



**Public Transport Authority**  
Yanchep Rail Extension  
Biological Factors - Additional Information

June 2018

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# 1. Introduction

## 1.1 Background

The Public Transport Authority (PTA) is in the planning stage for the extension of the northern suburbs passenger railway, the Yanchep Rail Extension (YRE) (the project). The proposed alignment will ultimately extend from Butler Railway Station to the proposed Yanchep Railway Station.

The PTA referred Part 1 of the project that proposes to extend the existing Joondalup railway line by 7.3 kilometres (km) from Butler Station to the suburb of Eglinton in the City of Wanneroo, to the Environmental Protection Authority (EPA) in February 2018. Part 1 of the project includes the proposal to construct and operate the rail extension and includes two new intermodal transit stations at Alkimos and Eglinton. The EPA determined the referred proposal would be assessed on referral information with additional information requested.

Having regard to the significance considerations in the EPA's Statement of Environmental Principles, Factors and Objectives, the key environmental issues are considered to include clearing of native vegetation (including up to 1.12 hectares (ha) of Threatened Ecological Community 26a), loss of threatened fauna habitat; and fragmentation of a small reserve that provides an east-west linkage.

The EPA did note the proposal is located in an area primarily designated for urban development under the Metropolitan Region Scheme (MRS), with the railway and stations located within commercial and residential areas once surrounding land is fully developed.

## 1.2 Purpose of report

The purpose of this report is to:

- Provide additional contextual information of the environmental aspects present within Part 1, as well as at local and regional scales
- Describe and quantify the potential impacts (direct and cumulative) associated with Part 1 of the project on the identified environmental aspects at local and regional scales to support the EPA assessment.

## 2. Methods

### 2.1 Approach

This report quantifies potential Part 1 project impacts at a local and regional scale to vegetation, fauna habitat and parabolic dunes. The significance of these impacts are presented, taking into consideration foreseeable future development at the local and regional scale (i.e. potential cumulative impacts).

GHD has used the following approach to quantify the impacts in a systematic manner for vegetation, fauna habitat and parabolic dunes:

1. Describe and quantify the environmental aspects present within the development envelope and footprint.
2. Describe and quantify the environmental aspects present within the development envelope and footprint at a local, regional and bioregional scale.
3. Quantify the potential impacts associated with Part 1 of the project, with consideration given to the cumulative impacts associated with foreseeable future development at a local and regional scale.

### 2.2 Development areas

PTA has defined a development envelope (DE) and development footprint (DF) for this project as presented in the referral documentation. The Part 1 DE covers 70.2 ha and the Part 1 DF covers 45.4 ha. The development areas are a combination of vegetation, re-vegetation and cleared areas. The DF is fully contained within the development envelope.

These areas were used for the basis of this assessment. Collectively the DE and DF has been referred to within this report as development areas and/or Part 1 project.

### 2.3 Scales

To provide context to the potential Part 1 project impacts, this assessment has considered the extent of vegetation, fauna habitat and parabolic dunes at a local and regional scale.

- The local scale included a 1 km buffer of the DE.
- The North West (NW) subregion, as defined in Perth and Peel@3.5million was used as a regional scale. This subregion comprises the City of Joondalup and the City of Wanneroo local government areas (LGAs).

The local and regional scale are shown in Figure 1, Appendix A.

Where spatial data was available, a larger regional scale was also considered for vegetation and fauna habitat, which encompassed the Perth Interim Biogeographical Regionalisation for Australia (IBRA) subregion.

### 2.4 Data sources

This assessment has used a combination of project specific and publically available GIS spatial files largely sourced from Government of Western Australia (GoWA) (2018a). The data sources utilised are presented in Table 1.

**Table 1 Data sources**

Aspect	Description and source
Boundaries	YRE Development Envelope (PTA) YRE Development Footprint (PTA) NW subregion (as shown in Perth and Peel@3.5) Perth IBRA subregions
Vegetation	YRE vegetation type mapping (GHD 2018) Pre-European Vegetation (DPIRD-006) Native Vegetation Extent (DPIRD-005) Vegetation Complexes – Swan Coastal Plain
Threatened and Priority Ecological Communities	Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial dataset (Department of Biodiversity, Conservation and Attractions (DBCA) 2017) Interim Recovery Plan (Luu and English 2005) Approved Conservation Advice (Threatened Species Scientific Committee (TSSC) 2016) Priority Ecological Communities of Western Australia (DBCA 2017)
Conservation estate and reserves	Bush Forever Areas 2000 (DOP-071) DBCA – Legislated Lands and Waters (DBCA-011) DBCA – Lands of Interest (DBCA-012) Regional Parks (DBCA-026)
Ecological linkages	City of Wanneroo Local Biodiversity Strategy 2011-2016 Regional Ecological Linkages for the Perth Metropolitan Region (Western Australian Local Government Association (WALGA) (Perth Biodiversity Project) 2003)
Landforms	Soil Landscape Mapping (DPIRD-027)
Planning	Perth and Peel Urban Land Development Outlook (ULDO) 2016/17 - staging (DOP-096) Perth and Peel ULDO 2016/17 - Industrial (DOP-097) Local Planning Scheme – City of Wanneroo Local Planning Scheme – City of Joondalup MRS Region Scheme - Zones and Reserves (DOP-072)

