



# **Main Roads Western Australia**

## Romeo Road and Wanneroo Road Upgrade Native Vegetation Clearing Permit Supporting Documentation

November 2019

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# Abbreviations

BAM Act	<i>Biosecurity and Agricultural Management Act 2007</i>
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
MS	Ministerial Statement
NVCP	Native Vegetation Clearing Permit
PEC	Priority Ecological Community
TEC	Threatened Ecological Community
WoNS	Weeds of National Significance

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# 1. Introduction

## 1.1 Project background

Main Roads Western Australia (Main Roads) proposes to undertake clearing in association with road upgrade works to Romeo Road and Wanneroo Road (from Dunstan Road to Trian Road), in the City of Wanneroo (the proposal).

The proposal will result in upgrading Wanneroo Road to a dual carriageway for 5.5 kilometres (km) from Dunstan Road to Trian Road. The proposal will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's northern suburbs.

Whilst the majority of the Mitchell Freeway Extension project is covered by Ministerial Statement (MS) 629, there are some areas outside of the MS 629 boundary that contain native vegetation, which must be cleared for project construction. These areas will require a native vegetation clearing permit under the *Environmental Protection Act 1986* (EP Act), and are the subject of this report.

## 1.2 Scope and purpose of this document

This document has been prepared in support of an application for a Native Vegetation Clearing Permit (NVCP) under Section 51E of Part V of the EP Act, to clear up to 32.86 hectares (ha) of native vegetation within an envelope of 53 ha.

This document includes:

- An overview of works required and description of clearing activities to be undertaken (Section 2)
- An overview of existing environment (Section 3)
- Potential impacts identified (Section 4)
- Environmental management measures to be implemented to minimise clearing impacts (Section 5)
- An assessment against the Ten Clearing Principles, as defined in Schedule 5 of the EP Act (Section 6).

A biological assessment was completed for the larger Mitchell Freeway Extension project (GHD 2019). The assessment included a desktop review with a 5 km buffer (the study area) and field surveys of a survey area. The data from the biological assessment and desktop assessment have been utilised to assess the impacts resulting from clearing in the NVCP area.

The location of the NVCP area is shown in Figure 1, Appendix A. The biological survey area is shown on Figure 2, Appendix A.

## 1.3 Location and land ownership

The NVCP area is located on the existing Romeo Road and Wanneroo Road intersections, in the City of Wanneroo (Figure 1, Appendix A). Land ownership is a mixture of road reserve and private land. Main Roads is the public authority that is responsible for road reserves. Main Roads partially owns the land on which the application occurs. Under the *Land Administration Act 1997*, Main Roads has the right to compulsorily acquire land for works associated with the construction of the Mitchell Freeway Extension. A corridor of land surrounding the alignment will

ultimately be acquired by Main Roads from the individual landowners and transferred from freehold land to road reserve.

## 2. Description of clearing activities

Vegetation will be cleared for the following activities:

- Road construction of approximately 7 km of road
- Installation of culverts, safety barriers and other related infrastructure
- Intersections at Romeo Road and Wanneroo Road associated with the extension of the Mitchell Freeway
- Installation of road reserve fencing.

Laydown areas and site offices will be located in already cleared areas designated for the Mitchell Freeway Extension project.

Clearing of native vegetation will be undertaken using traditional earth moving machinery such as bulldozers. Topsoil will be striped separately and stockpiled for later reuse.



## 3. Existing environment

### 3.1 Climate

The Perth Metropolitan area experiences a Mediterranean climate with cool, wet winters and warm, dry summers. Rainfall is generally received in winter (June-August), however, the area also receives periodic summer rainfall as a result of thunderstorm activity or rain-bearing depressions from tropical cyclones. The closest Bureau of Meteorology (BOM) weather station with sufficient historical data is Perth weather station (site no. 009225). Average temperatures range from 7.8 °C (July) to 31.6 °C (February), with an average rainfall of 733.2 mm per annum (BOM 2019).

### 3.2 Land use

The NVCP area is zoned as “Primary regional roads” and “Parks and recreation” under the City of Wanneroo Town Planning Scheme No. 2.

### 3.3 Landforms and soils

The NVCP area lies within the Spearwood Dunes, described as: Pleistocene and aeolian sands overlying Tamala limestone. Low dunes and swales of shallow pale grey sands over yellow sands are characteristic of the Spearwood system. Wetlands are associated with peats and carbonate sands, occasionally with clay overlaying sands. Soils in this location are typically yellow deep sands, pale deep sands and yellow/brown shallow sands (McArthur and Bettenay 1960, Churchwood and McArthur 1980).

### 3.4 Hydrology

#### 3.4.1 Groundwater

The NVCP area is located in the Perth Groundwater Area proclaimed under the *Rights in Water and Irrigation Act 1914* and the Perth Coastal Underground Water Pollution Control Area public drinking water source area (Priority 3 Protection Zone) proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (Government of Western Australia (GoWA) 2019a).

#### 3.4.2 Surface water

There are no wetlands, watercourses or drainage lines located within the NVCP area.

No wetlands of national or international importance (Ramsar) are present within the study area (DotEE 2018). The nearest wetlands are detailed in Table 1 (Hill *et al.* 1996).

**Table 1 Geomorphic wetlands mapped within the study area**

Name	Unique feature identifier	Category	Location relative to NVCP area
Carabooda Lake	8009	Resource enhancement	Approximately 0.2 km from the NVCP east boundary.
Nowergup Lake	8021	Resource enhancement	Approximately 0.7 km from NVCP south eastern boundary
Unknown	8020	Multiple	Approximately 0.5 km from NVCP east boundary.

## 3.5 Flora and vegetation

### 3.5.1 Broad vegetation mapping and extents

#### Vegetation associations

Broad scale (1:250,000) pre-European vegetation mapping (Beard 1979) mapping indicates the NVCP area intersects two vegetation associations:

- Low woodland; Banksia (Association 949)
- Medium woodland; Tuart (Association 998).

The pre-European mapping has been adapted and digitised by Shepherd *et al.* (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the Department of Biodiversity, Conservation and Attractions (DBCA) (current as of March 2019 – GoWA 2019b).

As shown in Table 2, the current extents of all vegetation associations that intersect the NVCP area are above 30 % of their pre-European extents at the State, IBRA bioregion, IBRA subregion and Local Government Authority (LGA) levels.

#### Vegetation complexes

Regional vegetation complex mapping has been completed by Heddle *et al.* (1980) with updates from Webb *et al.* (2016) based on major landform boundaries on the Swan Coastal Plain (SCP) and forested region of south-west Western Australia. The mapping indicates two vegetation complexes are present within the NVCP area:

- Cottesloe Complex – Central and South: Consists of a mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *E. gomphocephala* – *E. marginata* (Jarrah) – *Corymbia calophylla* (Marri); closed heath on the limestone outcrops (majority of survey area)
- Herdsman Complex: Consists of sedgelands and fringing woodland of *E. rudis-Melaleuca* spp.

GoWA (2019c) has assessed the vegetation complexes mapped by Heddle *et al.* (1980) and Webb *et al.* (2016) against presumed pre-European extents within the SCP bioregion (Table 3) and LGA (Table 4). These tables show the current extent of all the vegetation complexes within the NVCP area are above 30 % of their pre-European extents remaining within the SCP bioregion and the City of Wanneroo.

**Table 2 Extent of vegetation associations mapped within the NVCP area (2019b)**

Pre-European Vegetation Associations	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% of Remaining in DBCA reserves
949	State: WA	218,193.94	123,104.02	56.42	55.86
	IBRA bioregion: Swan Coastal Plain	209,983.26	120,287.93	57.28	56.40
	Sub-region: Perth	184,475.82	104,128.96	56.45	58.99
	LGA: City of Wanneroo	37,138.40	17,196.34	46.30	70.10
998	State: WA	51,015.33	18,492.63	36.25	48.68
	IBRA bioregion: Swan Coastal Plain	50,867.50	18,492.32	36.35	48.68
	Sub-region: Perth	50,867.50	18,492.32	36.35	48.68
	LGA: City of Wanneroo	4,635.30	2,787.40	60.13	52.75

**Table 3 Extent of vegetation complexes on the SCP mapped within the NVCP area (GoWA 2019c)**

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)
Cottesloe Complex – Central and South	45,299.61	14,567.87	32.16	14.58
Herdsmen Complex	9,665.15	3,103.70	32.11	10.95

**Table 4 Extent of vegetation complexes within the City of Wanneroo mapped within the NVCP area (GoWA 2019c)**

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Proportion of the vegetation complex within the LGA (%)
Cottesloe Complex – Central and South	13,313.58	5,545.39	41.65	29.39
Herdsmen Complex	1,759.23	843.62	47.95	18.20

### **3.5.2 Vegetation types and condition**

The biological survey identified 14 vegetation types in the survey area, ranging in condition from Excellent to Completely Degraded. The NVCP area is predominantly located along existing transport corridors (Wanneroo Road, Joondalup line railway and Romeo Road) as well as established residential areas. A large proportion of the NVCP area had been highly disturbed and/or cleared. The vegetation type and condition mapped within the NVCP area are described in Table 5 and shown on Figure 4 and 5, Appendix A.

