, however concluded that the surface water effects on Ramsar sites have been adequately assessed through the EES. I support this conclusion. Further discussion on surface water can be found in section 6.1 of my assessment.

The EES states that as the Ramsar site is upstream of the Hattah Lakes North project by nearly a kilometre there is no direct impact pathway between the project and the Ramsar site (or species which occur within the Ramsar site). Consequently, targeted surveys of the Ramsar site and the flora and fauna associated with the Ramsar listing were not undertaken for the EES.

The EES also concluded that there would be no change in water quality of the Hattah-Kulkyne Lakes Ramsar site, as surface water flows would not be significantly changed, and the Hattah Lakes North project would not involve the discharge of water from managed events to the Ramsar site. The SIAC considered that the impacts of surface water effects on Ramsar sites have been adequately assessed through the EES. The SIAC accepted evidence presented during the hearing by the proponent's expert that there would be no effect on the water regime or water quality of the Hattah-Kulkyne Lakes Ramsar site as a result of the project. The SIAC noted that future decisions about the planning and delivery of environmental water would consider and prioritise the allocation of water to the Ramsar sites.

As discussed in section 6.1 of my assessment, the SIAC recommended that EDS SW2 should be revised to ensure that the timing of inundation events reduced the risk of hypoxic or anoxic blackwater events. I agree with the SIAC's recommendation and consider that this and the other EDS for surface water will adequately reduce the risk of surface water impacts on nearby and downstream Ramsar sites.

An assessment of the impacts of the Hattah Lakes North project on Hattah-Kulkyne Lakes Ramsar site under the Significant Impact Guidelines 1.1 for wetlands of international importance was undertaken and it was determined that the site is unlikely to be significantly impacted (EES Attachment IX). On the basis that the water regime and water quality of Hattah-Kulkyne Lakes Ramsar site will not be negatively impacted, I agree that there are unlikely to be any significant impacts on the site.

Cumulative effects of the Belsar-Yungera and Hattah Lakes North projects on Ramsar sites were assessed in Tabled Document 113. The cumulative assessment was developed in relation to the other seven proposed VMFRP projects, the New South Wales Sustainable Diversion Limit Adjustment Mechanism projects, The Living Murray projects at Gunbower Forest, Hattah Lakes and Chowilla. It examined potential impacts on several Ramsar sites: the Gunbower Forest, NSW Central Murray Forests, Hattah-Kulkyne Lakes and Riverland. The assessment concluded that there is potential for cumulative adverse effects on species which use the Ramsar sites, from the spread of weeds and pests during construction and Carp during operation. An assessment under the Significant Impact Guidelines 1.1 of the cumulative impacts of the projects on the above Ramsar wetlands of international importance determined that with implementation of the proposed EDS the sites are unlikely to be significantly impacted. On the basis that invasive weeds and pests, including Carp, are already present at the Ramsar sites considered and mitigation measures are proposed for the Belsar-Yungera and Hattah Lakes North projects to minimise Carp movement, and to monitor and manage invasive plant and pest animals, I agree that it is unlikely that these two projects will result in significant cumulative impacts on these Ramsar sites.

A.2 Listed threatened species and communities

Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions

Buloke Woodlands of the Riverine and Murray-Darling Depression Bioregions (BWRMDDB) is a threatened ecological community which is listed as endangered under the EPBC Act. Where it meets condition thresholds, this community is synonymous with Semi-arid Woodland (EVC 97). Two patches of BWRMDDB (totalling 0.779 ha) were identified along access tracks within the area of investigation of the Hattah Lakes North project. Other patches of EVC 97 were mapped within the area of investigation but found to be degraded and not meet the description of the community. The EES states that construction works are not proposed along the existing tracks where the community was identified. Targeted surveys for the community were undertaken within the maximum inundation area and the threatened community was not found to be present. The EES states that although BWRMDDB is not present within the maximum inundation area, increases to the water table and soil saturation are expected to have a neutral to positive impact on this community.

An assessment of the impacts of the project on BWRMDDB under the Significant Impact Guidelines 1.1 was undertaken and it was determined that the community is unlikely to be significantly impacted (EES Attachment IX). I agree that the project is unlikely to have a significant impact on BWRMDDB on the basis that patches of the community are not proposed for removal and are not considered present within the maximum inundation area. Further, should it occur within the maximum inundation area there is limited risk to the community as the water table and soil saturation are not expected to have a negative impact. I consider that effective implementation of the proposed EDS will further reduce the likelihood of indirect impacts on the ecological community, such as from dust, the spread of weeds and pathogens and erosion and sedimentation.

Winged Peppercress

Winged Peppercress is listed as endangered under the EPBC Act. The EES identified that the species occurs within the Belsar-Yungera project area and suitable habitat for the species occurs within the Hattah Lakes North project areas. Targeted surveys were undertaken for the species during the EES flora assessments. The EES describes that the species occurs in arid to semi-arid areas (with a rainfall of 200-450mm/year) in open, sparsely vegetated sites, usually in areas that are seasonally flooded or prone to waterlogging. The species grows in heavy clay or clay loam soils (EES Attachments IX and X). The EES noted that the Flora and Fauna Guarantee (FFG) Act Action Statement for the species states that Winged Peppercress has apparently suffered a widespread decline in both range and abundance since European settlement and that it is currently only known to occur at seven locations in Victoria.

The field assessments for Belsar-Yungera identified approximately 100 individual Winged Peppercress plants within the area of investigation including approximately 10 plants on the shoulder of the access track within the construction footprint. The EES notes that approximately 28 ha of potential habitat was recorded in the area of interest and 1,778 ha was recorded in the maximum inundation area. The species was not recorded within the maximum inundation area during targeted surveys.

Winged Peppercress is known to occur in the southern region of the Hattah-Kulkyne National Park. Suitable habitat for the species was identified within the construction footprint and maximum inundation area for the Hattah North Project, however the species was not recorded during targeted surveys. The EES identified that 14.66 ha of potentially suitable habitat within the construction footprint, and 1,009 ha of potentially suitable habitat identified within the maximum inundation area.

The EES notes that specific management measures would be adopted to avoid impacts to Winged Peppercress during construction, including EDS E1 and E2b, which cover protocols for protecting the known population within the Belsar-Yungera project area, and EDS 2a which outlines the process in the instance that additional populations of Winged Peppercress are found during construction. The EES concludes that overall the project is likely to promote growth and recruitment of the species.

The SIAC considered a submission from the owners of "Raakajlim", a property located on the northern edge of the Hattah Kulkyne National Park, stating that Winged Peppercress is present on their property, which is within the maximum inundation area. The SIAC concluded that further consideration of the population of Winged Peppercress on Raakajlim is required and therefore recommended a new EDS E5, requiring a new Winged Peppercress (Hattah Lakes North) Sub-Plan. The proposed plan is to validate whether the species or its habitat occurs on the property and assess and mitigate potential effects of inundation on the species on this property. I support this additional EDS.

The SIAC considered concerns submitted[1] by wetland botanist, Mr Frood, that the project may have negative impacts on the Winged Peppercress. Mr Frood's reasoning was that the species is found in areas that may be seasonally waterlogged or inundated by rainfall but is not known to utilise habitat subject to riparian flooding. He asserted that the proposed inundation may have a negative outcome for habitat and populations of the species. The SIAC noted the concerns that the project may have negative impacts through inappropriate inundation regimes and as a result the expected positive effects on the species predicted by the EES may be overstated. The SIAC concluded that the outcome for Winged Peppercress within the Belsar-Yungera project is more likely to be neutral rather than positive. I support this assessment.

An assessment of impacts on Winged Peppercress under the Significant Impact Guidelines 1.1 was undertaken for both projects. It was determined that the species is unlikely to be significantly impacted (EES Attachments IX and X). I agree that the projects are unlikely to have a significant impact on Winged Peppercress, provided that the proposed and amended EDS are effectively implemented.

Murray Cod

Murray Cod is listed as vulnerable under the EPBC Act. The EES identified that the species occurs within both the Belsar-Yungera and Hattah Lakes North project areas. Targeted surveys using eDNA techniques were undertaken at the Belsar-Yungera project area. These were not undertaken at the Hattah Lakes North project area as long-term monitoring has already occurred in the Hattah Lakes North vicinity for the Living Murray project. The EES describes that the species occupies a broad range of flowing and standing waters but favours permanent flowing river reaches and creeks with hydraulic complexity and instream woody habitat. During flood periods the species may move between the main channel, anabranches and floodplains and may forage within the floodplains before returning to the main channel (EES Attachments IX and X).

Murray Cod is present within the Belsar-Yungera project area, having been recorded in Narcooyia Creek and in the Murray River downstream of the site. The waterways within the vicinity of the project are not considered to support an

[1] VMFRP SIAC submission no. 4, Doug Frood, page 3.

important population, however an important population occurs within the Murray River downstream of the project area. The Murray River in the Belsar area is known to be a spawning hotspot for Murray Cod (EES Attachment IX).

Murray Cod is present within the Hattah Lakes North project area, having been recorded from Chalka Creek, and Lakes Bulla, Little Hattah and Mournpall in the National Park. The species was recorded during monitoring of the Hattah Lakes and study area undertaken between 2006 and 2020 for the Living Murray project. The waterways intersected by the construction of the Hattah Lakes North project are not considered to support an important population of the species, however an important population is present within the Murray River, downstream of the project area (EES Attachment X).

An assessment of the impacts on Murray Cod under the Significant Impact Guidelines 1.1 was undertaken for both projects and it was determined that the species is unlikely to be significantly impacted (EES Specialist assessment A). Residual impacts from Carp, potential barries to movement in the construction and operation stages, and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. Submitters including Environment Justice Australia and Friends of Nyah Vinifera Park raised concern about the potential for significant impacts on threatened fish species including the Murray Cod, from altered flooding regimes and potential water quality changes, such as blackwater events. The SIAC considered that the EES adequately considered the potential impacts to Murray Cod and concluded that the projects are unlikely to result in a significant impact to the species with implementation of the recommended changes to EDS SW2 and MAE7, and the inclusion of the new EDS SW5. I agree that the proposed EDS will reduce the likelihood and consequence of potential water quality impacts resulting from erosion and sedimentation, salinity and blackwater events, which will reduce the potential for project impacts on Murray Cod. Provided that proposed EDSs, including amendments proposed by the SIAC and this assessment, are effectively implemented, I support the view of the SIAC that the projects are unlikely to have a significant impact on the species for both the Belsar-Yungera and Hattah Lakes projects.

The EES states that both projects are expected to lead to slight improvements in populations of Murray Cod (Table 10-5, EES Specialist Assessment A). This improvement is expected due to increased foraging opportunities when the floodplains are inundated, and improved habitat quality and connectivity.

Cumulative effects of the Belsar-Yungera and Hattah Lakes North projects in relation to the other seven 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 Tabled Document 113. The cumulative impact assessment for EES Central projects concluded there are unlikely to be cumulative adverse effects on Murray Cod. I agree that based on the information provided in the EES Central documentation that the projects are unlikely to have significant cumulative impacts on this species, provided that the proposed EDSs are implemented effectively. This includes measures to manage impacts of weeds, pest and pathogens, return woody debris habitat following construction and provide for appropriate fish passage at regulating structures during operation.

Silver Perch

Silver Perch is listed as critically endangered under the EPBC Act. The EES identified that the species occurs within both the Belsar-Yungera and Hattah Lakes North project areas. Targeted surveys using eDNA techniques were undertaken at the Belsar-Yungera project area. These were not undertaken at the Hattah Lakes North project area as long-term monitoring has already occurred in the Hattah Lakes North vicinity for the Living Murray project. The EES describes that the species occurs in a variety of river habitat, ranging from fast flowing river reaches to slower flowing, turbid areas. The species prefers areas of rapid flow, is often found where there are rapids and races and requires perennial flowing water to complete its life cycle. The species is thought to rarely utilise the floodplain (Attachments IX and X).

