Bussell Highway Duplication Stage 2 - Hutton to Sabina EPBC 2020/8800

Vasse-Wonnerup System Environmental Management Plan

November 2022

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D20#1141406
November 2022

EXECUTIVE SUMMARY

Bussell Highway Duplication Stage 2 Hutton to Sabina Proposal

Main Roads Western Australia (Main Roads) is proposing to construct and operate the Bussell Highway Duplication Stage 2 Hutton to Sabina Proposal (the Bussell Highway Duplication).

To provide dual carriageway access along the entire 46 km portion of the highway between Bunbury and Busselton, Main Roads is planning to construct a second carriageway along the existing two-lane single carriageway section. The Bussell Highway Duplication will be undertaken in two stages with Stage 1, comprising a 5.55 km distance between Capel and Hutton Road, already under construction.

The Proposal comprises Stage 2, which involves the construction of the remaining 12.8 kilometre (km) two-lane carriageway (southbound) to duplicate the existing carriageway effectively between Hutton Road and the Sabina River bridge and other road infrastructure, including but not limited to bridges, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs.

The Proposal occurs within the City of Busselton and Shire of Capel. Construction of the Proposal is anticipated to commence in June 2021 and continue for a period of up to approximately three years.

The Proposal development envelope, describing the maximum extent of potential disturbance, is 128 hectares (ha). Within this envelope, a proposed Clearing area, containing 27.3 ha of mixed native, non-native and regrowth vegetation, was defined based on the current road design.

Proposal design has sought to minimise the required clearing through the use of existing cleared areas where possible. Approximately 83% of the development envelope comprises cleared land.

The Proposal was formally referred to the Department of Agriculture, Water and the Environment (DAWE) on 1 October 2020 (EPBC number 2020/8800) as a potential Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* due to impacts on Matters of Nation Environmental Significance.

DAWE provided advice on 12 November 2020 that the Proposal is considered a Controlled Action and that it would be assessed by Preliminary Documentation (DAWE, 2020).

Purpose of this EMP

This EMP sets out the environmental management actions proposed to manage, monitor and mitigate the direct and potential indirect impacts of the Proposal on the Vasse-Wonnerup wetland system Ramsar site (Vasse-Wonnerup System).

This EMP comprises a revision of the version approved by DAWE on 30 June 2021. Amendments made to this EMP relate to minor design changes for bridges that pass over Abba and Ludlow River, which are upstream of the Vasse- Wonnerup System, see Section 5.3.2.

This EMP has been prepared consistent with the *Environmental Management Plan Guidelines* (Department of the Environment (2014)).

Environmental management and monitoring

As outlined within this EMP, the key environmental management and monitoring actions for the Proposal are identified in Table E-1.

Table E-1 Environmental management measures

Timing	Management Actions	Performance Target
Prior to construction	• As part of the contractor's CEMP, development of a Hygiene Management Plan to prevent the spread of dieback and weeds to adjacent vegetation. The CEMP will include procedures such as machinery/vehicle clean down, weed treatments and restrictions on vehicle/machinery movements • As part of the contractor's CEMP, development of a Fire Management Plan	• No indirect impacts to the Vasse-Wonnerup System
During construction	• Contractor induction will include familiarisation with and discussion of the Vasse-Wonnerup System, riparian vegetation and hygiene management • Long-term hydrocarbon storage (i.e. hydrocarbons which shall not be used that day or not stored within equipment waiting to be used) or re-fuelling of equipment (with the exception of stationary plant) will not be permitted within 100 m of riparian vegetation • The Construction Contractor will prepare a Spill Response Procedure for oil, chemical or hazardous material spill events to ensure any spill is contained effectively and cleaned up appropriately and efficiently with approved materials • Implement standard construction drainage management as detailed under Main Roads Specification 204 • As part of the contractor's CEMP, the construction contractor will prepare a Fire Management Plan to minimise risk of ignition from construction activities and effectively manage any resulting fire/wildfire • All Department of Fire and Emergency Services (DFES) and Local Government Authority (LGA) restrictions on fire and machinery movement will be strictly adhered to	• No indirect impacts to the Vasse-Wonnerup System
Post construction	• Not applicable (monitoring and as-needed corrective action activities only)	• Not applicable

GLOSSARY OF TERMS

Defined Terms	
Term	**Definitions**
Main Roads	Main Roads Western Australia
Proposal	Main Roads proposes to construct the Bussell Highway Duplication Hutton to Sabina Stage 2, in the South West Region of Western Australia (WA) (referred to as the Proposal)
Proposal Area/Development Envelope	The Proposal Area, also referred to as the Development Envelope, is located within the City of Busselton and Shire of Capel. It extends along the existing Bussell highway carriageway for approximately 12.8 km between Hutton Road and the Sabina River. The Proposal Area covers 128 hectares (ha) and includes the existing road reserve, portions of which contain native vegetation.
Site	The Vasse-Wonnerup wetland system Ramsar site
Standard construction management	Measures that have been applied successfully to other large scale projects that are considered appropriate in minimising the environmental impacts. These measures ensure that clearing is implemented properly, that erosion does not occur, and that spills are minimised and managed appropriately
Acronyms	
ANZECC	Australian and New Zealand Environment and Conservation Council
BC Act	*Biodiversity Conservation Act 2016*
CCW	Conservation Category Wetland
CEMP	Construction environmental management plan
DAWE	Department of Agriculture, Water and the Environment
DPaW	Department of Parks and Wildlife
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
MNES	Matters of National Environmental Significance
WA	Western Australia

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APPENDICES

Amendments

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Senior Environment Officer	Draft v1	11/12/2020
Reviewer:	Senior Environment Officer	Draft v2	13/01/2021
Author:	Senior Environment Officer	Rev 0	19/01/2021
Reviewer:	Senior Environment Officer	Rev 0	19/01/2021
Author:	Senior Environment Officer	Rev 1	18/11/2021
Reviewer:	Senior Environment Officer	Rev 1	18/11/2021
Author:	Environment Officer	Rev 2	15/12/2021
Reviewer:	Senior Environment Officer	Rev 2	15/12/2021
Author:	Environment Officer	Rev 3	23/11/2022
Reviewer	Senior Environment Officer	Rev 3	23/11/2022

COVER PAGE AND DECLARATION OF ACCURACY

- **EPBC number**: 2020/8800
- **Project name**: Bussell Highway Duplication Hutton to Sabina Stage 2
- **Environmental management plan title**: Bussell Highway Duplication Hutton to Sabina Stage 2 Vasse-Wonnerup System Environmental Management Plan
- **Proponent / approval holder and ACN or ABN**: Main Roads Western Australia, ABN 50860676021
- **Proposed / approved action**: Construction and operation of Bussell Highway Duplication Proposal Stage 2
- **Location of the action**: Bussell Highway between Hutton Road and the Sabina River, within the Shire of Capel and City of Busselton
- **Date of preparation of the action management plan**: January 2021
- **Person accepting responsibility for the action management plan**: Martine Scheltema, Manager Environment, Main Roads Western Australia

Declaration of accuracy

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct. I am duly authorised to sign this declaration on behalf of the proponent / approval holder. I am aware that:

a) giving false or misleading information is a serious offence under section 137. 1 of the Criminal Code Act 1995 (Cth)

b) section 137.2 of the Criminal Code Act 1995 (Cth) makes it an offence for a person to produce a document to another person in compliance or purported compliance with a law of the Commonwealth where the person knows that the document is false or misleading;

c) section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading; and

d) section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (EPBC Regulations) where the person knows the information or document is false or misleading.

Signed: Martine Scheltema

Full name: Martine Scheltema, Manager Environment

Organisation: Main Roads Western Australia (ABN 50 860 676 021)

Date 23/11/22

Election to have an action management plan approved

Note: Pursuant to section 132B of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), this election must be given to the Minister before the Minister grants an approval of the proposed action under section 133 of the EPBC Act.

Person Proposing to Take Action

Name and Title:	Martine Scheltema, Manager Environment
Organisation:	Main Roads Western Australia
EPBC Referral Number:	EPBC 2020/8800
ACN/ABN:	ABN 50860676021
Postal Address:	PO Box 6202 EAST PERTH WA 6002
Telephone:	138 138
Email:	enquiries@mainroads.wa.gov.au

☑ I elect to submit an action management plan(s) for approval in accordance with section 132B of the Environment Protection and Biodiversity Conservation Act 1999. I understand that a fee of $2,690 may apply under the cost recovery arrangements.

Declaration:

☑ I declare that to the best of my knowledge the information I have given on this form is complete, current and correct.

☑ I understand that giving false or misleading information is a serious offence.

Signed: Martine Scheltema

Full name: Martine Scheltema, Manager Environment

Organisation: Main Roads Western Australia (ABN 50 860 676 021)

Date 23/11/22

1 PROPOSAL DESCRIPTION

1.1 Bussell Highway Duplication Stage 2 Hutton to Sabina Proposal

Main Roads Western Australia (Main Roads) is proposing to construct and operate the Bussell Highway Duplication Stage 2 Hutton to Sabina Proposal (the Bussell Highway Duplication).

To provide dual carriageway access along the entire 46 km portion of the highway between Bunbury and Busselton, Main Roads is planning to construct a second carriageway along the existing two-lane single carriageway section. The Bussell Highway Duplication will be undertaken in two stages with Stage 1, comprising a 5.55 km distance between Capel and Hutton Road, already under construction.

The Proposal comprises Stage 2, which involves the construction of the remaining 12.8 kilometre (km) two-lane carriageway (southbound) to duplicate the existing carriageway effectively between Hutton Road and the Sabina River bridge (Figure 1, Appendix A) and other road infrastructure, including but not limited to bridges, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs. The new carriageway will lie approximately 25 m east, south or south east of the existing carriageway.

The Proposal will upgrade this section of Bussell Highway to a four-lane highway with lane widths of 3.5 m across the two lanes. The left shoulder width is to be 2.5 m and will be fully sealed. The right shoulder width is to be 1.5 m fully sealed. The total median width from edge to edge is to be a minimum of 27 m with a target width of 31 m.

The Proposal occurs within the City of Busselton and Shire of Capel. Construction of the Proposal is anticipated to commence in June 2021 and continue for a period of up to approximately three years.

The Proposal development envelope, describing the maximum extent of potential disturbance, is 128 hectares (ha). Within this envelope, a proposed Clearing area, containing 27.3 ha of mixed native, non-native and regrowth vegetation, was defined based on the current road design.

The Proposal design will minimise the required clearing through the use of existing cleared areas where possible. Approximately 83% of the development envelope comprises cleared land.

1.2 Environmental assessment and management

The Proposal was formally referred to the Department of Agriculture, Water and the Environment (DAWE) on 1 October 2020 (EPBC number 2020/8800) as a potential Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to impacts on Matters of Nation Environmental Significance (MNES).

DAWE provided advice on 12 November 2020 that the Proposal is considered a Controlled Action and that it would be assessed by Preliminary Documentation (DAWE, 2020).

This Environmental Management Plan (EMP) has been prepared to support the documentation prepared to address the DAWE request for further information. The DAWE request identified a requirement for Main Roads to detail the proposed management measures relating to potential impacts on the Ramsar-listed Vasse-Wonnerup wetland system (Vasse-Wonnerup System).

This EMP sets out the environmental management actions to manage, monitor and mitigate the direct and potential indirect impacts of the Proposal on the Vasse-Wonnerup System.

This EMP has been prepared consistent with the *Environmental Management Plan Guidelines* (Department of the Environment (DotE) (2014)).

1.3 Vasse-Wonnerup System

1.3.1 Description

The following description is taken form the Australian Wetlands Database (DAWE, 2020).

The Vasse-Wonnerup System is situated in the Perth Basin, south-western Western Australia (Figure 2, Appendix A). It is an extensive, shallow, nutrient-enriched wetland system of highly varied salinities. Large areas of the wetland dry out in late summer.

The site is located on a narrow, flat plain separated from the ocean by a narrow system of low dunes. The system is comprised of two former estuaries - the Vasse and Wonnerup Lagoons, with inflows of seawater managed by floodgates (weirs) since early 1900s. Water in the Vasse-Wonnerup System is fresh in winter and becomes saline in summer due to leakage past the floodgates and, since 1988, some seawater being allowed to enter.

Vasse-Wonnerup System is fringed by samphire and rushes with some melaleuca woodlands on higher ground. The Tuart Forest National Park component of the site is dominated by open-forest of mature Tuart trees and Western Australian Peppermint trees.