**Table 5 Vegetation types and condition mapped within the NVCP area**

Vegetation Type	Description	Area (hectares)	Condition	Area (hectares)
Banksia low woodland	Low woodland of <i>Banksia attenuata</i> and <i>B. menziesii</i> with occasional <i>Allocasuarina fraseriana</i> and <i>Eucalyptus tottiana</i> over a mid to low shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over open sedgeland and forbland of <i>Mesomelaena pseudostygia</i> , <i>Conostylis aculeata</i> and <i>Desmocladius flexuosus</i> .	17.95	Completely Degraded	0.01
		Degraded	2.18	
		Good - Degraded	1.91	
		Good	4.65	
		Very Good - Good	0.44	
		Very Good	8.76	
Banksia sessilis tall closed shrubland	Tall closed shrubland of <i>Banksia sessilis</i> , <i>Melaleuca systena</i> and <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> over shrubland of <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> and <i>Hakea trifurcata</i> over forbland/sedgeland of <i>Desmocladius flexuosus</i> , <i>Conostylis aculeata</i> and <i>Mesomelaena pseudostygia</i> .	0.30	Good	0.10
		Very Good - Good	0.20	
Jarrah tall woodland	Tall woodland of <i>Eucalyptus marginata</i> , <i>Banksia</i> spp. and <i>Allocasuarina fraseriana</i> over shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over a forbland/grassland of <i>Mesomelaena pseudostygia</i> , <i>Desmocladius flexuosus</i> and weedy grasses (* <i>Ehrharta longiflora</i> and * <i>Briza maxima</i> ).	0.82	Degraded	0.82
Mixed low heathland	Low heath of mixed species dominated by <i>Melaleuca systena</i> , <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> , <i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> over a mixed dense understorey (dominated by <i>Desmocladius flexuosus</i> , <i>Mesomelaena pseudostygia</i> and <i>Lomandra maritima</i> ).	1.26	Degraded	0.09
		Good	0.78	
		Very Good	0.39	
Scattered natives over weeds	Areas that have been impacted by previous clearing or grazing and consist of scattered native trees and/or shrubs including <i>Eucalyptus marginata</i> , <i>E. gomphocephala</i> , <i>Corymbia calophylla</i> , <i>Banksia</i> spp.,	8.57	Completely Degraded	1.18
		Degraded - Completely Degraded	6.35	
		Degraded	0.86	

Vegetation Type	Description	Area (hectares)	Condition	Area (hectares)
	<i>Allocasuarina fraseriana</i> with a scattered mid and lower storey including <i>Acacia</i> spp., <i>Xanthorrhoea preissii</i> and <i>Hibbertia hypericoides</i> over a groundcover completely dominated by introduced grasses (* <i>Avena barbata</i> , * <i>Bromus diandrus</i> and * <i>Ehrharta calycina</i> ) and herbs (* <i>Euphorbia terracina</i> , * <i>Carpobrotus edulis</i> and * <i>Pelargonium capitatum</i> ).		Good	0.19
Tuart tall woodland	Woodland of <i>Eucalyptus gomphocephala</i> over sparse shrubland of <i>Xanthorrhoea preissii</i> , <i>Acacia saligna</i> and <i>Rhagodia baccata</i> over a sparse forbland/grassland of weeds (* <i>Carpobrotus edulis</i> , * <i>Euphorbia terracina</i> and * <i>Ehrharta longiflora</i> ).	2.57	Degraded	0.45
			Good - Degraded	1.79
			Good	0.33
Tuart/Banksia open woodland	Tall open woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> over a mid to low shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over open sedgeland and weedy grassland of <i>Mesomelaena pseudostygia</i> , * <i>Bromus diandrus</i> and * <i>Briza maxima</i> .	1.38	Good	1.38
Total		32.86		32.86

### 3.5.3 Conservation significant ecological communities

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) identified three EPBC Act-listed Threatened Ecological Communities (TECs) potentially occurring within the study area. These TECs were also identified in a search of the DBCA TEC/PEC database along with one additional TEC and six PECs.

Mapping from the biological survey (GHD 2019) indicates that three PECs were recorded in the NVCP area. A breakdown of community type and clearing area is provided in Table 6.

**Table 6 Threatened and Priority Ecological communities in NVCP area**

Community type	Status	Extent within the NVCP Area (ha)
Banksia dominated woodlands of the SCP IBRA region (PEC) (Banksia woodlands of the SCP (TEC)) <sup>1</sup>	DBCA: P3 EPBC Act: Endangered TEC	19.31 (16.66 <sup>1</sup> ) ha
Northern Spearwood shrublands and woodlands (SCP24) (PEC)	DBCA: P3	1.56 ha
Tuart ( <i>Eucalyptus gomphocephala</i> ) woodlands of the SCP (PEC). Potentially representative of Tuart of the Swan Coastal Plain TEC.	DBCA: P3; Critically Endangered TEC	2.57 ha

<sup>1</sup> Banksia woodlands (TEC) extent is a subset of the PEC. To be representative of the Banksia Woodlands TEC, vegetation must meet key diagnostic characteristics which include minimum patch size and condition thresholds. Only vegetation in Good or better in condition was considered representative of the Banksia Woodlands TEC.

A total of 2.57 ha of Tuart (*Eucalyptus gomphocephala*) woodlands of the SCP PEC was recorded in the NVCP area. This is likely to represent the EPBC listed Tuart Woodlands of the Swan Coastal Plain TEC, however this TEC was not listed at the time of the biological survey.

### 3.5.4 Flora diversity

The *NatureMap* database identified 337 flora taxa in the study area, representing 67 families and 189 genera previously recorded within the study area. This total comprised 272 native flora taxa and 65 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (42 taxa), Asteraceae (30 taxa) and Proteaceae (22 taxa).

The *NatureMap* database search is provided in Appendix B.

### 3.5.5 Conservation significant flora

The EPBC Act PMST, *NatureMap* and DBCA Threatened and Priority Flora databases identified the presence/potential presence of 26 conservation significant flora taxa within the study area.

The biological survey identified no Threatened flora, and six Priority species:

- *Acacia benthamii* (Priority 2)
- *Pimelea calcicola* (Priority 3)
- *Stylidium maritimum* (Priority 3)
- *Leucopogon* sp. Yanchep (M. Hislop 1986) (Priority 3)
- *Hibbertia spicata* subsp. *leptotheca* (Priority 3)
- *Baekkea* sp. Limestone (N. Gibson & M.N. Lyons 1425) (Priority 1).

None were identified inside the NVCP area. The closest recorded conservation significant taxon is Priority 3 *Leucopogon* sp. Yanchep, located 30 m from the NVCP area.

Six species are considered possible or likely to occur in the NVCP area, however not recorded in the survey:

- *Eucalyptus argutifolia* (Vulnerable under EPBC Act and BC Act) – Possible
- *Leucopogon maritimus* (Priority 1) – Possible
- *Conostylis bracteata* (Priority 3) – Possible
- *Conostylis pauciflora* subsp. *euryrhipis* (Priority 4) – Possible
- *Fabronia hampeana* (Priority 2) – Possible
- *Jacksonia sericea* (Priority 4) – Likely.

### 3.5.6 Weeds

Of the 80 introduced taxa recorded within the GHD (2019) survey area, eight are listed as Declared Pests under the *Biosecurity and Agricultural Management Act 2007* (BAM Act). Four of these taxa are also listed as Weeds of National Significance (WoNS).