Silver Perch is present within the Belsar-Yungera project area, having been recorded at Narcooyia Creek. The Murray River in the Belsar area is known to be a spawning hotspot for Silver Perch (Attachment IX).

Silver Perch is also present within the Hattah Lakes North project area, having been recorded at Chalka Creek South, the Murray River and the Lakes Yerang and Hattah. The species was recorded during monitoring of Wallpolla Creek and Dedmans Creek undertaken between 2006 and 2018 for the Living Murray project (Attachment X).

An assessment of the impacts of the projects on Silver Perch under the Significant Impact Guidelines 1.1 was undertaken for both projects and it was determined that the species is unlikely to be significantly impacted (Specialist Assessment A). Residual impacts from Carp, potential barries to movement in the construction and operation stages, and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. Submitters including Environment Justice Australia and Friends of Nyah Vinifera Park raised concern about the potential for significant impact on Silver Perch, from altered flooding regime and potential water quality changes, such as blackwater events. The SIAC considered that the EES adequately considered the potential impacts to Silver Perch and concluded that the projects are unlikely to result in a significant impact to the species with implementation of the recommended changes to EDS SW2 and MAE7, and the inclusion of the new EDS SW5. I agree that the projects are unlikely to have a significant impact on the species, provided that proposed and amended EDSs are effectively implemented, which includes measures to reduce the likelihood and consequence of potential water quality impacts resulting from erosion and sedimentation, salinity and blackwater events.

Cumulative effects of the Belsar-Yungera and Hattah Lakes North projects in relation to the other seven 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 Silver Perch were assessed in Tabled Document 113. The cumulative impact assessment for EES Central concluded there are unlikely to be cumulative adverse effects on Silver Perch. I agree that based on the information provided in the EES Central documentation the projects are unlikely to have significant cumulative impacts on the species, provided that EDSs are effectively implemented, which include measures to manage impacts of weeds, pest and pathogens and provide for fish passage at regulating structures during operation.

Southern Pygmy Perch (Murray-Darling lineage)

Southern Pygmy Perch (Murray-Darling lineage) is listed as vulnerable under the EPBC Act. The EES describes the species as being a wetland specialist which also occurs within slow flowing creeks. The species commonly occurs in shallow water with aquatic vegetation and woody debris. It is dependent on refuge pools to survive when streamflow ceases. The species is known to disperse and colonise sites following inundation of the floodplain (EES Specialist assessment A). Targeted surveys were undertaken for the species.

Southern Pygmy Perch has not been recorded within the Belsar-Yungera project area and is considered unlikely to occur. Southern Pygmy Perch is present within the Hattah Lakes North project area, having been recorded form Lakes Bulla and Bitterang during the targeted surveys. The EES states that no important populations of this species have been defined. As the population recorded from Lakes Bitterang and Bulla is isolated from other populations of the species, it is considered in the EES that this is an important population.

An assessment of the impacts of Hattah Lakes North project on Southern Pygmy Perch under the Significant Impact Guidelines 1.1 was undertaken for the EES and it was determined that the species is unlikely to be significantly impacted (EES Specialist assessment A). Residual impacts as a result of Carp proliferation, potential barriers to movement in the construction and operation stages, and water quality deterioration were not considered to be significant with the implementation of relevant mitigation measures. Submitters including Environment Justice Australia and Friends of Nyah Vinifera Park raised concern with the potential for significant impacts on Southern Pygmy Perch, from altered flooding regime and potential water quality changes, such as blackwater events. The SIAC considered that the EES adequately considered the potential impacts to Southern Pygmy Perch and concluded that the projects are unlikely to result in a significant impact to the species with implementation of the recommended changes to EDS SW2 and MAE7, and the inclusion of the new EDS SW5. I agree that the projects are unlikely to have a significant impact on the species, provided that proposed and amended EDSs are effectively implemented which include measures to reduce the likelihood and consequence of potential water quality impacts resulting from erosion and sedimentation, salinity and blackwater events and to minimise colonisation and potential habitat impacts of Carp. The EES states that the Hattah Lakes North project is likely to have a long-term positive effect on the species as inundation of the project area would improve the potential for the species to disperse and increase its distribution. I support with this conclusion.

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 both Belsar-Yungera and Hattah Lakes North project sites. 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 may occur within suitable habitat in both project sites. The EES describes that the species forages 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 species has been recorded in Hattah State Forest in 2008 (60 km west of the Belsar-Yungera project area and 25 km west of Hattah Lakes North project area) and in the southern part of the Murray-Sunset National Park in 1962 (80 km south-west of the Belsar-Yungera project area and 40 km south-west of the Hattah Lakes North project area) (Specialist Assessment A). The EES states 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 areas.

Suitable habitat for South-eastern Long-eared Bat is present within the Belsar-Yungera project area, within both the construction footprint and the maximum inundation area and it is possible that the species occurs within these areas (EES Attachment IX).

The EES states that it is possible that the species is present within both the construction footprint and maximum inundation area of the Hattah Lakes North project area, as suitable habitat for the species is present within the maximum inundation area. Whilst suitable habitat for South-eastern Long-eared Bat is generally not present within the construction footprint of the Hattah Lakes North area, the species may use a range of habitats occasionally (EES Attachment X).

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

Whilst the SIAC did not explicitly consider impacts of the projects on South-eastern Long-eared Bat, it found that the EES assessment of construction effects to listed fauna species and the proposed EDSs are appropriate and that project operations are unlikely to significantly impact any terrestrial fauna species.

The EES discusses 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. These impacts are expected to be localised, minor and not ecologically significant. I agree with the findings of the EES that the ecology of the species is unlikely to be significantly impacted by the projects, 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. However, I note that the loss of a significant number 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, following project vegetation clearance, some displaced hollow-dependent fauna may move into hollows suitable for South-eastern Long-eared bat, reducing the number available for use by the species and increasing competition with other species. It is my recommendation, as discussed in Section 6.3 of this assessment, that a hollow replacement plan is required to mitigate against this loss. This mitigation measure will 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.

An assessment of the impacts of the projects on South-eastern Long-eared Bat under the Significant Impact Guidelines 1.1 was undertaken in the EES and it was determined for both projects that the species is unlikely to be significantly impacted (EES Specialist assessment B). I agree that the projects are unlikely to have a significant impact on the species, given the small extent of the construction works relative to habitat availability across the broader landscape. The EES states that the projects are likely to have a long-term positive effect on the species through the additional watering of the floodplain habitats used by the species. I support this conclusion.

South-eastern Long-eared Bat was not considered in the EES 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 field surveys for Belsar-Yungera and Hattah Lakes North, however no known nesting habitat was identified within 100 meters of Belsar-Yungera construction footprint or 200 metres of Hattah Lakes North Construction Footprint. The EES describes that the species is highly mobile, and notes they typically nest within suitable hollows of River Red-gum and feed mostly on the ground in mallee, with some foraging occurring in mallee trees, vineyards, orchards, cereal crops and riparian woodlands. Specialist Assessment A notes that the entire project areas are considered to be potential foraging habitat. Potential breeding habitat also occurs within the project areas, 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 EES describes that the Belsar-Yungera project would lead to the following habitat impacts for Regent Parrot:

- the removal of up to 50.3 ha of potential foraging habitat, including 27.7 ha of potential breeding habitat;
- the removal of up to 8.67 ha of preferred breeding habitat, which is within 120 m of water; and
- impacts to 39 trees identified as potential breeding trees (with a DBH>160cm).

The EES describes that the Hattah Lakes North project would lead to the following habitat impacts for Regent Parrot:

- the removal of 18.9 ha of potential foraging habitat (the EES states that this is not considered to be favoured foraging habitat); and
- no clearance and limited disturbance of potential breeding habitat (0.11 ha of potential breeding habitat was identified near an existing access track proposed to be used for access purposes).

The EES identified a number of potential impact pathways for Regent Parrot from the projects including loss of hollow bearing trees, a reduction of foraging, perching, roosting and potentially breeding opportunities in the construction footprint and habitat fragmentation. The EMF includes mitigation measures intended to mitigate potential impacts to Regent Parrot including EDS 2a which requires all personnel to undertake a site-specific induction to reduce the potential for fauna collision with vehicles; and EDS E2b which includes fauna salvage protocols for trees that will be removed. The EES also notes that if the removal of potential Regent Parrot nesting trees is required, the works would occur outside of the breeding season.

The SIAC suggested changes to EDS E2g and EDS E2a, and the subsequent deletion of monitoring requirement M TE1 to clarify and simplify monitoring requirements for Regent Parrot. I agree with these amendments. The SIAC acknowledged the potential effects on this species, but concluded that these impacts will be appropriately managed with implementation of the amended EDSs.

I support the SIAC's proposed amendments to EDSs. The adoption of the amended EDSs consistent with my assessment will also assist in reducing impacts on the breeding activities of Regent Parrot, such as through further reduction in clearance of vegetation and hollow bearing trees where possible, and replacement of hollows to mitigate initial impacts from large trees that are cleared. However, I recommend that EDS E2g is updated to require further analysis during detailed design, to ensure impacts on Regent Parrot habitat are minimised and documented, particularly for the breeding habitat of the species in the area of the Belsar-Yungera project. This analysis should be provided to DCCEEW to consider as appropriate.

The loss of a significant number of hollow bearing trees potentially used for nesting/breeding, has the potential to impact Regent Parrot. I note there is a risk that, following vegetation clearance during construction, some other displaced hollow-dependent fauna may move into hollows suitable for Regent Parrot, including the known nest sites. This could reduce the number available for use by the species and increase competition with other species in these areas. It is my

recommendation, as discussed in Section 6.3 of this assessment, that a hollow replacement plan is required to mitigate against this loss of hollow bearing trees.

An assessment was undertaken in the EES of the impacts on Regent Parrot under the Significant Impact Guidelines 1.1 for both projects. It was determined that the species is unlikely to be significantly impacted (EES Specialist Assessment B). The EES concluded that adverse impacts to Regent Parrot are possible but were considered unlikely to be a significant impact under the EPBC Act guidelines. The EES considered that the projects will likely benefit the species by providing water to floodplain habitats used by the species, which would result in greater foraging resources, and a succession of woodland trees that would eventually support suitable nesting hollows. I agree that with implementation of the proposed EDSs, including amendments by the SIAC and this assessment, the Hattah Lakes North project on its own is unlikely to have significant impacts, as no removal of breeding habitat is proposed. However, I do not support the findings of the assessment under the Significant Impact Guidelines 1.1 for the Belsar-Yungera project, as I consider that likely residual impacts meet two of the criteria to be considered a significant impact under the Guidelines. 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 population of Regent Parrot at Belsar-Yungera is considered an 'important population' as it belongs to the Mid-Murray Victorian group of breeding pairs nominated in the Regent Parrot Recovery Plan[2]. The project will reduce the area of occupancy of this important population due to the loss of 27.7 ha of breeding habitat (including 8.67 ha of preferred breeding habitat[3]) and 50.3 ha of foraging habitat in an area where the Regent Parrot has been confirmed to occur. The EES states that this is a small proportion of the total area occupied by the species (0.19%). However, I note that this figure refers to the area of occupancy of the species, not the population. The proportion of the area of occupancy of the important population to be impacted is likely to be greater and the removal of vegetation for the project would reduce the population's occupancy of those areas. I therefore consider this significant impact criterion to be met.

The Regent Parrot Recovery Plan 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 Belsar-Yungera project is therefore considered critical to the survival of the species. The EES states that none of the potential breeding trees proposed for removal have been recorded as being used for breeding. I consider that a lack of evidence of their past use for breeding does not reduce their value as nesting trees by the species in the future. The proposed removal of a substantial area of breeding habitat, particularly preferred breeding habitat within 120m of water, is an impact which I consider adversely affects habitat critical to the survival of the species, meeting the significant impact criterion.