## 2.5 Flora and vegetation considerations

### 2.5.1 Vegetation condition

Vegetation rated as Completely Degraded has been excluded from the analysis as it is considered to no longer represent intact native vegetation. This approach is consistent with the referral documentation this report is supplementing and other recent transport infrastructure environmental assessments assessed by the EPA, such as the Perth Darwin National Highway (Swan Valley Section) project.

### 2.5.2 Assigning vegetation association and complexes

The GHD Biological Assessment Report (2018) vegetation types for the project have been aligned with previously described/mapped vegetation associations (Beard 1979) and complexes (Heddl et al. 1980) where possible to enable the local, regional and cumulative assessment to occur. Alignment was based on vegetation structure and species present. The vegetation associations and complexes mapped as present in the development areas are presented in Table 2 and Table 3, respectively.

**Table 2 Vegetation association descriptions (Beard 1979)**

Association	Description	Structure	Flora
949	Low woodland; banksia	Low woodland or open low woodland	Other Acacia, <i>Banksia</i> , <i>Agonis flexuosa</i> , <i>Callitris</i> , <i>Allocasuarina</i> , <i>Eucalyptus loxophleba</i> .
998	Medium woodland; tuart	Woodland southwest	<i>Eucalyptus gomphocephala</i> .
1007	Mosaic: Shrublands; <i>Acacia lasiocarpa</i> & <i>Melaleuca acerosa</i> [now <i>M. systema</i> ] heath / Shrublands; <i>Acacia rostellifera</i> & <i>Acacia cyclops</i> thicket	Scrub-heath / Thicket	<i>Acacia lasiocarpa</i> , <i>Melaleuca acerosa</i> , <i>A. rostellifera</i> , <i>A. cyclops</i>

**Table 3 Vegetation complex descriptions (Hedde et al. 1980)**

Complex	Description
Quindalup complex	Coastal dune complex consisting mainly of two alliances- the strand and fore dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of <i>Melaleuca lanceolata</i> – <i>Callitris preissii</i> and the closed scrub of <i>Acacia rostellifera</i> .
Cottesloe complex – north	Predominantly low open forest and low woodland of <i>Banksia attenuata</i> – <i>B. menziesii</i> – <i>Eucalyptus todtiana</i> ; closed heath on the limestone outcrops
Cottesloe complex – central and south	Mosaic of woodland of <i>Eucalyptus gomphocephala</i> and open forest of <i>E. gomphocephala</i> – <i>E. marginata</i> – <i>Corymbia calophylla</i> ; closed heath on the limestone outcrops
Herdsmen Complex:	Dominated by sedgelands and a woodland of <i>E. rudis</i> – <i>Melaleuca</i> spp. The vegetation on elevated areas of Herdsmen is mainly associated with that of adjacent Cottesloe and Karrakatta units

### 2.5.3 Threatened and Priority Ecological Communities

In the absence of available spatial data, the local and regional extents of Threatened and Priority Ecological Communities (TECs and PECs) have been estimated using previously described/mapped vegetation associations (Beard 1979) and/or information in publically available Plans and Advice.

- *Melaleuca huegelii* – *M. acerosa* (*M. systema*) shrublands on limestone ridges (TEC) (SCP26a): The estimated extent of SCP26a was calculated based on that provided in the interim recovery plan for the TEC (CALM 2005) and reported in the GHD Biological Assessment (2018).
- *Banksia* woodlands of the Swan Coastal Plain (SCP) (TEC) and *Banksia* dominated woodlands of the SCP IBRA region (PEC): Approved Conservation Advice for the TEC (TSSC 2016) provides a list of vegetation associations that are likely to comprise a major component of the Banksia Woodlands ecological community. The vegetation associations mapped in the local and regional areas that have been used to calculate the estimated extent of the TEC and PEC include 949 and 1001.
- Tuart (*Eucalyptus gomphocephala*) woodlands of the SCP (PEC): The Priority Ecological Communities for WA List (DBCA 2017) provides information on the vegetation structure and flora assemblages present with Tuart communities considered the PEC. The vegetation associations mapped in the local and regional areas that have been used to calculate the estimated extent of this PEC include 998 and 1011.



