1 INTRODUCTION

1.1 Background

The Commissioner of Main Roads Western Australia (Main Roads) is proposing to construct and operate the Northern and Central sections of the Bunbury Outer Ring Road (BORR) project (Figure 1, Appendix A). BORR is a planned Controlled Access Highway linking the Forrest Highway and Bussell Highway. The completed project will provide a high standard route for access to the Bunbury Port, improve road user safety and facilitate proposed development to the east of the City of Bunbury. BORR will also provide an effective bypass of Bunbury for inter-regional traffic. BORR forms a major component of the planned regional road network for the Greater Bunbury area. The land requirement for BORR was identified in the draft Greater Bunbury Region Scheme (GBRS), with the route advertised to the broader community as part of the GBRS assessment.

In late 2016, Main Roads commenced a planning review for a future South West Freeway (Forrest Highway, BORR and Bussell Highway between Mandurah to Busselton) spanning the Forrest and Bussell Highways. This network forms the primary connection of Perth with Bunbury, Busselton and the broader South West Region including the Ports of Fremantle, Bunbury and the proposed Outer Harbour at Kwinana. This planning review resulted in a revised alignment for the northern section of BORR that joins Forrest Highway near Australind, which is now located further east than previously proposed. This revised alignment is therefore not identified in the GBRS.

The proposed BORR comprises three sections:

- 'BORR Northern Section' – Forrest Highway to Boyanup-Picton Road
- 'BORR Central Section' – Boyanup-Picton Road to South Western Highway, of which a four kilometre section was constructed in May 2013
- 'BORR Southern Section' – South Western Highway (near Bunbury Airport) to Bussell Highway.

The proposed BORR occurs within the City of Bunbury and Shires of Capel, Dardanup and Harvey. This document refers to BORR Northern and Central Sections (the Proposal) only.

Subsequent to the referral of the Proposal on 26 June 2019, the Department of the Environment and Energy (DoEE) was consolidated with the Department of Agriculture. Effective 1 February 2020, the Department of Agriculture, Water and the Environment (DAWE) is the Commonwealth Department with primary *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) regulatory authority. Reference documents published prior to 1 February 2020 will be appropriately attributed to DoEE or the relevant predecessor agency. All discussion and context relative to EPBC Act responsibilities and compliance will refer to DAWE.

1.2 Purpose of this document

This document has been prepared to address DoEE's 18 October 2019 request for further information to support assessment of a controlled action by preliminary documentation. The general location of the further information requested is outlined in Table 1-1, while the section that addresses the specific content to be included is shown in Appendix B.

Table 1-1 Additional information requirements reference table

SPECIFIC CONTENT TO BE INCLUDED	ADDITIONAL INFORMATION PROVIDED Y/N/NA	SECTION NUMBER
1. Description of the action	Y	Section 1.3 to Section 1.3.6
2. Description of the environment and MNES	Y	Section 2
3. Assessment of impacts	Y	Section 3
4. Avoidance and mitigation measures	Y	Section 4
5. Offsets	Y	Section 5
6. Economic and social matters	Y	Section 6
7. Ecologically sustainable development	Y	Section 7
8. Environmental record of the person proposing to take the action	Y	Section 8
9. Other approvals and conditions	Y	Section 9

1.3 Description of the action

The Proposal is located approximately 200 km south of Perth and at its closest point, approximately six km south-east of Bunbury.

The Proposal includes construction and operation of BORR Northern and Central sections. These sections comprise 20 km of new freeway standard dual carriageway and associated bridges, interchanges and other road infrastructure including, but not limited to, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs. The components of the Proposal are described in Section 1.3.

The area referred by Main Roads is up to 625 hectares (ha) and referred to as the Proposal Area (Figure 1, Appendix A). There have been modifications to the Proposal Area since it was referred to the DoEE on 26 June 2019. This has resulted in a reduction in the overall area (from 651 ha to 625 ha) and potential impact of the Proposal on the environment, in particular on habitat for threatened species and Threatened Ecological Communities (TECs). Further details of the changes are provide in Sections 1.3.6 and 4.