The inclusion of the recommended changes to EDS E2g, and the hollow replacement plan required under the recommended new EDS E8 will assist in mitigating against the impacts to breeding habitat for Regent Parrot to some degree, however these mitigation measures will not compensate for the substantial loss of habitat including preferred breeding habitat (8.67 ha). Whilst hollow replacement is required to support the immediate and short-term welfare of parrots, artificial hollows require ongoing monitoring and maintenance and do not provide the same ecological value as natural tree hollows.

I do acknowledge the positive effects of the Belsar-Yungera project in the medium to longer term, due to increase in tree health due to environmental watering within the inundation area during operations. This may be able to be considered as offsets for the likely significant impact on Regent Parrot, which will need to be determined by DCCEEW during the EPBC Act approval decision. I note that the maximum inundation area for Belsar-Yungera does not contain as much habitat near waterways (i.e., areas preferred by the species for breeding habitat) as is to be removed by construction. There will also be a substantial temporal difference between impacts from habitat removal and the expected positive benefits. I recommend that DCCEEW consider these factors in assessing the suitability of positive effects to the Belsar-Yungera project maximum inundation area as an offset under the EPBC Act Environmental Offsets Policy[4].

[2] 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.

[3] Habitat within 120m of water

[4] Department of Sustainability, Environment, Water, Population and Communities (2012). Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, Commonwealth of Australia.

Cumulative effects of the Belsar-Yungera and Hattah Lakes North projects in relation to the other seven 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 Regent Parrots were assessed in Tabled Document 113. The cumulative impact assessment for EES Central in this tabled document concluded there are unlikely to be cumulative adverse effects on Regent Parrot, and the SIAC considered this to be acceptable.

The cumulative assessment notes Regent Parrots are considered present in six of the nine VMFRP project areas (Lindsay Island, Belsar-Yungera, Hattah Lakes North, Vinifera, Nyah, Burra), and breed or may breed at four project areas (Lindsay Island, Belsar-Yungera, Hattah Lakes North, Burra Creek). 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 notes that across the projects relevant to the Regent Parrot, 273.70 ha of 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.

For the Hattah Lakes North project, I agree that there is unlikely to be notable cumulative impacts with other projects, particularly given that no breeding habitat is proposed to be removed by the project as discussed above. However, given the potential for the Belsar-Yungera project to result in a significant residual impact to Regent Parrot as discussed above, there will be potential for other VMFRP projects to add cumulatively to this impact due to additional habitat clearance for the species. I note that further work regarding cumulative impacts is being progressed for other VMFRP projects. The accredited environmental assessment processes for the seven other VMFRP projects are still underway and could assist with the understanding of cumulative impacts on key MNES/species including the Regent Parrot.

Consideration of overall improvement to biodiversity

As noted in Section 4.2 and 6.3 of my assessment, the proponent undertook an Assessment of Overall Improvement to Biodiversity (AOIB) for each project (EES Attachments V and VI). The AOIB reports were intended to demonstrate the expected benefits of each project and support the decisions regarding the proposed alternative arrangement to offsets. Based on the findings of the AOIBs, the EES stated that for Belsar-Yungera it is expected that 1,436 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 100,000 megalitres per day (ML/day) scenario and that there is the potential to benefit 11,862 large trees within the maximum inundation area. At Hattah Lakes North it is expected that 716 ha of floodplain vegetation would receive improved frequency and duration of inundation under the 140,000 ML/day scenario at Lake Boolca Water Management Area and 318 ha would receive improved frequency and duration of inundation under the 120,000 ML/day scenario at Chalka North Water Management Area. It is also expected that 8,759 large trees may benefit within the Hattah lakes North maximum inundation area.

The SIAC concluded that while there is reasonable expectation of overall benefit to biodiversity values in the long-term, the EES did not demonstrate that all the native vegetation within the floodplains would benefit from the projects. As discussed earlier in my assessment, the SIAC recommended additional work to address specific uncertainties relating to floodplain hydraulics and floodplain ecology, with the results of this work to be used to confirm the extent of benefits. Specifically, the SIAC recommended the addition of EDS SW4 which requires an updated assessment of overall improvements to biodiversity to address the uncertainty surrounding the implications of hydraulic effects for floodplain vegetation. The SIAC further recommended changes to EDS E7 to require assessment to provide an appropriate level of certainty regarding preferred and tolerable water regimes to inform initial operating scenarios and adaptive management.

The SIAC also recommended the findings of this further work required by EDS SW4 and E7 should then be used to update the assessment of overall biodiversity improvement, prior to final decision-making on the alternative arrangement to state offsets, set out in the proposed incorporated document designed to establish state approval for the two projects.

Approval decisions under the EPBC-Act should, as appropriate, consider the outcomes of the additional analysis that I have recommended relating to floodplain hydraulics and any implications for relevant floodplain vegetation, as described further in Section 6.1, particularly where assumed positive effects may be considered as a mitigation and compensatory measure for impacts to threatened species and communities protected under the EPBC Act.

Other MNES species and communities

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

The EES also included an assessment of a number of EPBC-listed species and ecological communities that are unable to be considered under DCCEEW's assessment as they are not controlling provisions. These included:

- Migratory species: including, but not limited to Glossy Ibis, Fork-tailed Swift, and Latham's Snipe;
- Mallee Bird Threatened Ecological Community; and
- Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregion.

My assessment of migratory species is provided in Table A3 for those with a likelihood of occurrence in either project area of possible or higher. For all species in this table, impacts from both projects are considered to be unlikely and significant impacts under the Significant Impact Guidelines 1.1 are considered to be unlikely.

For the Mallee Bird Community of the Murray Darling Depression Bioregion, the EES outlines that no adverse effects are expected as the community occurs in mallee vegetation which occurs within the broader project areas. Little, if any, of the associated mallee vegetation community occurs within the maximum inundation area for either project, and the community is considered unlikely to occur in the construction footprints and therefore is not expected to be impacted by construction. Species associated with community may experience benefits to foraging opportunities and improved habitat conditions when environmental water is present. I support this assessment.

No adverse effects from the projects are expected on the Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregion, as the vegetation community was not recorded within either project area.

Table A2 Summary of assessment of other MNES species (with a likelihood of occurrence in either project area of possible or higher)

Species	EPBC Status	Project	Potential impacts (EES assessment)	Potential positive effects (EES assessment)	Relevant EDSs	EES assessment of significant effects	Minister's assessment
Australian painted snipe	Endangered	Belsar-Yungera	Impacts unlikely	Project operation would result in increased habitat availability when environmental water is present.	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2c; E2e; E3; GS1; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely and both projects are likely to have positive effects on the species.
		Hattah Lakes North	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; GS1; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3	Impacts unlikely	
Painted Honeyeater	Vulnerable	Belsar-Yungera	Permanent and temporary loss of localised small areas of foraging and perching habitat from construction.	Potential greater floristic resources as floodplain woodlands flower more frequently and insect abundance increases.	EMF1; EMF2; EMF3; EMF4; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; E4a; GS1; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW3; BF2;	Impacts unlikely to be significant under the EPBC Act.	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely for both projects.
		Hattah Lakes North	Permanent and temporary loss of localised small areas of foraging and	Potential greater floristic resources as floodplain woodlands flower more	EMF1; EMF2; EMF3; EMF4; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; E4a; GS1; GS2; GW1;	Impacts unlikely to be significant under the EPBC Act.	

Species	EPBC Status	Project	Potential impacts (EES assessment)	Potential positive effects (EES assessment)	Relevant EDSs	EES assessment of significant effects	Minister's assessment
			perching habitat from construction.	frequently and insect abundance increases.	LV3; NV1; NV2; RU1; SW1; SW2; SW3; BF2		
Growling grass frog	Vulnerable	Belsar-Yungera	Impacts unlikely.	Project operation would result in increased habitat availability, encouraging recolonisation.	EMF1; EMF2; EMF3; EMF4; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GW1; LV3; NV1; RU1; SW1; SW2; SW3	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely.
Flat-headed Galaxias	Critically endangered	Belsar-Yungera	Impacts unlikely as species has not been recorded.	N/A	N/A	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely for both projects.
		Hattah Lakes North	Impacts unlikely as species has not been recorded.	N/A	N/A	Impacts unlikely	

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

Species or community	EPBC Status	Project	Potential impacts (EES assessment)	Potential positive effects (EES assessment)	Relevant EDSs	EES assessment of significant effects	Minister's assessment
Glossy Ibis	Migratory	Belsar-Yungera	Impacts unlikely	Project operation would result in increased habitat availability when environmental water is present.	EMF1; EMF2; EMF3; EMF4 AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely and both projects are likely to have positive effects on the species.
		Hattah Lakes North	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; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	
Fork-tailed Swift	Migratory	Belsar-Yungera	No impacts expected	Species may benefit from insect proliferation following environmental watering.	EMF1; EMF2; EMF3; EMF4 AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely for both projects.
		Hattah Lakes North	No impacts expected	Species may benefit from insect proliferation following environmental watering.	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	
Latham's Snipe	Migratory	Belsar-Yungera	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; EMF4 AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e;	Impacts unlikely	Agree with EES that, with implementation of the proposed

Species or community	EPBC Status	Project	Potential impacts (EES assessment)	Potential positive effects (EES assessment)	Relevant EDSs	EES assessment of significant effects	Minister's assessment
					E3; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3; GS1; GS2		EDSs, significant impacts are unlikely for both projects.
		Hattah Lakes North	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	
Red-necked Stint	Migratory	Belsar-Yungera	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; EMF4 AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely.
Sharp-tailed Sandpiper	Migratory	Belsar-Yungera	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; EMF4 AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; E3; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; SW3; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely for both projects.
		Hattah Lakes North	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	

Species or community	EPBC Status	Project	Potential impacts (EES assessment)	Potential positive effects (EES assessment)	Relevant EDSs	EES assessment of significant effects	Minister's assessment
Australian Gull-billed Tern	Migratory	Hattah Lakes North	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely.
Caspian Tern	Migratory	Hattah Lakes North	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely.
Marsh Sandpiper	Migratory	Hattah Lakes North	No impacts expected	Likely to benefit from environmental watering	EMF1; EMF2; EMF3; AQ1; CM1a; CM1b; CM1c; E1; E2a; E2b; E2c; E2d; E2e; GS2; GW1; LV3; NV1; NV2; RU1; SW1; SW2; GS1; GS2	Impacts unlikely	Agree with EES that, with implementation of the proposed EDSs, significant impacts are unlikely.

A.3 Assessment

Belsar-Yungera

It is my conclusion, taking account of the findings and recommendations of this assessment, that the Belsar-Yungera project is likely to have the following impacts on EPBC-listed MNES:

- The project will likely have a significant residual impact on Regent Parrot due to the loss of 27.7 ha of breeding habitat and 50.3 ha of foraging habitat. I recommend that EDS E2g is updated to require further analysis during detailed design to further minimise impacts on Regent Parrot habitat (particularly breeding habitat). Positive effects of the Belsar-Yungera project on floodplain vegetation within the inundation area during operations may be able to serve as EPBC offsets for the likely significant residual impact on Regent Parrot, which will need to be considered by DCCEEW as appropriate, during the EPBC Act approval decision.

- The project is unlikely to have significant impacts on any other EPBC Act-listed threatened species or communities assessed through the EES. I consider that residual impacts on these species and communities will be acceptably avoided or minimised through the effective implementation of the proposed EDSs, taking account of the amendments recommended by the SIAC and this assessment.

- Approval decisions under the EPBC-Act should consider the outcomes of the additional analysis that I have recommended relating to floodplain hydraulics and relevant implications for floodplain vegetation, as described further in Section 6.1.

Hattah Lakes North

It is my conclusion that, taking account of the findings and recommendations of this assessment, the Hattah Lakes North project is unlikely to have significant residual impacts on EPBC Act-listed MNES, as set out below.