- Northern Spearwood shrublands and woodlands (PEC) (SCP24): This community does not clearly align with previously described/mapped vegetation associations (Beard 1979), therefore, the local and regional extent of this PEC has not been calculated. However, TSSC (2016) notes that SCP24 is a component of the Banksia Woodland TEC and estimates there is 1009 ha mapped over a range of about 170 km from Nowergup to Binningup.

## 2.6 Terrestrial fauna considerations

### 2.6.1 Estimating the local and regional extent of Black Cockatoo habitat

Black Cockatoo habitat has been estimated by reviewing previously described/mapped vegetation associations (Beard 1979), and based on vegetation structure and species present, assessing the suitability as either breeding and/or foraging habitat. Black Cockatoo habitat types, definitions and species suitability were sourced from DSEWPaC (2012). The vegetation associations mapped in the local and regional areas, and their suitability as Black Cockatoo habitat is provided in Table 4.

**Table 4 Black Cockatoo habitat**

Association	Description	Black Cockatoo suitability
6	<u>Description:</u> Medium woodland; tuart & jarrah <u>Structure:</u> Woodland southwest <u>Flora:</u> Jarrah, Marri, Wandoo	Breeding Foraging
37	<u>Description:</u> Shrublands; teatree thicket <u>Structure:</u> Thicket <u>Flora:</u> <i>Acacia</i> , <i>Allocasuarina</i> , <i>Melaleuca</i> alliance.	No
51	<u>Description:</u> Sedgeland; reed swamps, occasionally with heath <u>Structure:</u> Sedgeland <u>Flora:</u> Cyperaceae, Restionaceae, Juncaceae	No
126	<u>Description:</u> Freshwater Lake	No
949	<u>Description:</u> Low woodland; banksia <u>Structure:</u> Low woodland or open low woodland <u>Flora:</u> Other <i>Acacia</i> , <i>Banksia</i> , Peppermint, <i>Callitris</i> , <i>Allocasuarina</i> , York Gum.	Foraging
965	<u>Description:</u> Medium woodland; jarrah & marri <u>Structure:</u> Woodland southwest <u>Flora:</u> Jarrah, Marri, Wandoo	Breeding Foraging
998	<u>Description:</u> Medium woodland; tuart <u>Structure:</u> Woodland southwest <u>Flora:</u> Jarrah, Marri, Wandoo	Breeding Foraging
1001	<u>Description:</u> Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina <u>Structure:</u> Low forest, woodland or low woodland with scattered trees <u>Flora:</u> Jarrah, <i>Banksia</i> , <i>Allocasuarina</i>	Breeding Foraging
1007	<u>Description:</u> Mosaic: Shrublands; <i>Acacia lasiocarpa</i> & <i>Melaleuca acerosa</i> [now <i>M. systema</i> ] heath / Shrublands; <i>Acacia rostelifera</i> & <i>Acacia cyclops</i> thicket. <u>Structure:</u> Scrub-heath / Thicket	No
1011	<u>Description:</u> Medium open woodland; tuart <u>Structure:</u> Woodland southwest <u>Flora:</u> Jarrah, Marri, Wandoo	Breeding Foraging

## **2.6.2 Black Cockatoo foraging habitat value**

Black Cockatoo foraging habitat value within the development areas has been determined by reviewing the described/mapped fauna habitat types present within the Part 1 project (GHD 2018), and based on vegetation structure, species (and food items) present and vegetation condition, assigned a value of either high, medium or low. Black Cockatoo habitat types, definitions and species suitability were sourced from DSEWPaC (2012) to guide this determination. The foraging habitat scoring tool (Commonwealth of Australia 2017) was also considered when assigning values.

Trees of suitable diameter breast height (DBH) for Black Cockatoos (DSEWPaC 2012) were recorded from the development areas, however as there is no reliable local or regional publicly available data this aspect has not been considered further as part of this assessment.