The majority of the land within the Proposal Area is cleared agricultural land. Pockets of native vegetation are present within the Proposal Area in road reserves, along sections of the Collie, Ferguson and Preston Rivers, or as isolated patches on properties. The Proposal Area excludes areas within BORR Central Section which was constructed in 2013.

1.3.1 Layout plan

A layout plan for the Proposal, including the locality, has been included in Figure 1, Appendix A.

Land use type within and surrounding the Proposal Area is illustrated in Figure 3, Appendix A.

1.3.2 Pre-construction, construction and operation of the Proposed Action

1.3.2.1 Pre-construction

The Concept Design has been developed to accommodate traffic generated by a future population of 200,000 in the Greater Bunbury Region and increased demand between Perth and the south west. A key

constraint on the design is mitigation of impacts on private land as the BORR alignment traverses or is in close proximity to a range of land uses, public infrastructure and environmental constraints, including:

- Residential development (Meadow Landing) on the western boundary near the proposed Raymond Road crossing
- Residential development (Kingston Estate) along the western boundary north of the BORR/ Forrest Interchange
- Rail line running parallel with South Western Highway
- Large farm lots with dairy and stock operations
- Environmental constraints.

The Concept Design was developed to minimise these impacts as far as practicable.

The Proposal is planned as a future freeway and accordingly has been designed as a high-speed dual carriageway road. The adopted cross sections and geometry are consistent with Austroads, Main Roads and local government standards. The vertical alignment has been designed as low as possible to minimise the impacts on the landscape and quantities of imported fill.

The locations of all proposed structures in the Concept Design are included in Table 1-2 and illustrated in Figure 2, Appendix A.

Table 1-2 Locations of proposed structures in the Concept Design

PROPOSED BRIDGE STRUCTURE	VERTICAL CLEARANCE (m)	SPAN LENGTH (m)	NO OF SPANS
Paris Road/Clifton Road over BORR/Forrest Highway (including PSP)	7.0	32	2
Raymond Road over BORR	7.0	26	2
BORR over Collie River (including PSP)	Based on 100 year flood level	35	4
BORR over South Western Highway (North)	5.9	28	2
BORR over ARC rail	7.3	43	1
BORR over Railway Road	4.6	20	1
BORR over Wireless Road (2 bridges)	7.0	22	1
BORR over Golding Crescent/Ferguson River	5.9 m / 100 year flood level	33	3
BORR over Boyanup-Picton rail	7.3	43	1
BORR over Boyanup-Picton Road	7.0	25	1
Martin Pelusey Road over Golding Crescent/Ferguson River	5.8 m / 100 year flood level	33	3
Martin Pelusey Road over Boyanup-Picton rail	7.3	43	1
Martin Pelusey Road over Boyanup-Picton Road	7.0	25	1

PROPOSED BRIDGE STRUCTURE	VERTICAL CLEARANCE (m)	SPAN LENGTH (m)	NO OF SPANS
Willinge Drive over BORR (2 bridges)	5.8	28	2
Willinge Drive westbound entry ramp over Preston River (widening)	Based on 100 year flood level	25	3
Willinge Drive Extension over Preston River	Based on 100 year flood level	35	3
BORR over South Western Highway (South)	7.0	35	1

The majority of the Proposal has been designed in 'fill' as it will be constructed on existing palusplain wetlands, with established overland flow patterns and in some areas, established flood irrigated agricultural land.

The earthworks volumes calculated for the Proposal are approximated as:

- Cut: 400,000 cubic metres
- Fill: 7,000,000 cubic metres.

Key areas of earthworks are:

- Raised earthworks are necessary at interchange locations to facilitate the grade separation between the highway and connecting roads
- Between Raymond Road and the Collie River, the vertical alignment has been lowered below ground level to mitigate the visual impacts of the proposed Raymond Road interchange to the adjacent Meadow Landing community. A clearance of 7.0 m from the design reference line to confined aquifer groundwater level is achieved through this section
- Significant fill is required over South West Highway (North), the ARC railway and Railway Road to achieve the required vertical clearances
- Significant fill is required for BORR to span over Golding Crescent, Ferguson River, the Boyanup Picton rail and Boyanup Picton Road.