- The project is unlikely to have significant impacts on Hattah-Kulkyne Lakes Ramsar site with implementation of the proposed EDSs, including amendments recommended by the SIAC and this assessment.

- The project is unlikely to have significant impacts on any EPBC Act-listed threatened species or communities assessed through the EES. I consider that residual impacts on these species will be acceptably avoided or minimised through the effective implementation of the proposed EDSs, taking account of amendments recommended by the SIAC and this assessment.

- Approval decisions under the EPBC-Act should consider the outcomes of the additional analysis that I have recommended relating to floodplain hydraulics and any relevant implications for floodplain vegetation, as described further in Section 6.1.

Assessment of cumulative impacts on MNES for both the Belsar-Yungera and Hattah Lakes North projects have been undertaken and provide an understanding of potential cumulative impacts on MNES, as examined above, which can be considered by DCCEEW. However, I also note further work is being progressed to understand cumulative impacts for the other seven VMFRP projects 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 either the Hattah Lakes North and/ or Belsar-Yungera projects.

Appendix B Environmental Delivery Standards

The SIAC recommended specific changes to the EMF and several environmental delivery standards (EDS) in response to submissions and through their analysis of the issues.

Table B1 below contains the proponent's final day version of the EDSs, that was tabled at the SIAC hearing (Tabled Document 177) and incorporates recommended changes from the SIAC denoted as either 'additions' and/or 'deletions'. I generally endorse all changes recommended by the SIAC except where qualified in Table B1.

Further details regarding my findings and responses summarised in this table are contained in the relevant sections of the assessment and Appendix A regarding MNES.

Table B1 Recommended changes to environmental delivery standards and incorporated document conditions

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
Environmental Management Framework				
EMF1	**Environmental Management System** Develop, prepare and implement an Environmental Management System that is consistent with AS/NZS ISO 14001:2015 Environmental management systems – Requirements with guidance for use through the design and construction of the Projects.	Construction	Contractor	Supported
EMF2	**Construction Environmental Management Plan** Prepare and implement a project specific Construction Environmental Management Plan and other relevant sub-plans as required by the Environmental Delivery Standards and in accordance with the Environmental Management Framework. The development of the Construction Environmental Management Plan and sub-plans must include consultation with relevant stakeholders as listed in the Environmental Management Framework and as required under any statutory approvals. ~~Allowance of sufficient review time in agreement with the relevant stakeholders is to be included in the development process timeline.~~ The Construction Environmental Management Plan and all sub-plans shall be prepared or approved by Lower Murray Water before construction commences. The Plan and all sub-plans will be audited for compliance by the Independent Environmental Auditor.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
EMF3	**Operational management** Operate the Projects in accordance with the following documents (or equivalent) within the environmental watering framework in accordance with the Environmental Management Framework and as applicable to the relevant project: • Operation Environmental Management Plan • Environmental Water Management Plan • Seasonal Watering Plan • Operating Plan • Operations and Maintenance Plan.	Operation	CMA (as preparer of the plans except the O&M Plan) LMW (as preparer of the O&M Plan)	Supported
EMF4	**Operation performance management** Operation of the projects will be monitored, evaluated and reported on in accordance with: • Operation Environmental Management Plan • Ecological Monitoring, Evaluation and Reporting Plan • Socio-economic Monitoring, Evaluation and Reporting Plan • Environmental Watering Management Plans Annual Operational Environmental Performance Reports will be prepared to report on performance against the EDSs and other operational obligations. As part of this process the Plans will address the management of, and access to, baseline and monitoring data. Implement a process to ensure that the outcomes of the monitoring, evaluation and reporting inform adaptive management of environmental watering events as per the Environmental Watering Management Plans.	Operation	CMA (as preparer of the plans)	Supported
Aboriginal cultural heritage				
ACH1	**Cultural Heritage Management Plan** Comply with the Cultural Heritage Management Plans (No. 16898 and No. 14330) approved by First Peoples – State Relations for the Belsar-Yungera and Hattah Lakes North projects under the *Aboriginal Heritage Act 2006*.	Design, operation and construction	LMW Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
ACH2	**Connection to Country** Integrate Aboriginal knowledge, values, and aspirations into the planning, delivery and evaluation of the Belsar-Yungera and Hattah Lakes North projects. Create opportunities for enhancing and sharing cultural connection to Country.	Design, operation and construction	CMA Parks Victoria	Supported
ACH3	**Cultural Heritage Management - Operation** Operate the projects in accordance with the existing Victorian environmental watering management framework, including via Environmental Watering Management Plans, Seasonal Watering Proposals and/or Delivery Plans (or equivalent), to: a. Undertake a risk-based approach to identify, avoid and minimise risks (where practicable) to cultural heritage in (and immediately adjacent to) the Maximum Inundation Area in consultation with Registered Aboriginal Parties/Traditional Owners and interested parties (as applicable), and b. In accordance with that framework, before watering develop measures to avoid, mitigate, minimise or manage risks (e.g. protection measures). All measures are to be commensurate with the level of risk and must be developed in consultation with Registered Aboriginal Parties/Traditional Owners and interested parties (as applicable). If culturally sensitive locations are observed or reported to be at risk from pest or overabundant native species or human activity (i.e. visitation), conduct monitoring at these locations to determine the potential for impact, and as a first priority, implement protective measures, and secondary to this, implement remedial measures, where necessary. These actions are to be commensurate with the level of risk and determined and agreed between the land manager and Registered Aboriginal Parties/Traditional Owners and interested parties (as applicable).	Operation	CMA	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
Agriculture				
AG1	**Avoid and minimise impacts on agricultural productivity** The Construction Environmental Management Plan must include measures to manage: • biosecurity risks in accordance with the Catchment and Land Protection Act 1994 and Best practice viticulture biosecurity (Victoria Agriculture, 2021). Specific measures to be agreed with the landholder and/or land manager • access disruptions to private land and infrastructure in accordance with EDS TT2.	Construction	Contractor	Supported
AG2	**Operational agricultural impacts** Any potential impacts on private land including agricultural land during operation will be managed in accordance with the easements or other agreements as detailed in EDS LU2. The Operations and Maintenance Plan will inform day-to-day operation and detail operating control limits, action triggers and associated response procedures for watering events.	Operation	LMW (as preparer of O&M Plan and Property Management Plan) CMA (as preparer of Operating Plan)	Supported
Air quality				
AQ1	**Construction air quality management: dust** The Construction Environmental Management Plan must include an Environmental Emission Management Sub-plan with processes and measures to avoid and, where avoidance is not practicable, minimise emissions to air in accordance with the requirements of the *Environment Protection Act 2017*, subordinate legislation and other relevant statutory requirements and guidelines. Measures to include: • A process for confirming all sensitive receptors within 350 metres of active construction sites • Apply dust suppression on unsealed roads/tracks and areas to the extent practicable for reducing impacts within 350m of stationary human sensitive receptors • Vehicle loads on public roads to be covered when carrying dust (or litter) generating material	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	• Setting speed limits for construction vehicles (in accordance with the Traffic Management Plan required by EDS TT2) to reduce dust as far as practicable • Dust suppression activities must consider weather patterns, ground cover, ground conditions e.g. type and moisture content of soil present, and type of activities being conducted as well as proximity to sensitive receptor locations • Manage stockpile areas to minimise dust (eg, through compaction, lining, covering, wetting or use of a binding agent) • Environment inspections as detailed in the Construction Environmental Management Plan to include dust observations, record inspection results • Contractors will be required to refer to and utilise the following three documents and implement measures where appropriate during the construction phase of the project in accordance with the following publications: - Managing stockpiles (EPA Publication 1895) - Managing soil disturbance (EPA Publication 1894) - Managing truck and other vehicle movement (EPA Publication 1897) • Undertake visual observations of nuisance dust and reactive continuous/realtime dust monitoring (as defined in Guideline for assessing and minimising air pollution in Victoria (EPA Publication 1961) where construction and/or haulage on unsealed roads occurs within 20m of occupied residences. Reactive dust monitoring is required at these locations only while construction and/or haulage is being undertaken (i.e. not required outside of working hours). If fine dust particles are measured to exceed PM10 of 100 ug/m3 for a 15 minute average and/or the trigger level identified in Guideline for assessing and minimising air pollution in Victoria (EPA Publication 1961) and following an investigation which determines that the dust is attributed to the project construction, then the contractor must temporarily modify or suspend dust generating activities until controls are put in place to avoid and reduce dust.			
AQ2	**Dust nuisance and complaints** The Community and Stakeholder Engagement Management Plan required by EDS SB1 must detail a process to receive and respond to queries or complaints relating to dust. This must include a project specific hotline to receive queries or complaints and a process for investigating and responding as required. Measures to address the complaint must be implemented as soon as practicable.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
AQ3	**Pumping equipment** All pumping infrastructure involving diesel plant to be serviced within appropriate servicing frequencies and maintained to manufacturer specifications (where available).	Operation	LMW (as preparer of O&M plan) CMA (as preparer of Operating plan)	Supported
Bushfire management				
BF1	**Bushfire management during construction** Prepare and implement a Bushfire Emergency Response Plan for the construction of the projects in consultation with the relevant land manager, emergency management and fire authorities (including DELWP Forest Fire Management Victoria). The Bushfire Emergency Response Plan must include: • Training and equipment requirements for on-ground personnel • Site access/equipment restrictions and permits that apply according to the Fire Danger Rating • Pre work assessment (for example a Job Safety Analysis) to incorporate fire ignition risk assessment and controls • Monitoring of bushfire danger by using the Bureau of Meteorology and Victorian and NSW government recommended emergency information sources (e.g. VicEmergency app) • Emergency response actions (including evacuation routes or shelter in place locations) in the event that bushfire is detected on or off site. • Procedures for managing flammable material to prevent ignition, explosion or spread of fire from fuels such as: - Minimisation of storage quantities and use of mobile refuelling where feasible - Storage methods and locations for flammable materials such as fuels, with low radiant heat exposure • Setbacks and vegetation management procedures to provide suitable separation between fuels and combustible materials.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
BF2	**Bushfire management during operation** Activities associated with the operation and maintenance of project infrastructure with relevance to bushfire ignition, preparedness and management must be undertaken in accordance with existing relevant processes (such as the Joint Fuel Management Program including cultural burning), procedures and requirements of the relevant land manager and relevant emergency management authorities. Prior to the commencement of operation: • Prepare a pre work assessment (for example a Job Safety Analysis) to incorporate fire ignition risk assessment and controls for any operation and maintenance activities. • Prepare Emergency Response Plans (or equivalent) in consultation and agreement with the relevant land manager and relevant emergency management authorities. The Emergency Response Plans must include maps with key access/egress roads, alternative routes and key visitation sites for each proposed watering scenario. • Prepare guidelines for operational or maintenance activities on Total Fire Ban days, and during the Fire Danger Period, including requirements to adhere with any relevant restrictions as applicable. Before a watering event notify land owners and managers, emergency management agencies and DELWP Forest Fire Management Victoria of the timing and type of event (confirm the watering scenario) regarding any changes to access/egress.	Operation	LMW (as preparer of the O&M Plan) CMAs (as preparer of OEMP and Operating Plan) Parks Vic (as land manager)	Supported
Contaminated land, soils and waste				
CM1a	**Contaminated land duties** The Construction Environmental Management Plan must include processes and procedures to manage contaminated land, spoil and waste in accordance with land manager processes, procedures and requirements and the requirements of the *Environment Protection Act 2017*, the Environment Protection Regulations 2021, and the following publications as appropriate and as amended or replaced from time to time: • EPA Victoria, 2020, Publication 2008 Notifiable contamination guideline – Duty to notify contaminated land • EPA Victoria, 2021, Publication 1827.2 Waste classification assessment protocol • EPA Victoria, 2021, Publication 1828.2 Waste disposal categories – characteristics and thresholds • EPA Victoria, 2021, Publication 1799.2 Permissions scheme policy • EPA Victoria, 2022, Publication 1977: Assessing and controlling contaminated land risks: A guide to meeting the duty to manage for those in management or control of land	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	• WorkSafe Victoria, 2010, Asbestos Contaminated Soil Guidance Note • Australian Standard AS1940 Storage Handling of Flammable and Combustible Liquids • EPA Victoria, 2020, Publication 1834 Civil construction, building and demolition guide • EPA Victoria, 2018, Publication 1698: Liquid storage and handling guidelines • EPA Victoria, 2021, Publication 1756.2, Summary of waste framework • EPA Victoria, 2021, Publication 1915, Contaminated land policy • EPA Victoria, 2021, Publication 1940, Contaminated land: understanding section 35 of the Environment Protection Act 2017 • EPA Victoria, 2021, Publication 1820.1, Construction – Guide to preventing harm to people and the environment. Specifically, the Construction Environmental Management Plan must include: • A framework for managing contamination risks to achieve compliance with the contaminated land duties, including the General Environmental Duty, duty to manage contaminated land and duty to notify the EPA of contamination. • A framework for monitoring baseline and post-construction conditions to measure compliance with the duties and assess whether contamination has occurred as a result of the project • A framework for managing waste to achieve compliance with the Duties and regulatory requirements including classification, transportation and disposal at a lawful place. This will include minimisation of waste generation and implementation of the waste hierarchy • Management measures for storage, handling and transport of materials for the protection of human health and the environment, including controls for minimising dust generation, sediment and stormwater run-off and seepage from stockpiled materials • Management measures to minimise chemical and fuel storage (including hazardous materials and dangerous goods) onsite, and store in accordance with EPA and Safe Work Australia requirements in the legislation and guidelines listed above. This must include: - Creating and maintaining a dangerous goods register - Disposing of any hazardous materials, including asbestos, in accordance with the Environmental Protection Regulations 2021 and relevant guidelines - Implementing requirements for the installation of bunds and precautions to reduce the risk of spills - Contingency and emergency response procedures to handle fuel and chemical spills, including availability of on-site hydrocarbon spill kits.			