## **2.7 Landform considerations**

### **2.7.1 Estimating the extent of parabolic dune formations**

The parabolic dune formation extent has been estimated by extracting the units Quindalup South oldest dune Phase (211Qu\_Q1), Quindalup South second dune Phase (211Qu\_Q2), Quindalup South third dune Phase (211Qu\_Q3) and Quindalup South youngest dune Phase (211Qu\_Q4) from Soil Landscape Mapping (DPIRD-027) spatial data. The current extent of the parabolic dune formation has been determined by estimating cleared areas (using Local Planning Scheme – City of Wanneroo and Perth and Peel ULDO 2016/17 - staging (DOP-096) layers) and overlaying the relevant mapping units listed above. Whilst aerial imagery (from Landgate) was also viewed to validate this approach visually, the imagery was not used to further refine the 'current' extent as the approach was deemed fit for purpose.

## **2.8 Assumption and Limitations**

This report has been prepared by GHD for PTA and may only be used and relied on by PTA for the purpose agreed between GHD and the PTA as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than PTA arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by PTA and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked. Observations and conclusions drawn from this information may reflect survey effort and not be a true reflection of distribution and species numbers. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has relied on spatial data available from Data WA and other government entities to quantify vegetation, fauna habitat and parabolic dune extents and foreseeable future development. It is noted in some instances there is very minor discrepancies between the spatially calculated results and those published by the provisioning organisations. These discrepancies do not adversely impact the analysis or validity of the conclusions drawn from the analysis.

## 3. Project context

### 3.1 Local and regional context

The project is situated in the South West Botanical Province of WA within the Swan Coastal Plain bioregion and the Perth subregion as described by IBRA. The project is located approximately 3 km east of the WA coastline extending from the suburbs of Butler to Eglinton.

Conservation areas and ecological linkages discussed in the following section are presented in Figure 2, Appendix A.

#### 3.1.1 Conservation areas

No DBCA-managed conservation areas are located within the development envelope. The closest DBCA managed areas are Yanchep National Park (R 9868, Class A) located adjacent (north east) to the Part 1 project and Neerabup National Park (R 27575, Class A) located approximately 200 m south east of the Part 1 project.

Much of the development areas reside within an Environmentally Sensitive Area (ESA). This ESA likely aligns with the presence of TECs and their buffer zones within the local area. The presence of TECs (and PECs) within the development areas is discussed further in Section 4.2.

The development areas are surrounded by Bush Forever sites, although none are intersected by the Part 1 project (Table 5).

The Alkimos Parks and Recreation Reservation (PRR) (also referred to as the Alkimos Parklands) is located within Lot 200 Alkimos Drive and is intersected by the Part 1 project. The Alkimos PRR is currently zoned 'Parks and Recreation' (89.77 ha) and intersected by a small section currently zoned 'Railways' (1.81 ha) under the MRS. The Alkimos PRR is bounded by Marmion Avenue on its western side and Romeo Road (unsealed track) on its eastern side, and ranges from 380 m to 1.7 km in width (north-south).

**Table 5 Bush Forever sites in the vicinity of the Part 1 project**

BF Site No.	Name	Size (ha)	Location relative to the Part 1 project
288	Yanchep National Park and Adjacent Bushland	2,899.51	Adjacent to (east)
383	Neerabup National Park, Lake Gnowergup Nature Reserve and adjacent bushland	1,836.14	20 m east
289	Ningana Bushland, Yanchep/ Eglinton	640.83	780 m north
130	Link between Yanchep and Neerabup National Parks	91.95	850 m east
397	Coastal strip from Wilbinga to Mindarie	552.50	1 km west
129	Bernard Road Bushland	102.75	1.1 km east
322	Burns Beach Bushland	368.41	6.6 km south
323	Link from Burns Beach Bushland to Neerabup National Park	119.70	7.7 km south

#### 3.1.2 Ecological Linkages

Two regional ecological linkages mapped in the Regional Ecological Linkages for the Perth Metropolitan Region (PMR) dataset occur in the vicinity of the Part 1 project; Links No. 1 and 6 (Figure 2). Link No. 1 occurs west of the development envelope and links Bush Forever Sites 406 through to 315 (including Bush Forever sites 322 and 397), maintaining connectivity along the Coast for the Quindalup Complex. Link No. 6 occurs east of the project and links Bush

Forever Sites 284, 288, 129, 130, 383, 299, 202. A 500 metre (m) wide buffer (250 m each side) is considered to be the minimum required to promote the inclusion of more viable natural areas within the ecological linkage (Del Marco et al. 2004). Both Link No. 1 and 6 have been impacted by previous vegetation clearing and urban development.