The design of the Proposal is at the concept stage (Concept Design). Detailed design during delivery will address key constraints such as groundwater level, bridge and culvert clearances, sight distance, vertical curve lengths and surfacing which may result in amendments to the Concept Design.

1.3.2.2 Construction

Construction of the Proposal is planned to commence in Quarter 1 (Q1) 2021 for a period of two to three years. The construction methodology for structures depends on their final form.

Construction of the road will be undertaken using traditional earth-moving, equipment and construction techniques. The road formation will be built using both imported fill and cut-to-fill materials from the Proposal Area. The majority of the road alignment is in fill, with some cut material to be sourced from the approaches to the Collie River Crossing. The depth of excavation at cut locations will be determined by groundwater and design levels. Geohydrology investigations and modelling are currently determining the levels that will inform site excavations.

Bridges are likely to consist of pre-cast concrete or steel, supported on piled foundations or spread footings with mechanically stabilised earth (MSE) walls at the abutments. Piers (upright support columns for the structure) will consist of concrete columns at bridges, over roads or rail lines. High-level construction methodology for bridges would typically comprise:

- Piling works for foundation construction
- Construction of concrete pier columns
- Construction and installation of MSE walls at abutments
- Construction of concrete topping slab
- Completion of ancillary works, such as landscaping.

Underpasses will be installed. These underpasses will either be a pre-cast concrete arch or trapezoid structure, supported on concrete strip footings. Separate fauna underpasses are also provided.

Materials for the construction of the road and associated structures will be sourced according to the Materials Sourcing Strategy (MSS) (BORR IPT, 2020f) and market sounding exercise for early materials procurement. The MSS considered projects, nearby developments, potential areas of acquisition, commercial quarries as well as alternative recyclable material sources. The key basic raw materials required for construction of the road include sand, limestone, clay, lateritic gravel, and crushed rock aggregate. Impacts associated with sourcing materials are not included in this Proposal.

Lay down areas for material will be established by the Contractor in consultation with Main Roads and the Local Government Authorities. All laydown areas are expected to be within the Proposal Area.

Construction water will be sourced from temporary boreholes, and other water suppliers.

1.3.2.3 Operation

BORR will operate as a controlled access highway (freeway standard), with access restricted to the grade-separated interchange locations. Traffic will generally be free flowing on the four lane dual carriageway (two lanes each direction). Daily volumes along the alignment are likely to ultimately range from 30,000 to 45,000 vehicles, with the busiest sections between South Western Highway (North) and Willinge Drive.

BORR will be subject to normal routine, recurrent and periodic maintenance during operation of the highway. The maintenance operations are confined to the road corridor and the road itself, typically including vegetation, drainage, lighting, road markings, signs and the road pavement.

1.3.3 Description of the activities associated with the Proposed Action

Key Proposal activities that quantify the limits or context of the physical and operation elements are presented in Table 1-3.

Table 1-3 Key Proposal activities

ELEMENT	PROPOSED EXTENT
Physical elements	
Overall Proposal footprint (including all physical elements below)	• Clearing or disturbance of up to 625 ha comprising approximately: • 73 ha of native vegetation and approximately 19 ha of revegetation (~15 % combined) • 532 ha (~82 %) of cleared and highly modified areas (agricultural land and existing built infrastructure). • Up to 2.6 ha of vegetation in Good or better condition would be cleared as a result of this Project.
Road construction and associated infrastructure (Figure 2)	The road construction and associated infrastructure for the Proposal includes the following components: • 19 km of new rural freeway standard, dual carriageway • A grade separated interchange at the intersection of Forrest Highway, Paris Road and Clifton Road • A grade separated interchange at Raymond Road