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	An unexpected finds protocol including procedures if building rubble/asbestos in fly-tipped waste, buried waste or previously unidentified contamination is encountered. This must include measures to identify asbestos and (if present) manage this soil in accordance with the WHS Act and Regulations and Safe Work Australia.			
CM1b	**Water, Soils and Waste Management Sub-plan** A Water, Soils and Waste Management plan must be prepared as a sub-plan to the Construction Environmental Management Plan to: • Comply with the General Environmental Duty as per the Environment Protection Act 2017 • Identify spoil management options and / or off-site disposal in accordance with regulatory requirements including details of reuse options for all categories of spoil expected to be generated through construction • Identify procedures and requirements for characterisation, management and reuse of soil to be imported and/or re-used in construction. Classification and relevant permits will be sought and obtained in accordance with the Environmental Protection Regulations 2021 and supporting EPA guidelines. Characterisation will also consider the National Environment Protection Measures (Assessment of Site Contamination) 2013 to confirm the material is suitable for the proposed end use (to be determined based on the identified re-use location). This will include: • Preparation of a sample analysis and quality plan and conceptual site models • Details of management measures to be implemented for sustainable handling and transport of spoil for the protection of human health and the environment • Details of design and specific environmental management plans for temporary stockpile areas and stockpile activities including but not limited to containment of stockpiled materials to prevent any impact to human health or the environment (if required) • Classify material for disposal and identification of a suitable receiving facility (dependant on the classification) in accordance with EPA Victoria requirements to classify spoil for disposal or re-use as required • Provide a framework for material and waste tracking • Apply the waste hierarchy, including avoidance as far as reasonably practicable, prioritise beneficial re-use of material as part of the project and avoid off-site disposal to landfill as far as reasonably practicable.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
CM1c	**Soil characterisation** Prior to construction activities commencing at a discrete location, the contractor must characterise the condition of the land by applying a risk based approach to understand the nature and extent of any potential (existing) contamination at the following locations: • Lay down areas and compounds • Other areas where soil or materials will be handled, or chemicals will be stored / used This characterisation will include: • Review of desktop information (including the EES Central Geology, Soils and Contamination ~~E2~~ Specialist Assessment and any further information provided from land managers, through the design process and other information that may have changed, for example publicly available information such as from EPA Victoria) • Site walkover across the locations identified above, with a particular focus on visual or olfactory signs of contamination such as staining, spills, dumped waste or stockpiles of soil • Depending on the outcomes of the tasks above, targeted soil sampling at locations identified as having potential to contain contaminated material. The outcomes of this characterisation will inform construction control measures, inform the re-use of soil, and/or to classify material in accordance with EPA waste guidelines. Soil will be managed in accordance with the Water, Soils and Waste Management Sub-plan as per EDS CM1b.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
CM2	**Acid sulfate soils** The Construction Environmental Management Plan must include an Acid sulfate soil management plan (ASMP). The ASMP must be prepared in accordance with the following where relevant: • National Guidance for the Management of Acid Sulfate Soils in Inland Aquatic Ecosystems • Guidance for the dewatering of acid sulfate soils in shallow groundwater environments • Environment Protection Act 2017 General environmental duty • Environment Protection Regulations 2021 • National Acid Sulphate Soils Guidance - A synthesis • National acid sulphate soils sampling and identification methods manual • Guidelines for the dredging of acid sulphate soil sediments and associated dredge spoil management • Land manager policies and requirements. The ASMP must include measures to: • Characterise and manage acid sulfate soils in accordance with: - EPA Victoria, 2009, Publication 655.1 Acid Sulfate Soil and Rock - Murray Darling Basin Authority, 2010, Detailed Assessment of Acid Sulfate Soils in the Murray-Darling Basin • Manage stockpile areas to prevent release of acid to the environment • Identify suitable sites for management, re-use or disposal of acid sulfate soil and rock in accordance with EPA Victoria requirements. As far as reasonably practicable, prevent oxidation that could lead to acid formation through cover and/or scheduling practices or addition of neutralising compounds to avoid acid formation.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
CM3	**Contaminated land duties** The Operation Environmental Management Plan must include processes and procedures to manage contaminated land, spoil and waste in accordance with land manager processes, procedures and requirements, and the requirements of the legislation and other relevant statutory regulations and guidelines as detailed in EDS CM1a. Specifically, the Operation Environmental Management Plan must include: • Reference to a framework(s) for managing contamination risks to achieve compliance with the contaminated land duties, including the General Environmental Duty, duty to manage contamination and duty to notify the EPA of contamination • Management measures for storage, handling and transport of soil, water and/or waste materials for the protection of human health and the environment, including measures for minimising dust generation, sediment and stormwater run-off. Soil and/or water monitoring and reporting would be undertaken to ensure effective implementation of the management measures and ongoing environmental compliance of the project infrastructure/operational activities. Controls must include: - Measures to minimise chemical and fuel storage on site and store hazardous materials and dangerous goods in accordance with EPA and Safe Work Australia requirements in the legislation and guidelines listed in EDS CM1a. This must include: › Creating and maintaining a dangerous goods register › Disposing of any hazardous materials, including asbestos, in accordance with the Environmental Protection Regulations 2021 and relevant guidelines › Implementing requirements for the installation of bunds and precautions to reduce the risk of spills › Contingency and emergency response procedures to handle fuel and chemical spills, including availability of on-site hydrocarbon spill kits	Operation	Mallee CMA LMW Parks Victoria	Supported
RU1	**Waste management** Develop and implement management measures for resource use and waste (excluding soils) minimisation during construction and operation in accordance with the EPA waste management hierarchy and management options, to address: • Litter management • Construction and demolition wastes • Organic wastes.	Operation and construction	LMW (as asset owner / operator) GMW (as State Constructing Authority) CMA (as preparer of Operating Plan)	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
Biodiversity, ecology and native vegetation				
E1	**Native vegetation and habitat design minimisation** Avoid and, where avoidance is not practicable, minimise native vegetation removal and ensure that the removal of native vegetation will not exceed 50.30 ha for the Belsar-Yungera project and 18.90 ha for the Hattah Lakes North project. For Belsar-Yungera, review the native vegetation removal calculations in light of the reduction of new access tracks and update as necessary. If the amount remains 50.30 ha despite review of calculations, review the need for two access tracks in WMA1 for Belsar-Yungera. The following measures to avoid and minimise impacts to native vegetation (including habitat fragmentation) are to be implemented as part of detailed design and construction planning phases including: • Undertake further investigation of identified alternatives where there may be opportunity to further avoid and minimise adverse effects to native vegetation through detailed design and construction methods (as identified in Attachment VII to the EES). • Minimise footprint and surface disturbance of temporary and permanent works within the Construction Footprint as far as reasonably practicable, particularly near waterways, wetlands, endangered EVCs and fauna habitats (eg native and exotic vegetation, hollows, logs, soil and water). This includes movement and storage of all vehicles, machinery, equipment and materials • Avoid and/or minimise the removal of native vegetation including Large and/or hollow-bearing trees, threatened species and threatened communities as far as reasonably practicable, particularly in the design phase when finalising the Construction Footprint (e.g. looking at alternative locations for turning circles and laydown areas that avoid impacts to any large trees, refining track class and alignment to avoid and minimise impacts to threatened species and Large or Very Large Trees). Design and implement no-go zones to protect ecological values, and provide detailed maps of their location in the Construction Environmental Management Plan. No-go zone fencing (bunting/barriers considerate of culturally sensitive areas) to be installed around significant ecological values to be retained, including populations of EPBC Act-listed flora within the Area of Investigation, FFG Act listed flora and Large or Very Large Trees on the edge of the Construction Footprint that are proposed to be retained during construction).	Design and construction	Contractor	Generally supported, with the following recommendations: • Amend first sentence in first paragraph of EDS to place greater emphasis on further reducing clearance, whilst recognising there is a maximum worst case for total area of native vegetation removal. • Adjust requirement for further avoidance and minimisation of vegetation clearance to encompass both identified alternatives and any others wherever possible, explored through detailed design, and then construction. • Include requirement for further consideration to reduce impacts on Plains Grassland EVC during detailed design. If impacts to Plains Grassland are unavoidable this should be explicitly addressed in the update of AOIB (recommended in EDS SW4) to inform consents under Condition 4.6 of the incorporated document. • Revise native vegetation removal calculations to include the native vegetation impacts