The Vasse-Wonnerup System supports tens of thousands of resident and migrant waterbirds of a wide variety of species. More than 80 species of waterbird have been recorded in the System such as Red-necked Avocets and Black-winged Stilts, Wood Sandpiper, Sharp-tailed Sandpiper, Long-toed Stint, Curlew Sandpiper and Common Greenshank. Thirteen waterbird species are also known to breed at the Ramsar site, including the largest regular breeding colony of Black Swans in south-western Australia.

The Sabina and Abba Rivers of the Ramsar site are important indigenous cultural heritage sites and the Ramsar site would have traditionally been used by indigenous people of the area.

The Ramsar site is used mostly for conservation, nature-based activities, residential areas, farming and tourism. The site is used as a compensating basin for discharge from four rivers; the Vasse, Abba, Sabina and Ludlow Rivers (DPaW, 2014a).

1.3.2 Conservation status

The Vasse-Wonnerup System Ramsar site was designated on 7 June 1990 (DPaW, 2014a). As a Ramsar site, the System is considered MNES and is protected under the EPBC Act. Large expanses of the System are also mapped as Conservation Category Wetlands (CCW) (GoWA, 2020a), which are protected at the state level as declared Environmentally Sensitive Areas (ESA) (GoWA, 2005).

The Ramsar site covers an area of 1,109 ha. The boundary includes part of Crown Reserve 31188 known as Sabina Nature Reserve, the majority of Nature Reserve 41568 and the part of Crown Reserve 40250 known as Tuart Forest National Park west of Tuart Drive Ludlow. Various parcels of Unallocated Crown Land are also included. It includes parts of the Sabina River and a length of the Abba River. All road reserves are excluded from the Ramsar site (DPaW, 2014a). The Tuart Forest National Park and various Nature Reserves were added to the site in 2001. These contribute substantially to the conservation values of the site by providing protected buffer zones for wetlands (DPaW, 2014).

The System meets two of the nine Ramsar criteria:

- Criterion 5: *A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds***.**

  More than 33,000 waterbirds have been counted at the Vasse-Wonnerup System. Waterbird data indicate that more than 20,000 waterbirds use the Ramsar site each year, suggesting

that the wetland regularly supports 20,000 waterfowl. This includes species such as Red-necked Avocets and Black-winged Stilts, Wood Sandpiper, Sharp-tailed Sandpiper, Long-toed Stint, Curlew Sandpiper and Common Greenshank.

- Criterion 6: *A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.*

  At least 1% of the Australian population of Black-winged Stilt and at least 1% of the world population of Red-necked Avocet use Vasse-Wonnerup System in most years.

The site supports the largest regular breeding colony of Black Swan (*Cygnus atratus*) in southwestern Australia. More than 150 pairs of swans nest in most years and breeding is often successful.

The site's migratory shorebirds are listed under the Japan–Australia Migratory Bird Agreement (JAMBA), the China–Australia Migratory Bird Agreement (CAMBA), the Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA), Convention on the Conservation of Migratory Species of Wild Animals (Bonn) and are specially protected under the EPBC Act.

There are no nationally rare, threatened or endemic wetland plants known at the site. Problematic invasive plants including Bulrush *Typha orientalis* and Arum Lily *Zantedeschia aethiopica* are established in and around the Sabina and Abba Rivers.

2 OBJECTIVES

2.1 Purpose

This EMP has been developed to support documentation prepared to address the DAWE request of 12 November 2020 for further information for assessment of the Proposal (DAWE, 2020).

This EMP sets out the environmental management actions proposed to manage, monitor and mitigate the direct and potential indirect impacts of the Proposal on the Vasse-Wonnerup System. It has been prepared consistent with the guidance documentation detailed in Section 1.2.

2.2 Objectives

This EMP has been prepared to ensure the impacts of the Proposal to the Vasse-Wonnerup System are acceptable, minimised and managed. It is a 'management-based' EMP to document management actions required during Proposal implementation and operation. Management measures within this EMP include both standard measures and those developed specific to the Proposal.

The following management objective has been identified: To construct and operate the Proposal to avoid and minimise impacts to the Vasse-Wonnerup System.

3 ENVIRONMENTAL MANAGEMENT ROLES AND RESPONSIBILITIES

This EMP identifies the environmental management of activities to be undertaken by Main Roads during the implementation of the Proposal. Main Roads acknowledges that the environmental management actions contained within this EMP are legal requirements to be met by Main Roads.

The Manager Environment at Main Roads will maintain responsibility for implementation of the management actions outlined within this EMP, on behalf of Main Roads' Managing Director. Management actions may be undertaken by employees and / or contractors of Main Roads on behalf of the Managing Director.

Where management actions are undertaken by employees and / or contractors of Main Roads, these will be communicated and documented to the relevant personnel through relevant environmental training (refer to Section 4.2).

4 REPORTING AND ACCOUNTABILITY

4.1 Reporting

Main Roads will report to DAWE on the implementation of this EMP as part of annual compliance reporting under the conditions of approval for the Proposal.

Where compliance audits undertaken by Main Roads identify that the environmental management actions and / or the environmental objectives are not being achieved (i.e. non-compliance or an environmental incident), Main Roads will notify DAWE as soon as reasonably practicable. Consistent with standard document control procedures, Main Roads will maintain copies of all reports submitted to DAWE.

The reporting requirements for this EMP are identified in Table 4-1. A template for the annual compliance report is included in Appendix B.

Table 4-1 Reporting requirements

Aspect	Report From	Report To	Reporting Frequency
Implementation of EMP	Manager Environment	DAWE	Annually (as part of annual compliance reporting)
Non-compliance with EMP or Environmental Incident	Manager Environment	DAWE	As soon as reasonably practicable but not more than seven days

The format and content of annual reporting will be in accordance with the requirements of the annual reporting conditions. The format and content of reporting of a non-compliance event or an environmental incident will be subject to the nature of the non-compliance / incident and will include all requested information from DAWE. In consideration of this, specific templates for reporting these are not provided as part of this EMP.

4.2 Environmental training

Main Roads will ensure that all personnel undertaking works for the Proposal, including visitors, have undertaken a site induction training program, or are escorted to the site. Main Roads will evaluate all personnel undertaking the site induction training program through a written test to ensure that all personnel have an understanding of the environmental requirements for the Proposal.

Where it is identified that personnel have not undertaken the works in accordance with the environmental requirements for the Proposal, Main Roads will require such personnel to repeat the site induction training program.

The general content of the site induction training program for the Proposal is outlined in Table 4-2.

Table 4-2 Site induction training program content

Aspect	Site Induction Training Program Content
Site induction training program	Awareness of Main Roads' Environmental Policy
	Identification of the environmental values in the area of the Proposal
	Identification of key environmental risks associated with the Proposal, and the identification of management requirements to control such risks
	Roles and responsibilities of all personnel in the protection and management of the environment, including identification of key personnel that have specific roles or responsibilities
	Awareness of importance of compliance with the environmental requirements (including penalties for non-conformance with the environmental requirements)

Aspect	Site Induction Training Program Content
	Pegging of the area of works, and other pegging types (for example, trees to be retained)
	Clearing of native vegetation and management of topsoil
	Hygiene procedures for *Phytophthora* Dieback management and weed management
	Appropriate disposal of wastes
	Environmental incidents, including the requirements for management and reporting
	The environmental benefits of improved personal performance

4.3 Emergency contacts and procedures

Emergency contact details will be signposted at appropriate locations within the Proposal Area, to enable immediate contact and response in the event of an emergency/environmental incident observed by Main Roads' personnel, contractors or the public.

Emergency response procedures will be followed in the event of an emergency/environmental incident.

Main Roads' general and emergency contacts for the Proposal are provided in Table 4-3.

Table 4-3 Emergency contact details

Aspect	Contact Details
General contact	• Main Roads Head Office Address: Don Aitken Centre, Waterloo Crescent, EAST PERTH WA 6004 Mail: PO Box 6202, EAST PERTH WA 6002 Email: enquiries@mainroads.wa.gov.au Phone: 138 138 • Main Roads South West Region Address: Robertson Drive, BUNBURY WA 6231 Mail: PO Box 5010, EAST PERTH WA 6231 Email: enquiries@mainroads.wa.gov.au Phone: 138 138 / (08) 9724 5600
Emergency contact	• Manager Environment, Main Roads Email: Martine.Scheltema@mainroads.wa.gov.au Phone: (08) 9323 4614 • Regional Manager, Main Roads South West Region Email: robert.barnsley@mainroads.wa.gov.au Phone: (08) 9724 5600

5 POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

Main Roads considers that the environmental impacts associated with the construction and operation of Proposal on the Vasse-Wonnerup System are minor, temporary, readily managed. The type of work involved in constructing the bridges over the Ludlow, Abba and Sabina Rivers is work that Main Roads undertakes regularly and well. The agency is responsible for all road bridges within the state and, within the last five years, has successfully managed the construction of new bridge crossings such as the Matagarup Bridge in the Swan River and the replacement of Bow River, Greenough River, Fortescue River, Phillips River, Collie River and Mandurah Bridges.

5.1 Threats to the Vasse-Wonnerup System

The Ecological Character Description prepared for the Vasse-Wonnerup System (Wetland Research & Management, 2007) lists the following four key threats to the System:

- Hyper-eutrophication
- Urban and industrial development
  - increased use of pesticides, herbicides, heavy metals and oils,
  - physical and noise disturbance of waterbirds.
- Changes to the hydrology
  - climate change and rising seawater levels, reduced rainfall and reduced surface/groundwater flows,
  - abstraction from aquifers.
- Acid sulphate soils (ASS).

Past management of water levels in the system has been largely satisfactory for waterbirds (DPaW, 2014a).

With respect to the Proposal, DAWE (2020) note that "…potential impacts are considered most likely to arise through altered hydrological regimes and run-off water contamination (sediment, hydrocarbon spills, etc) that enter the Ludlow, Abba and Sabina Rivers that flow into the Vasse-Wonnerup Ramsar wetland".

A complete assessment of the potential impacts of the Proposal to the Vasse-Wonnerup System is contained within *Bussell Highway Duplication Stage 2 Hutton to Sabina Additional Information for Preliminary Documentation* (Main Roads, 2020).

5.2 Assumptions and uncertainties

This EMP has been prepared on the basis of information provided in the environmental surveys for the Proposal (Table 5-1), and based upon knowledge of Main Roads' construction and operation of similar linear infrastructure works.

Table 5-1 Environmental and geotechnical surveys relevant to this EMP

Survey/Report Name	Location/Extent of Survey	Methodology
Bridge 1763 - Bussell Highway Over Sabina River Geotechnical Factual, Interpretive and Design Report (AECOM, 2016a)	Survey conducted over the Sabina River bridge site	Geotechnical field survey and laboratory analysis of samples
Bridge 1762 - Bussell Highway Over Abba River Geotechnical Factual,	Survey conducted over the Abba River bridge site	Geotechnical field survey and laboratory analysis of samples

Survey/Report Name	Location/Extent of Survey	Methodology
Interpretive and Design Report (AECOM, 2016b)		
Bridge 1761 - Bussell Highway over Ludlow River Geotechnical Factual, Interpretive and Design Report (AECOM, 2016c)	Survey conducted over the Ludlow River bridge site	Geotechnical field survey and laboratory analysis of samples
Geotechnical Investigation. Duplication of Bussell Highway Hutton Road to Sabina River (WML, 2017)	Survey along the proposed centreline of the new alignment (35m offset from the existing edgeline)	Geotechnical field survey and laboratory analysis of samples
Detailed and Targeted Flora and Vegetation Survey along Bussell Highway, Hutton Road to Sabina River (Ecoedge, 2020b)	Flora and vegetation survey conducted over ~72.4 ha to identify vegetation types and vegetation condition for the Proposal	Detailed and targeted field surveys conducted between spring 2013 and spring/summer 2020 in accordance with relevant State and Commonwealth survey guidelines
Targeted Vegetation Survey of Threatened and Priority Ecological Communities Hutton Road to Sabina River, Capel	Targeted TEC/PEC survey conducted over ~72.4 ha to confirm TEC/PEC presence within the Proposal Area	Targeted survey conducted in November and December 2020 in accordance with relevant State and Commonwealth survey guidelines

The key assumptions and uncertainties relevant to the Proposal and the Vasse-Wonnerup System are:

- Environmental survey reports have not been independently verified. These surveys were undertaken by suitably qualified individuals experienced in flora, vegetation, and fauna ecology and in geotechnical survey are therefore assumed to have accurately recorded site conditions and characteristics; and
- The Proposal may have the potential for indirect impacts to the Vasse-Wonnerup System.