ELEMENT	PROPOSED EXTENT
	• A grade separated interchange at South West Highway • A grade separated interchange at Waterloo (Wireless Road) • A grade separated interchange at Willinge Drive • Extension of Willinge Drive south (3 km) to intersect with South West Highway • New local roads and existing local road modifications • Utility modifications.
Bridges and drainage infrastructure	The bridge construction and associated infrastructure for the Proposal includes the following components: • New bridge [14 m and 19 m width / 4 x 35 m spans] BORR over the Collie River • New bridge [35 m width / 2 x 40 m spans] BORR over the South Western Highway (north) • New bridge [35 m width/ 40 m and 20 m spans] BORR over the Perth Bunbury Rail line and Railway Road • New bridge [27 m width/ 3 x 32 m spans] BORR over Golding Crescent/Ferguson River • New bridge [16.5 m width / 3 x 32 m spans] Martin Pelusey over Golding Crescent/Ferguson River • New bridge [27 m width / 40 m span] BORR over Boyanup-Picton Rail • New bridge [16.5 m width / 40 m span] Martin Pelusey over Boyanup-Picton Rail • New bridge [27 m width / 32 m span] BORR over Boyanup-Picton Road • New bridge [16.5 m width / 32 m span] Martin Pelusey over Boyanup-Picton Road • New bridge [30.5 m width/ 40 m span] over South West Highway near Davenport • Drainage basins, drains and other associated infrastructure.
Principal Shared Path (PSP)	A PSP [4.6 m width] will be constructed for the full length of the Proposal, situated on the western side and generally elevated 1 – 1.5 m above the existing ground level. Shared paths to be constructed along connecting roads and within interchanges.
Other road infrastructure and furniture	Other road infrastructure and furniture, including but not limited to culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs.
Operational elements	
Constructed BORR	Main Roads will operate the Proposal including standard management and maintenance practices.

1.3.4 Anticipated timing

Construction is expected to start in Quarter 1, 2021 and continue until Quarter 4, 2023.

Once the BORR Northern and Central Sections are constructed and open for public use, operation of the BORR will be ongoing.

1.3.5 Rehabilitation activities

Revegetation along the development envelope would comply with *MRWA Vegetation Placement within the Road Reserve* Doc. No. 6707/022 (MRWA, 2013). This guide defines the recommended setbacks and clearance requirements that apply to all revegetation or landscaping associated with new road construction.

Revegetation would utilise locally native species that will be resilient within three years after the rehabilitation works are completed. Revegetation would not include species of foraging habitat for black cockatoos, including but not limited to, *Banksia* spp., *Hakea* spp., *Grevillea* spp. and *Eucalyptus* spp. within 10 m of the constructed road carriageway.

Placement of vegetation near road infrastructure is restricted to maintain road safety. These requirements minimise ongoing maintenance and maintain a standard amenity level for road users. Revegetation will incorporate these restrictions when undertaking planting, in particular, the need for roadside maintenance and clear zones. Rehabilitation would not include areas required for ongoing operations such as drainage basins, road embankments and median strips.

1.3.6 Feasible alternatives considered

Context

BORR concept was originally developed by Main Roads in the early 1970s in consultation with other State Government departments and Local Authorities. The original concept linked the Australind Bypass (now known as Forrest Highway) to the north of Bunbury with Bussell Highway to the south of Bunbury, over a distance of approximately 19 km. It was planned as a controlled access four-lane divided rural highway. This body of work formed part of the Bunbury Region Plan (State Planning Commission 1987), now replaced by the Bunbury Wellington Region Plan (Department of Planning and Urban Development, 1993). BORR Northern Section Alignment was identified to the west of the existing Hynes Road and included as regional roads in the GBRS, prepared by the Western Australian Planning Commission (WAPC), alongwith an alignment for BORR Southern and Central Sections.

Further planning and development work followed over many years, resulting in the construction of BORR Central Section in 2013 as part of the Bunbury Port Access Road, Stage 2 project, as shown in Figure 4, Appendix A.

In 2010, the Department of Planning (now Department of Planning, Lands and Heritage (DPLH)) approached Main Roads seeking to modify BORR Northern Section alignment detailed in the GBRS, to accommodate a future expansion of the Greater Bunbury urban and industrial footprint, including the newly identified Wanju Urban and Waterloo Industrial areas. This planning review was prompted by a number of factors including the need to accommodate a future population of Greater Bunbury and Main Roads understanding of the planned population of the proposed Wanju development (located to the east of BORR GBRS northern alignment) of around 16,500.

