



# Main Roads Western Australia High Street Fremantle Upgrade Project Environmental Impact Assessment

October 2018

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# Executive Summary

The State and Commonwealth government have committed funding for the High Street upgrade project. The project is located on High Street between Stirling Highway and Carrington Street, and aims to resolve safety issues along High Street and at the intersection with Stirling Highway. The project will involve:

- Upgrade of High Street and Stirling Highway intersection with a 60m diameter dual lane roundabout with bypass and slip lanes to improve traffic operations
- Grade separated pedestrian crossing of High Street at Montreal Street, and Stirling Highway at Forest Street
- Wide median west of Wilkinson Street to retain mature trees along High St verge
- 1.5 km of new carriageway
- A 1 km service road for existing properties
- Retaining walls, noise mitigation and landscaping

GHD was commissioned to prepare an Environmental Impact Assessment (EIA) to detail the environmental approvals expected for the project from both State and Commonwealth agencies, and support an application for approval to clear native vegetation. This included technical assessments for vegetation, large trees, noise and air quality. Key environmental considerations identified for the project include:

- Black Cockatoo – A total of 0.98 ha of foraging habitat was recorded in the survey area, of which 0.64 ha (including non-native vegetation) will be cleared. Sixteen trees with a DBH >500 mm will be cleared for the project, 2 with hollows. Neither tree contains hollows of suitable size for breeding by black cockatoos.
- Noise – The noise model constructed for the project predicts all of the specified sensitive receptors will be exposed to noise levels above the noise limit criteria by 2041 with or without the proposed upgrade occurring. However, with the implementation of this project and inclusion of noise walls, it is expected there will be a positive noise impact to many sensitive receptors. The noise model predicted more than 65% would comply with the limit noise criterion and an additional 13 % would marginally exceed the limit with noise walls incorporated into the design. The construction of the project had no impact on noise levels at some properties, or a minor improvement on noise for the 2041 scenario, when compared to not building the road upgrade.
- Air quality – There was stakeholder feedback raising concerns regarding air quality impacts. The air model developed for the project predicts existing, day of project opening (2020) and year 2041 all well below relevant ambient air quality criteria. The project will also move heavy vehicles further away from sensitive receivers and provide more free flowing traffic, which will reduce the potential impact on sensitive receivers.
- Visual amenity – The retention of many larger planted trees including large Tuarts located within a new median will minimise the visual impact of the project. A landscaping plan will also be developed for the proposal to improve the entrance to Fremantle. The current proposed layout of the noise walls is expected to provide a higher level of privacy for the majority of the residences along High Street compared to current screening.
- Reserves – The proposal is located partially on Class A (1.8 ha) and Class C (0.1 ha) reserves associated with the Fremantle Royal Golf Course and Fremantle Public Golf Course, established for recreation purposes. Land acquisition is being undertaken at these

locations and the proposal is expected to be tabled before Parliament in late 2018 for the Class A reserve.

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# 1. Introduction

## 1.1 Project information

### 1.1.1 Project background

In 2002, the Metropolitan Freight Network Review considered options for managing freight demand, improving the sustainability of freight transport, reducing future problems and focusing government intervention to reduce the impact of freight in Western Australia. The Review produced a Six Point Plan which identified major, high priority actions to safe guard freight movement in Western Australia. The Plan included recommendations to upgrade High Street between Stirling Highway and Carrington Street in Fremantle.

In November 2007 the then Department for Planning and Infrastructure commissioned a study to prepare a preliminary road design concept; and as part of that study in 2008/2009 undertook a comprehensive community consultation program to identify a preferred alignment option for the upgrade. Since taking ownership of the project in late 2011, Main Roads Western Australia (Main Roads) has collaborated with the City of Fremantle to further refine the concept design.

In 2014, a project to upgrade the road from Carrington Street to Stirling Highway, including Stirling Highway up to Canning Highway, was determined. This project involved:

- The upgrade of the road to a 4-lane dual carriageway, with the ultimate design being a 6-lane dual carriageway
- Realignment of the intersection of High Street and Stirling Highway, creating a continuous route at the eastern leg of the new Leach Highway and Stirling Highway
- Upgrade of the pedestrian and cyclist access from Marmion to Carrington Street along the route, including at the major intersections

In May 2017, the state and federal governments committed funding for the High Street upgrade project. The project has been revised from the 2014 design to include only High Street between Stirling Highway and Carrington Street, to resolve the safety issues along High Street and at the intersection with Stirling Highway. The project has a significantly smaller footprint than the 2014 project design.

### 1.1.2 Project purpose

The primary purpose of this project is to improve road safety along High Street between Carrington Road and Stirling Highway and improve the intersection of Stirling Highway and High Street. A number of truck roll-overs have occurred at this intersection.

High Street has had a significant number of accidents, with 15% of accidents resulting in recorded injuries during the 2013 to 2017 period. Over 70% of all accidents were rear-enders, over 14% were right angle sideswipes or right turn through and 12% side swipe in the same direction. Over 70% of accidents were on straight sections of road in dry conditions.

The purpose of this project is to improve road user safety and cater for traffic growth to 2041.

### 1.1.3 Project description

The High Street Upgrade (the project) will involve the upgrade of this road to a 4 lane dual carriageway, including:

- Upgrade of High Street and Stirling Highway intersection with a 60m diameter dual lane roundabout with bypass and slip lanes to improve traffic operations

- Grade separated pedestrian crossing of High Street at Montreal Street, and Stirling Highway at Forest Street
- Wide median west of Wilkinson Street to retain mature trees along High St verge
- 1.5 km of new carriageway
- A 1 km service road for existing properties
- Retaining walls, noise mitigation and landscaping

#### 1.1.4 Project location

The project is located on High Street, 2 km east of Fremantle. The works will be conducted along High Street between Stirling Highway and Carrington Street, 0.03 Straight line kilometre (SLK) to 1.49 SLK, in the City of Fremantle (Figure 1, Appendix A).

An environmental assessment was undertaken in June 2018 for the study area (Figure 2, Appendix A). The original project is detailed in (Appendix A) for comparison. An approvals envelope has been applied to the project, project works will be undertaken inside this area.

#### 1.1.5 Purpose of this report

The purpose of this report is to describe the existing environment and environmental impact of the project, as well as assess environmental matters that may necessitate referral to the Department of the Environment (DotEE) or Environmental Protection Authority (EPA) for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Environmental Protection Act 1986* (EP Act).

### 1.2 Key environmental impacts

The project area is based on the preliminary design plus 0.5 m for construction purposes. An approvals envelope has been applied to this project to allow for flexibility during detailed design (Figure 4, Appendix A). The approvals envelope is 20.1 ha in size, of which 0.63 ha of native vegetation is expected to be cleared.

### 1.3 Key management actions

Environmental management is outlined in Appendix B. Key management actions include:

- Mature trees identified as significant to the local streetscape will be retained where possible, particularly trees in the median
- Trees to be retained will be marked on site
- Prior to the start of clearing operations the Construction Contractor is to mark out the clearing line for review by Main Roads to determine that it is clearly defined prior to the commencement of clearing works
- Bridal creeper will be removed in the project area
- All surface run-off from the project area will be contained through appropriate drainage requirements
- Develop and implement dust controls in accordance with Department of Water and Environmental Regulation (DWER) guidance. Dust management to be included in the Construction Environmental Management Plan (CEMP).
- Works will be undertaken between 7am and 7pm, a Noise Management Plan approved by the local government will be required outside these times. Complaints by the public will be recorded and serious complaints actioned within 24 hours.

- Installation of noise walls at selected locations.

## 1.4 Approvals strategy

The approvals requirements for this project are provided in Table 1.

Table 1 Approvals requirement

Approval type	Applicable
EP Act – Part IV: Referral of Proposals to the EPA (Section 38)	Referral to the EPA will be undertaken as the project is likely to generate significant public interest.
Project specific native vegetation clearing permit	This will be applicable if the project is not assessed under part IV of the EP Act.
EPBC Act	Applicable as trees to be removed for the project trigger the referral guidelines as potential future habitat for Black Cockatoos.
EP Act – Part V; Works Approval & Licences.	Not applicable
Bed and Banks Permit under the <i>Rights in Water and Irrigation Act 1914</i> (RIWI Act)	Not applicable
Section 18 under the <i>Aboriginal Heritage Act 1972</i>	Works pose no threat to Aboriginal heritage sites. An Aboriginal Heritage Risk Assessment is included in Appendix C.
Government Heritage Property Disposal Process	Applicable, project under assessment. Houses over 60 years of age will be removed as part of pre-works and are not part of this Environmental Impact Assessment (EIA) assessment.
Excision of Class A reserve Reclassification of Class C reserve	The excision of the reserve will be tabled in Parliament at the end of 2018. A small part of Class C reserve will also be changed to road reserve prior to works.

### 1.4.1 Commonwealth referral

The decision whether to refer the project to DotEE was based on whether the project may have a significant impact upon Matters of National Environmental Significance (MNES), which are protected under the EPBC Act. These include; World Heritage properties, National Heritage places, wetlands of international importance (listed under the Ramsar convention), Commonwealth land or marine areas, migratory species protected under international agreements, nuclear actions, nationally threatened species and ecological communities and water resources.

Surveys of the project area identified trees which meet the referral guidelines for Black Cockatoo species. The clearing of these trees and associated habitat is not expected to have a significant impact on the Black Cockatoo. However, due to the considerable public interest associated with this project, referral to the DotEE will occur to de-risk the approval pathway.

### 1.4.2 State referral

Typically the decision to refer the project to the WA EPA was based on whether the project would impact on environmental factors significantly enough to require referral under Section 38 of the EP Act. Although the environmental impacts associated with this project are not expected to be significant, referral to the EPA will be undertaken to provide approval certainty, given the project history, location and considerable public interest.

## 1.5 Social and economic costs and benefits

The high rate of vehicle accidents within the project area indicates there ongoing issues with congestion and safety along this section of High Street and intersection of High Street and Stirling Highway. The purpose of this project is to improve road user safety by redesigning the road network to separate local traffic from commuter traffic, while catering for traffic growth to 2031.

The project is expected take 12 to 15 months to construct. Disruption to local landowners and traffic is expected to be minor with the project constructed in stages. Approximately 600 people will be employed by the project, subject to funding and final design.

## 2. Methodology

### 2.1 Previous works

GHD was commissioned in 2014 to prepare an EIA based on the 2014 project preliminary design to assess the environmental impacts and detail the environmental approvals expected for the project from both State and Commonwealth agencies, and support an application for approval to clear native vegetation under CPS818. The following technical studies were utilised in the EIA:

- Flora and Fauna Assessment (GHD 2014), including Black Cockatoo Habitat Survey by Tony Kirkby
- Arboricultural Report (Aldous-Ball 2008)
- Noise Assessment (Lloyd George Acoustics 2014)
- Air Quality Assessment (GHD 2013a)
- Preliminary Environmental Impact Assessment (GHD 2013b)
- Desktop Ethnographic Aboriginal Heritage Survey (Brad Goode 2008)
- Desktop Aboriginal Heritage Survey (Brad Goode 2012)
- Archaeological and Historical Site Assessment (Yates Heritage Consultants 2008)
- Contaminated Sites Preliminary Site Investigation (Site Environmental and Remediation Services (SERS) 2013a)
- Detailed Site Investigation: Soil and Groundwater (SERS 2013b)

### 2.2 2018 Technical assessments

The revision of the project necessitated selected technical assessments to be updated to supplement the previous studies and inform this EIA. The updated studies included vegetation, large tree, air quality and noise assessments.