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
				from the additional wells or bores recommended in EDS GW2. Any additional clearance should be accommodated in the current worst-case figures.
E2a	**Construction biodiversity administrative processes** Develop and implement a Native Flora and Fauna Management Sub-Plan as a sub-plan of the Construction Environmental Management Plan (EDS EMF2). The Native Flora and Fauna Management Sub-Plan must include auditable specific commitments, and identify requirements and methods for avoiding and minimising impacts on biodiversity values, particularly native vegetation and threatened species and communities, including: • the matters required by EDS E2b, E2c, E2d, ~~and~~ E2e, ~~and~~ E2f, E2g and E2h • Contractor inductions to be undertaken so that all staff onsite are aware of the ecological values (and other values) to be protected during construction • Monitoring and auditing requirements for implementation by the environmental supervisor to confirm works are proceeding in accordance with the Native Flora and Fauna Management Sub-plan (e.g. checking that works are occurring in approved areas, no-go zone delineation is accurately in place, pre-clearance surveys are proceeding appropriately) • If EPBC Act or FFG Act listed threatened species (individuals or population) are encountered which were not assessed within the EES assessment: - Stop works at that location and implement appropriate measures (e.g. temporary fencing will be installed), pending discussions with DAWE/DELWP as relevant - Notify a suitably qualified ecologist to determine the significance of any potential impacts - Seek any relevant approvals from the relevant authority if removal/impacts cannot be avoided. Should works be required outside the approved Construction Footprint, follow the change process as detailed in the Construction Environmental Management Plan which includes consideration of biodiversity (e.g. native vegetation, threatened species) implications, including approval requirements, re-quantification of impacts.	Construction	Contractor	Supported
E2b	**Construction vegetation management**	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	The Native Flora and Fauna Management Sub-Plan must include the following requirements for vegetation removal activities: • Clearly identify the trees to be removed. Trees that may be or are to be retained, must not be marked in any way • Delineate no-go zones incorporating Tree Protection Zones of Large Trees and threatened flora species populations to be retained to prevent access during construction • Tree protection measures to be implemented to respond to arborist recommendations (e.g. tree protection zone fencing, mats) where appropriate • Minimise removal of vegetation approved for removal/impacts (for example, reducing the number of trees felled) • Once the construction footprint and construction methods are finalised in areas not previously assessed by an arborist during the design phase, undertake a detailed arborist assessment for Large Trees that will be impacted by more than 10% of their Tree Protection Zone (TPZ) to document the tree condition and significance, tree protection zone, structural root zone, tree protection fencing or ground protection systems to be used, and determine if the tree can be retained. The arborist is required to have a minimum qualification of Diploma in Arboriculture (AQF level 5 or equivalent) and tree impacts are to be assessed in accordance with the Australian Standard 4970- 2009 Protection of Trees on Development Sites. For trees to be retained implement tree and vegetation protection measures outlined in this EDS • Pruning of trees to be retained will be undertaken to the minimum extent necessary and must not exceed one third of total canopy area. Pruning to be undertaken in accordance with AS4373 Pruning of Amenity Trees • Vegetation clearing, pruning and excavation controls and protection measures, including the following protocols: - pre-clearing surveys by an authorised and experienced wildlife handler of all accessible fauna habitat up to 5 days prior to clearing, as well as identified obscured fauna habitat (e.g. hollows, nests, logs, inaccessible habitat) up to 24 hours prior to clearing. These can be conducted together as one pre-clearing survey provided it occurs no more than 24 hours prior to clearing - fauna salvage by an authorised and experienced wildlife handler that is to be onsite during all vegetation removal/felling/lopping activities. - two-stage clearing and phased/staged removal to retain trees for as long as possible wherever practicable - minimised clearing during spring where practicable.			
E2c	**Construction fauna management**	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	The Native Flora and Fauna Management Sub-Plan must include the following requirements for terrestrial and aquatic fauna management during construction: • Development and implementation of handling and salvage protocols for terrestrial and aquatic fauna during construction, including legislative permit and authorisation requirements of wildlife handlers (e.g. a Management Authorisation under the Wildlife Act 1975). This will include guidance for appropriate methods to encourage wildlife to leave vegetation and the construction areas, and other procedures should fauna (including juveniles or eggs) be found within hollows or nests during the pre-clearance surveys. The protocols will include details of requirements, including wildlife handler/ecologist/Victorian Fisheries Authority permit and authorisation requirements and EPBC Act post-referral approvals processes • All fencing must be fauna friendly to minimise risk of wildlife injury from collision and include provision of egress points, for example: - Temporary to exclude construction: High visibility string of bunting or plastic mesh (not transparent) attached to star pickets with plastic caps (or weighted posts that avoid ground penetration in culturally sensitive areas) - Temporary to exclude wildlife (e.g. from open trenches): Chain wire fencing >1.8m high with a top rail or tension wire. Fencing stays located inside the exclusion area, or with high visibility mesh to guide wildlife away from obstructions. Shade cloth or other suitable deterrent attached to the lower 50 cm of the outside of the exclusion zone and weighted to the ground to exclude smaller animals - No barbed or razor wire will be used • Trench management, including avoiding open trenches overnight where practicable. Where trenches cannot be closed, check trenches at the start and end of each day (i.e. dawn/dusk), and consider feasibility of measures (e.g. ramps) to aid animal escape • Implement measures to minimise noise, vibration and lighting impacts on known threatened fauna species and habitat, including: - Avoid unnecessary light spill across a broader area than required to avoid attracting insects and subsequently their predators (bats and birds)). EDS LV3 provides additional requirements in relation to lighting during construction - Avoiding night works during periods of high insect/bird/bat activity (October to March) as far as reasonably practical, so as to minimise disturbance to fauna communication, foraging and other behaviours that depend on sound and darkness - Avoiding pile driving in waterways at night as far as reasonably practical. If pile driving in waterways must occur over multiple nights, consecutive days are to be separated with a night of no works in between to minimise ongoing chronic disturbance to wildlife.			