This resulted in Main Roads reviewing the road corridor for BORR Northern Section, including its intersection with Forrest Highway, and future requirements for passenger rail infrastructure. In 2012, Main Roads finalised a concept for a corridor located slightly east of that shown in the GBRS, referred to below as BORR Northern Section Western Alignment Corridor.

Draft District Structure Plans for the proposed Wanju (urban) and Waterloo (industrial) areas were advertised between 2016 and 2017 based on BORR Northern Section Western Alignment Corridor.

2017 Alignment Review

In late 2016, Main Roads Western Australia (WA) commenced a planning review for a future South West Freeway (from Mandurah to Busselton) spanning the Forrest and Bussell Highways, and including BORR. It was recognised that updated land use planning surrounding Greater Bunbury and BORR Northern Section Western Alignment Corridor, provided an opportunity for an alternative alignment to be considered. Government agency and stakeholder engagement confirmed broad support for investigations into a revised BORR Northern Section corridor to the east of BORR Northern Section Western Alignment Corridor, referred to as BORR Northern Section Eastern Alignment Corridor.

Main Roads consulted DPLH in 2017 regarding the South West Freeway planning, including BORR, in response to the advertising of the Draft District Structure Plans for Wanju and Waterloo developments. Main Roads sought advice regarding future land use planning where it was confirmed that Greater Bunbury's ultimate population is planned to be in the order of 200,000, including in excess of 50,000 people within the proposed Wanju urban development.

Main Roads completed a constraints mapping and option analysis of BORR Northern Section based on:

- The proposed increase in land use intensity surrounding BORR Northern Section Western Alignment Corridor
- Planned increase in the ultimate population of Greater Bunbury
- Complexities in catering for additional traffic pressures
- The review of BORR as part of the South West Freeway Planning Study.

The process and outcomes of this assessment is detailed in BORR Northern Section - Alignment Selection Report (Main Roads WA, 2018), and discussed below.

The constraints mapping and options analysis identified that the alternative BORR Northern Section Eastern Alignment Corridor, located to the east of BORR Northern Section Western Alignment Corridor, warranted consideration as it provided a number of potential benefits. The two options are shown in Figure 4, with the existing BORR Northern Section Western Alignment Corridor (light green) and an alternative BORR Northern Section Eastern Alignment Corridor (pink).

As part of the alignment selection process, a Multi-Criteria Assessment (MCA) was prepared to assess the two BORR Northern Section Alignment options under consideration. The MCA is included in Appendix 1 of BORR North Section Alignment Selection Report (Main Roads WA, 2018). The MCA included a desktop assessment of critical aspects relevant to major infrastructure projects including environment, social, economic and engineering considerations, using a consistent number of criteria for each aspect so as not to skew the results (i.e. three sub-headings for each aspect).

The desktop assessments, including the MCA, confirmed the alternative BORR Northern Section Eastern Alignment Corridor provided a number of advantages over BORR Northern Section Western Alignment Corridor. Based on the desktop assessment, the difference between BORR Northern Section Western Alignment Corridor and the alternative BORR Northern Section Eastern Alignment Corridor on environmental grounds was marginal.

A two phase consultation process was adopted as part of the planning study, comprising:

- Engagement with Government Agencies and key stakeholders through 2017 and 2018 to determine whether options were consistent with State and Federal frameworks, priorities and objectives and whether the options were robust enough to warrant targeted landholder consultation
- Targeted landholder consultation with those potentially directly impacted by either the existing BORR Northern Section Western Alignment Corridor or alternative BORR Northern Section Eastern Alignment Corridor. This initial consultation was undertaken between November 2017 and May 2018.

This consultation provided valuable information that has informed the assessment process.

The desktop assessment in the Alignment Selection Report found there was very little difference in terms of potential environmental impact of the two options (Main Roads WA, 2018). However, the alternative BORR Northern Section Eastern Alignment Corridor provided additional planning, traffic, safety, and efficiency benefits.