In most cases, desktop searches have been conducted with a 10 km buffer (defined as the study area), and the results of these have been included in Section 3. The 10 km buffer allows for the identification of the surrounding environment in order to provide regional context for the project, and identifies any nearby features that are outside the project area but may be indirectly impacted. The results of the survey work is detailed in each relevant section.

#### 2.2.1 Vegetation assessment

The updated vegetation assessment June 2018 by a GHD botanist. Native vegetation was assessed for condition, composition and the presence of rare or priority flora, as well as threatened or priority ecological communities (Appendix D).

#### 2.2.2 Large tree assessment

The large tree assessments were undertaken in June and July 2018, with a GHD zoologist and an Arborist from ArborCentre. Black Cockatoo habitat was assessed by a GHD zoologist, in association with Tony Kirkby, to determine presence of foraging or breeding habitat and potential for trees to be used by Black Cockatoos in the future (Appendix E). Tony Kirkby is a Senior Cockatoo Researcher with over 16 years' experience in monitoring and assessing Black Cockatoo habitat.

The health, structure and root zone of trees was also determined by the Arborists (Appendix F), and this information was used to modify the project design to decrease impacts on trees in the project area.

### 2.2.3 Air quality assessment

An Air Quality Assessment was undertaken in 2013 and has been updated for the revised project (Appendix G). The revision included:

- Outline of emission sources from the revised project, including traffic volume projections and associated road network and vehicle emission rates
- Identification of the appropriate air quality criteria and guidelines applicable to this assessment
- Investigation of the existing environment including topography, meteorology, background air quality and sensitive receptors
- Dispersion modelling for the assessment of predicted local air quality impacts from the project at day of opening (2020) and the year 2041.

### 2.2.4 Noise assessment

An updated noise assessment has been undertaken (Appendix H) including the following:

- Existing noise monitoring
  - Identification of sensitive receptors and selection of four representative locations for unattended monitoring. Unattended monitoring was undertaken for a minimum of three 24 hour normal weekdays at each site
  - Monitoring was used to determine conversion factors from model output to assessment criteria and predicted noise levels
- Noise modelling for three scenarios, which covered the existing situation (2018) and three options for the year 2041 (no build, build with no mitigation and build with mitigation).

## 3. Assessment of Aspects and Impacts

The project is located in a historically disturbed urban environment. The majority of the project area is currently road reserve, surrounded by residential, recreation and commercial properties. The environment is highly modified and has undergone extensive land clearing. Past and current land uses in the surrounding region include:

- Road and road reserve
- Residential
- Service station
- Golf course
- Industrial
- Quarry and landfill

This section details the existing environment and impacts associated with the project.

### 3.1 Climate

The majority of the project is located in the City of Fremantle, a major port city in WA. Fremantle is characterised by a Mediterranean climate, cool wet winters and hot dry summers.

Climate data was sourced from the nearest Bureau of Meteorology station in Swanbourne, 11 km north of the project. The highest monthly average maximum temperature is 30.5°C (February), and the lowest monthly average minimum temperature is 9.7 °C (July). Swanbourne averages 730 mm of rainfall a year, with the highest rainfall in July.

The project is 2.5 km from the coast and as such is not considered to be at significant risk of climate change events. Decreases in annual rainfall and increases in flood producing rainfall are expected (Main Roads 2017).

### 3.2 Geology and soils

The project is located on the Swan Coastal Plain, characterised by dune ridges on limestone along the coast with an inner alluvial plain. Aeolian sand and alluvial sand are the predominant soil type, with Tamala limestone geology.

Soils within the project area are part of the Cottesloe suite and described as “low hilly landscape with shallow brown soils over limestone with much exposed limestone (Churchward and McArthur, 1980).

Acid Sulphate Soils (ASS) are naturally occurring soils containing iron sulphides. These soils are typically benign within an anaerobic environment, however they can become oxidised, resulting in acidic soil and groundwater. The resulting sulphuric acid can also break heavy metal bonds and result in groundwater contamination. A desktop review of Landgate’s (2013) Shared Land Information Portal (SLIP) database identified the project area as having no known Acid Sulfate Soil (ASS) risk within 3 m of the natural soil surface. The Australian Soil Resource Information System (2018) identified an Extremely Low Probability of Occurrence of ASS.

### 3.3 Flora and vegetation

#### 3.3.1 Vegetation associations and complexes

The project is located in pre-European vegetation association 998, described as medium woodland; tuart. A total of 18, 411.73 ha (36.2%) of this vegetation association remains on the Swan Coastal Plain (Table 2).

Table 2 Extent of vegetation association (2018)

Pre-European Vegetation Association(s) in:	Pre-European (ha)	Current Extent (ha)	% Remaining	% of Remaining in DBCA reserves
IBRA Region Swan Coastal Plain	1,501,221.93	578,997.37	38.57	38.47
Statewide Veg Assoc No. 998	50,867.50	18,411.73	36.20	48.58
IBRA region Veg Assoc No. 998 in the IBRA region	50,867.50	18,411.73	36.20	48.58
Local Government Authority City of Fremantle	1,891.32	34.46	1.82	

Vegetation complexes were mapped by Heddle, Loneragan and Havel (1980), which provides mapping at a finer scale than Beard (1979) based on the landforms and underlying geology. The Heddle et al (1980) mapping identified one vegetation complex within the project area, which is described as Spearwood Dunes: Cottesloe complex – central and south: Mosaic of woodland of *Eucalyptus gomphocephala* (tuart) and open forest of *E. gomphocephala* – *E. marginata* (jarrah) – *E. calophylla* (now *Corymbia calophylla*) (marri); closed heath on the Limestone outcrops. The extent of the remaining vegetation complex is detailed in Table 3.

Table 3 Vegetation complexes (Heddle/Mattiske) within the project area

Heddle/Mattiske Veg Complex	Pre-European Extent (ha)	2017 Vegetation Extent	% Remaining
Cottesloe Complex central and south	45,100	14571.31	32.31

#### 3.3.2 Vegetation type and condition

The vegetation present in the project area is highly modified, consisting of planted trees, parkland, revegetation and scattered natives over introduced grasses and weeds. The native vegetation in the survey area has been extensively cleared to accommodate the activities associated with the golf course, road infrastructure and residential properties. The native vegetation that remains primarily occurs within the north eastern extent of the golf course (Figure 3, Appendix A) consisting of a combination of native and planted species over a predominately cleared understory. The vegetation units identified in the development envelope included:

- Marri over Grass Trees; *Corymbia calophylla* and *Agonis flexuosa* open woodland over *Xanthorrhoea preissii* sparse shrubland over weedy grass/herbland
- Marri and Eucalyptus spp.; *Corymbia calophylla*, *Eucalyptus marginata* and *E. gomphocephala* open woodland over weedy grass/herbland

- Tuart; *Eucalyptus gomphocephala* open woodland over weedy grass/herbland
- Planted; Predominately \**Eucalyptus cladocalyx*, \**E. robusta*, \**E conferruminata* and \**Corymbia citriodora* over weedy grass/herbland.

The condition of the native vegetation was rated as Degraded due to the deterioration of basic vegetation structure and weed dominance as a result of exotic plantings and clearing. A total of 0.63 ha of native vegetation will be cleared for the project.

### 3.3.3 Threatened and priority ecological communities

A search of the EPBC Act Protected Matters Search Tool (PMST) identified two EPBC Act-listed Threatened Ecological Communities (TECs) potentially occurring within the study area, Banksia Woodlands of the Swan Coastal Plain and Subtropical and Temperate Coastal Saltmarsh. These TECs were also identified in a search of the Department of Biodiversity and Conservation (DBCA) Threatened and Priority Ecological Communities database, however, one is listed as a Priority 3 Priority Ecological Community (PEC) by DBCA. An additional TEC and four PECs were identified in the DBCA TEC/PEC database search. The DBCA database did not identify any TECs or PECs specifically within the project footprint. The conservation significant communities identified in the desktop searches are listed in Table 4.

**Table 4 Threatened and Priority Ecological Communities identified in the desktop searches**

Community type	EPBC Act	DBCA
Banksia woodlands of the SCP (TEC)	TEC	PEC
Banksia dominated woodlands of the SCP IBRA region (PEC)	Endangered	Priority 3
Subtropical and Temperate Coastal Saltmarsh	TEC Vulnerable	PEC Priority 3
Northern Spearwood shrublands and woodlands (SCP24)		PEC Priority 3
Southern Eucalyptus gomphocephala-Agonis flexuosa woodlands (SCP25)		PEC Priority 3
Acacia shrublands on taller dunes (SCP29b)		PEC Priority 3
Callitris preissii (or Melaleuca lanceolata) forest and woodlands, Swan Coastal Plain (SCP30a)		TEC Vulnerable
Wooded wetlands which support colonial waterbird nesting areas		PEC Priority 2

No conservation significant ecological communities listed under the EPBC Act or DBCA were recorded during the field surveys.

The presence of Tuarts in the project area prompted an assessment against the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC and draft definition of the EPBC Act potential Tuart TEC as defined by the DotEE (2017). Due to the extensive disturbance, Tuarts within the project area were not considered to representative the Tuart PEC or potential TEC (Appendix D).

### 3.3.4 Flora diversity

The *NatureMap* database search identified 1,196 plant taxa, representing 120 families that have been previously recorded within the study area. This total comprises 815 native flora taxa and 381 introduced flora taxa. Dominant families recorded within the study area include Fabaceae (127 taxa), Poaceae (96 taxa) and Asteraceae (88 taxa).

### 3.3.5 Conservation significant flora

Desktop searches of the EPBC Act PMST database, *NatureMap* database, DBCA Threatened and Priority Flora List and WA Herbarium databases identified the presence/potential presence of 47 conservation significant flora taxa within the study area (Appendix I). The desktop searches recorded:

- Eleven taxa listed under the EPBC Act and/or as Threatened under the *Wildlife Conservation Act 1950* (WC Act)
- Three Priority 1 taxa
- Five Priority 2 taxa
- Eighteen Priority 3 taxa
- Nine Priority 4 taxa
- One presumed extinct taxon.

No rare or priority flora were identified in the survey of the development envelope or considered likely to occur due to the degraded nature of the survey area and lack of suitable habitat.

### 3.3.6 Introduced flora

The project area is infested with weed species, mostly dominated by grass, daisy and pea species. The limited native vegetation that remains is heavily infested with weeds. The road reserve contains a number of planted tree species that are non-native or not local to the Swan Coastal Plain.

A total of 64 introduced (exotic) and planted species were recorded within the 2014 study area. Declared Pest Bridal Creeper (*Asparagus asparagoides*) was recorded within the area.