Five significant weeds have been mapped within the NVCP area, these include:

- *Moraea flaccida* (One-leaf Cape Tulip)– Declared Pest – 10 plants
- *Gomphocarpus fruticosus* (Narrowleaf Cottonbush) – Declared Pest – 1 plant
- *Opuntia stricta* (Common Prickly Pear)- Declared Pest and WoNS – 2 plants
- *Lantana camara* (Common Lantana)- Declared Pest and WoNS – 1 plant
- *Asparagus asparagoides* (Bridal Creeper) – Declared Pest and WoNS – 1 plant

## 3.6 Phytophthora dieback

*Phytophthora cinnamomi* (Dieback) is an introduced plant pathogen targeting the roots of susceptible plants, common in the south west of WA where the mean annual rainfall exceeds 400 mm (Department of the Environment 2014). It is considered that Dieback may pose a risk to the native vegetation within the NVCP area, which experiences a mean annual rainfall of 733.2 millimetres (mm). Dieback is likely to be present in the NVCP area and a Dieback Management Plan is likely to be required.

## 3.7 Fauna

### 3.7.1 Fauna diversity

The *NatureMap* database identified 252 terrestrial vertebrate fauna species previously recorded within the study area. This total comprised of 163 birds, 54 reptiles, 30 mammals and 5 amphibians. Of the 252 fauna species previously recorded, 239 are native species and 13 are introduced species.

The *NatureMap* database search is provided in Appendix B.

### 3.7.2 Fauna habitat

The biological assessment identified nine broad fauna habitat types. Six fauna habitats occur within the NVCP area as detailed in Table 7. Habitat values ranged from high to low value, with the low value site areas that are degraded or modified. Fauna habitat mapping from GHD (2019) is shown on Figure 3, Appendix A.



**Table 7 Fauna habitat in NVCP area**

Fauna habitat	Corresponding VT	Area (ha)
Banksia woodland	VT01 VT05	17.95
Tuart Forest	VT02 VT04 VT14	3.95
Jarrah woodland	VT03 VT06	0.82
Mixed Heathland	VT07 VT08 VT09	1.57
Scattered natives over weeds, Cleared/highly disturbed	VT12	28.68
Total		52.97

### 3.7.3 Conservation significant fauna

The EPBC Act PMST and DBCA *NatureMap* database and GHD observations identified the presence/ potential presence of 25 conservation significance fauna taxa within the study area. This total does not include species identified by the PMST as marine and/or migratory marine. These species have been excluded from this assessment as no marine habitat was present within or immediately adjacent to the survey area.

The biological assessment recorded five conservation significant fauna species within the survey area; an additional two species were considered likely to occur. Vegetation in the NVCP area provides suitable habitat for all seven species (Table 8). Suitable Diameter at Breast Height (DBH) Trees are characterised as those with a DBH over 500 mm, as per the Black Cockatoo guidelines (DSEWPac 2012).

**Table 8 Conservation significant fauna habitat in NVCP area**

Species	Status	Likelihood of occurrence and estimated extent of habitat within the NVCP area (ha)
Carnaby's Cockatoo ( <i>Calyptorhynchus latirostris</i> )	Endangered under the EPBC Act and BC Act	Known 29.39 ha foraging Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon gum, Wandoo, Marri, Jarrah and Karri, and in shrubland or kwongan heathland dominated by <i>Hakea</i> , <i>Banksia</i> and <i>Grevillea</i> species. Breeding activity is restricted to eucalypt woodlands mainly in the semiarid and subhumid interior. The species has expanded its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain, including the Yanchep area. A total of 230 Black Cockatoo potential breeding trees were recorded in the NVCP area, 6 trees (all <i>Eucalyptus gomphocephala</i> ) have hollows suitable for Black Cockatoo use.
Forest Red-tailed Black Cockatoo ( <i>Calyptorhynchus banksii naso</i> )	Vulnerable under the EPBC Act and BC Act	Known 29.39 ha foraging The Forest Red-tailed Black Cockatoo inhabits the dense Jarrah, Karri, and Marri forests receiving more than 600 mm annual average rainfall but also occurs in a range of other forest and woodland types, including Blackbutt ( <i>E. patens</i> ), Wandoo ( <i>E. wandoo</i> ), Tuart ( <i>E. gomphocephala</i> ), Albany Blackbutt ( <i>E. staeri</i> ), Yate ( <i>E. cornuta</i> ), and Flooded Gum ( <i>E. rudis</i> ) (DSEWPAC 2012). Habitats tend to have an understorey of Balga ( <i>Xanthorrhoea</i> spp.), Kingia ( <i>Kingia australis</i> ),

Species	Status	Likelihood of occurrence and estimated extent of habitat within the NVCP area (ha)
		<p>Snottygobble (<i>Persoonia</i> spp.), Parrot bush (<i>Banksia sessilis</i>), Holly-leaved mirbelia (<i>Mirbelia dilatata</i>), Bull banksia (<i>B. grandis</i>), Bullich (<i>Taxandria</i> spp.) and Sheoak (<i>Allocasuarina fraseriana</i>). They are most common in the Jarrah forest region of the northern Darling Range from Collie north to Mundaring and are very local throughout the lower south-west. They can be found on the Swan Coastal Plain, mainly in search of food the exotic White cedar (<i>Melia azedarach</i>). A total of 230 Black Cockatoo potential breeding trees were recorded in the NVCP area, 6 trees (all <i>Eucalyptus gomphocephala</i>) have hollows suitable for Black Cockatoo use.</p>
Peregrine Falcon ( <i>Falco peregrinus</i> )	Other specially protected fauna under the BC Act	<p>No core breeding habitat with NVCP area.</p> <p>29.39 ha</p> <p>The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions (Morcombe 2004). They are not common but can be found almost anywhere throughout WA and in the southwest. The NVCP area is considered to provide foraging habitat for this species, with large hollows or branch platforms in the Tuart and Jarrah vegetation types potentially providing suitable breeding habitat.</p>
Southern Brown Bandicoot ( <i>Isodon fusciventer</i> )	Priority 4	<p>Known</p> <p>24.29 ha</p> <p>The Southern Brown Bandicoot prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. It also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. On the Swan Coastal Plain, Southern Brown Bandicoot are often associated with wetlands. The species often feeds in adjacent Jarrah and Wandoo forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan 2008). <i>Banksia</i> woodland, Tuart forest, mixed heathland and Jarrah woodland habitats are considered core habitat for this species.</p>
Western Brush Wallaby ( <i>Notamacropus Irma</i> )	Priority 4	<p>Known</p> <p>20.34 ha</p> <p>The Western Brush Wallaby is found primarily in open forest or woodland, particularly favouring open, seasonally-wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in Karri forest (Van Dyck and Strahan 2008). <i>Banksia</i> woodland and Jarrah woodland habitats are considered core habitat for this species.</p>

Species	Status	Likelihood of occurrence and estimated extent of habitat within the NVCP area (ha)
Black-striped Snake ( <i>Neelaps calonotos</i> )	Priority 3	Likely 20.34 ha The Black-striped Snake is a burrowing snake that is restricted to the southwest coastal regions of WA, on sand plains along the Swan Coastal Plain, from Dongara south to Mandurah (Wilson and Swan 2017). The Black Striped Snake is likely to utilise <i>Banksia</i> woodland and Jarrah woodland habitat, particularly in areas of deep sands, which would be considered core habitat.
Jewelled South West Ctenotus ( <i>Ctenotus gemmula</i> ) (Swan Coastal Plain population)	Priority 3	Likely 20.34 ha Apparently disjunct populations occur on the lower west coastal plain, and south coast and adjacent interior of Western Australia. Known to occur on pale sands supporting heaths in association with <i>Banksia</i> or mallee woodlands (Wilson and Swan 2017). The Jewelled South West Ctenotus is likely to utilise <i>Banksia</i> woodland and Jarrah woodland habitat, particularly in areas of deep sands, which would be considered core habitat.

### 3.8 Conservation areas

Four conservation reserves are located within the study area, with Neerabup National Park (Class A Reserve, R 27575) occurring adjacent to and intersecting the NVCP area. Neerabup National Park extends south and east of the NVCP area and intersects the western part of the NVCP area.

There are 44 Bush Forever Sites located within the study area. Of these, Site No. 383 (Neerabup National Park, Lake Nowergup Nature Reserve and adjacent bushland) intersects the NVCP area (Government of Western Australia 2000).

Conservation areas and Bush Forever in relation to the NVCP area are shown on Figure 3, Appendix A.