More information on the key assumptions and uncertainties are provided in the appendices of Main Roads (2020).

5.3 Potential impacts

The proposed Clearing area intersects three waterways, the Sabina, Abba and Ludlow Rivers. These rivers flow into the Vasse-Wonnerup System when flowing (generally in the wetter months), which is located approximately 700 m north of the development envelope at its nearest point (the Tuart Forest National Park component of the System), with the wetlands themselves approximately 1.5 km separation distance at the nearest point (Ecoedge, 2020a).

No known adverse impacts have been recorded on the Vasse-Wonnerup System as a result of the construction and operation of the existing carriageway. The new carriageway will be similar in scale and nature to the existing carriageway, with the new carriageway located further away from the wetland.

As outlined in Main Roads (2020), implementation of the Proposal will result in clearing of up to 27.3 ha of mixed native and non-native vegetation. Of this, approximately 0.26 ha is riparian vegetation associated with the Sabina, Abba and Ludlow rivers (Figure 2).

5.3.1 Direct impacts

Due to the relatively small scale and long narrow footprint of clearing and earthworks required for the Proposal, and the substantial separation distance of the development envelope to the Vasse-Wonnerup System, no direct impacts to the System are expected to result from Proposal implementation.

5.3.2 Indirect impacts

Potential indirect impacts resulting from the Proposal are expected to be limited to run-off water contamination (sediment and hydrocarbon spills), exposure of ASS and bushfires generated as a result of Proposal construction. Impacts to the Vasse-Wonnerup System from changes to hydrological regimes are not expected.

Changes to hydrological regimes

Land within the development envelope generally falls to the north west and is drained by the Ludlow, Abba and Sabina rivers into the System and adjacent wetlands. Except on the higher Bassendean dunes and deep sand mine site rehabilitation, the flat terrain and high water table causes the area to be prone to flooding and waterlogging in winter (WML, 2017).

Groundwater was present during the April 2016 geotechnical investigation in a number of boreholes, typically 2-3 m below the surface. These levels were monitored with temporary monitoring wells that were installed over the route. At time of the survey, the groundwater would still have been near its seasonal low. The majority of the drains contain flowing water throughout winter resulting in groundwater typically within 1 m of the surface (WML, 2016).

Works in areas prone to flooding and waterlogging in winter will be delayed to the summer months to allow the groundwater to recede. This will allow for effective site remediation, services and culvert installation. However, some localised areas may still require temporary dewatering in summer.

Dewatering for Proposal construction will be of a minor scale and short duration. Temporary dewatering will be required during bridge construction, which is intended to be undertaken during summer/autumn months when water levels and flows are low. As all three river systems are ephemeral, an impact to flows from these rivers into the System as a result of dewatering activities at this time of year is not expected. In regard to localised dewatering that may be required at other non-bridge sites, due to the substantial separation distance (>1 km) of the development envelope to the wetland, impacts from these dewatering activities are not expected. Impacts to the System from changes to hydrological regimes are not expected to result from implementation of the Proposal.

Monitoring for localised dewatering impacts will be conducted where remnant native vegetation remains adjacent to dewatering sites, including at the three bridge sites. Monitoring will comprise of monthly plant health/stress assessments during and for three months post- dewatering activities. Should an impact be observed that is attributable to the dewatering activity, dewatering will ceased until appropriate mitigation measures can be implemented.

Run-off water contamination

Construction

If not managed properly, construction works may have the potential to release sediment into riparian areas via run-off from cleared construction areas or during bridge construction works. Given the distances involved and the scale and nature of the work, there is a very low likelihood that this would in turn impact the Vasse-Wonnerup System.

The Proposal requires the duplication of the existing carriageway following the alignment of and immediately adjacent to the existing carriageway. The new carriageway will lie approximately 25 m upstream of the existing carriageway, which is the side of the existing carriageway furthest from the Vasse-Wonnerup System.

The Proposal will maintain the existing drainage regime through standard engineering design with no change to water flows. Proposal design incorporates table drains and flat-bottomed swale drains to facilitate infiltration of surface water runoff at source. Where culverts exist on the existing alignment, these will be duplicated on the new carriageway to maintain existing flow paths.

The Proposal will require the construction of a bridge at each river crossing. The original approved version of this EMP unnecessarily prescribed that all three river crossings would comprise clear span bridges. Although one of the three bridges (Sabina River) is proposed to be clear span, Main Roads intends to be consistent with the bridge design principles employed at the other two (Abba and Ludlow Rivers) bridges and incorporate piers within the design. The existing downstream Abba and Ludlow bridges currently consist of 24 and 30 piers respectively, with the proposed Abba and Ludlow bridges to each consist of 3 piers. This minor change is not anticipated to alter the hydrological regimes of the Ludlow or Abba Rivers. A memorandum "*Assessment of the Significance of Impact – Bussell Hwy Duplication Bridge Design*" is presented as Appendix C.

To ensure sedimentation of the Abba and Ludlow Rivers is not exacerbated by the new bridges, for each crossing point, the river channel will be widened to reduce the velocity of the stream flow during high flow events. The approximate current and proposed widths of the base of each river channel is presented in Table 5-2.

Table 5-2 Approximate current and proposed river channel widths

River	Current width of channel base	Proposed width of channel base
Abba	3 m	21.3 m
Ludlow	10 m	29.3 m
Sabina	3.2 m	18.8 m

Both the channel and embankments at each location, and immediately upstream and downstream of the bridge crossings, will be armoured with rock protection to further prevent scouring and the release of sediment.

By replicating the current bridge design principles and employing channel widening and rock armouring, no change in hydrological regimes in the rivers that are upstream of the Vasse-Wonnerup System is expected. As outlined in Section 5.3, it is important to note that the wetland components of the Vasse-Wonnerup System are located downstream approximately 1.5 km from the Proposal, further reducing the potential for an impact occurring.

As the approved Proposal was not expected to have a detectible impact on the Vasse-Wonnerup System, and the minor amendment to the bridge designs is not expected to alter the expected hydrological regimes (nor sedimentation loads) within each river, the proposed minor bridge design changes are not expected to change the likelihood or consequence of any potential impact on the Vasse-Wonnerup System.

It is intended that construction of bridge foundations (abutments and rock pitching) will be undertaken during summer/autumn months, when water levels and flows are low. Silt curtains will be installed where required during bridge construction to minimise the risk of sedimentation. Hydrocarbon booms will be used down gradient of works to contain and enable mitigation of any potential spills during construction.

The Proposal will require the storage and use of common hazardous materials (e.g. vehicle fuels and oils, bitumen) required for road construction works. In accordance with standard operational controls, all hazardous materials will be stored and used in accordance with the relevant Materials Safety Data Sheet. Neither hydrocarbon storage nor the installation of re-fuelling equipment will occur within 100 m of the Sabina, Abba or Ludlow Rivers.

Rainfall events (1 year ARI) have the potential to mobilise spilled or leaked contaminants such as hydrocarbons and mobilise loose topsoil and sand disturbed during construction. The contamination of surface or underground water will be prevented through the best practice storage of hazardous materials and bunding of hydrocarbon storage and re-fuelling areas to prevent contaminated runoff. Mobilisation of suspended solids during frequent rainfall events will be managed via the implementation of best management practice techniques including:

- Incorporation of stormwater management measures into road design such as temporary detention storages, drop structures and rock lined/pitched drainage channels; and
- Implementation of temporary drainage infrastructure during construction to promote sediment fall out and prevent erosion.

No impacts to surface or groundwater are expected to result from the use of hazardous substances during construction of the Proposal.

Operation

Via the construction of a second carriageway, the Proposal will double the area over which the existing traffic travels. The new carriageway will lie approximately 25 m east, south or south east of the existing carriageway, which is the side of the existing carriageway furthest from the Vasse-Wonnerup System.

Existing road drainage infrastructure will also be duplicated for the second carriageway, which will improve drainage along this section of the highway, resulting in greater opportunity for at-source infiltration and less likelihood of overland flow. Drainage for the Proposal will be managed through standard engineering design to ensure no change to local drainage water flows.

Under current conditions, traffic along the existing single carriageway is high-volume, often congested and does not free-flow. Duplication of the existing carriageway will reduce traffic congestion, allowing for more consistent cruising conditions and free-flowing traffic. This will result in a corresponding reduction in the quantum and concentration of motor vehicle emissions and pollutants potentially ending up in roadside drains.

Bridge design will ensure drainage from the bridge surface to the roadside table drains. In high rainfall events, overland flows into the rivers may occur, as occurs along the existing Bussell Highway. The quantum of this potential impact is not expected to increase as a result of Proposal implementation and may in fact decrease due to the decreased concentration of contaminants.

Acid Sulphate Soils

Mapping of Acid Sulphate Soils (ASS) Risk on the Swan Coastal Plain indicates that there is a 'high to moderate risk of ASS occurring within 3 m of natural soil's surface' in areas where the development envelope intersects the foreshore and banks of the Ludlow, Sabina and Abba Rivers. All remaining areas of the development envelope are mapped as 'moderate to low risk of ASS occurring within 3 m of natural soil's surface'.

The existing highway and proposed alignment of the second carriageway generally follow the Bassendean Sand ridge that has been mined and rehabilitated. There are also small 'marsh' areas

comprising Peaty Clay (Cps1) - dark grey and soft, variable organic content, variable quartz sand content, of lacustrine origin dark grey and soft, variable organic (WML, 2017).

Based on the test results from the investigation (WML, 2017; AECOM, 2016a; 2016b; 2016c), ASS is present at four sites along the development envelope, being at the bridge sites crossing each of the three rivers and one (site CH35230) near the intersection with the Eros Creek crossing.

An ASS Management Plan detailing soil management procedures to be undertaken during bridge and embankment construction works will be prepared as part of the contractor's CEMP. ASS remediation measures will be undertaken should any excavation be required at the known ASS locations. It is likely that ASS management options will be limited to either on-site treatment (lime neutralisation) of cuttings prior to re-use or removal of cuttings off-site (within 18 hours) to a licenced soil treatment facility.

ASS is commonly and successfully managed for many road projects that occur on the Swan Coastal Plain. The implementation of the ASS Management Plan will ensure no adverse impacts occur as a result of ASS.

Weeds and *Phytophthora* dieback

Arum Lily (*Zantedeschia aethiopica*), which is a Declared pest plant under the *Biosecurity and Agriculture Management Act 2007* is established in and around the Sabina and Abba Rivers. Should individuals of this species be present within the development envelope near to these or the Ludlow rivers during construction, they will be controlled. This management action will be included in the Proposal Hygiene Management Plan.

5.4 Risk assessment

DotE (2014) identifies a requirement for a risk assessment to assess the likelihood and consequence of each potential impact in order to ensure that risks are translated into controls, mitigation and management actions.

Main Roads applies a standard risk assessment matrix to its operations, whereby the 'likelihood' and 'consequence' of events is considered, with monitoring and management actions identified to control the level of risk.

Main Roads has completed a risk assessment in preparation of this EMP. The likelihood and consequence assessment, with the resulting 'risk outcome', have been based upon the residual risk levels after management and monitoring activities are implemented. The assessment has applied the definitions for both likelihood and consequence as prescribed within DotE (2014).

The outcome of the risk assessment for the Vasse-Wonnerup System is shown in Table 5-3.

Table 5-3 Risk assessment

Objective: To construct and operate the Proposal to avoid and minimise impacts to the Vasse-Wonnerup System. Key Environmental Values: The Vasse-Wonnerup System Ramsar site				
Environmental Objective	**Risk**	**Post Control Risk Assessment**	**Management**	**Monitoring**
Minimise impacts to the Vasse-Wonnerup System	Hydrocarbon spill near the Sabina, Abba or Ludlow rivers during construction	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	Management required during construction for risk of impact to Sabina, Abba and Ludlow rivers	Monitoring of hydrocarbon use and storage during construction Monitoring of water quality in the case of a spill

Objective: To construct and operate the Proposal to avoid and minimise impacts to the Vasse-Wonnerup System. Key Environmental Values: The Vasse-Wonnerup System Ramsar site				
Environmental Objective	**Risk**	**Post Control Risk Assessment**	**Management**	**Monitoring**
	Erosion or sedimentation as a result of construction that impacts the Sabina, Abba or Ludlow rivers	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	Standard construction management to control erosion and sedimentation	Standard construction monitoring for incidents of erosion or sedimentation
	ASS contamination as a result of construction that impacts the Sabina, Abba or Ludlow rivers	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	Standard construction management to control ASS	Standard construction monitoring for incidents of ASS contamination
	Bushfire occurrence as a result of construction causing loss of adjacent riparian vegetation	Likelihood: Possible Consequence: Minor Risk outcome: Low	Standard construction management to control potential ignition sources construction clearing	Standard construction monitoring to verify management of potential ignition sources and fire response during construction

6 ENVIRONMENTAL MANAGEMENT MEASURES

In order to comply with relevant environmental legislation and manage impacts to the local environment, Main Roads has defined objectives, outcomes and management based provisions to ensure that impacts to the Vasse-Wonnerup System are avoided and minimised as far as practicable during the implementation of the Proposal.