### 3.3.7 Dieback

GHD (2014) undertook a preliminary assessment for *Phytophthora* spp. (Dieback) as part of the vegetation condition assessment. This was based on the presence/absence of typical indicator species, such as *Banksia* and *Eucalyptus marginata*. Insufficient indicator species remained in the area to be able to provide an indication of Dieback status. Given the project is in an extensively disturbed area and adjacent to a golf course, it has been determined that the area is Uninterpretable and Unprotectable from Dieback. As such, the site will be treated as though it were infested and standard Main Roads protocols will be applied to prevent contamination.

## 3.4 Fauna

### 3.4.1 Fauna habitat and diversity

During the 2013 field survey, a total of 29 fauna species, consisting of 27 birds (four introduced), and two mammals (both introduced) were recorded. The project area has been extensively cleared and provides limited fauna habitat. Areas of native vegetation within the golf course, revegetation and street trees in the survey area would be utilised by species which tolerate urbanised environments. However, the lack of vegetation structure, diversity and micro-habitats (presence of logs, leaf litter etc.) would restrict fauna usage. The survey area contains both native (to WA), Australian and introduced species. Native species recorded in the survey are primarily Tuarts, Jarrah and Marri of various ages and structure, some of which have hollows suitable for bird breeding. Galahs, Rainbow Lorikeets and Australian Ring-necks were recorded breeding in the 2013 survey and evidence of Galah breeding was identified in the 2018 survey.

### 3.4.2 Fauna habitat connectivity

#### **Regional**

The project is located within a suburban environment in the City of Fremantle and is surrounded by residential and commercial development, thus having little regional connectivity.

#### **Local**

Locally the project is connected to the Royal Fremantle and Public Golf Course (approximately 68 ha and 16 ha, respectively). Surrounding links include Booyeembara Park (and its associated man-made water body, approximately 15 ha in total) and Fremantle Cemetery (approximately 40 ha of park lands), providing local connectivity. This creates a large parcel of park lands that the project area is a part of, suitable for numerous species (in particular birds) that have the ability to persist in such environments. Vegetation within the project area is narrow and linear and discontinuous. Clearing of this vegetation is unlikely to significantly impact local connectivity to the surrounding area.

For larger birds (e.g. Carnaby's Cockatoo), the project will not increase the distance between patches of habitat for these species, as this patch will not be totally lost.

### 3.4.3 Conservation significant fauna

Shapefiles received from the DBCA identified 86 conservation listed fauna potentially occurring within 10 km of the survey area. The PMST identified 30 birds and 2 terrestrial mammals in the same search area.

Of these, only Carnaby's Black Cockatoo and Red-tailed Black Cockatoo are considered likely to occur based on habitat availability. The list of fauna identified by DBCA, including likelihood of occurrence, is included in Appendix J.

#### **Black Cockatoo assessment**

The project area occurs within the known range of two species of Black Cockatoo, Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo (DSEWPaC 2012). Baudin's Black Cockatoo sporadically visit the Swan Coastal Plain and are not considered a regular visitor, primarily utilising the Darling Range and associated regions.

The survey area was most recently surveyed in June 2018 by a GHD zoologist and Tony Kirkby for potential cockatoo trees and hollows. A total of 0.98 ha of foraging habitat was recorded in the survey area, of which 0.64 ha (including non-native vegetation) will be cleared. Forest Red-tailed Black Cockatoo were recorded on several occasions flying over the survey area in flocks of 2 to 6 birds. On two occasions this species was also recorded feeding on Marri nuts, once along Stirling Highway and the other near to the golf course. Along Stirling Highway birds were also recorded loafing in Swamp Mahogany.

Feeding evidence was recorded across the survey area predominantly where Marri and Jarrah were present. Marri and Jarrah feeding appeared mainly by Forest Red-tailed Black Cockatoo, however some Marri appeared to be utilised by Carnaby's Black Cockatoo. In total 58 native Eucalyptus trees (Tuart, Marri, Jarrah and Flooded Gum) were recorded in the survey area, having a DBH > 500 mm. An additional four non-native (to WA) Eucalypt (Sugar Gum) trees with hollows were recorded. Small, medium and large hollows were inspected via ground assessment. From ground inspection there were four hollows that appeared large enough for use by Black Cockatoo, and had evidence of being previously worked (i.e. chews present). The pole camera inspection of the four large hollows found only one hollow is potentially suitable for Black Cockatoo use. The tree identified is outside the project area and will not be impacted.

Sixteen trees with a DBH >500 mm will be cleared for the project, two with hollows. Neither tree contains hollows of suitable size for use. The details of the Black Cockatoo potential breeding trees to be cleared are provided in Table 5.

No roosting evidence was recorded during the surveys. There are no water sources within the project area, and there is suitable Black Cockatoo habitat in close proximity to water bodies in the local and regional area, which would more likely be favourable for roosting habitat and not indirectly impacted by the project. The closest known Black Cockatoo roost is located approximately 3 km away in Willagee. Although the survey was not carried out within the breeding season of the white-tailed species but Forest Red tailed Black Cockatoos breed in all months (mainly spring and autumn) and were breeding at the time of the survey (Tony Kirkby pers comm.). No evidence of breeding was recorded in the project area.

Table 5 Black Cockatoo potential breeding trees to be cleared

Species	Common name	Native or Non-native	DBH (m)	Height (m)	Hollows
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.76	16	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.89	19	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.71	18	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.95	16	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.73	17	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.72	23	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.72	19	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.87	21	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.62	14	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.89	16	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.59	16	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.81	15	no
Corymbia calophylla	Marri	Native Eucalypts with DBH >500mm	0.77	12	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm	0.87	22	no
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm with hollows	1.10	17	3 x med/large
Eucalyptus gomphocephala	Tuart	Native Eucalypts with DBH >500mm with hollows	1.65	23	1 medium. Galah activity

### 3.5 Reserves and conservation areas

The project area extends into both Class A (1.8 ha) and Class C (0.1 ha) reserves, which exist as part of the Fremantle Public Golf Course, Royal Fremantle Golf Club and Fremantle

Environmental Resource Network (FERN). The Class A and C reserves are shown on Figure 4, Appendix A.

A description of their location and type of facility occupying these reserves is as follows:

- Class A Reserve 6638 for the purpose of recreation
- Class C Reserve 8860 for the purpose of recreation
- Class C Reserve 21964 for the purpose of recreation

The cadastral boundary is being changed to convert parts of these recreation reserves to road reserve for the purposes of the project.

No Environmentally Sensitive Areas (ESA) were recorded within the project area. The closest ESA is the Swan Estuary Marine Park, located at Alfred Cove approximately 2 km north east of the project area.

#### 3.5.1 Bush Forever Sites

State Planning Policy 2.8: *Bushland Policy for the Perth Metropolitan Region* (Western Australian Planning Commission 2010) indicates there are no Bush Forever sites located within the project area. The closest Bush Forever site is Cantonment Hill (Site 490), which is located approximately 1 km north west of the project area.

## 3.6 Surface water and drainage

### 3.6.1 Surface water and drainage

No significant impacts are expected to surface water or drainage. There are no water courses, drainage lines or wetlands are present within the project area.

The project area is situated approximately 1.2 km south of the Swan River, within the Swan Coastal catchment. The project is located within the Swan/Canning Estuary surface water allocation sub-areas. Stormwater runoff will be captured in drainage basins adjacent to the road and therefore will not flow offsite or towards the Swan River.

### 3.6.2 Wetlands

No geomorphic wetlands were identified during the survey. However, the Swan River Estuary, classified as an Estuary-Waterbody, is situated 900 m north of the project area.

Wetlands of International Significance are listed under the Ramsar Convention, an International treaty that covers the conservation of internationally important wetlands. The closest Ramsar wetlands are Thomsons Lake and Forrestdale Lake located approximately 11 km south southwest and 18 km southeast, respectively, from the proposed action. The proposed action does not drain into the surface water catchment of either Ramsar wetland.

There is a small modified wetland approximately 270 m from the project area, within the adjacent golf course, this wetland is not expected to be impacted.

The risk of potential surface water impacts including uncontrolled surface water runoff, hydrocarbon contamination and erosion is likely to be similar or less than from the existing road infrastructure with new drainage infrastructure proposed.

## 3.7 Groundwater

The project area is located in the Perth Groundwater Area, a Proclaimed groundwater area under the RIWI Act. The project area crosses two groundwater sub-areas, the City of Fremantle South and City of Melville subareas.

The DWER (2018) *Perth Groundwater Atlas* database identified water depth between 21 and 57 m below ground level, and groundwater salinity ranging between 500 – 1000ppm total dissolved solids. If construction water is sourced from the project area, a licence will be required.

### 3.7.1 Public drinking water resource areas

A search of the DWER (2018) *Perth Groundwater Atlas* database identified no Public Drinking Water Source Areas (PDWSA) within the project area.

## 3.8 Noise and Vibration

A noise assessment was undertaken by GHD in 2018 (Appendix H) to monitoring existing noise levels and model future impacts based on the revised smaller scale upgrade proposed.

Noise monitoring indicates sensitive receptors locations adjacent to High Street currently exceed relevant ambient noise criteria specified in the State Planning Policy 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP5.4). As a guide to the impact from traffic noise to sensitive receivers, the SPP5.4 outdoor noise criteria are shown below in Table 6.

Table 6 Outdoor noise criteria

Time	Target	Limit
Day (6 am to 10 pm)	55 dB LAeq(Day)	60 dB LAeq(Day)
Night (10 pm to 6 am)	50 dB LAeq(Night)	55 dB LAeq(Night)

The 5 dB difference between the target and limit is referred to as the margin. These criteria apply at ground floor level of a noise sensitive premises, one metre from a habitable facade.

Observations during the attended noise measurement identified dominant sources to include vehicle traffic, including from heavy vehicles. Predicted noise traffic impacts on receptors were modelled using CadnaA, by Datakustik, a program for the calculation, assessment and prognosis of noise exposure.

CadnaA considers local topography, reflection, ground absorption, relevant building structures, site sources and the locations of the receptor areas to predict received noise levels. Road links were generated for the existing and build scenario, based in the preliminary design. Noise emissions were determined based on traffic speed, vehicle counts, road gradient and surface type, and vehicle category. The noise model was used to predict road traffic noise levels based on existing and predicted future road traffic flows for the following scenarios:

- Current noise impacts with existing road alignment, 2018 (Existing 2018)
- Future noise impacts with existing road alignment, 2041 (No Build 2041)
- Future noise impacts with upgraded design, 2041 (Build 2041)
- Future noise impacts with upgraded design and design noise mitigation, 2041 (Build 2041 with Mitigation).

The noise model constructed for the project predicts more than 85% of the specified sensitive receptors are currently exposed to noise levels above the SPP 5.4 day time noise limit criteria.

### 3.8.1 Operational noise (traffic)

Under Section 5.4 of the SPP5.4, a modification to an existing road does not specifically require compliance with noise limit criteria, but rather to attempt to reasonably address any impacts.

The noise model results predict all residential properties identified as a receptor will be exposed to noise levels above the day time noise limit criteria during 2041 with (No Build 2041 scenario) or without the proposed upgrade occurring (Build 2041 scenario). Therefore, it does not appear the development of the project would not have a significant incremental impact on currently impacted sensitive receptors. The construction of the project had no impact, or in some instances resulted in a minor reduction in noise levels due to movement of the southern lane away from residential properties along High Street, when compared to the No Build 2041 scenario.