### 3.9 Regional Ecological linkages

One Regional Ecological Linkage intersects the NVCP area. Greenways linkage I.D number 6 and is part of a regionally significant contiguous bushland/wetland linkage (GoWA 2000). Greenways linkage I.D number 6 links Neerabup National Park (Bush Forever Site No. 383) to Lake Joondalup (Bush Forever Site No. 299) in the south and Yanchep and Neerabup National Parks (Bush Forever Site No. 130) in the north.

### 3.10 Environmentally Sensitive Areas

The majority of the NVCP area occurs within an Environmentally Sensitive Area (ESA). The ESAs mapped over the NVCP area are likely associated with the Bush Forever Sites, Neerabup National Park and TECs.

## 4. Potential impacts

### 4.1 Impact avoidance through design

The project design is currently being commenced, and impacts will be minimised where possible to prevent the clearing of native vegetation. Although the design has not been finalised, significant effort has been taken to avoid impacts on the environment. The following avoidance measures have been considered:

- The upgrade of Romeo Road will prevent the more extensive clearing of a greenfield road corridor
- The project has been designed to impact degraded vegetation and avoid better condition vegetation in the vicinity.

The following will be considered during project design:

- Excluding a median to minimise the project footprint
- Steepening of batters
- Avoiding intrusion into or bisection of patches of native vegetation, including Neerabup National Park and Neerabup Nature Reserve.
- Implementation of typical surface water control measures including swales and culverts to prevent impacts to adjacent vegetation from surface water runoff and control 1 in 50 flooding events.

### 4.2 Potential impacts to vegetation and flora

The proposal will involve the clearing of 32.86 ha of native vegetation, including 23.44 ha of TECs and PECs. Vegetation condition ranges from Degraded - Completely Degraded to Very Good. The majority is in Good and Very Good condition.

The proposal is in a phytophthora dieback susceptible bioregion, with conservation significant protectable vegetation adjacent to the NVCP area. A Dieback Management Plan and project specific Construction Environmental Management Plan (CEMP) will be developed for the larger Mitchell Freeway Extension project and utilised during the clearing of the NVCP area.

The proposal may also result in a range of indirect impacts on adjacent vegetation including dust and introduction and spread of weeds. These will be managed as part of the CEMP for the larger project. Declared Pests and WoNS will be subject to a targeted weed spray program, as detailed in Section 5.

### 4.3 Potential impacts to conservation areas

Neerabup National Park (Class A Reserve, R 27575) is located along the western edge of the NVCP area. A total of 6.58 ha of vegetation in the Neerabup National Park is in the NVCP area.

The proposal may also result in a range of indirect impacts on adjacent conservation areas including dust introduction and spread of weeds. These will be managed as part of the CEMP for the larger project. Declared Pests and WoNS will be subject to a targeted weed spray program, as detailed in Section 5.

### 4.4 Potential impacts to fauna and fauna habitat

The NVCP area contains habitat suitable for seven conservation significant fauna species:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – Endangered under the EPBC Act and BC Act
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the EPBC Act and BC Act
- Peregrine Falcon (*Falco peregrinus*) – Other specially protected fauna under the BC Act
- Southern Brown Bandicoot (*Isodon fusciventer*) – Priority 4
- Western Brush Wallaby (*Notamacropus Irma*) – Priority 4
- Black-striped Snake (*Neelaps calonotos*) – Priority 3
- Jewelled South West Ctenotus (*Ctenotus gemmula*) (Swan Coastal Plain population) – Priority 3.

Clearing of vegetation suitable for conservation significant species will occur, with the majority of the NVCP area providing habitat for Black Cockatoo species. A total of 29.39 ha of foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo will be cleared, as well as 230 potential breeding trees, 6 with hollows suitable for Black Cockatoo use.

There is 29.39 ha of habitat for the Peregrine Falcon are present in the NVCP area, however this species is migratory and the NVCP area does not contain core breeding habitat for the species. Significant impacts are not expected.

There is 24.29 ha of habitat suitable for the Southern Brown Bandicoot, and 20.34 ha for the Western Brush Wallaby present in the NVCP area.

Up to 20.34 ha of Black-striped Snake habitat and 20.34 ha of *Ctenotus gemmula* (Swan Coastal Plain population) habitat will be cleared.

One Regional Ecological Linkage intersects the NVCP area, and provides for movement of fauna through the landscape. The NVCP area intersects Regional Ecological Linkage ID 6, which links Neerabup National Park (Bush Forever Site No. 383) to Lake Joondalup (Bush Forever Site No. 299) in the south and Yanchep and Neerabup National Parks (Bush Forever Site 130) in the north. The NVCP area is located on an existing road, therefore the impacts are expected to be less significant than bisecting contiguous vegetation. Soft starts will be implemented and clearing will be undertaken in one direction so as to allow mobile animals to vacate the area.

Indirect impacts to fauna include vehicle strikes and deaths during project construction, as well as secondary impacts such as dust, noise and vibration. All potential impacts will be managed under the project CEMP (See Section 5).

#### **4.5 Land degradation, water quality and flooding**

The NVCP area is located within the Perth Groundwater Area and the Perth Coastal and Gwelup Underground Pollution Control Area public drinking water source area (Priority 3 Protection Zone). Priority 3 areas are declared over land where water supply sources need to coexist with other land uses such as residential, commercial and light industrial developments. Given the scale and nature of the clearing, the construction of the road extension is unlikely to impact groundwater quality.

According to the GoWA (2019a) land degradation mapping, the NVCP area is mapped within an area having low risk of water erosion, flooding and salinity, and high risk of wind erosion and subsurface acidification. The proposal is unlikely to cause subsurface acidification.

Revegetation will be undertaken post-construction which is expected to mitigate the wind erosion risk.

## 5. Environmental management framework

A CEMP has been prepared for the larger Mitchell Freeway Extension (Hester Avenue to Romeo Road) and will be utilised for these works. The CEMP includes:

- Vegetation Clearing Management:
  - Vegetation to be retained will be clearly marked with flagging on site
  - Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works
- Fauna Management:
  - Pre-clearance surveys will be undertaken for all areas of Black Cockatoo habitat proposed to be cleared within the breeding period of Black Cockatoos
  - Speed limits between 40-80 km p/hr will be applied throughout the construction site which will consequently reduce the risk of fauna strikes during construction.
  - Transfer of any injured fauna found on site to an appropriate fauna rescue organisation or individual. A list of local fauna rescue organisations and individuals will be maintained on site.
- Other management measures:
  - Water carts and/or surface stabilization measures (e.g. hydro mulch) will be used to minimise dust generated from cleared areas
  - Topsoil will be harvested, stockpiled and reused in accordance with Main Roads *Environmental Guideline* Topsoil Management.
  - Temporary drainage will be installed to capture and infiltrate surface runoff from construction areas and prevent runoff from entering adjacent native vegetation.
  - All heavy plant and machinery will be inspected at entry and exit of the work site and be confirmed to be clean and free of vegetation and soil material.
  - The proposal is in a phytophthora dieback susceptible bioregion, with conservation significant protectable vegetation adjacent to the NVCP area. Dieback Management will be undertaken for the larger Mitchell Freeway Extension project including within the NVCP area.
  - Revegetation will be undertaken post-construction to prevent soil and wind erosion.
  - Weed control will be undertaken during works as part of the CEMP, specifically targeting WoNS and Declared Pests. The NVCP area will also be subject to the yearly Main Roads weed spraying program.

## **6. Assessment against the 10 Clearing Principles**

Schedule 5 of the EP Act defines 10 Clearing Principles for native vegetation. These principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way. Clearing required for construction of proposal has been assessed against the Ten Clearing Principles, with each principle being assessed in accordance with the DWER's A Guide to the Assessment of Applications to Clear Native Vegetation (Department of Environment Regulation 2014) to determine whether the application is at variance to the principles. The assessment indicates that the proposal is at variance with principles a, b and h. An offset will be required to compensate for the residual impacts associated with the proposed clearing (see Section 7).