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E2d	**Construction weed and pest management** The Native Flora and Fauna Management Sub-Plan must include the following requirements and measures to mitigate weed (terrestrial and aquatic) and pathogen introduction and spread: • Vehicle, personnel, material and equipment hygiene protocols (including measures required to prevent the spread or transmission of Chytrid Fungus as per Hygiene protocols for the control of diseases in Australian frogs (Murray et al. (2011)) • Weed, pest animal and pathogen management and monitoring and reporting requirements • Biosecurity check/inspections of all vehicles entering the Construction Footprint for plant material, seeds and soils containing organic matter. Following this initial check upon entry, biosecurity checks are not required each time the vehicle comes into the Construction Footprint if the vehicle has only travelled on bitumen or well-established gravel or dirt roads (i.e. no vegetation growing within roads) outside the Construction Footprint. These measures must be auditable and linked to management outcomes such as: • Identify CaLP Act listed weeds in the construction area and assess the risk of additional spread prior to relocating topsoil. Implement measures to manage this risk during clear and grade, and reinstatement • To a reasonable extent practicable during the clear and grade phase, ensure that vehicles and plant are free of soil (dust/clods) and vegetation prior to entry and exit from the construction area • Evaluate disturbed areas post-construction and implement rehabilitation in accordance with EDS E2e. To avoid and minimise spread of pathogens, all vehicles and plant undertaking construction works directly in the watercourse must be cleaned and free of soil prior to entrance of each waterway and on exit if working between multiple waterways (excluding vehicles and plant using the constructed access route).	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E2e	**Construction rehabilitation management** The Native Flora and Fauna Management Plan must include the following requirements for rehabilitation following construction: • Where possible, reuse timber and logs from felled trees on site with habitat improvement uses prioritised • Replace large woody debris (existing logs and snags) removed during construction from waterbodies or the floodplain as close as practicable to where it was initially located, in consultation with land managers • The projects must include rehabilitation of all affected areas following construction within the timeframe specified by the land manager: - Rehabilitation for all areas except Borrow sites must be detailed in the CEMP and must be developed in consultation with the relevant land manager. Rehabilitation should include as appropriate topsoil, leaf litter, log reinstatement and targeted revegetation (using indigenous species in areas of native vegetation pre-construction or soil stabilising non-invasive species in other areas), as agreed with the land manager - Borrow sites rehabilitation works are to be addressed in Property Management Plans, developed in agreement with the relevant land owner. Rehabilitation should include as appropriate topsoil, leaf litter, log reinstatement, weed monitoring and management and targeted revegetation as agreed with the land manager.	Construction	Contractor	Supported, with the addition of the hollow replacement plan as per the recommended new EDS E8
E2f	**Aquatic fauna management** In addition to the handling and salvage protocols for aquatic fauna as detailed in EDS E2c implement the following: • Where works in waterbodies require coffer-damming that completely blocks the waterway: - Where practical, undertake works under no-flow conditions or outside the periods of time when fish migration occurs - Clearance of coffer dams during the de-watering process and following flood events which over-top the coffer dam - If clearance is not possible (e.g. for safety reasons), screens/filters to be placed on temporary pumps to be used to dewater coffer dam to avoid entrainment - Implement flow-through via pumping from upstream to downstream to maintain water quality and levels on both sides of the coffer dam	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	- Monitor water quality (specifically dissolved oxygen) and depths upstream and downstream of the coffer dam during construction period to maintain similar conditions on both sides of the construction site Minimise the duration of fish passage restrictions during works undertaken in or within the vicinity of any waterbodies to reduce impacts on aquatic fauna movements and water quality.			
E2g	**Site specific additional measures - Regent Parrot** • Implement measures to avoid and minimise impacts on Regent Parrot including (unless otherwise agreed with DAWE and DELWP): - Removal/lopping/felling of active nesting trees, if required, must be done outside the breeding season - Where possible, schedule construction activities to avoid active construction within 350m of active nesting trees during the breeding season (spring/early summer). Active construction includes construction activities associated with track upgrades and new track construction, but does not include construction vehicle transit, where vehicles are simply using tracks for access to construction sites or routine track maintenance • Where construction occurs within 350 metres of an active nesting tree during the Regent Parrot breeding season (August to December inclusive), undertake monitoring, consistent with that outlined in Table 13-5 of Specialist Assessment B to the EES, in accordance with the Native Flora and Fauna Management Sub-Plan. • Active nesting trees are to be determined with reference to potential nesting locations identified in regent parrot habitat maps in Appendix I to Specialist Appendix B of the EES.	Construction	Contractor	Supported, with recommended update to EDS E2g to require further analysis during detailed design, to ensure impacts on Regent Parrot habitat are minimised and documented, particularly for the breeding habitat of the species in the Belsar-Yungera project area. This analysis should be provided to DCCEEW to consider as appropriate.
E2h	**Mildura Butterfly *Ogyris subterrestris* Site specific additional measures – Hattah Lakes North** • Schedule construction traffic to avoid the use of Mournpall Track during active flying times.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E3	**Pest Plant and Animal Monitoring and Management Plan** Prepare (prior to the commencement of operation) and implement a Pest Plant and Animal Monitoring and Management Plan to detect and manage terrestrial and aquatic pest presence and activity due to managed environmental watering events, including carp. The Plan may be prepared for multiple VMFRP projects, and will include: • A monitoring program to indicate pest presence and activity, which will inform adaptive management and treatment measures • Thresholds for implementation of contingency management measures • Contingency measures, which may refer to existing policies, practices and procedures. The monitoring program must include monitoring objectives, indicators and requirements (e.g. parameters, locations, frequency) appropriate to identify the exceedance of thresholds for pest presence and activity. Locations must include culturally sensitive locations relevant to EDS ACH3. The Pest Plant and Animal Monitoring and Management Plan should include measures to assist private landowners with the increased risk of pest presence and activity due to managed environmental watering events. Measures should include raising awareness to inform landowner monitoring and reporting, appropriate measures to manage any pest presence or activity, providing support to implement measures by coordinating efforts.	Operation	Parks Victoria	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E4a	**Overall biodiversity improvement – Belsar- Yungera** Operate the Belsar-Yungera project to better align the frequency, duration and timing of managed inundation events with the ecological needs of the floodplain, including to improve ecosystem function, threatened species' habitat, and native vegetation. Operation of the projects, including the monitoring and reporting of outcomes, is to be undertaken in accordance with the principles of adaptive management through the following documents (or successors, as applicable): • Operation Environmental Management Plan • Environmental Water Management Plan • Seasonal Watering Proposal • Operating Plan • Operations and Maintenance Plan • Monitoring, Evaluation and Reporting Plan.	Operation	CMA (as preparer of the MER)	Supported
E4b	**Overall biodiversity improvement – Hattah Lakes North** Operate the Hattah Lakes North project to better align the frequency, duration and timing of managed inundation events with the ecological needs of the floodplain, including to improve ecosystem function, threatened species' habitat and native vegetation. Operation of the projects, including the monitoring and reporting of outcomes, is to be undertaken in accordance with the principles of adaptive management through the following documents (or successors, as applicable): • Operation Environmental Management Plan • Environmental Water Management Plan • Seasonal Watering Proposal • Operating Plan • Operations and Maintenance Plan • Monitoring, Evaluation and Reporting Plan.	Operation	CMA (as preparer of the MER)	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E5	**Winged peppercress - Hattah Lakes North** Develop and implement a sub-plan of the Operations Environmental Management Plan to identify, assess and mitigate any potential effects of inundation on winged peppercress on the Raakajlim property. The plan should include: • Prior to inundation, identification and assessment of habitat for winged peppercress on the Raakajlim property • If found, definition and implementation of preferred inundation requirements for this species and reasonably feasible mitigation measures (such as altered inundation frequency, sandbagging to prevent inundation, seed collection and other appropriate measures). Liaise directly with the landowner in development of the plan prior to submission to the Department of Energy, Environment and Climate Action for approval.	Operation	LMW/CMA	Supported
E6	**Mildura Butterfly *Ogyris subterrestris* - Hattah Lakes North** Develop and implement a sub-plan of the Operations Environmental Management Plan to monitor/assess effects of the 2022 flood event and proposed environmental watering on the butterfly. Outcomes are to be used to inform the appropriate management approach which balances the need to prevent further decline of the butterfly from environmental watering with overall ecosystem health and the needs of any other relevant threatened species. Liaise directly with the relevant landowners in the development of the plan prior to submission to the Department of Energy, Environment and Climate Action for approval.	Operation	LMW/CMA	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
E7	**Water regimes to inform initial operations** For Hattah Lakes North, prior to operation, undertake a Hydrological Analysis of Ecological Vegetation Classes. For both Projects' areas, use the site-specific hydrological analyses of Ecological Vegetation Classes (including the analysis recommended for Hattah Lakes North above and *Hydrological analysis of ecological vegetation classes in relation to expert elicitation report – Belsar Yungera floodplain* (2023, Ecological Associates) together with *A Guide to water regime, salinity ranges and bioregional conservation status of Victorian wetland Ecological Vegetation Classes* (2016, Frood and Papas) and the expert elicitation report (*Expert elicitation of tolerable and optimal watering regimes for Murray River floodplain vegetation,* 2022 ARI), to inform initial operating scenarios and adaptive management to be tested through environmental monitoring of response of vegetation to watering events.	Design	LMW/CMA	Supported, with the inclusion of the VMFRP (with Basin Plan) scenario included in the updated analysis
Groundwater				
GW1	**Construction groundwater management** The Construction Environmental Management Plan must include measures to manage groundwater impacts in accordance with the requirements under the *Environment Protection Act 2017,* subordinate legislation and other relevant statutory requirements and guidelines. Measures must include: • Avoid extracting contaminated groundwater wherever possible • Seeking advice from a suitably qualified person on the most suitable way to manage contaminated groundwater • Disposal of groundwater from dewatering must minimise impacts to land and/or waterways. Disposal option(s) selected for each dewatering activity must consider the volume and or quality of the groundwater to be disposed (i.e. salinity) and be undertaken to avoid and minimise effects on groundwater values • Dewatering must be restricted to the minimum volume required • Spills of contaminants must be avoided and managed in accordance with EDS CM1.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
GW2	**Operational groundwater management** The Operation Environmental Management Plan must provide for the monitoring of groundwater and surface water levels, surface water flow and salinity to minimise the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program that complies with *Basin Salinity Management 2030* or its successor. The groundwater monitoring should include wells or bores within the Projects' areas, including parts of each Project's area that are expected to be the most sensitive to groundwater rise or salinity increase, with a sufficient number of monitoring wells or bores within each WMA to adequately detect and interpret any changes in water levels and salinity. The operation of the Projects should be reviewed and, if necessary, modified, if a significant trend of increasing salinity is identified at any of the monitoring sites.	Operation	CMAs (as preparers of plans)	Supported, with the vegetation impact from the additional wells or bores to be considered in the updated impact figures for EDS E1.
Historic heritage				
HH1	**Management of Historical Heritage during construction** The Construction Environmental Management Plan must include: • An unexpected finds protocol that specifies measures to avoid and minimise impacts on any previously unidentified historical archaeological sites and values discovered during construction. The management protocol must be consistent with the requirements of the Heritage Act 2017 and include procedures for ceasing work if human remains or archaeological sites, values or objects are discovered, notifying Heritage Victoria of the find, obtaining consent to deal with the find, and dealing with the find in accordance with the consent • Measures to manage historical heritage impacts including physical barrier protection and/or exclusion zones to manage unplanned effects • Details around training and awareness in relation to historic heritage places and obligations (e.g. Project induction toolbox talks and staff inductions) • Requirement to obtain any necessary consent under the Heritage Act 2017 prior to the disturbance of a known archaeological site.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
HH2	**Management of Historical Heritage during operation** In accordance with the *Heritage Act 2017*, manage historical heritage impacts including: • Details around training and awareness in relation to historic heritage places and obligations (eg. Project induction toolbox talks and staff inductions) • An unexpected find protocol that specifies measures to avoid and minimise impacts on any previously unidentified historical archaeological sites and values discovered during operation. The management protocol must be consistent with the requirements of the Heritage Act 2017 and include procedures for ceasing work if human remains or archaeological sites, values or objects are discovered, notifying Heritage Victoria of the find, obtaining consent to deal with the find, and dealing with the find in accordance with the consent • Apply for and obtain any necessary consent under the Heritage Act 2017 where an archaeological site is to be disturbed, and comply with the conditions of that consent.	Operation	CMA (as preparer of the plans) Parks Victoria (joint, responsibilities as asset owner)	Supported
HH3	Prior to operation, undertake an archaeological investigation and archival photographic survey of the Moonah Track and Wattle Track Charcoal Pits (VHI H7328-0002) to understand the construction and/or historic use of the pits.	Construction	LMW	Supported
Land uses, landscape and visual				
LU1	**Land use effects – Construction** Minimise or manage land use impacts by: • Developing and implementing private landowner agreements in consultation with private landowners and in advance of construction activities occurring on their property which include measures to minimise site specific disruptions • Obtain required consents from public land managers for areas to be occupied during construction for the building of infrastructure and comply with the conditions of those consents.	Construction	LMW	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
LU2	**Land use effects – Operation** Prior to operation: • Where operation will involve inundation of private land or operation of infrastructure located on private land, establish private landowner agreements for the operation and maintenance of infrastructure and areas to be inundated • Obtain licences from the public land managers, as applicable, for the operation and maintenance of infrastructure on public land. During operation: • Operate and maintain infrastructure in accordance with the private landowner agreements and licences over public land • Undertake inundation in accordance with the private landowner agreements and licences over public land and in consultation with those landowners and public land managers.	Operation	CMAs (as owners of Seasonal Watering Plans and Operating Plans) LMW (as preparers / owners of the O&M Plans)	Supported
LV1	**Avoid and minimise visual impacts through design** Design permanent and temporary works in consultation and agreement with relevant stakeholders (e.g. land and asset managers) to minimise any adverse landscape and visual impacts as far as reasonably practicable.	Design and construction	Contractor	Supported
LV2	**Avoid and minimise visual impacts during construction** As far as reasonably practicable, locate construction equipment, stockpiles, and other visible elements away from key sensitive receptor views (as identified in the Construction Environmental Management Plan) and otherwise incorporate screening measures such as hoarding where necessary. Remove construction equipment and temporary construction infrastructure when no longer required.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
LV3	**Minimise construction and operation lighting impacts** Temporary and permanent lighting used during construction and operation must avoid and minimise light spillage where safe to do so (considering AS/NZS 4282:2019 Control of the Obtrusive Effects of Outdoor Lighting), to protect the amenity of adjacent sensitive receptors (as identified in the Operations Environment Management Plan). Develop and implement measures to avoid and minimise lighting impacts to terrestrial and aquatic fauna species including considering the siting of temporary pumps and associated equipment to avoid impacts (such as downward angles or directional lights to avoid unnecessary light spill across a broader area than required, yellow/orange LED light wavelengths to avoid attracting insects and subsequently their predators (bats and birds)).	Construction and operation	Contractor CMAs (as owners of Operating Plan)	Supported
Noise and vibration				
NV1	**Construction noise and vibration management** The Construction Environmental Management Plan must include measures to minimise as far as reasonably practicable and manage construction noise and vibration in accordance with the requirements of the Environment Protection Act 2017, subordinate legislation and other relevant statutory requirements and guidelines. The Construction Environmental Management Plan must include measures, such as: • Fit and maintain appropriate mufflers on vehicles • Maximise shielding taking topography, existing structures and equipment location into consideration • Where an activity is likely to cause noise effects to nearby noise and vibration sensitive receivers, restrict operating hours to between 7 am and 6 pm weekdays and 7 am to 1 pm Saturday, except where, for practical reasons, the activity is unavoidable. All reasonable measures must be implemented to mitigate the effects of such unavoidable works • Inform the community on work scheduling and working hours in accordance with EDS SB1 and advise local residents when unavoidable out-of-hours work would occur • Provide the opportunity for the community to raise issues / concerns and respond to these in accordance with EDS SB1 • Setting speed limits for construction vehicles (in accordance with EDS TT2) to minimise vibration and noise effects • Prior to the commencement of vibration intensive works (such as compaction, sheet piling, rock breaking), prepare a risk assessment to inform the need to undertake dilapidation survey(s)	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	• A framework for justification and approval of out-of-hours works that is established in consultation with the relevant stakeholders. Such a framework should: o include a clear rationale for the justification of both unavoidable works and managed impact works, and response strategies with EDSs to reduce noise and vibration and their impacts, so far as reasonably practicable, consistent with EPA publications 1834 and 1820.1 (as amended or replaced from time to time); o ensure that all assessments for out-of-hours works and their approval are conducted by a suitably qualified independent person, such as the Independent Environmental Auditor, who has no prior involvement in planning or delivery of the Projects and is able to make decisions free from influence or pressure related to the delivery of the Projects; and o ensure that, in respect of unavoidable works: ▪ the necessity for such works to be carried out outside of normal working hours is assessed and documented by a person with skills and expertise in risk/safety assessments; ▪ the EDSs to reduce noise and vibration are assessed and documented by a person with skills and expertise in noise and vibration control; and ▪ contingency measures will be taken to address the residual noise and vibration impacts from unavoidable works (for example respite periods or alternative accommodation) and the conditions in which they will apply.			
NV2	**Operational noise management** Noise and vibration from operation and commissioning (e.g. pumps) must be minimised as far as reasonably practicable and be within established limits as set by the Noise Limit and Assessment Protocol for the control of noise from commercial, industrial and trade premises and entertainment venues (EPA Publication 1826).	Operation	CMAs (as owners of Operations Plans)	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
Social and business				
SB1	**Community and Stakeholder Engagement Management Plan** Prior to construction (other than preparatory buildings and works), develop and implement a Community and Stakeholder Engagement Management Plan to engage and consult the community and affected stakeholders and discuss progress and timing of construction activities. The Community and Stakeholder Engagement Management Plan must include measures to: • Provide advanced notification to relevant Councils and land managers to allow communication of upcoming construction activities, their timing and duration to direct visitors away from the construction footprint where appropriate • Provide advanced notification to potentially affected stakeholders (i.e. local irrigators on Narcooyia Creek, private landowners and leaseholders) of the extent and timing of access disruptions associated with construction and commissioning activities • Establish communication protocols to provide adequate notification to the local community, stakeholders, businesses, registered recreational users of the park/forest and emergency response organisations prior to access disruptions and communicate alternate access arrangements • Notify relevant agencies (e.g. DELWP) to engage with license holders (e.g. apiary and other) to provide information on the timing of construction activities • Establish a project specific hotline to receive queries or complaints • Investigate and respond to community complaints or enquiries, as soon as practicable • Prepare incident notification and governance protocols for relevant Councils and land managers. Timing and type of notification to potentially affected stakeholders will be determined in consultation with the relevant stakeholder prior to the commencement of construction (other than preparatory buildings and works), and may be amended from time to time, subject to agreement.	Construction	Contractor	Supported
SB2	**Minimise social and business impacts – Construction** Where recreation facilities are displaced or potentially affected by access restrictions or amenity impacts, work in collaboration with land managers, relevant Councils and other relevant authorities to identify relocation opportunities with the objective to maintain the continuity of affected facilities and activities, as far as reasonably practicable.	Construction	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
SB3	**Community and Stakeholder Engagement activities - Operation** Catchment Management Authorities to continue to deliver communication and stakeholder engagement activities in accordance with Victoria's Catchment Management Authorities Community Engagement and Partnership Framework and Toolkit. Communication and engagement during the operation of the project must include: • Advanced notification to relevant Councils and land managers to allow communication of upcoming operational activities, their timing and duration to direct visitors away from inundation areas where appropriate • Advanced notification to potentially affected local irrigators on Narcooyia Creek, private landowners and leaseholders of the extent and timing of access disruptions associated with commissioning and operational activities • Advanced notification to the local community, stakeholders, businesses and registered recreational users of the park/forest and emergency response organisations prior to access disruptions and communicate alternate access arrangements • Advanced notification to relevant agencies (e.g. DELWP) so that they can engage with license holders (i.e. apiary and other) to provide information on the timing of watering events • A process to receive queries or complaints and respond to these • A protocol for how community expectations regarding potential adverse effects, in particular adverse anoxic (blackwater) events, will be managed at identified stages of inundation events. Timing and type of notification to potentially affected stakeholders will be agreed prior to the commencement of operation, and may be amended from time to time, subject to agreement	Operation	CMAs, in consultation with land manager.	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
Surface water and hydrology				
SW1	**Surface water management - Construction** The Construction Environmental Management Plan must include processes and measures to manage surface water in accordance with the relevant requirements of the *Environment Protection Act 2017*, subordinate legislation and other relevant statutory requirements and guidelines. Mitigation and management measures will be informed by the EPA Publication 1834 and must include requirements to: • Manage sediment and erosion during construction in accordance with EDS GS2 • Manage storage, handling and transport of materials in accordance with EDS CM1 for the protection of drains and waterway • Establish water quality criteria through baseline monitoring (as specified in the CEMP) to inform site specific objectives for the treatment of water prior to discharge to receiving waterways • Manage dewatering rates to prevent bank slumping • Monitor surface water quality (in accordance with the requirements set out in the CEMP) upstream and downstream from where works occur within a designated waterway* to confirm effectiveness of established controls and implement additional controls as required • Include contingency plans should flooding occur during construction to avoid spills, erosion and discharge of poor quality water to waterways. * Designated waterways are named or unnamed, permanent or seasonal, and range in size from a river to a natural depression.	Construction	Contractor	Supported