Noise mitigation in the form of noise walls has been proposed and modelled for the project to 2041. The noise model developed for the project predicts that 75% (57 of 76) of assessed sensitive receptors are exposed to existing noise levels above the day noise limit criterion of 60 dBA. Only seven sensitive receptors will be exposed to noise levels below the noise limit criteria by 2041 without the propose upgrade, and all sensitive receptors will be exposed to noise levels above the noise limit with the upgrade without any noise mitigation.

However, with the inclusion of recommended design noise walls, it is predicted that only 15 sensitive receptors would be exposed to noise levels above the noise limit. Of these, three are expected to exceed marginally, by 2 dBA. Furthermore, 13 of the 15 receptors that exceed the noise limit for the Build 2041 with Mitigation scenario are predicted to be exposed to noise levels equal to or less than the No Build 2041 scenario, showing an improvement in almost all cases. Two receptors are likely to require property treatments, as noise levels will be worse as a result of the project and higher than the No Build scenario.

### 3.8.2 Construction noise and vibration

Noise from construction will be temporary and localised, and performed in accordance with a CEMP. Works will be undertaken between 7am and 7pm where possible, and a Noise Management Plan approved by the local government will be required for construction works outside these times. Complaints by the public will be recorded and all complaints actioned within 24 hours.

Vibration monitoring will be required as part of construction works, with particle velocity not to exceed 5 mm/s at the receiving property. A complaints system will be established and maintained by the contractor. Buildings within 200 m of the project will be subject to a property inspection prior to and following works to ensure there is no damage resulting from the project.

## 3.9 Air Quality

The major vehicle pollutants include products of combustion, such as carbon monoxide (CO), particulate matter with an aerodynamic diameter of 10 microns or less (PM<sub>10</sub>), oxides of nitrogen (NO<sub>x</sub>), and volatile organic compounds (VOCs). New or upgraded road projects have the potential to increase (or reduce) emissions of vehicle pollutants.

An air quality assessment was completed to estimate the potential air quality impacts associated with the proposed road upgrade. The AUSROADS air dispersion model was used with a full year of meteorological data and representative 'road links' to simulate the proposed road upgrade. Three scenarios were modelled:

- Scenario 1: Existing road network (no build) based on projected 2018 traffic volumes and estimated 2020 emission factors
- Scenario 2: Upgraded road network day of opening based on projected 2020 traffic volumes and estimated 2020 emission factors
- Scenario 3: Upgraded road network 21 years after opening based on projected 2041 traffic volumes and estimated 2020 emission factors

The road network included in this assessment currently averages 16.4 % heavy vehicles with the remainder consisting of passenger cars or light vehicles (Main Roads 2018). Traffic data for the modelling years was estimated using a conservative growth rate of 2.8%. Although it is expected the Australian fleet will become cleaner with time due to enhanced technology and more stringent emission standards, estimated vehicle emission rates for 2020 were used for all modelling scenarios, including the year 2041. The resulting predicted concentrations are therefore considered to be a conservative estimate under worst case conditions.

Modelled air quality concentrations were compared against appropriate ambient air criteria included in the National Environment Protection Measures (NEPMs) for Ambient Air Quality and Air Toxics and World Health Organisation (WHO) guidelines.

### 3.9.1 Operational air emissions (traffic)

Predicted air quality concentrations for the pollutants modelled comfortably comply with the relevant air quality criteria, under all scenarios.

The no build scenario at 2020 identified all pollutants below 47% of criterion (Table 7).

**Table 7 Predicted maximum concentrations - Scenario 1: Existing road network 2020**

Pollutant	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Predicted maximum concentration ( $\mu\text{g}/\text{m}^3$ )		Assessment criterion ( $\mu\text{g}/\text{m}^3$ )	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
CO	625	654	769	11,254	8-hrs	7%
NO <sub>2</sub>	43.1	48	70	247	1-hr	28%
PM <sub>10</sub>	18.9	19.0	19.9	50	24-hrs	40%
PM <sub>2.5</sub>	11.3	11.4	11.7	25	24-hrs	47%
Volatile organic compounds						
Benzene	-	0.01	0.14	10.5	Annual	1.3%
Toluene	-	0.06	0.42	4114	24-hrs	0.01%
Xylene	-	0.05	0.35	1183	24-hrs	0.03%
Formaldehyde	-	0.05	0.35	53.6	24-hrs	0.65%
Acetaldehyde	-	0.11	0.59	2300	24-hrs	0.03%
Benzo(a)pyrene	-	0.000002	0.00006	0.0003	Annual	20%

The pollutants modelled for the project on day of opening are detailed in Table 8 below.

**Table 8 Predicted maximum concentrations - Scenario 2: Upgraded road network day of opening, 2020**

Pollutant	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Predicted maximum concentration ( $\mu\text{g}/\text{m}^3$ )		NEPMs/WHO criterion ( $\mu\text{g}/\text{m}^3$ )	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
CO	625.2	689	921	11,254	8-hrs	8%
NO	43.1	54	81	247	1-hr	33%
PM <sub>10</sub>	18.9	19.2	21.2	50	24-hrs	42%
PM <sub>2.5</sub>	11.3	11.4	12.1	25	24-hrs	49%
Volatile organic compounds						
Benzene	-	0.01	0.24	10.5	Annual	2%
Toluene	-	0.12	0.90	4114	24-hrs	0.02%
Xylene	-	0.10	0.75	1183	24-hrs	0.06%
Formaldehyde	-	0.10	0.75	53.6	24-hrs	1%

Acetaldehyde	-	0.26	1	2300	24-hrs	0.05%
Benzo(a)pyrene	-	0.000003	0.00009	0.0003	Annual	31%

While the difference in predicted concentrations between scenarios is slight, the upgraded road network resulted in higher concentrations than the existing road network in 2020.

Benzo(a)pyrene increased by 11%, NO<sub>2</sub> by 5% and PM<sub>2.5</sub> by 2%. Modelling still indicated all parameters below 50% of the emissions standards. The predicted increase in concentrations for the build scenario is likely to be associated with extra road links (roundabout and Stirling Highway slip lane) included in the upgraded road network.

Future pollutant levels for the year 2041 were modelled in Scenario 3, as displayed in Table 9.

Table 9 Predicted maximum concentrations - Scenario 3: Year 2041

Pollutant	Background conc. (µg/m <sup>3</sup> )	Predicted maximum concentration (µg/m <sup>3</sup> )		NEPMs/WHO criterion (µg/m <sup>3</sup> )	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
CO	625.2	732	1130	11,254	8-hrs	10%
NO <sub>2</sub>	43.1	62	107	247	1-hr	43%
PM <sub>10</sub>	18.9	19.4	22.8	50	24-hrs	46%
PM <sub>2.5</sub>	11.3	11.6	13.7	25	24-hrs	55%
Volatile organic compounds						
Benzene	-	0.02	0.42	10.5	Annual	4%
Toluene	-	0.20	2	4114	24-hrs	0.04%
Xylene	-	0.16	1	1183	24-hrs	0.11%
Formaldehyde	-	0.17	1	53.6	24-hrs	3%
Acetaldehyde	-	1	5	2300	24-hrs	0.21%
Benzo(a)pyrene	-	0.000007	0.0001	0.0003	Annual	55%

In 2041, the additional increase in air quality impacts is due to increases in traffic volumes over time, which is independent to the project proceeding. Although not accounted for in the modelling, the proposed inclusion of noise walls are expected to reduce air emissions approaching nearby houses based on findings of various studies.

Diesel vehicles were assumed to account for 22% of the vehicle traffic in the model. Heavy duty vehicles were estimated to account for 16.4% of the total vehicle traffic, with all of these assumed to be diesel. The inclusion of diesel emissions in the model did not significantly impact either the discrete or auto generated receptor within all three scenarios considered, with resulting concentrations well below the air quality criteria considered. The separation of local and commuter/commercial traffic, along with the introduction of a round-about in the upgraded road network is likely to reduce stop start traffic and associated emissions from heavy duty vehicles.

### 3.9.2 Construction dust

Dust is expected to be generated during construction, however this will be limited as the road will be constructed with live traffic diverted away from the lane under construction. Dust will be controlled with standard mitigation measures, such as watering trucks as per the EMP.

## 3.10 Visual amenity and land use

The approvals envelope has a large number of old planted trees including Tuarts, which form part of the existing visual amenity of the road and are held in high regard by the public. These street trees were assessed via an arboricultural assessment to identify larger streetscape trees (typically greater than 300mm DBH) that could noticeably reduce amenity if removed during construction. A total of 650 native, non-WA native and introduced trees were identified within the area surveyed.

The larger streetscape trees were assessed for condition, age, and the root zone of each. This information was then used in a tree avoidance workshop with the proposal design team to avoid removal of large trees as far as practicable. The locations of project elements were amended to reduce the number of trees to be cleared. A large median has been incorporated to accommodate the older Tuart trees currently on the roadside that have particular importance for visual amenity.

Further assessment will be undertaken as part of the detailed design to ascertain the level of visual intrusion into houses resulting from the removal of a small amount of vegetation, and upgrade of the road. The current proposed layout of the noise walls is expected to provide a higher level of privacy for the majority of the residences along High Street compared to current screening.

Main Roads will acquire all land for the project prior to construction commencing.

### 3.11 Contaminated sites

In 2010, a preliminary site investigation (PSI) was conducted along High Street and Leach Highway (SERS 2013a). This survey was of the former project area and therefore much larger area than the current proposed works. Several sites were identified as potential contamination sources including:

- Historical Landfills associated with Booyeembara Park and 3 – 7 Blinco Street
- Current and former petrol service stations
- Cemetery site
- Uncontrolled fill which has been used within Booyeembara Park and potentially within Gibson Park
- Storage of chemicals or fuels within industrial properties
- The use of pesticides across the two golf courses may impact underlying soils

Only one site is within the current project area, the Muzz Buzz site on the corner of High Street and Montreal Street. This site was a former service station and was decommissioned as a service station in 2004. A Detailed Site Investigation was undertaken by SERS (2013b) (Appendix K) focusing on soil and groundwater sampling and analysis. Based upon the investigations performed to date at the former petrol station site, no pollutant linkages have been identified within the underlying soils or groundwater (SERS 2013b).

#### 3.11.1 Management of contamination during construction

There is a minor risk that the construction works will create temporary or localised pollution/contamination as a result of fuel or chemical spills or mismanagement of construction materials. These risks will be managed via a CEMP including the following standard measures:

- Bulk fuel and oil stores will be bunded and managed in accordance with relevant Australian Standards
- Vehicle or machinery servicing, if required, will occur in designated servicing areas with adequate spill response equipment
- Litter and construction waste will be securely contained and removed regularly to an approved waste refuge facility.

## 3.12 Heritage

### 3.12.1 Indigenous heritage

In 2017, the project was assessed and it was determined that no Aboriginal heritage sites will be impacted (Figure 5, Appendix A) and no additional investigations are required (Appendix C).