**Table 9 Assessment against the Ten Clearing Principles**

Principle	Assessment	Outcome
<p>A Native vegetation should not be cleared if it comprises a high level of biological diversity.</p>	<p>The majority of native vegetation in the NVCP area is mapped as Banksia low woodland (54%), with six additional vegetation types identified. The NVCP area has a high level of biodiversity, commensurate with the surrounding region. Vegetation was mainly in Good (22%) and Very Good condition (27%), with large sections of Degraded (13.4%) or Degraded to Completely Degraded (19%). This reflects the context of the site, between an existing road and conservation areas. A total of 20.9 ha of vegetation is in Good or better condition and represents high biodiversity vegetation.</p> <p>Class A Neerabup National Park is located along the western edge of the NVCP area. A total of 6.58 ha of vegetation in the Neerabup National Park is in the NVCP area.</p> <p>A number of conservation significant flora were considered to potentially occur in the survey, however none were recorded within the NVCP area. The closest recorded conservation significant taxon is Priority 3 <i>Leucopogon</i> sp. Yanchep, located 30 m from the NVCP area.</p> <p>One Bush Forever site occurs within the NVCP area, Bush Forever Site No. 383 Neerabup National Park, Lake Nowergup Nature Reserve and adjacent bushland. Approximately 6.18 ha of Bush Forever Site No. 383 is within the NVCP area.</p> <p>The majority of the proposal area (23.44 ha) is representative of three State PECs, these include:</p> <ul style="list-style-type: none"> <li>• 1.56 ha of Northern Spearwood shrublands and woodlands PEC</li> <li>• 19.31 ha of Banksia woodlands of the Swan Coastal Plain PEC. This includes 16.66 ha of the EPBC Act listed Banksia woodlands of the Swan Coastal Plain TEC</li> <li>• 2.57 ha of Tuart (<i>Eucalyptus gomphocephala</i>) woodlands of the Swan Coastal Plain PEC. This is likely to represent the EPBC Act listed Tuart Woodlands and Forests of the Swan Coastal Plain TEC.</li> </ul> <p>In addition to the direct impacts discussed above, indirect impacts may occur to adjacent vegetation including dust and weed invasion.</p> <p>The proposed action will clear vegetation in an area of high biological diversity. The proposal is at variance to this principle.</p>	<p>At variance to this principle</p>
<p>B Native vegetation should not be cleared if it comprises the whole</p>	<p>The NVCP area contains habitat suitable for seven conservation significant fauna species including:</p> <ul style="list-style-type: none"> <li>• Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>) – Endangered under the EPBC Act and BC Act</li> </ul>	<p>At variance to this principle</p>



Principle	Assessment	Outcome
<p>or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia</p>	<ul style="list-style-type: none"> <li>• Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) – Vulnerable under the EPBC Act and BC Act</li> <li>• Peregrine Falcon (<i>Falco peregrinus</i>) – Other specially protected fauna under the BC Act</li> <li>• Southern Brown Bandicoot (<i>Isodon fusciventer</i>) – Priority 4</li> <li>• Western Brush Wallaby (<i>Notamacropus irma</i>) – Priority 4</li> <li>• Black-striped Snake (<i>Neelaps calonotos</i>) – Priority 3</li> <li>• <i>Ctenotus gemmula</i> (Swan Coastal Plain population) – Priority 3.</li> </ul> <p>Clearing of vegetation suitable for conservation significant species will occur, with the majority of the NVCP area providing habitat for Black Cockatoo species. A total of 29.39 ha of foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo will be cleared, of 217 ha (13%) recorded in the biological survey.</p> <p>A total of 230 suitable DBH trees, of 570 recorded (40%) will be cleared, 6 with hollows. All six hollows are considered suitable for Black Cockatoo use. The proposal represents approximately 0.48% of approximately 6,047 ha of Carnaby's Cockatoo habitat remaining within 5 km of the proposal, of which 3,060 ha is protected in Bush Forever sites and/or DBCA managed lands (GoWA 2019a). The project lies well within the range of the species distribution within the northern Perth metropolitan region. The extensive, well reserved areas in the vicinity are expected to provide suitable foraging, roosting and potential breeding resources for the highly mobile species.</p> <p>Clearing of the NVCP area will also result in the loss of:</p> <ul style="list-style-type: none"> <li>• 29.39 ha of habitat for the Peregrine Falcon</li> <li>• 24.29 ha of habitat for the Southern Brown Bandicoot</li> <li>• 20.34 ha of habitat for the Western Brush Wallaby</li> <li>• 20.34 ha of habitat for the Black-striped Snake</li> <li>• 20.34 ha of habitat for <i>Ctenotus gemmula</i> (Swan Coastal Plain population).</li> </ul> <p>One Regional Ecological Linkage intersects the NVCP area, and provides for movement of fauna through the landscape. The NVCP area intersects Regional Ecological Linkage ID 6, which links Neerabup National Park (Bush Forever Site No. 383) to Lake Joondalup (Bush Forever Site No. 299) in the south and Yanchep and Neerabup National Parks (Bush Forever Site No. 130) in the north. The NVCP area is</p>	

Principle	Assessment	Outcome
	<p>located on an existing road, therefore the impacts are expected to be less significant than bisecting contiguous vegetation.</p> <p>Given the clearing of habitat for conservation significant fauna, including Black Cockatoo foraging habitat and suitable DBH trees, the proposal is considered to be at variance to this principle.</p>	
C	<p>Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.</p> <p>Twelve Threatened flora were considered to potentially in the NVCP area based on desktop searches. No EPBC Act or BC Act listed flora were recorded within the survey area or NVCP area during the GHD (2019) biological assessment.</p> <p>As no EPBC Act or BC Act listed flora were recorded within the NVCP area, the proposal is considered not at variance to this principle.</p>	Not at variance to this principle
D	<p>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.</p> <p>No State listed TECs were recorded in the NVCP area nor will be cleared for the proposal. The proposal is at not variance to this principle.</p>	Not at variance to this principle
E	<p>Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</p> <p>Broad scale (1:250,000) pre-European vegetation mapping (Beard 1979) mapping indicates the NVCP area intersects two vegetation associations:</p> <ul style="list-style-type: none"> <li>• Low woodland; Banksia (Association 949)</li> <li>• Medium woodland; Tuart (Association 998)</li> </ul> <p>The current extents of all vegetation associations that intersect the NVCP area are above 30 % of their pre-European extents at the State, IBRA bioregion, IBRA subregion and Local Government Authority (LGA) levels.</p> <p>Regional vegetation complex mapping has been completed by Heddlé <i>et al.</i> (1980) with updates from Webb <i>et al.</i> (2016) based on major landform boundaries within the IBRA subregion SWA and forested</p>	Not at variance to this principle

Principle	Assessment	Outcome
	<p>region of south-west Western Australia. The mapping indicates two vegetation complexes are present within the NVCP area:</p> <ul style="list-style-type: none"> <li>• Cottesloe Complex – Central and South: Consists of a mosaic of woodland of <i>Eucalyptus gomphocephala</i> (Tuart) and open forest of <i>E. gomphocephala</i> – <i>E. marginata</i> (Jarrah) – <i>Corymbia calophylla</i> (Marri); closed heath on the limestone outcrops (majority of survey area)</li> <li>• Herdsman Complex: Consists of sedgeland and fringing woodland of <i>E. rudis-Melaleuca</i> spp.</li> </ul> <p>The current extent of all the vegetation complexes within the NVCP area are above 30 % of their pre-European extents remaining within the SWA IBRA bioregion and the City of Wanneroo. The proposal is not at variance to this principle.</p>	
F Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	<p>There are no wetlands, watercourses or drainage lines located within the NVCP area. The nearest waterbody is Carabooda Lake, 0.2 km from the NVCP area. Surface water runoff will be managed as part of project design.</p> <p>The proposal is not at variance to this principle.</p>	Not at variance to this principle.
G Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	<p>According to the GoWA (2019a) mapping, the NVCP area is mapped within an area having low risk of water erosion, flooding and salinity, and high risk of wind erosion and subsurface acidification. The proposal is unlikely to cause subsurface acidification. Revegetation will be undertaken post-construction which is expected to mitigate the wind erosion risk.</p> <p>The proposal is not likely to be at variance to this principle.</p>	Not likely to be at variance to this principle
H Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values	<p>Class A Neerabup National Park is located along the western edge of the NVCP area. Up to 6.58 ha of Neerabup National Park will be cleared.</p> <p>The proposal is at variance to this principle.</p>	At variance to this principle.