These benefits are:

- Provision of an integrated planning solution that provides a defined outer perimeter rather than dividing Wanju and the Greater Bunbury urban footprint
- Separation of regional/freight traffic from local traffic
- Separation of local, high speed regional and freight traffic improves road safety, efficiency and provides a more effective bypass and improved access to Bunbury Port
- Caters for a forecast population for Greater Bunbury in excess of 200,000 people
- Traffic demand can be accommodated with four lanes for the entire extent of BORR and efficiently caters for long weekend traffic peaks
- Provides improved connectivity between Wanju and Greater Bunbury through additional access points to Forrest Highway (strong east-west movements are suggested in the traffic model)
- Ties in further north of the existing green alternative considered, bypassing an additional major intersection on Forrest Highway, improving safety and efficiency
- Strongly aligns with State, Federal and Infrastructure Australia frameworks, drivers and objectives
- Is a cost effective solution consistent with broader overall ultimate South West Freeway strategy between Perth and the South West Region
- Does not preclude future rail options, including a future fast rail station within Wanju, a station in Bunbury's central business district (CBD) and a number of other possible rail scenarios yet to be identified/ planned.

In May 2018, Main Roads presented to the WAPC the alignment selection process for BORR Northern Section. A formal submission was made to the Commission for consideration at the 30 May 2018 session, seeking their support for the alternative BORR Northern Section Eastern Alignment Corridor. In June 2018, the WAPC confirmed their support for selection of the alternative BORR Northern Section Eastern Alignment Corridor to allow further detailed planning activities to progress.

BORR Northern Section Alignment being assessed as part of this Proposal, is the alternative BORR Northern Section Eastern Alignment Corridor.

Refinement of BORR Northern Section

BORR Northern Section Alignment has undergone further refinement by BORR Integrated Project Team (IPT) during development of the current concept design, to minimise environmental impacts where possible. An MCA was undertaken for several of the interchange options to determine a preferred option. The MCA evaluated six equally weighted criteria:

- Road safety
- Community amenity
- Freight efficiency
- Urban congestion
- Environment
- Project cost.

Desktop information was used to inform the MCA as the field survey results were not available at the time. The environmental considerations and outcomes of the MCA informed the locations and form of the interchanges within the final Proposal Area, and are provided in Appendix 1 of *BORR North Section*

Alignment Selection Report (Main Roads WA, 2018). Interchange concepts may change in detailed design but will remain within the Proposal Area and consistent with approvals.

An additional access road was under consideration to link the South Western Highway to Willinge Drive (the 'Davenport Link'). This option was discarded as part of the scope for the current Proposal and not considered further.

Since referral to DoEE in June 2019, Main Roads has undertaken a comprehensive review of the design and amended the Proposal Area to reduce the potential impacts on key environmental features including:

- Habitat for Western Ringtail Possum (WRP), Black Cockatoos, Carter's Freshwater Mussel (CFM) and Black-stripe Minnow (BSM)
- Banksia Woodlands TEC, Clay Pans TEC and Corymbia Woodland TEC.

The extents to which design changes result in impact reductions for conservation significant species and communities is summarised in Table 1-4.

Table 1-4 Extent of design changes to avoid impacts to threatened flora, fauna ecological communties

ASPECT	ORIGINAL PROPOSAL (JUNE 2019 REFERRAL)	REVISED PROPOSAL (JANUARY 2020)	REDUCTION IN IMPACT
Banksia Woodlands TEC	Up to 7.6 ha (direct impacts) 2.11 ha (indirect impacts - fragmentation)	Up to 3.7 ha (direct impacts) No occurrences of fragmentation	3.9 ha (direct impacts) 2.11 ha (indirect impacts)
Clay Pans TEC	Up to 1.6 ha (including 1 ha unconfirmed)	Up to 0.63 ha	0.21 ha *
Corymbia Woodland TEC	2.0 ha**	Up to 1.3 ha	0.7 ha
Western Ringtail Possum habitat (ha)	70.3 ha	43.9 ha	26.4 ha
Black Cockatoo habitat (ha)	59.7 ha	37.8 ha	21.9 ha
Black Cockatoo suitable Diameter at Breast Height (>500 mm) (DBH) trees	1116	710	406
Black Cockatoo trees with a suitable nest hollow	5	3 (potentially suitable nest hollows)	2
Black Cockatoo known nesting trees	0	0	n/a
Black-stripe Minnow habitat	0.55 ha	0.55 ha	No Change
Carter's Freshwater Mussel habitat	Potential for bridge piers or abutments within water courses	No bridge piers or abutments within water courses	No direct impacts

*– Additional surveys found 0.79 ha was not Clay Pans TEC.