SW2	**Surface water management – Operation** In accordance with the *Water Act 1989*, operate the project within the Victorian annual environmental water management cycle and, at the local level, be guided by site specific Operating Plans developed to outline the operational arrangements including identification of overarching operating risks and mitigation measures associated with the delivery of environmental water. The Catchment Management Authority is to develop the Operating Plan in consultation with relevant stakeholders prior to the first watering event. Operation of the project to consider and seek to avoid, minimise and manage where practicable: • Adverse anoxic (blackwater) events • Excessive algal growth • Increased Carp population • Native fish stranded on the floodplain during drawdown events • Excessive erosion during filling and drawdown. This will include consideration of the following measures as appropriate: • Factor seasonal implications in the timing of filling and drawdown to reduce the likelihood of creating suitable breeding conditions for Carp and to reduce the risk of hypoxic or anoxic blackwater events. Inundation events should only occur in the warmer months when conditions are conducive to carp breeding if benefits outweigh the risks associated with Carp proliferation • Maintain throughflow during managed inundation if appropriate and possible to mitigate anoxic conditions • Assess accumulated organic material load and adjust inundation timing and extent (if larger litter loads are present then consider small inundation with maintenance of throughflow) to minimise the risk of anoxic blackwater events • Provide throughflow to replicate first flush or consider staged inundation to minimise the risk of anoxic blackwater events • Manage drawdown rates to maintain mixing and dilution in the Murray River, especially during times of low Murray River flow to reduce the negative impacts of hypoxic or anoxic discharges from the Project areas on the Murray River • Develop and test the success of a native fish exit strategy to allow native fish to migrate from the floodplain • Monitor and report on native fish strandings associated with the Projects. In the event that large numbers of high value large-bodied fish species are found to be regularly stranded on the floodplain, review and investigate the cause of the strandings. Develop and implement mitigation measures to address the strandings, which may include modifications to Project infrastructure, changes to operating arrangements, and/or capture and relocation of stranded native fish	Operation	CMAs (as preparers of Operating Plan)	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
	• Develop and test the success of a strategy to retain carp on the floodplain for the Hattah Lakes North project • Manage drawdown rates to minimise increase in velocity and shear stress downstream of regulators. Operating rules for regulator ER1 should have regard to variability in Euston Weir pool levels, which provide tailwater support for releases from regulator ER1.			
SW3	**Surface water – Monitoring** Monitor the volume, duration, frequency and surface water quality of managed environmental watering events in accordance with the Operation Environmental Management Plan to inform adaptive management (e.g. through the *Operating Arrangements for the Environmental Water Holdings of the Murray System* and the Ecological Monitoring, Evaluation and Reporting Plans).	Operation	CMA (as preparer and owner of plans)	
SW4	**Surface water – assessment of floodplain hydraulics and implications for floodplain vegetation prior to detailed design** Undertake the following hydraulic analysis to inform the floodplain vegetation assessment and the minimisation of erosion and sedimentation through design (EDS GS1) and operation (EDS GS3 and EDS SW2): • Mapping of key hydraulic parameters (depth, velocity and shear stress) for each operating scenario (including managed inundation events and comparable natural and existing flood events) at key stages of managed inundation events (including filling, holding and releasing with regulators closed and open) • 'Difference maps' should be used in conjunction with mapping of the key hydraulic parameters for each scenario to determine the locations where they key hydraulic parameters will be changed by the Projects, and the magnitude of the change. Undertake further assessment to determine implications of hydraulic effects of the Project for floodplain vegetation having regard to EVCs and vegetation depth preferences and tolerances. Outcomes of this hydraulic analysis and further assessment should be used to inform any necessary design or operational changes and an updated assessment of the overall improvements to be provided to the Secretary of Department of Energy, Environment and Climate Action under Clause 4.5.1 of the incorporated document.	Design	LMW	Supported, including additions relating to: • Consideration of the outcomes of this further analysis and report updates in relevant project approval decisions and secondary consents, including those related to native vegetation removal and the proposed alternative offset arrangement; and • Inclusion of the VMFRP (with Basin Plan) scenario included in the updated AOIB reports. Note: Clause 4.5.1 is now Clause 4.6.1 in the SIAC recommended version of the incorporated document.

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
SW5	Surface water design – regulators, containment banks and spillways The design of the regulators should ensure that suitable flow velocities are provided to enable the passage of all target species of native fish to the extent reasonably practicable. The design of the containment banks and spillways should have regard to the facilitation of turtle passage.	Design	LMW	Supported
GS1	**Minimising erosion and sedimentation through design** Design the projects having regard to soil characterisation, for example dispersive, saline, reactive and/or soft soils, with the objective of dispersing water flows and minimising water velocities to minimise the potential for erosion and sedimentation, to the extent practicable. The hydraulic assessment of floodplain and waterway erosion risks in Specialist Assessment C should be confirmed based on the velocity and shear stress mapping required by EDS SW4 to ensure that all areas with elevated erosion risks are identified. Design the Projects having regard to the hydraulic effects of the Projects on erosion risks, to minimise the potential for erosion including in the vicinity of structures and in watercourses between the Project areas and the Murray River (including Narcooyia Creek, Bonyaricall Creek and Chalka Creek). The hydraulic assessment and design should take into account the possible effects of the various operational objectives in EDS SW2 on water releases.	Design	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
GS2	**Erosion and Sediment Control Plan** The Construction Environmental Management Plan must include an Erosion and Sediment Control Plan which details measures to: • Minimise clearance of vegetation and retain existing vegetation wherever possible, particularly along drainage lines and waterways, steep slopes and areas with unstable soils • Stabilise exposed soil where applicable with the appropriate structural materials and media for the construction activities (e.g. stabilisation matting, rock armour or vegetation) • Manage vehicle movement to designated roads and access areas as detailed in the Traffic Management Plan (EDS TT2) • Erosion and sediment control measures to be maintained as appropriate following construction until the site is stabilised or vegetation is established, or as otherwise agreed with the land manager • Install sediment controls around stockpiles to contain coarse soil and sediment, as applicable to prevent sedimentation of watercourses • If required, treat dispersive or reactive soils prior to importation and use in construction.	Construction	Contractor	Supported
GS3	**Soils and landform stability** The Operation and Maintenance Plan must identify infrastructure locations (including but not limited to, regulators and containment banks) to be monitored for erosion risk. This monitoring is to inform adaptive management and/or any measures to ensure structural integrity of infrastructure. Monitoring of bank and bed erosion should be undertaken in watercourses between the Projects' areas and the Murray River (including Narcooyia Creek, Bonyaricall Creek and Chalka Creek), to inform adaptive management and any structural responses to address accelerated erosion, if required.	Operation	LMW (as owners and operators of the infrastructure)	Supported
Traffic and transport				
TT1	**Safety in road design** Undertake independent road safety audits during project development to ensure all new and upgraded access tracks meet relevant land manager or road management authority requirements with respect to transport network user safety. Implement relevant recommendations from the audit as appropriate.	Design	Contractor	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
TT2	**Traffic Management Plan** Prepare and implement a Traffic Management Plan to minimise disruption during construction in consultation with relevant road management authorities and the land manager. The Traffic Management Plan must clearly outline measures to: • Identify routes for construction haulage and construction vehicles travelling to and from the projects (including within the park(s) and outside) and identify any specific requirements for those routes • Minimise road closures, access restrictions and disruption to all road users and active users • Provide for safe construction practices in accordance with road authority requirements • Specify vehicle speed limits considering safety, noise, vibration and dust. • Provide alternative routes for affected road users and active users where practicable • Maintain property accesses during construction where practicable or provide alternative access • Maintain emergency service access (as developed in consultation with emergency services), consistent with the Fire Access Road Plan (see clause 4.10.2 of the incorporated document) • Notify affected residents and landholders of changes to traffic conditions and access to property for duration of the works • Provide a clear delineation between road and areas dedicated for construction and roads and areas available for public use (e.g through fencing, signage, etc) • Monitor weather conditions to reduce the risk of a heavy vehicle travelling into the area during poor weather conditions • Minimise the risk of vehicles getting bogged or stuck due to wet weather (including the requirement for recovery equipment to be on site) • Provide adequate access to heavy vehicles (including adequate vegetation clearance from vehicles) • Determine whether any pavement damage has occurred due to construction activity (including the requirement for pre and post construction road pavement reports.	Construction	Contractor	Supported
TT3	**Safety during operation – recovery equipment** The Operations and Maintenance Plan must detail the requirement for all maintenance vehicles associated with the operation of the projects to have recovery equipment on-board in order to recover any vehicles that are bogged or stuck and blocking access.	Operation	LMW (as preparer of O&M Plan)	Supported

#	Environmental Delivery Standard	Project phase	Responsibility	Minister's response and recommendation
TT4	**Safety during operation – signage** During operation, the land manager is to provide: • advisory signage on closed or inaccessible tracks • public advice regarding changes in-park/forest conditions (eg. via websites).	Operation	Parks Victoria (as Land manager)	Supported
TT5	**Track maintenance program** Land managers to continue implementing a track maintenance program (according to regional priorities) to facilitate continued safe access for park users and emergency services, consistent with the Fire Access Road Plan (see clause 4.10.2 of the incorporated document).	Operation	Parks Victoria (as Land manager)	Supported, with correction to refer to clause 4.11.2 as presented in Appendix F of the SIAC report.