A search of the Department of Aboriginal Affairs (DAA) *Aboriginal Heritage Inquiry System* in 2013 (DAA 2013) did not identify any known heritage sites within the larger project area. However, five Registered and 'Other' heritage sites occurred within 1 km. Brad Goode was commissioned by the Department of Planning and Infrastructure to undertake a heritage survey for the previous High Street proposal (Appendix L). No evidence of Aboriginal heritage was identified between Stirling Highway and Carrington Street. The closest heritage site identified by Brad Goode (2008) was a camping area (Fremantle Site ID3726) located north of the Fremantle Cemetery listed as an "Other Heritage Place".

### 3.12.2 European heritage

The project will require the removal of several buildings that are part of pre-works and therefore not the subject of this EIA. All appropriate approvals will be received prior to pre-works. No impacts to European heritage sites are expected from the project. Buildings within 200m of the project will be subject to a property inspection prior to works to ensure no damage results to heritage buildings.

## 4. Assessment of vegetation clearing

The majority of the project area is highly modified and does not contain native vegetation. Vegetation in the survey area has been extensively cleared to accommodate the activities associated with the golf course, road infrastructure and residential properties. The native vegetation that remains within the north eastern extent of the golf course consisted of a combination of native and planted species over a predominately cleared understory.

### 5.1 Measures to Avoid, Minimise, Mitigate and Manage Project Clearing Impacts

The project impacts have been significantly reduced from the original 2014 works, as detailed in Table 10.

Table 10 Comparison of 2014 project environmental impacts and 2018 project environmental impacts

Aspect	2014 project area	2018 project area
Length of road	Approx. 3 km	Approx. 1.5 km
No of carriageways	4 lanes with future upgrade to 6	4 lanes
Intersection works	Realignment of the intersection of High Street and Stirling Highway.	Roundabout at the intersection of High Street and Stirling Highway.
Hectares of native vegetation to be cleared	6.6 ha	0.63 ha within the approvals envelope based on the project area.
Foraging habitat for Black Cockatoo	3.9 ha	0.63 ha
No of habitat trees for Black Cockatoos to be removed	79 trees with a diameter at breast height (DBH) >500 millimeters (mm) which may be used in the future by Black Cockatoos for potential breeding.	16 trees with a DBH >500 mm (2 with hollows).
EPBC risk level of significant impact on black cockatoo	'High risk of significant impacts: referral to DotE recommended' and 'Uncertainty: referral recommended or contact the DotE'	'Uncertain: referral recommended or contact the department'.  Refer to Table 12.

Main Roads has also implemented a number of measures to avoid, minimise and mitigate the impact from the proposed road upgrade on the remaining native vegetation and Black Cockatoo habitat, including:

- Steepening batters to 1 in 6 from 1 in 12 slope
- Aligning the design so that the majority of large trees on the south side of the existing road will be retained in the new median.
- Installation of a retaining wall to minimise the clearing of native vegetation in the north eastern extent of the golf course.
- Arboricultural findings were used to map the root zone of trees on the edge of the project area. The design was modified in order to retain as many trees as possible and increase tree survival.

A detailed list of design changes made to avoid clearing are in Table 11 below.

Table 11 Measures to Avoid, Minimise, Mitigate and Manage Project Clearing Impacts

Design or Management Measure	Applied to Current Design	Discussion and Justification
Steepen batter slopes	Yes	Batter slopes were increase to 1 in 6 from 1 in 12. The original design was to have a gradual slope to the natural surface, however this was steepened to retain more trees.
Installation of safety barriers	No	Installation of safety barriers will be considered during detailed design, however safety barriers will not reduce the clearing extent of native vegetation.
Alignment to one side of existing road	Yes	The existing road will be utilised as the east bound lane, with a median in the middle to retain large trees and a new lane built to the south in the disturbed golf course area.
Alternative alignment to follow existing road (or) to preferentially locate within pasture or a degraded areas	Yes	
Installation of kerbing	Yes	Kerbing will be installed on both sides of the road.
Simplification of design to reduce number of lanes and/or complexity of intersections	Yes	The project has been simplified from the original 2014 design and will have a smaller footprint as well as clearing area.
Preferential use of existing cleared areas for access tracks, construction storage and stockpiling	Yes	Existing disturbed areas will be utilised for storage and access. No clearing for storage or access will be permitted.
Other design treatment	Yes	Installation of a retaining wall to minimise the clearing of native vegetation in the north eastern extent of the golf course. The assessment provided by the arborists was used to further refine the design to minimise impacts to tree root zones. The number of Black Cockatoo potential breeding trees was reduced from 44 to 16 native trees.

#### 4.1 Assessment against the Ten Clearing Principles

In assessing whether the project’s proposed clearing is likely to have a significant impact on the environment, the project was assessed against the Ten Clearing Principles (EP Act, Schedule 5).

The proposed clearing may be at variance with one or more of the Ten Clearing Principles.

##### a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Proposed clearing is not at variance to this Principle

Comments	The native vegetation within the project area is degraded to completely degraded and little to no vegetation structure remaining The vegetation units identified within the development envelope were:
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	<ul style="list-style-type: none"> <li>• Marri over Grass Trees; <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> open woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over weedy grass/herbland</li> <li>• Marri and Eucalyptus spp.; <i>Corymbia calophylla</i>, <i>Eucalyptus marginata</i> and <i>E. gomphocephala</i> open woodland over weedy grass/herbland</li> <li>• Tuart; <i>Eucalyptus gomphocephala</i> open woodland over weedy grass/herbland</li> </ul> <p>The condition of the vegetation was rated as Degraded due to the deterioration of basic vegetation structure and weed dominance as a result of exotic plantings and clearing. A total of 0.63 ha of native vegetation will be removed for the project.</p> <p>No conservation significant ecological communities listed under the State or Commonwealth legislation were recorded during the field assessment. Desktop searches identified 47 conservation significant flora taxa within 10 km of the project. The desktop searches recorded:</p> <ul style="list-style-type: none"> <li>• Eleven taxa listed under the EPBC Act and/or as Threatened under the WC Act</li> <li>• Three Priority 1 taxa</li> <li>• Five Priority 2 taxa</li> <li>• Eighteen Priority 3 taxa</li> <li>• Nine Priority 4 taxa.</li> <li>• One presumed extinct taxon.</li> </ul> <p>No rare or priority flora were identified in the survey or considered likely to occur due to the degraded nature of the survey area and lack of suitable habitat.</p> <p>The proposed clearing is not in an area of high biological diversity and is therefore not at variance to this principle.</p>
Methodology	DBCA shapefiles <i>NatureMap</i> (July 2018) DBCA shapefiles PMST

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

Proposed clearing is unlikely to be at variance to this Principle

Comments	<p>Shapefiles received from the DBCA identified 86 conservation listed fauna potentially occurring within 10 km of the survey area. Of these, only Carnaby's and Forest Red-tailed Black Cockatoo are considered likely to occur based on habitat availability.</p> <p>Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) were recorded on several occasions flying over the survey area in flocks of 2 to 6 birds. On two occasions this species was also recorded feeding on Marri nuts, once along Stirling Highway and the other near to the golf course. Feeding evidence was recorded across the survey area predominantly where Marri and Jarrah were present. Marri and Jarrah feeding appeared mainly by Forrest Red-tailed Black Cockatoo, however some Marri appeared to be utilised by Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>). A total of 0.98 ha of foraging habitat was recorded, 0.63 ha of native foraging habitat will be cleared.</p> <p>The number of Black Cockatoo potential breeding trees to be cleared for the project was reduced from 44 to 16 trees, two with hollows (Table 5) through refinement of the project area. Of the 16 trees, only 13 were Eucalypt</p>
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	<p>species in areas mapped as native in the survey. The remaining trees were planted. None of the 13 trees to be cleared have hollows.</p> <p>No roosting or breeding evidence was recorded during the surveys.</p> <p>Surveys from the region indicate there are trees suitable for future Black Cockatoo breeding and foraging habitat available outside the project area. Therefore the limited clearing required for the project is unlikely to comprise the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna, specifically Black Cockatoos.</p> <p>The proposed clearing is unlikely to be at variance to this Principle.</p>
Methodology	<p>DBCA Shapefiles GHD Black Cockatoo assessment (2018) GHD 2014</p>

**c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora**

Proposed clearing is not at variance to this Principle

Comments	<p>Desktop searches identified 47 conservation significant flora taxa within 10 km of the project including eleven taxa listed under the EPBC Act and/or as Threatened under the WC Act.</p> <p>No rare or priority flora were identified in the survey or considered likely to occur due to the degraded nature of the survey area and lack of suitable habitat for rare species.</p> <p>Nearest record to the project is <i>Caladenia huegelii</i>, 7 km south-east in remnant bush on private property.</p> <p>The proposed clearing is not at variance to this Principle.</p>
Methodology	<p>DBCA shapefiles Florabase GHD vegetation assessment (2018)</p>

**d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community**

Proposed clearing is not likely to be at variance to this Principle

Comments	<p>The desktop searches undertaken for the vegetation survey (Appendix D) identified 2 TECs occurring within 10 km of the project area. None of these were identified in the survey area.</p> <p>The Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain ecological community is potentially to be listed as a TEC by DotEE. Tuarts were identified within the survey area however they did not meet all the key diagnostic characteristics of the Tuart TEC as defined by the draft conservation advice (DotEE 2017). The Tuart communities were in Degraded condition (Category D) with little to no native understory present due to clearing and exotic plantings. All Tuarts were established (&gt; 15 cm DBH), some were significant (&gt;50 cm DBH) and they were grouped in patches as defined by DotEE (2017). However the understory consisted of few to no native species and where hollows and/ or large trees (&gt; 50 cm DBH) were present the patch size of the community was below the minimum threshold for the assigned condition category 1.</p> <p>The proposed clearing is not likely to be at variance to this Principle.</p>
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Methodology	DBCA shapefiles GHD vegetation assessment (2018)
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**e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared**

Proposed clearing is not at variance to this Principle

Comments	<p>The Heddle et al (1980) mapping identified one vegetation complex within the project area, which is described as Spearwood Dunes: Cottesloe complex – central and south: Mosaic of woodland of <i>Eucalyptus gomphocephala</i> (tuart) and open forest of <i>E. gomphocephala</i> – <i>E. marginata</i> (jarrah) – <i>E. calophylla</i> (now <i>Corymbia calophylla</i>) (marri); closed heath on the Limestone outcrops. A total of 32% of this vegetation complex remains. On the Swan Coastal Plain, vegetation is considered to be extensively cleared when less than 10% remains. Based on this, the project area is not considered to be extensively cleared.</p> <p>The proposed clearing is not at variance to this principle.</p>
Methodology	Government of Western Australia (2018) Heddle et al (1980) GHD vegetation assessment (2018)

**f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland**

Proposed clearing is not likely to be at variance to this Principle

Comments	<p>No watercourses, drainage lines or wetlands are present within the project area.</p> <p>The project area is situated approximately 1.2 km south of the Swan River, within the Swan Coastal catchment. The project is located within the Swan/Canning Estuary surface water allocation sub-areas. No geomorphic wetlands were identified during the survey. The Swan River Estuary, classified as an Estuary-Waterbody, is situated 900 m north of the project area.</p> <p>The proposed clearing is not likely to be at variance to this principle.</p>
Methodology	DWER and DBCA shapefiles