Principle	Assessment	Outcome
<p>of any adjacent or nearby conservation area.</p>		
<p>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.</p>	<p>There are no wetlands, watercourses or drainage lines located within the NVCP area. The nearest waterbody is Carabooda Lake, 0.2 km from the NVCP area. Surface water runoff will be managed as part of project design with the usual road drainage strategies, including culverts and swales as needed.</p> <p>The NVCP area is located within the Perth Groundwater Area and the Perth Coastal and Gwelup Underground Pollution Control Area public drinking water source area (Priority 3 Protection Zone). Priority 3 areas are declared over land where water supply sources need to coexist with other land uses such as residential, commercial and light industrial developments. The construction of the road extension is unlikely to impact groundwater quality.</p> <p>The proposal is not at variance to this principle.</p>	<p>Not at variance to this principle.</p>
<p>J Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.</p>	<p>According to the GoWA (2019a) mapping, the NVCP area is mapped within an area having low risk of water erosion and flooding. Surface water management measures will be implemented as part of project design, including culverts and swales as needed.</p> <p>The proposal is not at variance to this principle.</p>	<p>Not at variance to this principle.</p>

## 7. Offsets

A total offset of 140 ha will be required for this proposal, taking the largest result from the offset calculations (Black Cockatoo). It is assumed that land purchased for offset purposes will include suitable land for the other environmental factors impacted.

The financial contribution was calculated using the EPBC Offset Calculator Tool to determine the area of the offset required in hectares (140 ha total) multiplied by the market valuation of the unimproved (vegetated) land, \$3,520 for a land parcel size of 100 ha within the Shire of Gingin obtained from the Valuer-General (Landgate 2016).

The offset strategies proposed will provide adequate and commensurate offsetting of the impacted environmental values. A conservative approach has been adopted in calculating the offset requirements by using the total amount of clearing required, rather than the residual impact following landscaping and revegetation activities. This is likely to provide a slight net gain in the overall conservation outcome for environmental values being offset.

The Offset Strategy is attached as Appendix C.

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# Appendices



# Appendix A – Figures

**Figure 1 Project location**

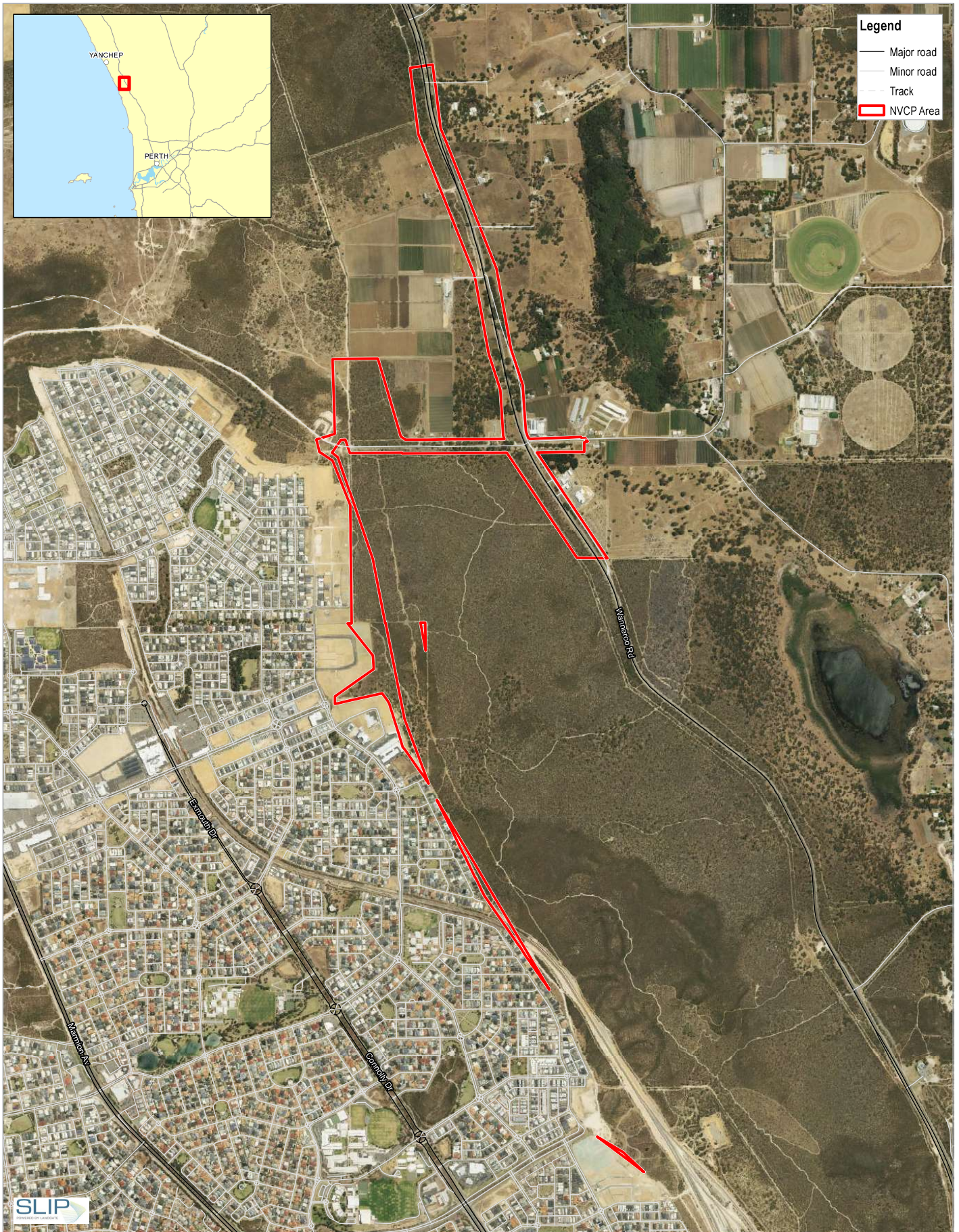
**Figure 2 Survey areas**

**Figure 3 Environmental constraints**

**Figure 4 Vegetation types**

**Figure 5 Vegetation condition**





Paper Size ISO A3  
 0 100 200 300 400  
 Metres  
 Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 50