6.1 Environmental management activities, controls and performance targets

As identified in Section 5.3, no direct impacts to the Vasse-Wonnerup System are expected to result from Proposal implementation.

Main Roads has taken a 'hierarchical approach' to the mitigation of potential impacts associated with the Proposal. Where impacts cannot be avoided, Main Roads has designed the Proposal to reduce the intensity and/or extent of impacts on the Vasse-Wonnerup System.

Main Roads has identified a range of management actions to be implemented to control and minimise potential indirect impacts of the Proposal to the System. These have been informed by the results of field studies (Table 5-1), best practice and recent experience on similar road projects in Western Australia. These will minimise potential residual impacts and achieve the identified management target.

The following documents have informed the development of this EMP:

- Wetland Research & Management (2007). *Ecological Character Description for the Vasse-Wonnerup Wetlands Ramsar Site in South-west Western Australia*. Unpublished report to the Department of Environment and Conservation and Geographe Catchment Council Inc.
- Department of Parks and Wildlife (2016). *Swan Coastal Plain South Management Plan 2016. Management Plan Number 85*. Department of Parks and Wildlife, Perth.
- Department of Parks and Wildlife (2014b). *Tuart Forest National Park Management Plan 2014. Management plan number 79*. Department of Parks and Wildlife, Perth.

Based on the controls identified in Table 5-3 above and associated proposed management actions, Main Roads has developed a performance target to identify the outcomes sought from the management actions. These, along with the proposed management actions, are identified in Table 6-1.

Table 6-1 Management actions and performance targets

Timing	Management Actions	Performance Target
Prior to construction	• As part of the contractor's CEMP, development of a Hygiene Management Plan to prevent the spread of dieback and weeds to adjacent vegetation. The CEMP will include procedures such as machinery / vehicle clean down, weed treatments and restrictions on vehicle / machinery movements • As part of the contractor's CEMP, development of a Fire Management Plan	Avoid indirect impacts to the Vasse-Wonnerup System
During construction	• Contractor induction will include familiarisation with and discussion of the Vasse-Wonnerup System, riparian vegetation, *Phytophthora* dieback management and hygiene management • Long-term hydrocarbon storage (i.e. hydrocarbons which shall not be used that day or not stored within equipment waiting to be used) or re-fuelling of equipment (with the exception of stationary plant) will not be permitted within 100 m of riparian vegetation • The Construction Contractor will prepare a Spill Response Procedure for oil, chemical or hazardous material spill events to ensure any spill is contained effectively and cleaned up appropriately and efficiently with approved materials • Implement standard construction drainage management as detailed under Main Roads Specification 204 • As part of the contractor's CEMP, the construction contractor will prepare a Fire Management Plan to minimise risk of ignition from construction activities and effectively manage any resulting fire / wildfire • All Department of Fire and Emergency Services (DFES) and Local Government Authority (LGA) restrictions on fire and machinery movement will be strictly adhered to • Implement ASS Management Plan as part of the contractor's CEMP	Avoid indirect impacts to the Vasse-Wonnerup System
Post construction	Not applicable (monitoring and as-needed corrective action activities only)	Not applicable

6.1.1 SMART performance standards

The DAWE additional information request (2020) specified the need for this EMP to conform to 'SMART' (specific, measurable, achievable, relevant and time-bound) principles.

SMART performance standards are intended to relate to measurable (numerical) values which can be applied to a Proposal, rather than qualitatively measured management / monitoring actions. They may include measurements such as 'threshold criteria', 'performance indicators', 'corrective actions' and 'completion criteria'.

In relation to the Vasse-Wonnerup System, Main Roads has prepared SMART performance standards directly related to the potential risks of the Proposal as identified in Table 5-3. These SMART performance standards complement the management actions and performance targets identified in Table 6-1. The proposed SMART performance standards for the Proposal are identified in

Table 6-2. Proposed monitoring and corrective actions are identified in Table 6-3 and Table 6-4 respectively.

The 'threshold criteria' and 'completion criteria' are considered to be achievable, with the risk potential of not achieving the proposed SMART performance standards captured by the risk assessment presented in Table 5-3.

As the proposed SMART performance standards for 'threshold criteria' and 'completion criteria' relate to physical measures which can be readily controlled through standard construction management processes, it is considered the proposed SMART performance standards have a low level of uncertainty, with additional margins for safety not required.

The SMART performance standards do not require detailed statistical analysis to determine if the 'threshold criteria' and 'completion criteria' have been met, nor require statistical power to detect change (for example, seasonal or climatic variability), nor control or reference sites (for comparative purposes).

Table 6-2 SMART performance standards

Threshold Criteria	Performance Indicators	Corrective Actions	Completion Criteria
ANZECC guidelines Vol 1 standard triggers[1] in two monitoring periods	Water quality	• Investigate cause and raise an incident report if necessary • Remedial action controls will be undertaken if required – to be determined based on likely cause e.g. spills, sedimentation or erosion • Conduct review of management measures and/or further education of staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance • Monitor outcomes	Water quality levels are maintained within specified guidelines
Erosion/ sedimentation cause has not been remediated within 8 days of detection	Number of days before erosion/ sedimentation is remediated after detection	• Investigate cause and raise an incident report if necessary • Remedial action controls will be undertaken immediately to repair damage if required • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. These may include: - Application of fill/mulch - Installation of gabion cages - Installation of jute matting to secure bank. • Conduct review of management measures and/or further education of staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence • Monitor outcomes	Sedimentation no longer detected or observed
ASS contamination has not been remediated within 8 days of detection	Number of days before ASS contamination is remediated after detection	• Investigate cause and raise an incident report if necessary • Remedial action controls will be undertaken immediately to repair damage if required • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance • Conduct review of management measures and/or further education of staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence • Monitor outcomes	Water quality levels are maintained within specified guidelines
Bridges not installed as per design specification at the Sabina, Abba and Ludlow Rivers	Bridges not within design specification	• Investigate cause and raise an incident report if necessary • Implement contingency actions which may include: - Review practicality and relevant of management measures - Improve training and education for all personnel - Improve and implement increased protective measures/controls as necessary - Review monitoring frequency and method • Monitor outcomes	Installation of bridges as per specification

[1] For toxicants at 95% level of protection (Table 3.4.1) and Tables 3.3.6 – 3.3.7 default trigger values for physical and chemical stressors for south-west Australia for slightly disturbed ecosystems.

6.2 Environmental monitoring

Main Roads has identified key monitoring actions to monitor the potential indirect impacts of the Proposal to the Vasse-Wonnerup System during and post construction.

Monitoring will be undertaken by suitably qualified individuals for the methodology type specified. The proposed monitoring program for the Proposal is identified in Table 6-3.

Table 6-3 Proposed monitoring program

Performance Target	Parameter To Be Monitored	Methodology	Frequency	Recording And Reporting
Avoid indirect impacts to the Vasse-Wonnerup System	Presence of erosion or sedimentation at or near to the Sabina, Abba or Ludlow Rivers	Visual inspection	During construction: Post each clearing event near rivers, daily during bridge construction and opportunistically Post construction: Not applicable	Erosion and/or sedimentation incidents at or near rivers recorded by construction contractor and reported to Manager Environment within 24 hours of incident occurring Report annually to DAWE as part of annual compliance reporting or in response to exceedance of an agreed trigger or threshold
	Location of hydrocarbon storage and re-fuelling facilities	Visual inspection	During construction: Weekly and opportunistically Post construction: Not applicable	Report annually to DAWE as part of annual compliance reporting or in response to exceedance of an agreed trigger or threshold
	Water quality (only required in the event of a hydrocarbon spill or erosion/sedimentation incident that directly impacts the Sabina, Abba or Ludlow Rivers)	Sampling using appropriate water quality meters and/or laboratory analysis Location: downstream of the impacted bridge site	During construction: Weekly during bridge construction and three months post- bridge construction, and opportunistically Post construction: Not applicable	Incidents potentially impacting water quality in any of the three listed rivers recorded by construction contractor and reported to Manager Environment within 24 hours of incident occurring Report annually to DAWE as part of annual compliance reporting or in response to exceedance of an agreed trigger or threshold
	ASS contamination	Visual inspection	During construction: Daily during bridge construction and opportunistically Post construction: Not applicable	Occurrences of ASS contamination recorded by construction contractor and reported to Manager Environment monthly Report annually to DAWE as part of annual compliance reporting or in response to exceedance of an agreed trigger or threshold
	Appropriate management of potential ignition sources and fire response	Visual inspection	During construction: Daily and opportunistically	Bushfire incidents impacting riparian vegetation or the Vasse-Wonnerup System Ramsar site reported to Manager Environment monthly

Performance Target	Parameter To Be Monitored	Methodology	Frequency	Recording And Reporting
				Report annually to DAWE as part of annual compliance reporting or in response to exceedance of an agreed trigger or threshold

6.3 Corrective actions

Consistent with the DotE (2014) guideline, triggers and corrective actions have been considered in the event that monitoring/observation identifies that the management actions have not achieved the environmental objectives.

The purpose of the corrective actions is to provide an appropriate remedy to the environmental objectives not being met, and may include changes to equipment, processes and/or management measures. The degree to which the corrective actions will be implemented may depend upon various factors, such as the type and severity of the trigger, the location and condition of the surrounding environment, and the specific location/nature of the works being undertaken for the Proposal.

Changes to processes and/or management may require this EMP to be updated, with additional environmental training to be provided to site personnel.

Corrective actions may incorporate the identification, investigation and reporting of an environmental incident. Environmental incidents are to be reported to the Manager Environment (or delegate) by the person responsible for the incident or the first person to observe the incident. The type and severity of an environmental incident will be assessed in accordance with Main Roads' standard incident procedures. In the event that an environmental incident has resulted in a significant environmental impact to the Vasse-Wonnerup System, the environmental incident will be reported to DAWE (as identified within Section 4.1).

The proposed corrective actions are identified in Table 6-4.

Table 6-4 Corrective actions

Aspect	Trigger	Corrective Action
Water quality in the Sabina, Abba and Ludlow Rivers Bushfire risk	Hydrocarbon spill or ASS contamination incident attributable to the Proposal that results in contamination of the Sabina, Abba or Ludlow Rivers	• Stop works (temporary) • Record environmental incident • Investigate cause • Initiate water quality monitoring program • Update environmental training of personnel (if appropriate) • Report incident to DAWE • Undertake remediation works (if appropriate, following consultation with DAWE) • Initiate water quality monitoring program
	Evidence of bank instability or new erosion/sedimentation attributable to the Proposal that impacts the Sabina, Abba or Ludlow Rivers	• Investigate cause and raise an incident report if necessary • Remedial action controls will be undertaken immediately to repair damage if required • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. These may include: - Application of fill/mulch - Installation of gabion cages - Installation of jute matting to secure bank • Initiate water quality monitoring program • Conduct review of management measures and/or further education of staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence • Monitor outcomes
	Bridges not installed as per design specification at the Sabina, Abba and Ludlow Rivers	• Investigate cause and raise an incident report if necessary • Construct and install clear span bridges at the Sabina, Abba and Ludlow Rivers • Monitor outcomes

7 AUDIT AND REVIEW

This EMP adopts an 'adaptive management' approach which seeks to embed a cycle of monitoring, reporting and implementing change, where required. Accordingly, it is intended that this EMP may be updated (as required) over the life of the Proposal to reflect changes in the monitoring and management practices, subject to the results of the monitoring to identify that the environmental objectives are being achieved. The EMP may also be revised to address learnings from the implementation of corrective actions, should this occur.

In addition, auditing and review schedules are necessary to embed a formal process to identify and consider any need to update the EMP in order to achieve improved environmental performance (which may not otherwise be triggered by management or monitoring outcomes).