One local ecological linkage occurs in the vicinity of the Part 1 project (Figure 2). It is an east-west linkage that has been identified in the City of Wanneroo Local Biodiversity Strategy 2011-2016 (City of Wanneroo 2011). This local linkage connects the coastal reserves to the Neerabup and Yanchep National Parks and includes Bush Forever Site No. 397, native vegetation that forms a buffer around a water treatment plant, the Alkimos PRR, Bush Forever Sites No. 129 and 130, and Yanchep and Neerabup National Parks. The linkage is intersected by the existing Marmion Avenue and Wanneroo Road as well as a small section zoned 'Railways' under the MRS (approximately 950 m east of Marmion Avenue, where the Part 1 project is proposed).

For the purpose of this assessment the extent of the local ecological linkage to be impacted by the Part 1 project includes the Alkimos PRR and Rail reserve within the local ecological linkage, which covers 91.58 ha.

### **3.2 Cumulative considerations**

There are a number of existing, approved or proposed developments within the vicinity of the Part 1 project, which have the potential to contribute to cumulative impacts at a local and regional scale. Whilst the impacts of each development may be limited in isolation, they have the potential to become more substantial due to additional impacts from other developments. The reported and/or potential impacts from these local and regional developments (where information is available) have been used to determine potential cumulative impacts.

The spatial distribution of the cumulative considerations quantified as part of this assessment are shown in Figure 3, Appendix A.

#### ***Future residential, commercial and industrial development***

The Urban Land Development Outlook (ULDO) 2016/17 is based on an assessment of future land supply at all stages of the planning, zoning, approval, development and redevelopment pipeline. The ULDO output covers Perth to Peel and includes scheme amendments, developer intentions, structure planning in progress, subdivision applications/approvals (Western Australian Planning Commission) and local government development applications/approvals. There have been a number of local and regional scheme amendments in the vicinity of the project, with these largely associated with rezoning and subsequent urban development. The ULDO 2016/2017 spatial data has been used to capture future residential, commercial and industrial development at a local and regional scale.

The ULDO 2016/17 data indicates that within the NW Subregion approximately 1,350 ha will support likely future residential/commercial development within the next 5 years. Of this, approximately 848 ha (62.8%) has current conditional approval. Similarly, the data indicates that within 1 km of the project footprint approximately 410 ha will support likely future residential/commercial development within the next 5 years with approximately 109 ha (26.56 %) having current conditional approval (Table 6). The total future development within the NW Subregion and 1 km buffer is considerably more than this when the longer term development is also considered.

The Part 1 DE intersects ULDO foreseeable future development areas. To avoid double counting of potential impacts, this overlap in areas has been accounted for by extracting these common areas from the ULDO extents as part of the cumulative assessment.

**Table 6 Future residential and industrial development at local and regional scales**

Development type	Staging	Extent (ha)	
		NW Subregion	1 km buffer
Residential/commercial	Short term (0-5 years) with current conditional approval	847.47	108.83
	Short term (0-5 years)	501.99	300.82
	Medium term (6-10 years)	789.73	190.26
	Long term (10+ years)	4,370.36	547.49
Industrial	Short term (0-5 years)	39.94	-
	Medium term (6-10 years)	27.23	-
	Long term (10+ years)	680.77	-
<b>TOTAL</b>		<b>7,257.49</b>	<b>1,147.40</b>

Data sources: Perth and Peel Urban Land Development Outlook 2016/17 - staging (DOP-096), Perth and Peel Urban Land Development Outlook 2016/17 - Industrial (DOP-097). Note: the areas presented in this table do not consider the overlap with the Part 1 and Part 2 project areas.

**Other potential projects**

Other proposed projects in the vicinity of the Part 1 project include the YRE Part 2 project. The Part 2 project extends approximately 8.7 km from Eglinton to Yanchep. The Part 2 DE covers 72.86 ha.

The Part 2 DE also intersects ULDO foreseeable future development areas. Similar to the Part 1 project, to avoid double counting of potential impacts, this overlap in areas has been accounted for by extracting these common areas from the ULDO extents as part of the cumulative assessment.

## 4. Assessment of impacts – Flora and vegetation

### 4.1 Native vegetation

#### 4.1.1 Receiving environment

Twelve vegetation types as well as re-vegetation in the rail corridor and cleared areas were recorded in the DE (Table 7). Nine of these vegetation types were recorded in the DF. The majority of the vegetation types could be aligned to previously described/mapped vegetation associations or complexes based on structure and species present. Two types (VT12 and VT13) were not considered representative of previously mapped vegetation associations/complexes; these types were mapped in areas that have been historically cleared or were impacted by other disturbances such as grazing and weed invasion.