**Main Roads Western Australia  
 Romeo Road and Wanneroo Road  
 Upgrade**

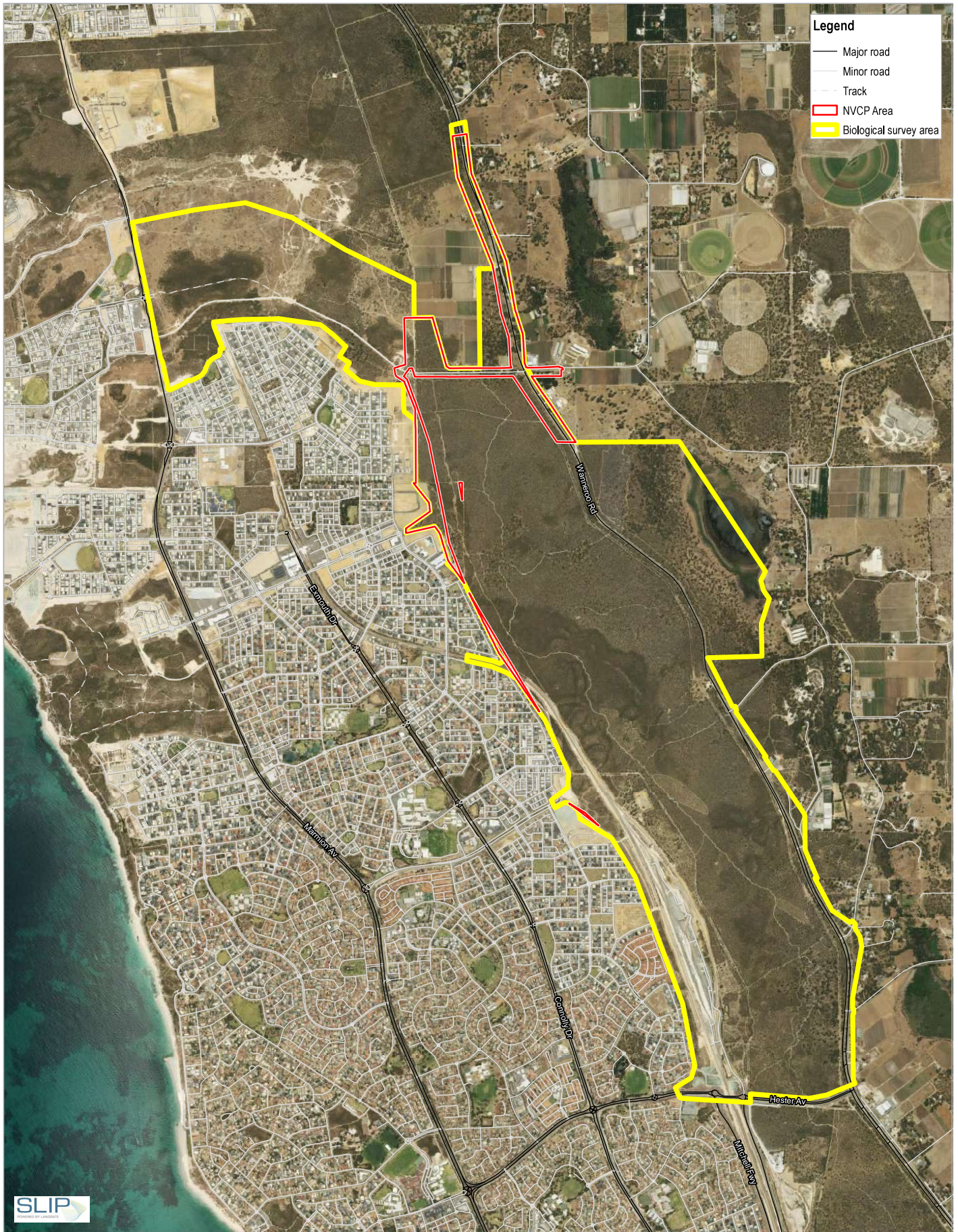
**Project Location**

Project No. 12510021  
 Revision No. 0  
 Date 15 Oct 2019

**FIGURE 1**

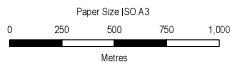
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 Print date: 15 Oct 2019 - 14:13  
 Data source: GHD: NVCP Area; Landgate: Roads - 201910128; Imagery: 20190410 [accessed: 20190731] GA; NatMap Geodata Topo 350i Series 3; Created by: spg/arsna





**Legend**

- Major road
- Minor road
- Track
- ▭ NVCP Area
- ▭ Biological survey area



**Main Roads Western Australia  
Romeo Road and Warnero Road  
Upgrade**

**Survey Area**

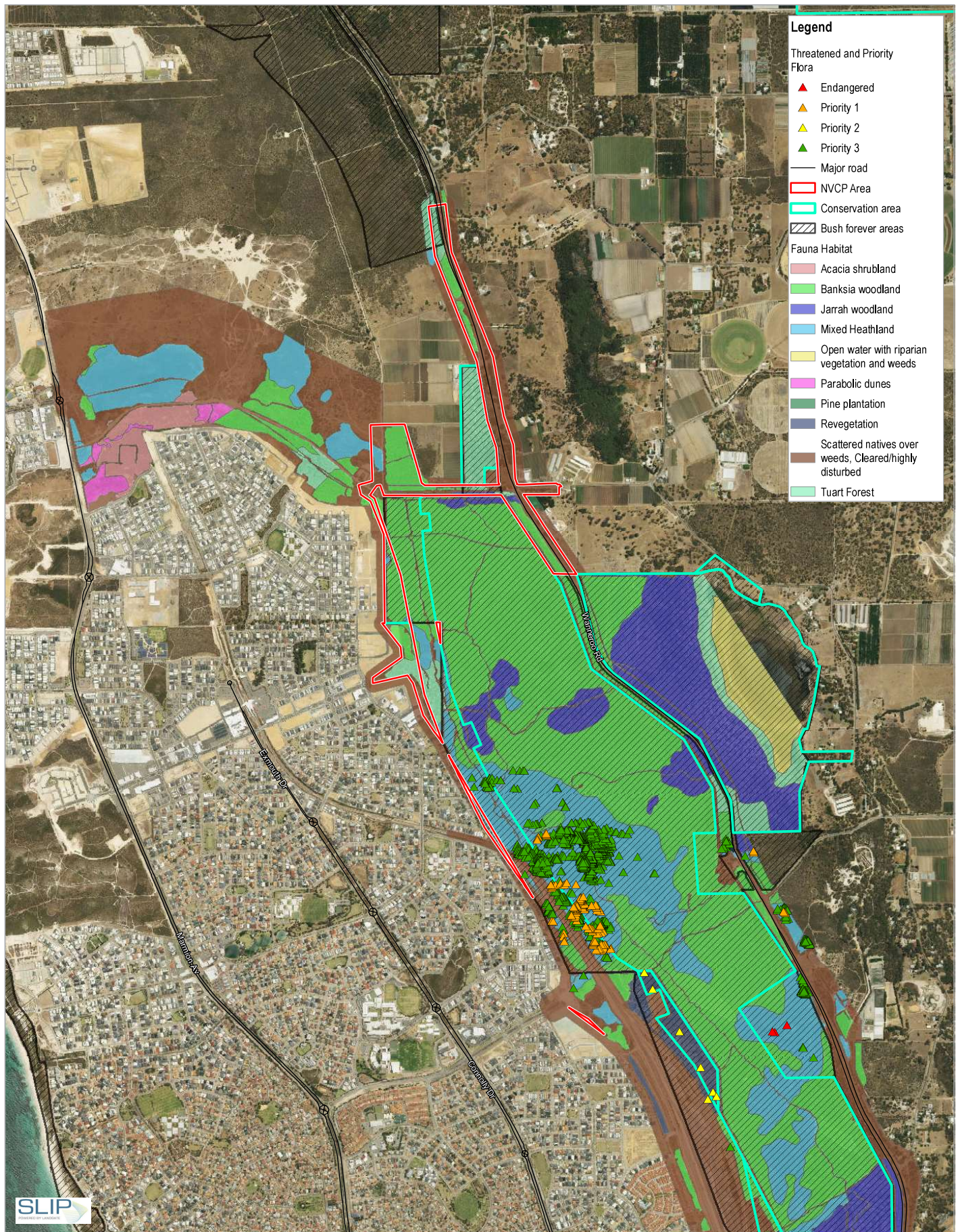
Project No. 12510021  
Revision No. 0  
Date 15 Oct 2019

**FIGURE 2**

©16/11/2019 10:08:10 AM MapInfo\Working\12510021\_02\_BiologicalSurveyArea\_Rev0.mxd  
Print date: 15 Oct 2019 - 14:19

Data source: GHD, NVCP area, Survey area, Landgate, Roads - 20190128, Imagery: 20180410 (accessed: 20180731), Created by: gperera





- Legend**
- Threatened and Priority Flora**
- ▲ Endangered
  - ▲ Priority 1
  - ▲ Priority 2
  - ▲ Priority 3
  - Major road
  - NVCP Area
  - Conservation area
  - ▨ Bush forever areas
- Fauna Habitat**
- Acacia shrubland
  - Banksia woodland
  - Jarrah woodland
  - Mixed Heathland
  - Open water with riparian vegetation and weeds
  - Parabolic dunes
  - Pine plantation
  - Revegetation
  - Scattered natives over weeds, Cleared/highly disturbed
  - Tuart Forest