7.1 Environmental auditing

This EMP will be audited annually by Main Roads during construction to ensure implementation of the management and monitoring measures, and to confirm the management measures specified are achieving the environmental outcomes.

The proposed auditing schedule is identified in Table 7-1.

Table 7-1 Environmental audit schedule

Timing	Action	Schedule
Pre-construction	Review of construction procedures to ensure EMP management / monitoring actions are incorporated within works procedures	Prior to construction (single event)
Construction	Inspections by site environmental personnel to identify compliance with EMP	Periodic (generally weekly)
	Independent 'third-party' audit for assessment of compliance with EMP	Annually (once per calendar year)
Post construction	Independent 'third-party' audit for assessment of compliance with EMP	Annually (once per calendar year for up to 3 years)

The results of the construction and post construction independent 'third-party' audit findings will be reported by Main Roads to DAWE as part of annual compliance reporting as outlined within Section 4.1.

7.2 Environmental review

Main Roads proposes to review this EMP annually in order to:

- consider the management and monitoring actions
- consider opportunities for an improvement in environmental performance (for example, changes to construction methodology or timing)
- identify a need to update this EMP to capture changes to the management and / or monitoring actions
- identify any general need to update this EMP (for example, to capture new information on knowledge or management).

Main Roads acknowledge that a revision to this EMP may trigger a need for additional approval by DAWE prior to implementing any changes to the specified management or monitoring actions.

The proposed EMP review schedule for the Proposal is identified in Table 7-2.

Table 7-2 EMP review schedule

Timing	Action	Schedule
Pre-construction, Construction and Post-construction	Review of EMP management and monitoring actions Review of opportunities for an improvement in environmental performance Revise EMP (if appropriate) and seek approval of DAWE for revised EMP	Annually (once per calendar year)

7.3 Data management

Main Roads will maintain records on the implementation of this EMP in accordance with Main Roads corporate standard document control procedures.

The retention of records held by Main Roads will be maintained and managed in accordance with the Western Australian *State Records Act 2000* (WA).

7.4 External communications / concerns

Main Roads and / or its Contractors will maintain a register of communications (including any public concerns / complaints) for the Proposal. Records to be obtained for external communications will include:

- Contact details for the person making the complaint (name, address and phone number as a minimum)
- Date, time and relevant location (if specific to part of the Proposal)
- Details of the communication (with sufficient detail to enable investigation / response, if appropriate)

The retention of records held by Main Roads (including external communications) will be maintained and managed in accordance with the Western Australian *State Records Act 2000* (WA).

8 REFERENCES

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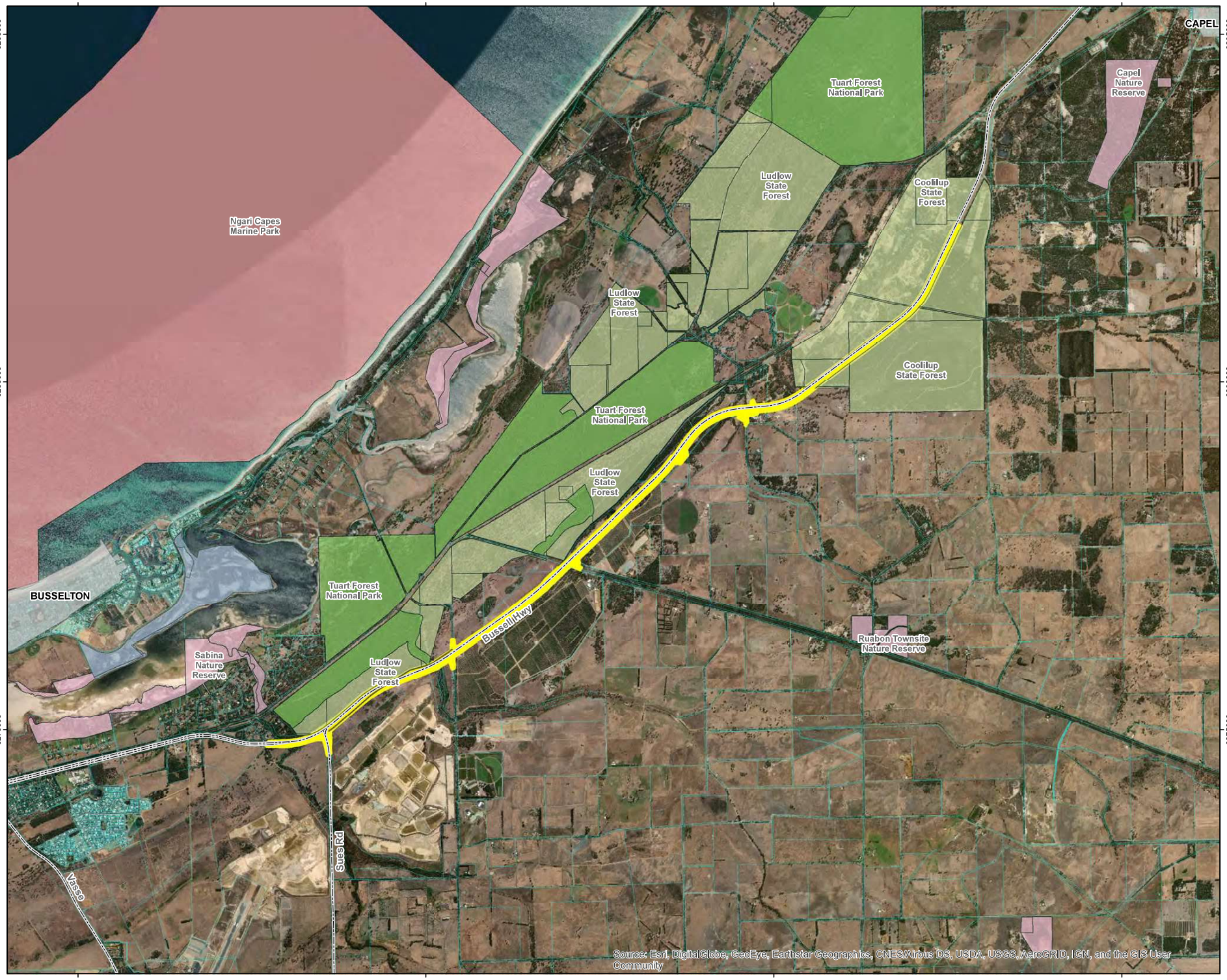
9 APPENDICES

Appendix	Title
Appendix A	Figures
Appendix B	Annual Compliance Report Template
Appendix C	Memorandum Assessment of Significance of Impact – Bussell Hwy Duplication Bridge Design

Appendix A: Figures



mainroads WESTERN AUSTRALIA

H043 Bussell Hwy [31.15 to 44.0 SLK] Stage 2

Hutton to Sabina Construct Second Carriageway

Proposal Area Location

Figure 1

Legend

- Proposal Area
- Cadastre
- Built up Areas
- State Roads

DBCA Legislated Lands and Waters

- Marine Park
- National Park
- Nature Reserve
- Section 5(1)(h) Reserve
- State Forest

N

0 0.5 1 2
Kilometers

Scale 1:50,000

Datum: GCS GDA 1994

Projection: GDA 1994 MGA Zone 50

Date:	15/01/2021
Status:	Draft
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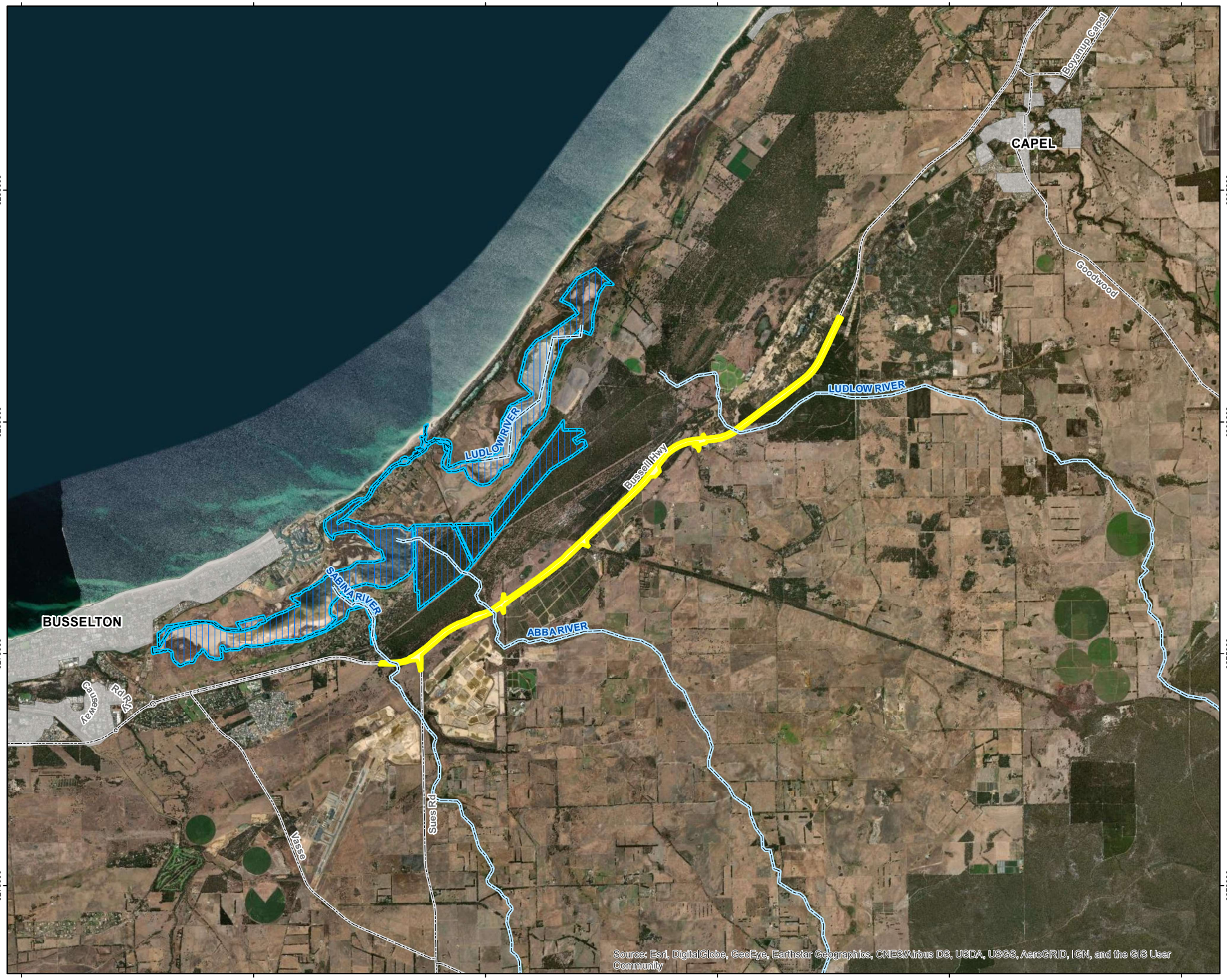
Drawn by:	GSM
Requested by:	MP

Ver.	Comment	App.	Date



mainroads WESTERN AUSTRALIA

H043 Bussell Hwy [31.15 to 44.0 SLK] Stage 2

Hutton to Sabina Construct Second Carriageway

Vasse-Wonnerup Ramsar Wetland System in relation to the Proposal Area

Figure 2

Legend

- Ramsar Wetlands
- Proposal Area
- State Roads
- Builtup Areas

N

0 0.5 1 2 3
Kilometers

Scale 1:75,000

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Projection: GDA 1994 MGA Zone 50

Date:	19/01/2021
Status:	Draft
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Sheet Size:	A3
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Requested by:	MP

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Appendix B: Annual Compliance Report Template

We're working for Western Australia.

EPBC 2020/8800
Annual Compliance Report

Bussell Highway Duplication Stage 2
Hutton to Sabina
Month/Year

Contents

1. Introduction

To provide dual carriageway access along the entire 46 km portion of the highway between Bunbury and Busselton, Main Roads Western Australia (Main Roads) is planning to construct a second carriageway along the existing two-lane single carriageway section (the Bussell Highway Duplication). The Bussell Highway Duplication will be undertaken in two stages with Stage 1, comprising a 5.55 km distance between Capel and Hutton Road, already under construction.

The Proposal comprises Stage 2, which involves the construction of the remaining 12.8 km two-lane carriageway (southbound) to duplicate the existing carriageway effectively between Hutton Road and the Sabina River bridge and other road infrastructure, including but not limited to bridges, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs.