**g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**

Proposed clearing is not likely to be at variance to this Principle

Comments	<p>The project is located in a residential area that has been highly modified. The project is expected to improve land degradation as it will require the upgrade of road and adjacent surfaces, drainage improvement and landscaping to improve local amenity.</p> <p>The proposed clearing is not likely to be at variance to this principle.</p>
Methodology	High Street Upgrade Design

**h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

Proposed clearing is not at variance to this Principle

Comments	There are no environmental conservation areas adjacent or in close proximity to the project area and therefore the clearing will not be at variance to this principle.
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Methodology	DBCA shapefiles GHD vegetation assessment (2018)
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**i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.**

Proposed clearing is not at variance to this Principle

Comments	<p>The project area is situated approximately 1.2 km south of the Swan River, within the Swan Coastal catchment. The project is located within the Swan/Canning Estuary surface water allocation sub-areas. No watercourses, drainage lines or wetlands are present within the project area.</p> <p>The project area is located in the Perth Groundwater Area, a Proclaimed groundwater area under RIWI Act. No impacts to groundwater are expected to result from the project which will have minimal clearing and involve the upgrade of an existing road.</p> <p>Water will be managed on site through upgraded drainage structures which will channel water to the north and away from the median trees in order to minimise clearing. Landscaping will be applied, which will assist with the management of surface water runoff. Contamination sources will be managed under a CEMP to prevent potential impacts to groundwater.</p> <p>The proposed clearing is no at variance to this principle.</p>
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Methodology	DWER and DBCA shapefiles High Street Upgrade Design
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**j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.**

Proposed clearing is not at variance to this Principle

Comments	The project area is situated approximately 1.2 km south of the Swan River, within the Swan Coastal catchment. No watercourses, drainage lines or wetlands are present within the project area. Flooding is not considered to be a significant risk for this project, with “<3% of the project having a moderate to high risk of flooding (Department of Primary Industries and Regional Development (DPIRD) 2017).
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Methodology	DPIRD 2017
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## 5. Commonwealth Aspects and Impacts

The project was assessed to determine impacts to MNES, as detailed in Table 12.

The project will impact habitat found suitable for Listed Threatened Species (Forest Red-tailed Black Cockatoo and Carnaby's Black Cockatoo). However the clearing of these trees and associated habitat is not expected to have a significant impact on this MNES.

Table 12 Assessment of Existing Environment, Matters of National Environmental Significance and Likely Impact.

MNES	Existing environment and likely impact										
Nationally listed threatened species or ecological communities	<p>The PMST identified 30 birds and 2 terrestrial mammals within 10 km of the project (Appendix D). Of these only Carnaby's and Forest Red-tailed Black Cockatoo are expected to be impacted based on habitat requirements.</p> <p>The PMST identified two TECs:</p> <ul style="list-style-type: none"> <li>• Banksia woodland of the Swan Coastal Plain ecological community (endangered)</li> <li>• Subtropical and temperate coastal saltmarsh (vulnerable)</li> </ul>										
Justification of likely impact	<p><b>Listed Threatened Species</b></p> <p>Carnaby's and Forest Red-tailed Black Cockatoo are considered likely to occur based on habitat availability.</p> <p>Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) were recorded on several occasions flying over the survey area in flocks of 2 to 6 birds. On two occasions this species was also recorded feeding on Marri nuts. A total of 0.64 ha (including non-native vegetation) of foraging habitat is present in the project area.</p> <p>A tree by tree assessment was undertaken with the project designers in July 2018. The number of Black Cockatoo potential breeding trees cleared by the project was reduced from 44 to 16 trees, two with hollows (Table 5). No roosting evidence was recorded during the surveys.</p> <p>The project was assessed to determine if referral is required to the DotEE (Commonwealth of Australia 2013), based on impacts to Black Cockatoos detailed below.</p> <table border="1"> <thead> <tr> <th>Risk type</th> <th>Referral trigger</th> </tr> </thead> <tbody> <tr> <td>Clearing of any known nesting tree.</td> <td>Referral is not triggered. No currently known nesting trees.</td> </tr> <tr> <td>Clearing of any part or degradation of breeding habitat in a woodland or forest within a species' known breeding range.</td> <td>Referral is not triggered. Not within known breeding range. Two potential future breeding hollows were identified but they are not of suitable size.</td> </tr> <tr> <td>Clearing of more than 1 ha of quality foraging habitat.</td> <td>Referral is not triggered. Proposed clearing is less than 1 ha of foraging habitat.</td> </tr> <tr> <td>Creating a gap of greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting).</td> <td>Referral is not triggered, the site is within a highly modified environment and the project will not impact on current levels of fragmentation. There are areas of suitable cockatoo habitat in adjacent bushland.</td> </tr> </tbody> </table>	Risk type	Referral trigger	Clearing of any known nesting tree.	Referral is not triggered. No currently known nesting trees.	Clearing of any part or degradation of breeding habitat in a woodland or forest within a species' known breeding range.	Referral is not triggered. Not within known breeding range. Two potential future breeding hollows were identified but they are not of suitable size.	Clearing of more than 1 ha of quality foraging habitat.	Referral is not triggered. Proposed clearing is less than 1 ha of foraging habitat.	Creating a gap of greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting).	Referral is not triggered, the site is within a highly modified environment and the project will not impact on current levels of fragmentation. There are areas of suitable cockatoo habitat in adjacent bushland.
Risk type	Referral trigger										
Clearing of any known nesting tree.	Referral is not triggered. No currently known nesting trees.										
Clearing of any part or degradation of breeding habitat in a woodland or forest within a species' known breeding range.	Referral is not triggered. Not within known breeding range. Two potential future breeding hollows were identified but they are not of suitable size.										
Clearing of more than 1 ha of quality foraging habitat.	Referral is not triggered. Proposed clearing is less than 1 ha of foraging habitat.										
Creating a gap of greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting).	Referral is not triggered, the site is within a highly modified environment and the project will not impact on current levels of fragmentation. There are areas of suitable cockatoo habitat in adjacent bushland.										

Clearing or degradation (including pruning of top canopy) of a known roosting site.	Referral is not triggered, no known roosting sites have been recorded.
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat.	Referral is not triggered. Proposed clearing is less than 1 ha of foraging habitat.
Clearing or disturbance in areas surrounding Black Cockatoo habitat that has the potential to degrade habitat through introduction of invasive species, edge effect, hydrological changes, increase human visitation or fire.	Referral is not triggered. Much of the project area and surrounding area is already highly modified due to various external impacts (such as introduced species, edge effect, clearing, human visitation, etc.). The project is unlikely to impact on the current levels of habitat degradation.
Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows.	Referral will not be triggered. No potential breeding trees were recorded within the project area. As such, clearing of the project area would not reduce the amount of available nesting habitat, increasing competition for remaining hollows in the area.
Actions with the potential to introduce known plant diseases such as Phytophthora spp.	Referral is unlikely to be triggered. Phytophthora is known to occur widely in the region and may already be present at the site. Much of the project area is already highly degraded. Management measures should be implemented to reduce the risk of introduction and spread of Phytophthora.
Actions that do not affect Black Cockatoo habitat or individuals	Not applicable.
Actions whose impacts occur outside the modelled distribution of the three Black Cockatoos	Not applicable.

### Significant Impact 1.1 Assessment

The project was assessed against Significant Impacts Guideline 1.1 (Commonwealth of Australia 2013) for both Endangered and Vulnerable Black Cockatoo species to determine the level of impact expected.

Endangered Significant Impact Criteria	Comments
Carnaby's Black Cockatoo	

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

<p>Lead to a long-term decrease in the size of a population</p>	<p>Black Cockatoo are considered likely to occur based on habitat availability. Feeding evidence for Carnaby's Black Cockatoo was observed on site and it is assumed that a population occurs in the project area.</p> <p>In total 58 native Eucalyptus trees (Tuart, Marri, Jarrah and Flooded Gum) were recorded in the survey area, having a DBH &gt;500mm. Sixteen trees with a DBH &gt;500 mm will be cleared for the project, two with hollows not suitable for Black Cockatoo use.</p> <p>No roosting evidence was recorded during the surveys.</p> <p>No impacts to current breeding habitat for Black Cockatoos is expected from the project, and future impacts are minimal. The project is not expected to lead to a long-term decrease in the size of a population.</p>
<p>Reduce the area of occupancy of the species</p>	<p>The area of occupancy for Black Cockatoo will not be significantly reduced as a result of the project, with only 0.64 ha (including non-native vegetation) foraging habitat to be cleared.</p> <p>The Royal Fremantle and Public Golf Course provide appropriate habitat and are 68 ha and 16 ha in size, respectively. Surrounding links also include Booyeembara Park and its associated man-made water body, approximately 15 ha in size, and Fremantle Cemetery (approximately 40 ha of park lands).</p> <p>Given the surrounding features, the clearing for the project is unlikely to significantly impact the area of occupancy for Black Cockatoos.</p>
<p>Fragment an existing population into two or more populations</p>	<p>Carnaby's Black Cockatoo are a highly mobile species and the loss of 0.67 ha of foraging habitat will not fragment an existing population. The project will not result in fragmentation of existing habitat.</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>Habitat critical to the survival of Carnaby's Black Cockatoo is defined as (Department of Parks and Wildlife 2013):</p> <ul style="list-style-type: none"> <li>- known breeding and nearby feeding habitat</li> <li>- former breeding habitat that has hollows intact</li> <li>- vegetation that provides habitat for feeding, watering and regular night roosting.</li> </ul> <p>The project area does not contain known or former breeding habitat. One tree in the survey showed signs of initial working by Black Cockatoo but not a fully developed nest. This tree is outside the project area. No night roosting was identified in the project area.</p> <p>Feeding habitat and water is available in the surrounding area, therefore it is considered likely that the areas adjacent to the project provide critical habitat and the project does not.</p>

Disrupt the breeding cycle of a population	<p>Sixteen trees with a DBH &gt;500 mm will be cleared for the project, two with hollows.</p> <p>Only one hollow within the immediate vicinity of the project area was found to be suitable for potential Black Cockatoos, with this outside the project area and will not be impacted.</p> <p>All hollows identified in the project area are currently too small for use by Black Cockatoo. The project is not considered likely to disrupt the breeding cycle of the population.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>The Royal Fremantle and Public Golf Course provide appropriate habitat and are 68 ha and 16 ha in size, respectively. Surrounding links also include Booyembara Park and its associated man-made water body, approximately 15 ha in size, and Fremantle Cemetery (approximately 40 ha of park lands).</p> <p>Given the surrounding features, clearing for the project is unlikely to decrease habitat availability to the extent that the species is likely to decline.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	<p>The project involves the upgrade of an existing road which is used for freight, and as such would benefit from biosecurity protocols at the port. No additional invasive species are likely to be introduced.</p> <p>European bees compete for hollows but are already established in the area, and bee infestations are managed by the golf course as required.</p>
Introduce disease that may cause the species to decline, or	<p>The upgrade of High Street is unlikely to introduce disease that would affect Black Cockatoos.</p>
Interfere with the recovery of the species.	<p>Species recovery, as defined by the Recovery Plan (Department of Parks and Wildlife 2013), is dependent upon stopping the further decline in the distribution and abundance of Carnaby's cockatoo by protecting the birds throughout their life stages and enhancing habitat critical for survival throughout their breeding and non-breeding range, ensuring that the reproductive capacity of the species remains stable or increases. The project will not involve the removal of critical habitat and is unlikely to impact species breeding.</p> <p>The project is unlikely to interfere with the recovery of the species.</p>