SLIP  
POWERED BY LANDSAT

Paper Size ISO A3  
 0 100 200 300 400 500  
 Metres

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 50



**Main Roads Western Australia**  
**Romeo Road and Wanneroo Road**  
**Upgrade**

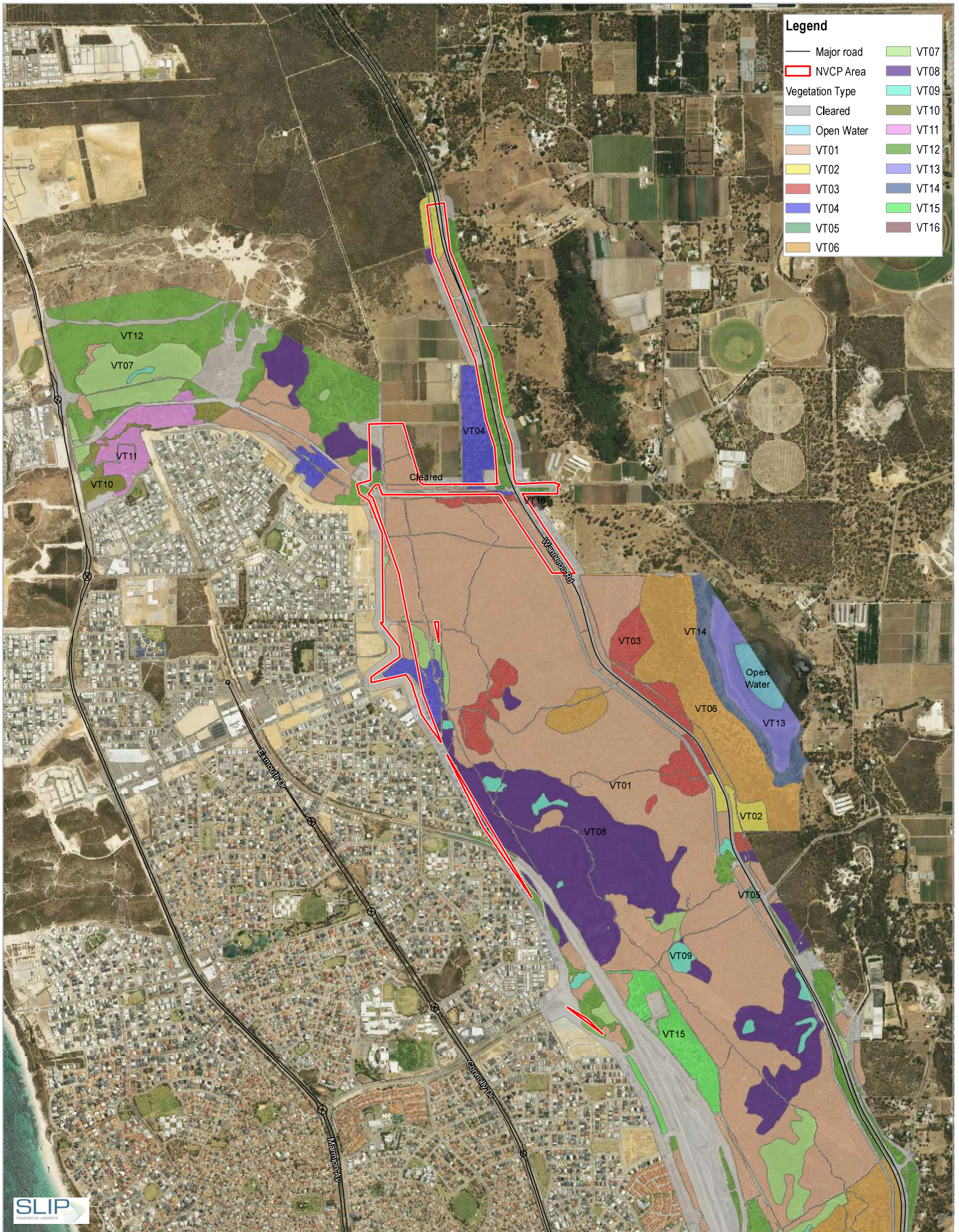
**Environmental Constraints**

Project No. 12510021  
 Revision No. 0  
 Date 16 Oct 2019

**FIGURE 3**

0161112510021000\_Maps\016112510021\_003\_EnvironmentalConstraints\_Rev0.mxd Data source: GHD, NVCP area, Survey area, Conservation significant flora, Fauna habitats, CECA, Conservation areas, DoP, Bush forever areas, Landgate, Roads - 20190128, Imagery - 20190410 (accessed 20190731), Created by: igor@terra





Legend	
— Major road	VT07
▭ NVCP Area	VT08
Vegetation Type	
▭ Cleared	VT10
▭ Open Water	VT11
▭ VT01	VT12
▭ VT02	VT13
▭ VT03	VT14
▭ VT04	VT15
▭ VT05	VT16
▭ VT06	



Paper Size ISO A3  
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 Metres  
 Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 50



Main Roads Western Australia  
 Romeo Road and Wanneroo Road  
 Upgrade

Project No. 12510021  
 Revision No. 0  
 Date 16 Oct 2019

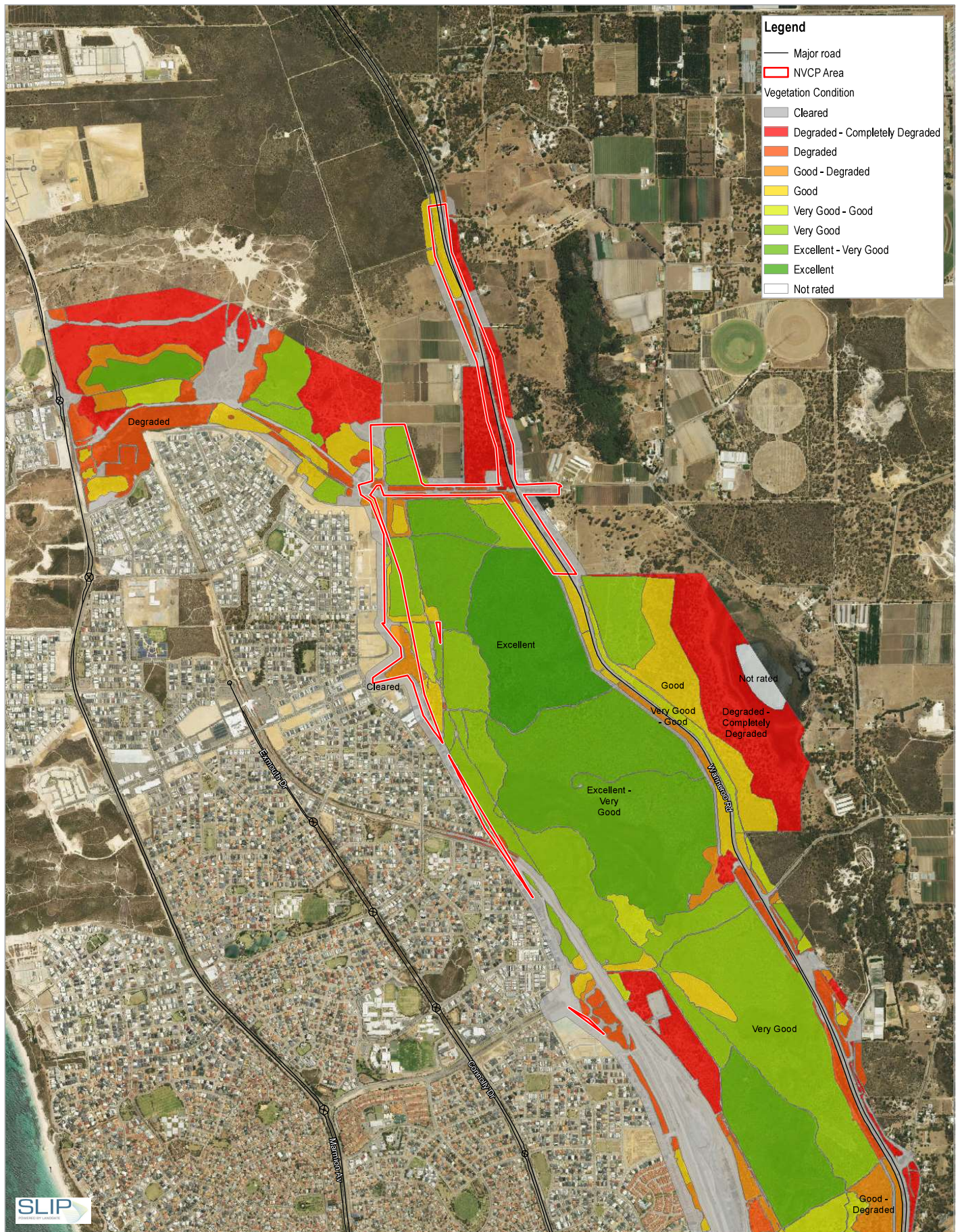
Vegetation Types

FIGURE 4

©16/11/2019 10:08:10 AM MapInfo Working 6112510021\_04\_VegetationType\_Rev0.mxd  
 Print date: 16 Oct 2019 - 15:44

Data source: GHD: NVCP area, Survey area, Vegetation types, Landgate: Roads - 20190108, Imagery: 20180410 (accessed: 20190731), Created by: qjz@oz





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Paper Size ISO A3  
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Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 50



Main Roads Western Australia  
Romeo Road and Wanneroo Road  
Upgrade

Vegetation Conditions

Project No. 12510021  
Revision No. 0  
Date 16 Oct 2019

FIGURE 5

0161112510021005\_Maps\W\King6112510021\_05\_VegetationConditions\_Rev1.mxd  
Print date: 16 Oct 2019 - 15:42

Data source: GHD, NVCP area, Survey area, Vegetation conditions, Landgate, Roads - 20190128, Imagery: 20180410 (accessed: 20180731), Created by: gprzesna