The Proposal will upgrade this section of Bussell Highway to a four-lane highway consisting of two carriageways. Once the new southbound carriageway is constructed, the existing single carriageway will become the northbound carriageway. The new carriageway is expected to be typically 31 metres (m) wide and will accommodate:

- A fully sealed 2.5 m wide left shoulder.
- A fully sealed 1.5 m wide right shoulder.
- Two 3.5 m wide lanes.
- Drainage and other infrastructure.

It is anticipated that construction of Stage 2 will commence in July 2021 and be completed in early 2024.

1.1 Approval under the *Environment Protection and Biodiversity Conservation Act 1999*

The Proposal was formally referred to Department of Agriculture, Water and Environment (DAWE) in October 2020 (EPBC Act referral 2020/8800) as a potential Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to impacts on Matters of National Environmental Significance (MNES). On 12 November 2020, DAWE provided advice that the Proposal is considered a Controlled Action.

The Department considered the proposed action likely to have a significant impact on MNES, specifically:

- Black Cockatoos (Carnaby's cockatoo (*Calyptorhynchus latirostris*) (endangered), Baudin's Cockatoo (*Calyptorhynchus baudinii*) (endangered), (FRTBC (*Calyptorhynchus banksii naso)* (vulnerable)) ('Black Cockatoos').
- Western Ringtail Possum (*Pseudocheirus occidentalis*) (critically endangered) ('WRP').
- Tuart (*Eucalyptus gomphocephala*) forests and woodlands of the Swan Coastal Plain Threatened ecological community (critically endangered) ('Tuart Woodlands TEC')).

The Project was assessed through Preliminary Documentation with a request for further information to assist in the assessment of the Proposal. The DAWE issued approval of the Project on Day/Month/Year and included a number of conditions that Main Roads is required to fulfil.

1.2 Purpose of this Report

Construction of the Project commenced on Day/Month/Year. This compliance report has been produced as required by Condition X of EPBC approval 2020/8800. Table 1 of this report outlines the compliance with each approval condition over the past 12 month period, Day/Month/Year to Day/Month/Year. The clearing area of TEC vegetation is shown in Figure 1 and that of conservation significant fauna habitat in Figure 2.

2. Compliance

Table 1: Year - Year compliance with EPBC Approval 2020/8800

Condition Number	Condition Description	Status

Figure 1 Total Clearing of TEC vegetation from Project Area

Figure 2 Total clearing of conservation significant fauna habitat from Project Area

3. Attachments

Attachment	Title
Attachment 1	
Attachment 2	
Attachment 3	
Attachment 4	
Attachment 5	
Attachment 6	
Attachment 7	

Attachment 1:

Attachment 2:

Attachment 3:

Attachment 4:

Attachment 5:

Attachment 6:

Attachment 7:

Appendix C: Memorandum Assessment of Significance of Impact – Bussell Hwy Duplication Bridge Design

Memorandum

Ref: **EPBC 2020/8800 – Vasse-Wonnerup Environmental Management Plan**

Date: 27 October 2022

Subject: **Bussell Highway Duplication Stage 2 - *Environment Protection and Biodiversity Conservation Act 1999* - Non-Referral Decision Supporting Advice – Abba, Ludlow and Sabina Rivers Proposed Bridge Design Revision**

Purpose

The purpose of this memorandum is to document the decision making process regarding the non-referral of a minor change to the design of two bridges over the Abba and Ludlow Rivers as part of the Bussell Highway Duplication Stage 2 – Hutton to Sabina Project (the Project), to the Department of Climate Change, Energy, the Environment and Water (DCCEW) (formally the Department of Agriculture, Water and the Environment) and under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Background

On 30 June 2021, Main Roads received conditional approval under the EPBC Act to construct the Bussell Hwy Duplication Stage 2 (EPBC 2020/8800).

During the assessment process, DCCEW identified a requirement for Main Roads to detail the proposed management measures relating to potential impacts on the Ramsar-listed Vasse-Wonnerup wetland system (Vasse-Wonnerup System). An Environmental Management Plan, The Vasse-Wonnerup Management Plan (VWMP) was submitted to DCCEW for assessment and approved via EPBC 2020/8800 Condition 3, which requires that Main Roads implement the VWMP for the duration of the approval.

A subsequent review of the VWMP by Main Roads identified a minor error within the plan that needs to be amended. It should be noted that this error will have no effect on any Matters of National Environmental Significance.

The Project involves the construction of the remaining 12.8 kilometre (km) two-lane carriageway (southbound) to duplicate the existing carriageway effectively between Hutton Road and the Sabina River bridge (**Figure 1**, Appendix A) and other road infrastructure, including but not limited to bridges, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs. The new carriageway will lie approximately 25 m east, south or south east of the existing carriageway.

Three new bridges over the Abba, Ludlow and Sabina Rivers will be constructed upstream, on the side furthest from the Vasse- Wonnerup System, effectively duplicating the three existing bridges over these rivers.

The approved version of the VWMP unnecessarily prescribes that all three river crossings over the Abba, Ludlow and Sabina Rivers are to comprise clear span bridges (the bridge designs of each of the three bridges had not been finalised when the Proposal was being assessed).

Although the proposed bridge at the smaller Sabina River crossing will be a clear span bridge, it was never planned that the proposed bridges over the larger Ludlow and Abba Rivers would be clear span bridges.

Main Roads intends to be consistent with the bridge design principles employed at the existing Abba and Ludlow River Bridges and incorporate piers within the design. The existing downstream Abba and Ludlow bridges currently consist of 28 and 30 piers respectively, with the proposed Abba and Ludlow bridges to each consist of three piers which are aligned with the direction of stream flow. This minor change including three piers within the bridge design is not anticipated to alter the hydrological regimes of the Ludlow or Abba Rivers, and as outlined below, additional controls have been employed to further reduce risk.

The type of bridge installed at these crossing points will have no effect on the quality or quantity of water entering the Vasse-Wonnerup System given:

- the controls incorporated into the design
- wetland components of the Vasse-Wonnerup System are more than 1.5 km away
- the current condition of the river systems
- scale and nature of the works proposed.

Review of Approved VWMP

Main Roads amended the approved VWMP to remove the statement that the bridges over the Abba and Ludlow Rivers will be clear span and sought approval from DCCEW, as per Condition 3 of EPBC 2020/8800. No other changes to the approved VWMP are proposed. There is no substantial change to the action which has previously been referred and approved, and the implementation of a design different to that which was erroneously included in the VWMP does not increase environmental risk and will not have any impact on Matters of National Environmental Significance. The implementation of proposed bridge design will not change the existing conditions within the river systems.

DCCEW advised that "*bridges with pylons were not specified in the referred action, or in the original approved Vasse-Wonnerup System EMP. As a result,* ***we cannot consider*** *the revised EMP for approval, as the action appears to have changed from the action that was referred and approved*"

As such, Main Roads must now assess whether the proposed amendments to the Abba River and Ludlow River Bridges will have a significant impact on MNES, with particular regard to the Vasse-Wonnerup System.

DCCEW also advised that, in addition to the proposed bridge design changes, it was *"concerned that the proposed channel widening and bridges with pylons were not specified in the referred action, or in the original approved Vasse-Wonnerup System EMP"*. **It should be noted that the widening and armouring of the channel was always proposed and is not a change to the proposal** (widening and armouring is planned for the Sabina single span bridge).

Baseline Information

Vasse- Wonnerup System

Description

The following description is taken from the Australian Wetlands Database (DAWE, 2020a).

The Vasse-Wonnerup System is situated in the Perth Basin, south-western Western Australia (**Figure 1**, **Appendix A**). It is an extensive, shallow, nutrient-enriched wetland system of highly varied salinities. Large areas of the wetland dry out in late summer.

The site is located on a narrow, flat plain separated from the ocean by a narrow system of low dunes. The system is comprised of two former estuaries - the Vasse and Wonnerup Lagoons, with inflows of seawater managed by floodgates (weirs) since early 1900s. Water in the Vasse-Wonnerup System is fresh in winter and becomes saline in summer due to leakage past the floodgates and, since 1988, some seawater being allowed to enter.

The Vasse-Wonnerup System supports tens of thousands of resident and migrant waterbirds of a wide variety of species. More than 80 species of waterbird have been recorded in the System such as Red-necked Avocets and Black-winged Stilts, Wood Sandpiper, Sharp-tailed Sandpiper, Long-toed Stint, Curlew Sandpiper and Common Greenshank. Thirteen waterbird species are also known to breed at the Ramsar site, including the largest regular breeding colony of Black Swans in south-western Australia.

Threats

The Ecological Character Description prepared for the Vasse-Wonnerup System (Wetland Research and Management, 2007) lists the following four key threats to the System:

- Hyper-eutrophication
- Urban and industrial development
    - increased use of pesticides, herbicides, heavy metals and oils,
    - physical and noise disturbance of waterbirds.
- Changes to the hydrology
    - climate change and rising seawater levels, reduced rainfall and reduced surface/groundwater flows,
    - abstraction from aquifers.
- Acid sulphate soils (ASS).

Past management of water levels in the system has been largely satisfactory for waterbirds (DPAW, 2014).

With respect to the Project, DAWE (2020b) note that *"…potential impacts are considered most likely to arise through altered hydrological regimes and run-off water contamination (sediment, hydrocarbon spills, etc) that enter the Ludlow, Abba and Sabina Rivers that flow into the Vasse-Wonnerup Ramsar wetland*".

Abba, Ludlow and Sabina Rivers

Description

The following description is taken from the River Action Plan for the Sabina, Abba and Ludlow Rivers (GeoCatch, 2002).

Each of the river systems is in excess of 35 kms in length and comprise ephemeral systems which transmit drainage from adjacent agricultural land and mineral sands mines. The three river systems have been extensively modified as a result of clearing and drainage of the Swan Coastal Plain. These disturbances have had the effect of increasing river flow, which combined with clearing of fringing native vegetation, has led to erosion problems on all three rivers. In some sections the rivers have been intentionally modified via physical activities including diversion, enlargement of the channel, channel straightening and the creation of levee banks.

The rivers are highly degraded exhibiting issues such as: erosion and siltation, loss of native fringing vegetation, weed invasion, stock access, and water quality issues including high nutrient levels, sedimentation, low dissolved oxygen and salinity.

Baseline turbidity within the river system is high in response to rainfall runoff events flushing sediment from adjacent agricultural lands, localised erosion problems within the rivers, stock and vehicle disturbances and algal blooms.

Assessment of foreshore condition rating was conducted by GeoCatch (2002). The assessment included Woddidup Creek (the major tributary of the Sabina River) and Tiger Gully (the major tributary of the Ludlow River). As outlined in **Table 1**, the majority of the Rivers are degraded with Sabina, Abba and Ludlow Rivers displaying only 12%, 6% and 5% respectively of foreshore areas in pristine condition.

Table 1: Summary of Forshore condition rating of the Sabina, Abba and Ludlow Rivers (GeoCatch, 2002)

CONDITION RATING	SABINA RIVER AND WODDIDUP CREEK		ABBA RIVER		LUDLOW RIVER AND TIGER GULLY	
	Total Length	**Total %**	**Total Length**	**Total %**	**Total Length**	**Total %**
A (Pristine)	4.7 km	12%	2.2 km	6%	1.7 km	5%
B (Weedy)	4.3 km	11%	18.1 km	51%	15.8 km	45%
C (Erosion Prone)	9.2 km	24%	7.7 km	22%	12 km	33%
D (Ditch)	20.3 km	53%	7.5 km	21%	6 km	17%

Plate 1 displays an area of the Abba River classed as Condition D (Ditch). The Sabina, Abba and Ludlow Rivers contain 53%, 21% and 17% respectively of foreshore areas in this completely degraded condition.

Plate 1: The Abba River Condition D (ditch) at a location within the agricultural area upstream of the proposed bridge location. More than 20% of the Abba River is in this condition. Image from (GeoCatch, 2002)

Downstream of the proposed bridge locations, the Abba and Ludlow River systems have been classified as Condition B- Degraded, Weed Infested (GeoCatch, 2002). The weed infested nature of the river as it moves out of the agricultural zone and into denser vegetation in these locations reduces the flow rate and traps sediment migrating from upstream.