The vegetation condition within the DE was rated from Pristine to Completely Degraded. The extents of each vegetation type in Degraded or better condition are provided in Table 7.

#### 4.1.2 Direct impacts

The remaining extent of the aligned vegetation associations and complexes at a local, regional and bioregional scale are above 32% of the mapped pre-European extents (Table 8 and Table 10), with much of the remaining extents occurring in conservation areas at one or more scales (Table 9 and Table 11).

The largest % impact to a remaining vegetation association extent by clearing the DE is linked to vegetation association 949 at a local scale, which will account for a reduction of less than 6.6%. However, at a regional and bioregional scale this impact is significantly less at 0.2% and 0.03%, respectively (Table 8).

Clearing the entire DE may remove up to 1.43% of the remaining extent of the Cottesloe complex – central and south at a local level; however at a regional and bioregional level this impact is 0.15% and 0.06%, respectively (Table 10).

Of the aligned vegetation associations, the remaining extent within conservation areas ranges from 5.69% to 83.55% at a local scale and from 21.59% to 87.41% at a regional scale (Table 9). Similarly of the aligned vegetation complexes, the remaining extent within conservation areas ranges from 7.51% to 15.27% at a local scale and from 29.08% to 92.94% at a regional scale (Table 11). These percentages do not account for vegetation occurring within areas zoned as 'Parks and Recreation', such as the Alkimos PRR.

**Table 7 Vegetation types recorded in the Part 1 DE and DF**

ID	Vegetation type	Conservation significance	Aligning vegetation association/complex	Extent		Extent in Degraded+ condition	
				DE (ha)	DF (ha)	DE (ha) (%)	DF (ha) (%)
VT02	<i>Banksia sessilis</i> and <i>Melaleuca systena</i> mid-shrubland	Northern Spearwood shrublands and woodlands (PEC) (SCP24)	Association 949 Cottesloe complex - north	3.28	2.21	3.28 (100%)	2.21 (100%)
VT03	<i>Banksia sessilis</i> and <i>Spyridium globulosum</i> tall shrubland	Northern Spearwood shrublands and woodlands (PEC) (SCP24)	Association 949 Cottesloe complex - north	13.89	8.38	13.53 (97.4%)	8.38 (100%)
VT04	<i>Banksia attenuata</i> , <i>B. menziesii</i> low woodland	<i>Banksia</i> woodlands (TEC) / <i>Banksia</i> dominated woodlands (PEC)	Association 949 Cottesloe complex - north	16.45	12.20	16.28 (99.0%)	12.03 (98.6%)
VT05	<i>Lomandra</i> sp. herbland		Association 1007 Cottesloe complex – central and south	7.08	3.76	7.08 (100%)	3.76 (100%)
VT06	<i>Eucalyptus gomphocephala</i> tall woodland	Tuart ( <i>Eucalyptus gomphocephala</i> ) woodlands of the SCP (PEC)	Association 998 Cottesloe complex – central and south	0.32	-	0.32 (100%)	-
VT08	<i>Melaleuca huegelii</i> and <i>M. systena</i> shrubland	<i>Melaleuca huegelii</i> – <i>M. acerosa</i> ( <i>M. systena</i> ) shrublands on limestone ridges (TEC) (SCP26a)	Association 1007 Cottesloe complex – central and south	1.12	0.53	1.12 (100%)	0.53 (100%)
VT10	<i>Xanthorrhoea preissii</i> shrubland		Association 949 Cottesloe complex - north	0.47	0.47	0.47 (100%)	0.47 (100%)
VT11	<i>Eucalyptus decipiens</i> woodland		Association 949 Cottesloe complex - north	0.26	0.26	0.26 (100%)	0.26 (100%)
VT14	<i>Acacia rostelifera</i> tall shrubland		Association 1007 Quindalup complex	0.80	-	0.80 (100%)	-
VT15	<i>Banksia attenuata</i> and <i>B. grandis</i> low woodland	<i>Banksia</i> dominated woodlands (PEC)	Association 949 Cottesloe complex - north	0.001	-	0.001 (100%)	-
	<b>SUB-TOTAL</b>			<b>43.67</b>	<b>27.80</b>	<b>43.14 (98.8%)</b>	<b>27.64 (99.4%)</b>
VT12	Planted			0.11	0.11	-	-
VT13	Scattered Natives			16.94	9.02	-	-
NA	Re-vegetation rail corridor			1.82	1.82	-	-
CL	Cleared			7.66	6.65	-	-
	<b>TOTAL</b>			<b>70.19</b>	<b>45.40</b>	<b>43.14</b>	<b>27.64</b>