Vulnerable Significant Impact Criteria	Comments
<b>Forest Red-tailed Black Cockatoo</b>	
<b>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</b>	
<b>Lead to a long-term decrease in the size of an important population of a species</b>	<p>A population of Forest Red-tailed Black Cockatoos is known to occur in the project area. Birds were recorded on several occasions flying over the survey area in flocks of 2 to 6. On two occasions this species was also recorded feeding on Marri nuts, once along Stirling Highway and the other near to the golf course. Along Stirling highway birds were also recorded loafing in Swamp Mahogany. Sixteen trees with a DBH &gt;500 mm will be cleared for the project, two with hollows.</p> <p>Small, medium and large hollows were inspected and only one was suitable for current use. This tree is outside the project area and will not be impacted. Both hollows identified inside the project area are currently too small for use by Black Cockatoo.</p> <p>No roosting evidence was recorded during the surveys.</p> <p>No impacts to current breeding habitat for Black Cockatoos is expected from the project, and future impacts are minimal. The project is not expected to lead to a long-term decrease in the size of an important population.</p>
<b>Reduce the area of occupancy of an important population</b>	<p>The Royal Fremantle and Public Golf Course provide appropriate habitat and are 68 ha and 16 ha in size, respectively. Surrounding links also include Booyeembara Park and its associated man-made water body, approximately 15 ha in size, and Fremantle Cemetery (approximately 40 ha of park lands).</p> <p>Given the surrounding features, the clearing for the project is unlikely to significantly impact the area of occupancy for Red-tailed Black Cockatoos.</p>
<b>Fragment an existing important population into two or more populations</b>	<p>Red-tailed Black Cockatoo are a highly mobile species and the loss of 0.67 ha of foraging habitat will not fragment an existing population. The project will not result in fragmentation of existing habitat.</p>
<b>Adversely affect habitat critical to the survival of a species</b>	<p>Critical habitat included all Marri (<i>Corymbia calophylla</i>), Karri (<i>Eucalyptus diversicolour</i>) and Jarrah (<i>Eucalyptus marginata</i>) forests, woodlands and remnants in the South-west of Western Australia receiving more than 600 mm of annual average rainfall (DEC 2008).</p> <p>The project does not represent critical habitat for Red-tailed Black Cockatoo.</p>

	<p>Disrupt the breeding cycle of an important population</p>	<p>Sixteen trees with a DBH &gt;500 mm will be cleared for the project, two with hollows.</p> <p>Only one hollow within the immediate vicinity of the project area was found to be suitable for potential Black Cockatoos, with this outside the project area and will not be impacted.</p> <p>Both hollows identified in the project area are currently too small for use by Black Cockatoo. The project is not considered likely to disrupt the breeding cycle of the population.</p>
	<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>The Royal Fremantle and Public Golf Course provide appropriate habitat and are 68 ha and 16 ha in size, respectively. Surrounding links also include Booyeembara Park and its associated man-made water body, approximately 15 ha in size, and Fremantle Cemetery (approximately 40 ha of park lands).</p> <p>Given the surrounding features, the clearing for the project is unlikely to significantly impact the area of occupancy for Red-tailed Black Cockatoos.</p> <p>Given the surrounding features, clearing for the project is unlikely to decrease habitat availability to the extent that the species is likely to decline.</p>
	<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p>The project involves the upgrade of an existing road. European bees compete for hollows in this area, but are already established. Bee infestations are managed by the golf course as required.</p> <p>No harmful species are expected to be introduced as a result of this project.</p>
	<p>Introduce disease that may cause the species to decline, or</p>	<p>The upgrade of High Street is unlikely to introduce disease that would affect Black Cockatoos.</p>
	<p>Interfere substantially with the recovery of the species.</p>	<p>Species recovery, as defined by the Recovery Plan (DEC 2008), is dependent upon critical habitat including all Marri (<i>Corymbia calophylla</i>), Karri (<i>Eucalyptus diversicolour</i>) and Jarrah (<i>Eucalyptus marginata</i>) forests, woodlands and remnants in the South-west of Western Australia receiving more than 600 mm of annual average rainfall. The project does not represent critical habitat for Red-tailed Black Cockatoo and is unlikely to interfere with the recovery of the species.</p>
	<p><b>Listed Threatened Ecological Communities</b>  No conservation significant ecological communities listed under the EPBC Act were recorded during the field surveys.</p>	
<p>Methodology</p>	<p>DoEE PMST Report.  Carnaby's Cockatoo Recovery Plan  Red-tailed Black Cockatoo Recovery Plan</p>	

	GHD Vegetation memo Tuart TEC Draft Conservation Advice
<b>MNES</b>	<b>Existing environment and likely impact</b>
Migratory species	The PMST identified 52 migratory birds occurring within 10 km of the project (Appendix D).
Justification of likely impact	<p>The proposed action is approximately 2 km inland. Impacts to marine, coastal and estuarine migratory species will be negligible.</p> <p>There are no wetlands or watercourses within the Proposed action area, however the area is located in relatively close proximity to the Swan River (approximately 1 km). There is a small modified wetland approximately 270 m from the proposed action area, within the adjacent golf course, but this provides limited habitat for migratory species compared to much larger and intact wetlands such as North Lake and Bibra Lake, which are approximately 5 km and 5.6 km from the proposed action, respectively. The proposed action is unlikely to result in significant impacts according to the criteria specified in the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013). No important habitat for migratory birds is present in the project area and the lifecycle of migratory birds is not likely to be impacted.</p>
Methodology	DoEE PMST Report
<b>MNES</b>	<b>Existing environment and likely impact</b>
Wetlands of International Importance	Forrestdale and Thomsons lakes
Justification of likely impact	<p>The closest Ramsar wetlands are Thomsons Lake and Forrestdale Lake located approximately 11 km south southwest and 18 km southeast, respectively, from the proposed action.</p> <p>The proposed action does not drain into the surface water catchment of either Ramsar wetland.</p> <p>The proposed action is not expected to require any groundwater dewatering for construction, but if required would be associated with limited, localised and temporary groundwater drawdown during construction that would not affect either Ramsar wetland.</p> <p>The proposed action will use best practice pollution controls during construction and the design will incorporate stormwater treatment into the final design. These measures will avoid and minimise impacts to groundwater quality during construction and operation.</p> <p>The proposed action is unlikely to result in significant impacts according to the criteria specified in the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013). No wetlands will be destroyed or modified by the project. Hydrological changes and water quality impacts are not expected. The proposed action will not impact the habitat or lifecycle of wetland species or introduce invasive species to a wetland.</p> <p>The proposed action will not cause significant impacts to either Ramsar wetland.</p>
Methodology	DoEE PMST Report.
<b>MNES</b>	<b>Existing environment and likely impact</b>
World Heritage Properties	Australian Convict Sites (Fremantle Prison and buffer zones)

Justification of likely impact	Two world heritage properties are located within 5 km of the proposed action. Both listings are associated with the Fremantle Prison (Australian Convict Sites) and located approximately 950 m west southwest from the western extent of the proposed action.  The ground disturbance activities and road upgrade will not impact this property directly or indirectly.
Methodology	DoEE PMST Report.

MNES	
Existing environment and likely impact	
National Heritage Places	Fremantle prison
Justification of likely impact	One national heritage place is located within 5 km of the proposed action. The Fremantle Prison is located approximately 950 m west southwest from the western extent of the proposed action.  The ground disturbance activities and road upgrade will not impact this property directly or indirectly.
Methodology	DoEE PMST Report

MNES	
Existing environment and likely impact	
Commonwealth Land or Marine Areas	Not relevant to the proposed activity.
Justification of likely impact	Proposed action is approximately 2 km inland, with no impacts to the marine environment reasonably expected. There are no Commonwealth marine areas with 5 km of the proposed area. No commonwealth lands will be impacted.
Methodology	DoEE PMST Report ArcGIS shapefiles

MNES	
Existing environment and likely impact	
Nuclear Actions	Not relevant to the proposed activity.
Justification of likely impact	The project activities do not involve nuclear actions and this aspect is not relevant to the project.
Methodology	DoEE PMST Report

MNES	
Existing environment and likely impact	
Water Resource	Not relevant to the proposed activity.
Justification of likely impact	The project activities do not involve a coal seam gas development or a large coal mining development.
Methodology	DoEE PMST Report

## 6. Stakeholder engagement

### 6.1 Community consultation

The project has been the subject of extensive community consultation, as detailed below.

Date	Organisation	Details
2002	Local Impacts Committee	The Local Impacts Committee was set up by the Minister for Planning and Infrastructure. It was recommended that works be undertaken to resolve traffic related problems and the high volumes of freight on High Street as a high priority, to provide a safer road environment and to reduce noise levels affecting adjoining residential properties.
2008		The Department of Planning (DoP) commenced the community consultation process and engaged with the community and key stakeholders via letters, newspaper notices, information flyers, a website and community workshops. The first of two community workshops was held in May and the DoP presented five upgrade options for discussion and feedback
2009		<p>The Department of Planning held the second community workshop to discuss the shortlisted three preliminary road upgrading options (refined from five) for discussion and feedback.</p> <p>A Consultation Report was prepared for the Department of Planning by Estill and Associates (2009) for the Project. The document provides a summary of the consultation undertaken between September 2007 and August 2009 to inform the development of the road design and upgrade along High Street, Fremantle. Representatives from the City of Fremantle, Elected Members, the local community, and other key stakeholders worked through design constraints to develop a concept design that was most acceptable to all parties. Several design options were investigated at the time following a range of issues identified by many stakeholders.</p>
2012 - 2013	City of Fremantle	<p>March 2012 to July 2012 - three Project Alignment Workshops were held with City of Fremantle</p> <p>July 2012 to July 2013 - regular updates to the City of Fremantle and Elected Members on design developments</p> <p>September 2013 - Presentation of concept to full Council (Elected Members and Officers). In principle support of a concept design ready for stakeholder and community consultation</p>
2012 - 2014	A Stakeholder Advisory Group was formed with the following representation: WA Freight and Logistics Council	<p>These key stakeholders provide representative input from their specific portfolios into relevant project matters, issues and design.</p> <p>Meetings have also been held with the Port Operations Taskforce.</p>