Existing Bridges over the Abba Ludlow and Sabina Rivers

The proposed bridges span three waterways, the Abba, Sabina and Ludlow Rivers. These rivers flow into the Vasse-Wonnerup System when flowing (generally in the wetter months), which is located approximately 700 m north of the bridges its nearest point (the Tuart Forest National Park component of the System), with the wetlands themselves approximately 1.5 km separation distance at the nearest point (Ecoedge, 2020).

The existing Bridges contain multiple piers which are in the river channel. The constructed maximum width of each bridge has been designed to enable the transmission of waters during large flood events without jeopardising the road infrastructure. The approximate current and proposed widths of each river channel is presented in **Table 2**.

Table 2: Approximate existing and proposed channel widths at proposed bridge locations and existing bridge locations

River	Existing minimum width of channel base at proposed bridge location	Existing maximum width of channel at proposed bridge location	Proposed maximum width of channel base at proposed bridge location	Maximum width of channel at existing bridge location*
Abba	3 m	17.3 m	21.3 m	22 m
Ludlow	10 m	24.6 m	29.3 m	28 m
Sabina	3.2 m	19. 3.	18.8 m	18.5 m

**Measured from aerial imagery*

The above **Table 2** outlines both the existing minimum and maximum channel widths for each river at the proposed bridge locations, alongside the proposed maximum width. The river comprises a dynamic channel of varying widths, as is the nature of ephemeral river systems, will change after each flow event.

Furthermore, **Table 2** provides the current maximum width of the channel at the existing bridge locations. ***As evidence, the width of the channel at the existing bridge locations closely resembles the width of the channel at the proposed bridge locations.***

As discussed above, the proposed channel widths at the proposed bridge locations are independent of the bridge design (single span bridge or the proposed bridge design) and is not a change to the proposal. The existing river environment at each bridge location is shown in **Plate 2**, **Plate 3** and **Plate 4** (photos taken on 9 February 2022).

Plate 2: Abba River Bridge Looking Upstream

Within **Plate 2**, note the 28 piers (4 rows of 7 piers) within the river channel and the varying channel widths along the riverbed. The cross section of the channel basement is dynamic and changes annually during flow events in the wetter months, as sediment is transported from agricultural lands via the degraded upstream river system. The maximum width of the channel is bounded by the armoured embankments at approximately 22 m width. The riverbed is heavily degraded and comprises predominantly introduced flora species, with no resemblance to the structure of a natural riparian system.

Plate 3: Ludlow River Bridge Looking Upstream

Plate 3 displays the Ludlow River bridge and the dry riverbed, demonstrating the ephemeral nature of the river system. The design of the existing bridge employs 30 piers (5 rows of 6 piers). Armouring can be seen on the banks, however, has not been employed on the base of the riverbed, and variable scouring effects can be seen in the unarmoured vicinity of the piers. The maximum width of the channel is 28 m, and vegetation in the locality comprises mainly introduced species with no resemblance to the structure or composition of a natural system.

Plate 4: Sabina River Bridge Looking Upstream

Plate 4 displays the Sabina River Bridge, which is notably smaller than the Abba and Ludlow Bridges, containing only 14 piers (2 rows of 7 piers). As with the other two existing bridges, banks are armoured, however, the channel base is unarmoured. Scouring effects can been seen in the vicinity of the piers in the river channel in the form of a depression which retains water following the drying out of the ephemeral river system immediately downstream.

The new proposed bridges are located approximately 25 m upstream of the existing bridge crossings, on the side furthest away from the Vasse-Wonnerup System.

Matters of National Environmental Significance

A Protected Matters Search Tool (PMST) report was generated to identify a list of Matters of National Environmental Significance (MNES) that may occur at the bridge locations (DAWE, 2022). The resultant list identified: five TECs, 16 flora species, 12 avian species, two aquatic species, two mammal species and one wetland of international importance (the Vasse-Wonnerup System). Marine species have been omitted as there is no suitable habitat within the study area.

Potential direct and indirect impacts associated with the Stage 2 Project, inclusive of the bridge construction have been assessed and approved by EPBC 2200/8800. The Project was deemed a controlled action due to the potential to impact on the Western Ring-tailed Possum (WRP), Black Cockatoos, the Tuart Woodlands Threatened Ecological Community (TEC), and the proximity to the Vasse-Wonnerup System. The proposed minor change to bridge design will not impact on any conservation significant species including WRP or Black Cockatoos, nor on the Tuart Woodlands TEC.

Further consideration was given to the two listed aquatic species: Carter's Freshwater Mussel and

Balson's Pygmy Perch.

Carter's Freshwater Mussel prefers to inhabit perennial flowing riverine/ creek line habitats that do not completely dry out in summer months (Threatened Species Scientific Committee, 2018). The three river systems are ephemeral, drying into a series of pools through the summer. Given the lack of known records within the area and the lack of suitable habitat within the Project Development Envelope and downstream, there is unlikely to be a direct or indirect impact on individuals or reduction in habitat resulting from the proposed bridge construction.

Balston's Pygmy Perch is known from a small area of coastal peat flats in south-western Western Australia that extends from Margaret River to the Goodga River (near Albany). The species is found among inundated riparian vegetation associated with slow-flowing, low salinity, acidic and tannin-stained waters, and complex instream habitat (DWER, 2022). Although multiple surveys have occurred in the Abba, Sabina and Ludlow Rivers, the species has not been found and is assessed as unlikely to be found (DWER, 2022). Therefore, there is unlikely to be a direct or indirect impact on individuals or reduction in habitat resulting from the proposed bridge construction.

The referral concluded that the construction of the bridges requires minor disturbance of the riverbanks and construction will occur only when the rivers are dry. Once the crossings are installed there will be no significant impediments to the flow of water under the bridge and therefore little to no impact on these two species is predicted. No further information was required by DCCEW for Carter's Freshwater Mussel nor Balston's Pygmy Perch.

Following notifying DCCEW of the minor proposed change to the VWMP, advice received suggested that concerns were focused on the Vasse - Wonnerup System and particularly with respect to downstream sedimentation, water quality, and impacts to the riverbed and riparian areas. As demonstrated in the below sections, the implementation of the minor change in bridge design will not exacerbate any of the above factors and is likely to have a positive effect on the environment by reducing:

- the potential for local flooding during high rainfall events
- flow velocities at the bridge cross sites
- erosion at the bridge cross sites
- sedimentation at the bridge cross sites.

Proposed Change to Submitted Documentation

During large flow events in a natural ephemeral system, a narrower stream would overspill its banks onto the adjacent flood plains. However, this is not able to be replicated with the construction of major highway infrastructure across ephemeral rivers.

In the proposed bridge locations, the widening of the channels is required to allow the containment and control of large flow events. The bridge design is required to ensure infrastructure will not be overwhelmed by flood waters during extreme flood events.

For this reason, the bridge design must include a channel wide enough to accommodate volumes experienced in extreme flood events. The impact of a bridge wash out would have devastating consequences to the downstream environment, as construction materials are washed and deposited throughout the downstream river system.

Supplied with the original referral documentation were Geotechnical Factual, Interpretive and Design Reports for each of the three bridges (Attachments 11 – 13 of (Main Roads, 2020)).

The supplied geotechnical reports for both the Abba River Bridge and the Ludlow River Bridge

outline that three design options for each of the new bridges had been proposed, with a preferred option outlined in a 15% Design Report. Both reports then present geotechnical information based on the implementation of bridge designs employing piers (AECOM, 2016a) (AECOM, 2016b).

As outlined previously, a minor error within the VWMP stated that all three bridges required for the implementation of the Bussell Highway Duplication Stage 2 would be clear span. This was never the intent as engineering limitations make this an unfeasible option. It is proposed that the smallest of the crossings, the Sabina River Bridge is clear span. However, due to the current width, and width essential to allow transmission of water in large flood events, the Abba and Ludlow River Bridges are required to employ piers within their design. The proposed channel widening at the new bridge locations does not significantly exceed the width of the channel at the current bridge locations (**Table 2**).

DCCEW has advised that, in addition to the proposed bridge design changes, it was "concerned that the proposed channel widening and bridges with pylons were not specified in the referred action, or in the original approved Vasse-Wonnerup System EMP". It should be noted that the widening and armouring of the channel was always proposed and is not a change to the proposal (widening and armouring is planned for the Sabina single span bridge, as well as for the Abba and Ludlow bridges which contain pylons).

When the Preliminary Documentation request for further information was provided to Main Roads, DCCEW advised that:

"*As previously discussed, the inclusion of Ramsar Wetlands and Listed Migratory Species provisions in the PD (and CA decision) leads on from a new stance on NCA-PM decisions, wherein any activity that is considered a mitigation measure must be included as a PM. However, because the referral decision from Listed Threatened Species and Communities alone was already poised to be a CA, it was necessary to include the Ramsar Wetlands provision in the CA decision. Furthermore, because the Vasse-Wonnerup Ramsar Wetland is listed for its importance to Listed Migratory Species, we were further obligated to include Listed Migratory Species as a controlling provision.*

We stress, however, that the level of PD information we are seeking for the Ramsar Wetlands and Listed Migratory Species is unlikely to be extensive. The PD outlines the level of information we are seeking, and we are happy to discuss any uncertainties and answer any questions relating to this as they arise."

Identification of Risk and Proposed Controls

Source Pathway and Receptor Model

While the Vasse-Wonnerup System is recognised as a significant wetland (receptor), it is also important to consider the source and pathway associated with the proposed change.

Source

In this instance the source of potential impact is the addition of piers to the bridge design, creating the environmental risk of scouring releasing sediment from the river channel as water velocity is increased as it moves past the piers.

The condition of the highly altered and degraded river systems, which stretch for over 35 kms, through intensive agricultural land and mineral sands mines, is highly unlikely to be significantly impacted by the addition of three piers supporting the Abba and Ludlow bridge crossings respectively.

The alteration of hydrological regimes to the river systems was also identified as a potential source of impact. However, it is not considered that a reduction of water flowing to the Vasse-Wonnerup System is a feasible risk from the implementation of channel widening at a bridge location (replicating existing bridge designs located approximately 25 m adjacent) within a >35 km river system.

In line with best practice, controls have been applied to eliminate the risk at the source and are outlined in below sections.

Pathway

The pathway is the seasonally flowing water column within the river systems with the potential to transport mobilised sediment downstream to the Vasse-Wonnerup System. As previously outlined the existing water is of low quality and is unlikely to be further significantly reduced by the proposed minor change.

The weed infested degraded nature of the river systems as they move out of the cleared agricultural zone and into denser vegetation downstream of the proposed bridge locations will trap sediment and reduce flow velocity, encouraging sediment to drop out of the water column.

It is important to note that the wetland components of the Vasse-Wonnerup System are located downstream approximately 1.5 km from the Proposal. If there was any sediment generated as a result of the proposed bridge design, over and above the sediment associated with the proposed single span bridges, the sediment is likely to drop out of the water column prior to reaching the Vasse-Wonnerup System. It is considered that the pathway is sufficiently long enough such that if there was any potential sediment difference between designs, the difference would not have any detectable impact on to the receptor.

Receptor

The initial receptor is the river system which each bridge crosses. As outlined within the baseline information, these river systems are heavily degraded, and any potential minor sediment release is highly unlikely to significantly alter the existing conditions.

The Vasse-Wonnerup System is recognised as a significant receptor. It is listed as a Ramsar wetland and species of conservation significance (predominantly migratory) utilise habitat associated with the Vasse-Wonnerup System.

However, due to the highly degraded state of the river systems, it is unlikely that the minor changes proposed will influence the overall quality of the rivers or on the Vasse-Wonnerup System to which they report.

Risk assessment and proposed controls

As outlined in previous sections, key risks have been identified via DCCEW correspondence and a review of literature (DAWE, 2020b), (Wetland Research and Management, 2007).

A risk assessment process was conducted to provide a framework for assessing the severity of potential risk and effectiveness of proposed controls (**Table 3**). Risk assessment categories and definitions are provided in **Appendix B**.

Several controls have been employed in bridge design to minimise impacts following construction and have been employed in the risk assessment (**Table 3**). Further detail on each control is provided below:

Channel widening

Widening of the river channel allows water to flow freely under the bridges both during normal seasonal flow events and during extreme flood events. A narrow channel forces flood waters

through a bottle neck which increases flow velocity. Increased flow velocity intensifies scour effects creating sediment mobilisation and subsequent downstream deposition. By widening the channel, velocity of the water column is reduced at the bridge location and the potential for sediment mobilisation is decreased. Furthermore, the widening of the channel upstream at the new bridge locations will reduce the velocity of water as it flows toward the existing downstream bridge locations, decreasing the potential for scour and sediment to be released from the existing bridge locations.