**Table 8 Extents of vegetation associations mapped within the Part 1 DE and DF at local, regional and bioregional scales**

Vegetation association	Corresponding GHD VTs	Scale	Pre-European extent <sup>1</sup> (ha)	Current extent <sup>1</sup> (ha)	Remaining (%)	Extent in project <sup>2</sup> (ha)		% of current extent within project		Current extent after project developed (ha) (%)	
						DE	DF	DE	DF	DE	DF
949	VT02, VT03, VT04, VT10, VT11, VT15	Perth subregion	184,475.82	103,972.25	56.36	33.83	23.35	0.03	0.02	103,938.42 (56.34%)	103,948.90 (56.35%)
		NW subregion	38,330.32	17,173.49	44.80			0.20	0.14	17,139.66 (44.72%)	17,150.14 (44.74%)
		1 km buffer	1,208.69	514.88	42.60			6.57	4.54	481.05 (39.80%)	491.53 (40.67%)
998	VT06	Perth subregion	50,867.50	18,286.07	35.95	0.32	-	0.002	-	18,285.75 (35.95%)	18,286.07 (35.95%)
		NW subregion	7,473.03	3,016.23	40.36			0.01	-	3,015.91 (40.36%)	3,016.23 (40.36%)
		1 km buffer	208.19	95.52	45.88			0.34	-	95.20 (45.73%)	95.52 (45.88%)
1007	VT05, VT08, VT14	Perth subregion	30,109.89	20,681.70	68.69	8.99	4.29	0.04	0.02	20,672.71 (68.66%)	20,677.41 (68.67%)
		NW subregion	10,801.16	5,048.24	46.74			0.18	0.08	5,039.25 (46.65%)	5,043.95 (46.70%)
		1 km buffer	987.34	659.97	66.84			1.36	0.65	650.98 (65.93%)	655.68 (66.41%)

<sup>1</sup> Pre-European and Current extents: calculated using Native Vegetation Extent (DPIRD-005), Pre-European Vegetation (DPIRD-006). <sup>2</sup> Vegetation in Degraded or better condition (GHD 2018).

**Table 9 Current extent of vegetation associations mapped with the Part 1 DE and DF in conservation areas**

Vegetation association	Scale	Current extent <sup>1</sup> (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
				DBCA	BF	Total (ha)	% of current extent
949	Perth subregion	103,972.25	56.36	21,353.50	5,997.14	27,350.64	26.31
	NW subregion	17,173.49	44.80	12,047.74	2,963.67	15,011.41	87.41
	1 km buffer	514.88	42.60	23.95	19.18	43.13	8.38
998	Perth subregion	18,286.07	35.95	9,510.68	2,284.60	11,795.28	64.50
	NW subregion	3,016.23	40.36	1,528.72	868.08	2,396.80	79.46
	1 km buffer	95.52	45.88	76.23	3.58	79.80	83.55
1007	Perth subregion	20,681.70	68.69	3,049.76	1,954.09	5,003.85	24.19
	NW subregion	5,048.24	46.74	93.63	996.31	1,089.93	21.59
	1 km buffer	659.97	66.84	5.32	32.20	37.53	5.69

<sup>1</sup> Current extents: Taken from Table 8 <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent; calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

**Table 10 Extents of vegetation complexes mapped within the Part 1 DE and DF at local, regional and bioregional scales**

Vegetation complex	Corresponding GHD VTs	Scale	Pre-European extent <sup>1</sup> (ha)	Current extent <sup>1</sup> (ha)	Remaining (%)	Extent in project <sup>2</sup> (ha)		% of current extent within project		Current extent after project developed (ha)	
						DE	DF	DE	DF	DF	DF
Cottesloe complex - north	VT02, VT03, VT04, VT10, VT11, VT15	Perth subregion	43,474.30	25,162.35	57.88	33.83	23.35	0.13	0.09	25,128.52 (57.80%)	25,139.00 (57.82)
		NW subregion	8,715.75	5,950.36	68.27			0.57	0.39	5,916.53 (67.88%)	5,927.01 (68.00%)
		1 km buffer	-	-	-			-	-	-	-
Cottesloe complex – central and south	VT05, VT06, VT08	Perth subregion	45,030.93	14,571.13	32.36	8.51	4.29	0.06	0.03	14,562.62 (32.34%)	14,566.84 (32.35%)
		NW subregion	17,272.13	5,841.12	33.82			0.15	0.07	5,832.61 (33.77%)	5,836.83 (33.79%)
		1 km buffer	1,292.49	595.61	46.08			1.43	0.72	587.10 (45.42%)	591.32 (45.75%)
Quindalup complex	VT14	Perth subregion	53,007.07	32,954.86	62.17	0.80	-	0.002	-	32,954.06 (62.17%)	-
		NW subregion	11,184.24	5,634.59	50.38			0.01	-	5,633.79 (50.37%)	-
		1 km buffer	1,031.55	650.84	63.09			0.12	-	650.04 (63.02%)	-