**– FCT 3c was identified in a supplementary flora and vegetation survey conducted after the submission of the s.38. The Proposal Area boundary was then modified to reduce impacts to FCT 3c.

The changes to the design of the Proposal (detailed in Table 1-5) include:

- Reduction in median widths where the alignment is on high fill embankments
- Changes to the form of interchanges to reduce impacts including fragmentation
- Increased batter slope (gradients) and use of retaining walls to reduce the area of clearing required
- Bridge designs to avoid the need for piers or abutments within watercourses
- Amendment of the alignment to reduce the area of native vegetation cleared
- Staging of construction to allow for the reduced clearing footprint
- Pulling the principal shared path (PSP) in closer to the highway to reduce the project footprint
- Inclusion of fauna crossings
- Design of drainage to maintain hydrological regimes.

Table 1-5 Summary of design changes and benefits

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING				
	BC	WRP	CFM	BSM	TEC
Whole of alignment					
1800 m chainlink fence along the whole alignment with a fine gauge skirt in areas where smaller fauna may be present (i.e. not in farmland areas)	X	X	X	X	X
The median widths have been reduced where the BORR alignment is on high fill embankments to mitigate the environmental impacts	X	X			X
All bridge designs have been prepared to avoid the need to have piers or abutments within the watercourse, mitigating environmental and heritage impacts			X		
BORR / South West Highway (North)					
Design of works along South West Highway has been modified to mitigate the impact to the TEC west of Waterloo Road					X
BORR/Forrest interchange					
BORR main alignment has been designed to mitigate impacts on vegetation	X	X			X
Form for the interchange deliberately planned to reduce impacts to habitat and vegetation. Environmental benefits are substantial however the solution is largely unpopular with the community	X	X			X
Reduced median width on BORR to minimise the impacts on vegetation	X	X			X
Noise wall alignment designed to mitigate environmental impacts by building wall along an existing cleared track	X	X			X

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING				
	BC	WRP	CFM	BSM	TEC
Noise walls will be utilised instead of bunds to minimise the clearing footprint	X	X			X
Road profile has been adapted to ensure the existing hydrological flows are maintained and sufficient culverts can be provided			X	X	
Batter slopes have been steepened to minimise width of clearing	X	X			X
Existing vegetation on the south west quadrant of the interchange has been removed from the Proposal Area. This will restrict the construction staging options and require additional traffic staging at a cost to Main Roads	X	X			X
Existing vegetation on the north west quadrant of the interchange will be protected through engineering solutions to maintain the connectivity to the Brunswick River	X	X			X
Works along Forrest Highway have been minimised to retain as much vegetation as possible	X	X			X
43 fauna crossings included in the design to maintain and enhance existing movement pathways		X			
Potential inclusion of a water source for WRP within drainage infrastructure at the interchange – this is being negotiated with the Department of Water and Environmental Regulation (DWER)		X			
Fauna fence established as close to the highway as possible so that batters can be used for revegetation and recreation of habitat	X	X			X
BORR / Boyanup Picton Road interchange					
PSP moved closer to the BORR alignment to reduce footprint width and potential vegetation and habitat fragmentation impacts	X	X			X
Vegetation within the loop ramp has been removed from the referral boundary	X	X			X
Fauna movements will be supplemented with fauna crossings to provide connectivity to the Ferguson River		X			
BORR / Moore Road interchange					
Drainage design to move infrastructure to cleared areas not within vegetation or habitat	X	X			X

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING				
	BC	WRP	CFM	BSM	TEC
BORR / South West Highway (South) interchange					
Alignment modified to save existing vegetation on the northern boundary of the existing alignment. This will require additional construction staging efforts to accommodate existing traffic patterns while the new highway is constructed.	X	X			X

- BC: Black Cockatoo, WRP: Western Ringtail Possum, CFM: Carter's Freshwater Mussel, BSM: Black-stripe Minnow, TEC: Threatened Ecological Community.