The widening of the channel to accommodate the new bridge structure is typical for every new bridge build, regardless of the type of bridge being constructed.

Reduction of number of piers within the river channel

Piers within the river channel can act as an impediment to river flow. During large flow events water impacting the piers can create swirling patterns in the flume and localised increases in water velocity. By limiting the number of piers within the channel, these impacts can be reduced. As previously outlined, the existing Abba River Bridge has 28 piers, and the existing Ludlow River Bridge has 30 piers. The proposed Abba and Ludlow Bridges employ only 3 piers each, with the Sabina River Bridge proposed to be clear span. Proposed pier layout is a single row containing three piers, orientated in the direction of the stream flow. This layout creates a significantly reduced impediment to stream flow than that exhibited by the designs of the existing bridges.

Armouring of the channel base and banks

It is proposed to utilise armour rock to line the entire river channel, including the channel base and banks. This armour is proposed to extend under the bridges, and both upstream and downstream of the bridge locations. By utilising rock armour in the design, the ability for stream flow to interact with sediment at the bridge locations is removed and the potential for localised scouring to occur due to water swirling around piers is eliminated.

Additionally, armouring provides a surface roughness which serves to dissipate the energy associated with running water. This in turn reduces the erosive capacity of both high and low stream flow events.

By replicating the current employed bridge design principles, improving upon them by reducing the number of piers in the river channels and employing channel widening and rock armouring, no change in hydrological regimes in the rivers that are upstream of the Vasse-Wonnerup System are anticipated and the potential for increased sedimentation is eliminated.

Consultation

Main Roads has previously conducted extensive formal and informal stakeholder consultation in relation to the Project. Formal consultation has comprised two rounds of public advertising of the Native Vegetation Clearing Permit and two rounds of public advertising of the Preliminary Documentation. Main Roads is not aware of any commentary or concerns being raised by the Department of Biodiversity Conservation and Attractions (DBCA) nor any other stakeholders related to the construction of the bridges or potential impacts on the Vasse-Wonnerup System.

Main Roads has conducted extensive consultation with DBCA regarding the management of environmental values, inclusive of flora and fauna and the implementation of offsets and revegetation associated with the Project. Throughout this consultation process, DBCA have not raised concerns related to potential impacts to the Vasse- Wonnerup System.

In February 2022, both Main Roads and DCCEW invited DBCA to comment on the proposed bridge design changes at two locations. DCCEW also invited DBCA to comment on the bridge widening that was to occur at the three bridge locations.

In April 2022, DBCA subsequently advised that given the Department of Water and Environmental Regulation (DWER) had already provided advice regarding "wetlands and/or watercourses and water quality in their assessment", it was recommended that Main Roads continue to engage with DWER regarding the proposed amendments.

Accordingly, advice was sought from DWER's Native Vegetation Protection, Regulatory Services Section, who, in May 2022, stated that from a Native Vegetation Regulation perspective, as the inclusion of pylons was not going to change the clearing footprint assessed, it "had no concerns in relation to the use of the pylons".

Consultation was also undertaken with DWER's Aquatic Science branch regarding the proposed change. In October 2022, Malcolm Robb, (Manager Aquatic Sciences) advised that "we do not have concerns about water quality from this work".

Table 3: Risk Assessment of Proposed Changes

RISK PATHWAY	Factor	DESCRIPTION OF IMPACT	FACTORS EFFECTING INHERENT RISK RATING	INHERENT RISK			RISK TREATMENTS	RESIDUAL RISK		
				CONSEQUENCE	LIKELIHOOD	RISK RATING		CONSEQUENCE*	LIKELIHOOD	RISK RATING
Use of piers in bridge design creates localised scouring of river channel releasing sediment into the stream flow.	Biodiversity	Sediment is transported downstream to the Vasse-Wonnerup System, is deposited on vegetation and alters habitat of species of conservation significance.	All three river systems are heavily degraded and contain high baseline sediment loads from upstream erosion. The installation of piers at a bridge location will not significantly alter sediment movement beyond background levels in a >35 km river system. The ephemeral river systems are in a constant state of flux, with sediment mobilisation and deposition occurring after each major flow event. The separation distance from the proposed bridge locations to the Vasse-Wonnerup System wetland components >1.5km. This allows sediment to settle out of the water column prior to reporting to the Vasse-Wonnerup System.	**Minor**	**Possible**	**Moderate**	Widening of channel in bridge location to reduce velocity during flow events. Armouring of channel upstream and downstream of scour zone to prevent sedimentation occurring. Reducing the number of piers in each river channel to the minimum possible (3).	**Insignificant***	**Rare**	**Low**

	Water Resources	Sediment deposition downstream changes hydrological regime of river.	All three river systems are heavily degraded and contain high sediment loads from upstream erosion. The installation of piers at a bridge location will not significantly alter sediment movement beyond background levels in a >35km river system. The ephemeral river systems are in a constant state of flux, with sediment mobilisation and deposition occurring after each major flow event.	**Insignificant**	**Possible**	**Low**	Widening of channel in bridge location, reducing velocity during flow events and preventing mobilisation of sediment. Armouring of channel upstream and downstream of scour zone to prevent sedimentation. Reducing the number of piers in each river channel to the minimum possible (3).	**Insignificant**	**Rare**	**Low**

*Consequence has been altered in this instance as the source of the impact has been eliminated by armouring the river channel, removing all potential for scouring to occur.

Significance of Impact

Table 4 presents an assessment of the bridge replication in accordance with Significant Impact Criteria for Wetlands of International Importance, as outlined within *"Matters of National Environmental Significance – Significant Impact Guidelines 1.1"* (the Guideline) (DOE, 2013).

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in one or more of the following significant impact criteria. In accordance with the Guideline:

> *"the general test for significance is whether an impact is 'important, notable or of consequence, having regard to its context or intensity"* (DOE, 2013).

The proposed bridge design, including installation of piers (closely replicating the existing bridges located approximately 25 m downstream), will have no significant impacts on the Vasse-Wonnerup System, nor on species which utilise this wetland for habitat. Furthermore, the proposed installation of the bridges is not anticipated to have *any* detectable impact on the Vasse-Wonnerup System.

Table 4: Assessment of significant impact criteria of Wetlands of International Significance

SIGNIFICANT IMPACT CRITERIA	DESCRIPTION OF PROPOSED ACTION IN RELATION TO SIGNIFICANT IMPACT CRITERIA	ASSESSMENT
Areas of the wetland being destroyed or substantially modified	The replication of bridges employing designs which closely resemble existing bridge designs, however, with improvements to further prevent impacts, will not create conditions which lead to the destruction or substantially modification of areas of the Vasse-Wonnerup System.	**Not Significant**
A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	The proposed bridges will not substantially modify the hydrological regime of the Vasse Wonnerup-System. Employing piers in the bridge design will have no impact on surface water flows reporting to the Vasse- Wonnerup System. Ground water flows are not relevant to the installation of bridge infrastructure with a spatial separation of 1.5 km to the wetland components of the Vasse Wonnerup System. No impacts to ground water reporting to the Vasse- Wonnerup System will occur.	**Not Significant**
The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected	The installation of bridges that employ designs which closely resemble the designs of the existing adjacent bridges, however, with improvements to eliminate the potential of sediment release, will have no impacts to habitat or lifecycle of any native species dependant on Vasse-Wonnerup System.	**Not Significant**
A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health	No change to water quality is anticipated by implementation of bridges that employ designs which closely resemble the designs of the existing adjacent bridges, however, with improvements to eliminate the potential of sediment release. Due to the highly degraded nature and poor water quality of the river systems, and the controls employed in proposed bridge design to prevent any intensification of these conditions, there will be no measurable change to the water quality of the Vasse – Wonnerup System.	**Not Significant**
An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	The installation of the bridges will not introduce or exacerbate the spread of invasive species.	**Not Significant**

Discussion

DCCEW has advised that the construction of non-single span bridges at Abba and Sabina Rivers is not authorised under the EPBC 2020/8800 approval as both the referral and the assessed VWMP both referred to single span bridges at these locations.

DCCEW subsequently advised that it assessed the proposal as though single span bridges were being constructed at these locations and, accordingly, a change in design cannot be accommodated in the current approval. DCCEW advised that the proposed design change should be considered as a new proposal and, accordingly, as self-assessment should be undertaken to determine if the proposal should be referred.

As the approved Proposal (EPBC 2020/8800) was not expected to have a detectible impact on the Vasse-Wonnerup System, and the minor amendment to the bridge designs is not expected to alter the expected hydrological regimes (nor sedimentation loads) within each river, the proposed minor bridge design changes are not expected to increase the likelihood or consequence of any potential impact on the Vasse-Wonnerup System.

Main Roads has considered the risk of the proposed change and the implications of the controls proposed by Main Roads to adequately mitigate, and in some cases eliminate risk.

Main Roads notes DCCEEW's preliminary advice regarding its concern that the proposed design change may have on the Vasse-Wonnerup System, however it appears that this advice is primarily focused on the receptor only and has assumed that any change will create a significant impact. In providing this preliminary advice, it does not appear that consideration has been given to the existing environment (highly degraded ephemeral river systems), the source or pathway required to cause significant impact to MNS regulated by DCCEW, nor the scale and nature of the proposed works.

Following approval, Main Roads has conducted review of separate elements of the Project design, inclusive of roadside drainage and culvert works, which has reduced both the area of vegetation required to be cleared and impacts to habitat for Black Cockatoos and WRP.

Given the scale and nature of the work proposed, the degraded nature of the existing environment, the distance to the Vasse-Wonnerup System and the erosion and sedimentation mitigations to be applied as part of the approved Proposal, the proposed design amendments are highly unlikely to have an adverse impact on the Vasse-Wonnerup System, nor any other MNES. Accordingly, it is recommended that the proposed design amendments are not referred to the DCCEW to obtain a Controlled Action decision.

Supported

Martine Scheltema
Manager Environment
Date: 27.10.22

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Appendix B - Figures

Figure 1: Vasse-Wonnerup Wetland System Location

Appendix B – Risk Assessment Categories and Descriptions

Risk assessment categories

RISK MATRIX		CONSEQUENCE LEVEL				
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
LIKELIHOOD	ALMOST CERTAIN	Moderate	High	High	Extreme	Extreme
	LIKELY	Moderate	Moderate	High	High	Extreme
	POSSIBLE	Low	Moderate	Moderate	High	High
	UNLIKELY	Low	Low	Moderate	Moderate	High
	RARE	Low	Low	Low	Moderate	Moderate

Likelihood descriptions

DESCRIPTOR	FREQUENCY	PROBABILITY
Almost certain	Twice or more per year	Event will occur during the Project / period under review
		High number of known incidents.
Likely	Once per year	Event likely to occur during the Project / period under review.
		Regular incidents known.
Possible	Once in 5 years	Event may occur in some instances during the Project / period under review.
		Occasional incidents known
Unlikely	Once in 10 years	Event is not likely to occur during the Project / period under review
		Some occurrences known.
Rare	Once in 20 years	Event will occur in exceptional circumstances during the Project / period under review.
		Very few or no known occurrences

Consequence Descriptors

FACTOR	INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
Biodiversity	Alteration or disturbance to an isolated area with no effect on habitat or ecosystem. Loss of an individual plant / animal of conservation significance.	Alteration or disturbance to <10% of a habitat or ecosystem resulting in a recoverable impact within 2 years. Loss of multiple plants / animals of conservation significance.	Alteration or disturbance to 10- 40% of a habitat or ecosystem resulting in a recoverable impact within 2-5 years. Loss of <50% known local population of plant/animal of conservation significance.	Alteration or disturbance to 40- 70% of a habitat or ecosystem resulting in a recoverable impact within 5-15 years. Loss of >50% known local population of plant / animal species with possible loss of entire local population.	Alteration or disturbance to >70% of a habitat or ecosystem resulting in a recoverable impact >15 years. Local loss of conservation significant or listed species. Extinction of a species
Water Resources	Negligible change to hydrological processes, water availability or water quality.	Short-term modification of hydrological processes, water availability and quality within project tenure, but no change in beneficial use.	Medium-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Short-term modification of hydrological processes, water availability and water quality outside project tenure, but no change in beneficial use.	Long-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Medium-term modification of hydrological processes, water availability and water quality outside project tenure, with change in beneficial use	Long-term or permanent modification of hydrological processes, water availability or water quality outside project tenure, with impacts to a water-dependent environmental value and/or change in beneficial use.