	WA Road Transport Association Metropolitan Cemeteries Board City of Fremantle; City of Melville Town of East Fremantle Department of Planning Department of Transport Public Transport Authority Fremantle Ports LandCorp Main Roads WA	
2013	Community Information Session	<p>Given the high level of interest in the project, Main Roads held a Community Information Session on 25 September 2013. Three weeks prior the Session, letters were mailed to over 1,700 local residents, inviting them to participate in the session and nominate for the Community Focus Group. In addition, advertisements were placed in the local newspapers, and information was placed on the Main Roads website.</p> <p>Around 150 people attended the Session. Simone McGurk, MLA for Fremantle, was previously briefed on the Project and attended the Community Information Session. Greens MLC Lynn MacLaren also attended this session.</p>
2013 - 2014	Community Focus Group	<p>Main Roads established a Community Focus Group to ensure that surrounding communities had ongoing representative input into the project. The Group provided community input on specific design elements including pedestrian/cyclist access, noise mitigation and amenity walls, landscaping and public art components.</p>
Ongoing	Fremantle Public Golf Course Royal Fremantle Golf Club Fremantle Netball Association (Gibson Park facility) Fremantle Environmental Resource Network East Fremantle Primary School	<p>Independent meetings have taken place with stakeholders impacted by the works outside the Community Focus Group to ensure particular issues can be discussed with additional representatives from these groups.</p>
2013 - 2014	Regulatory agencies	<p>Main Roads met with the Office of the Environmental Protection Authority, Department of Environment Regulation Air Quality Management Branch and DER Noise Branch.</p>

2018	<p>City of Fremantle Royal Fremantle Golf Club Fremantle Public Golf Course Fremantle Netball Association Westport Taskforce</p> <p>Local community</p>	<p>Main Roads revisited the previous planning and project development for the project in 2017 and in March 2018 released a new draft concept plan for the upgrade of High Street – Stirling Highway to Carrington Street. A targeted six week consultation program was implemented to:</p> <ul style="list-style-type: none"> <li>• Identify how the upgrade could meet the community’s needs as much as possible within the space, cost and operational constraints of the project</li> <li>• Gather feedback to complement previous consultation.</li> </ul> <p>Feedback was invited from the local community, local community precinct committees for White Gum Valley and Gibson Park, businesses, road users and industry on the High Street Upgrade draft concept plan via:</p> <ul style="list-style-type: none"> <li>• Surveys – Online and paper based</li> <li>• Community drop-in information sessions and displays inviting community to discuss the plan with the project team</li> <li>• Dedicated project email address.</li> </ul> <p>Dissemination of information occurred via a range of communication channels including:</p> <ul style="list-style-type: none"> <li>• Formal State Government Media statement</li> <li>• Newsletters – emailed to project subscriber list, letterbox dropped to all local residents and mail out to all local landowners</li> <li>• Digital media – website updates and social media posts on Main Roads, City of Fremantle and Town of East Fremantle.</li> </ul> <p>The consultation program generated significant engagement and a number of key themes emerged which will be used to help refine the final concept and scope of works. Some of these included parking for netball facility, retaining large planted trees along current alignment, and inclusion of pedestrian underpasses.</p>
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Appendix M details both the initial newsletter inviting community feedback, consultation summary and the updated concept plan newsletter. Community and stakeholder engagement will continue throughout the project lifecycle with the objectives to:

- Ensure a high level of stakeholder engagement and support for the project
- Raise awareness of the project amongst a diverse range of stakeholders including the broader public
- Develop and deliver the project in a socially sensitive manner
- Collaborate with the City of Fremantle to ensure their needs/expectations are met
- Encourage an innovative approach to the design and construction of the project.

A Construction Reference Group will be established in late 2018/ early 2019 during the concept design phase. The group will continue to meet throughout construction.

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# Appendices

# Appendix A – Figures

- Figure 1 Project location
- Figure 2 Project and study areas
- Figure 3 Environmental constraints
- Figure 4 Heritage locations

# Appendix B – Environmental Management Plan

# Appendix C – Aboriginal Heritage Risk Assessment

# Appendix D – Vegetation Assessment

# Appendix E – High Street Upgrade - Black Cockatoo Tree Survey

# Appendix F – Preliminary Survey, Assessment and Report

# Appendix G – Air Assessment

# Appendix H – Noise Assessment

# Appendix I – Conservation significant flora desktop search results

## Appendix J – DBCA Conservation Fauna List

NAME	FAMILY	GENUS	SPECIES	SUB SPECIES	COMMON NAME	CONS CODE	LIKELIHOOD
Apus pacificus	Apodidae	Apus	pacificus		fork-tailed swift	IA	Unlikely- Species migratory and rarely seen in the south west, they are areal and unlikely to utilise a terrestrial environment
Ardea ibis	Ardeidae	Ardea	ibis		cattle egret	IA	Unlikely - The species is not known from the region and no domestic stock present
Ardea modesta	Ardeidae	Ardea	modesta		great egret	IA	Unlikely - No habitat available for this species
Arenaria interpres	Scolopacidae	Arenaria	interpres		ruddy turnstone	IA	Highly Unlikely - No habitat available for this species
Botaurus poiciloptilus	Ardeidae	Botaurus	poiciloptilus		Australasian bittern	EN	Highly Unlikely - No habitat available for this species
Cacatua pastinator pastinator	Cacatuidae	Cacatua	pastinator	pastinator	Muir's corella	CD	Unlikely - Species is rarely observed utilising the Swan Coastal Plain and is now restricted to the North of the Perth greater region
Calidris acuminata	Scolopacidae	Calidris	acuminata		sharp-tailed sandpiper	IA	Highly Unlikely - No habitat available for this species
Calidris alba	Scolopacidae	Calidris	alba		sanderling	IA	Highly Unlikely - No habitat available for this species
Calidris canutus	Scolopacidae	Calidris	canutus		red knot, knot	IA (& VU at subsp. level)	Highly Unlikely - No habitat available for this species
Calidris ferruginea	Scolopacidae	Calidris	ferruginea		curlew sandpiper	VU & IA	Highly Unlikely - No habitat available for this species
Calidris melanotos	Scolopacidae	Calidris	melanotos		pectoral sandpiper	IA	Highly Unlikely - No habitat available for this species
Calidris ruficollis	Scolopacidae	Calidris	ruficollis		red-necked stint	IA	Highly Unlikely - No habitat available for this species
Calidris subminuta	Scolopacidae	Calidris	subminuta		long-toed stint	IA	Highly Unlikely - No habitat available for this species
Calidris tenuirostris	Scolopacidae	Calidris	tenuirostris		great knot	VU & IA	Highly Unlikely - No habitat available for this species

Calyptorhynchus banksii naso	Cacatuidae	Calyptorhynchus	banksii	naso	forest red-tailed black cockatoo	VU	Present
Calyptorhynchus baudinii	Cacatuidae	Calyptorhynchus	baudinii		Baudin's cockatoo	EN	Unlikely - Species is rarely observed utilising the western portion of the Swan Coastal Plain
Calyptorhynchus latirostris	Cacatuidae	Calyptorhynchus	latirostris		Carnaby's cockatoo	EN	Present
Charadrius dubius curonicus	Charadriidae	Charadrius	dubius	curonicus	little ringed plover	IA	Highly Unlikely - No habitat available for this species
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii		greater sand plover, large sand plover	IA (& VU at subsp. level)	Highly Unlikely - No habitat available for this species
Charadrius mongolus	Charadriidae	Charadrius	mongolus		lesser sand plover	EN & IA	Highly Unlikely - No habitat available for this species
Charadrius rubicollis	Charadriidae	Charadrius	rubicollis		hooded plover	P4	Highly Unlikely - No habitat available for this species
Dasyurus geoffroii	Dasyuridae	Dasyurus	geoffroii		chuditch, western quoll	VU	Highly Unlikely - No habitat available for this species
Falco peregrinus macropus	Falconidae	Falco	peregrinus	macropus	peregrine falcon	OS	Likely - The species is known in the region, however use would be restricted to foraging, no breeding areas are provided in the survey area
Glareola maldivarum	Glareolidae	Glareola	maldivarum		oriental pratincole	IA	Highly Unlikely - No habitat available for this species
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster		water-rat, rakali	P4	Highly Unlikely - No habitat available for this species
Isodon fusciventer	Peramelidae	Isodon	fusciventer		quenda, southern brown bandicoot	P4	Unlikely - Although in the species range the survey area is highly modified and unlikely to support a population of the species
Lerista lineata	Scincidae	Lerista	lineata		lined skink	P3	Unlikely - Although in the species range the survey area is highly modified and unlikely to support a population of the species
Limicola falcinellus	Scolopacidae	Limicola	falcinellus		broad-billed sandpiper	IA	Highly Unlikely - No habitat available for this species
Limosa lapponica	Scolopacidae	Limosa	lapponica		bar-tailed godwit	IA (& VU at subsp. level)	Highly Unlikely - No habitat available for this species

Limosa limosa	Scolopacidae	Limosa	limosa		black-tailed godwit	IA	Highly Unlikely - No habitat available for this species
Macropus irma	Macropodidae	Macropus	irma		western brush wallaby	P4	Highly Unlikely - No habitat available for this species
Myrmecobius fasciatus	Myrmecobiidae	Myrmecobius	fasciatus		numbat, walpurti	EN	Highly Unlikely - No habitat available for this species
Neelaps calonotos	Elapidae	Neelaps	calonotos		black-striped snake	P3	Highly Unlikely - No habitat available for this species
Ninox connivens connivens (southwest subpop.)	Strigidae	Ninox	connivens	connivens (southwest subpop.)	barking owl (southwest subpop.)	P2	Highly Unlikely - No habitat available for this species
Numenius madagascariensis	Scolopacidae	Numenius	madagascariensis		eastern curlew	VU & IA	Highly Unlikely - No habitat available for this species
Numenius phaeopus	Scolopacidae	Numenius	phaeopus		whimbrel	IA	Highly Unlikely - No habitat available for this species
Oxyura australis	Anatidae	Oxyura	australis		blue-billed duck	P4	Highly Unlikely - No habitat available for this species
Philomachus pugnax	Scolopacidae	Philomachus	pugnax		ruff (reeve)	IA	Highly Unlikely - No habitat available for this species
Plegadis falcinellus	Threskiornithidae	Plegadis	falcinellus		glossy ibis	IA	Highly Unlikely - No habitat available for this species
Pluvialis fulva	Charadriidae	Pluvialis	fulva		Pacific golden plover	IA	Highly Unlikely - No habitat available for this species
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola		grey plover	IA	Highly Unlikely - No habitat available for this species
Setonix brachyurus	Macropodidae	Setonix	brachyurus		quokka	VU	Highly Unlikely - No habitat available for this species
Tringa glareola	Scolopacidae	Tringa	glareola		wood sandpiper	IA	Highly Unlikely - No habitat available for this species
Tringa hypoleucos	Scolopacidae	Tringa	hypoleucos		common sandpiper	IA	Highly Unlikely - No habitat available for this species
Tringa nebularia	Scolopacidae	Tringa	nebularia		common greenshank, greenshank	IA	Highly Unlikely - No habitat available for this species
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis		marsh sandpiper,	IA	Highly Unlikely - No habitat available for this species

					little greenshank		
Tyto novaehollandiae	Tytonidae	Tyto	novaehollandiae	novaehollandiae	masked owl (southwest)	P3	Highly Unlikely - No habitat available for this species

# Appendix K – Detailed Site Investigation: Soil and Groundwater

# Appendix L – Desktop Aboriginal Heritage Survey

# Appendix M – Community Consultation

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