<sup>1</sup> Pre-European and Current extents: calculated using Native Vegetation Extent (DPIRD-005), Vegetation Complexes – Swan Coastal Plain. <sup>3</sup> Vegetation in Degraded or better condition (GHD 2018).

**Table 11 Current extent of vegetation complexes mapped with the Part 1 DE and DF in conservation areas**

Vegetation association	Scale	Current extent <sup>1</sup> (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
				DBCA	BF	Total (ha)	% of current extent
Cottesloe complex - north	Perth subregion	25,162.35	57.88	16,431.54	1,252.43	18,789.29	74.67
	NW subregion	5,950.36	68.27	4,857.77	672.49	5,530.25	92.94
	1 km buffer	-	-	-	-	-	-
Cottesloe complex – central and south	Perth subregion	14,571.13	32.36	6,936.51	2,357.75	9,294.26	63.79
	NW subregion	5,841.12	33.82	2,382.93	1,218.78	3,601.72	61.66
	1 km buffer	595.61	46.08	75.75	15.18	90.93	15.27
Quindalup complex	Perth subregion	32,954.86	62.17	6,785.53	3,948.51	10,734.03	32.57
	NW subregion	5,634.59	50.38	109.69	1,528.79	1,638.47	29.08
	1 km buffer	650.84	63.09	10.17	38.70	48.87	7.51

<sup>1</sup> Current extents: taken from table 10. <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent: calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

### 4.1.3 Cumulative considerations

#### Future residential and industrial development

The current extents of vegetation associations and complexes mapped within the Part 1 project that will support future development in the NW Subregion and within 1 km of Part 1 (as reported by ULDO 2016/17 data) are shown in Table 12 and Table 13.

**Table 12 Extents of vegetation associations mapped within the Part 1 project at local and regional taking into consideration ULDO**

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Current extent within ULDO areas (ha)	Current extent within ULDO areas (%)
949	NW Subregion	38,330.32	17,173.49	795.91	4.63
	1 km buffer	1,208.69	514.88	305.90	59.41
998	NW Subregion	7,473.03	3,016.23	82.80	2.75
	1 km buffer	208.19	95.52	-	-
1007	NW Subregion	10,801.16	5,048.24	3,431.41	67.97
	1 km buffer	987.34	659.97	491.42	74.46

**Table 13 Extents of vegetation complexes mapped within the Part 1 project at local and regional taking into consideration ULDO**

Vegetation complex	Scale	Pre-European extent (ha)	Current extent (ha)	Current extent within ULDO areas (ha)	Current extent within ULDO areas (%)
Cottesloe complex - north	NW Subregion	8,715.75	5,950.36	163.96	2.76
	1 km buffer	-	-	-	-
Cottesloe complex – central and south	NW Subregion	17,272.13	5,841.12	841.39	14.40
	1 km buffer	1,292.49	595.61	266.06	44.67
Quindalup complex	NW Subregion	11,184.24	5,634.59	3606.11	64.00
	1 km buffer	1,031.55	650.84	531.27	81.63

#### Part 1 project

The Part 1 DE comprises 43.14 ha of vegetation in degraded or better condition. Of this 38.20 ha intersect areas likely to support future development, with the remaining 4.94 ha not currently intersecting areas considered for future land development.

#### Part 2 project

The Part 2 DE covers 72.86 ha with 45.23 ha comprising vegetation in varying condition. Therefore, the Part 2 will impact an additional 45.23 ha of native vegetation. Of the 45.23 ha, 5.49 ha is within the Part 1 DE 1 km buffer.

#### Cumulative impacts

Table 14 and Table 15 show the cumulative impacts on the vegetation associations and complexes mapped within the Part 1 DE at local and regional scales. The assessment shows there will be substantial pressure on the remaining vegetation at a local and regional scale primarily due to future residential, commercial and industrial development. The largest predicted cumulative impact will result in a 63.92% or more reduction to the current extents of vegetation association 1007 and Quindalup vegetation complex at all scales. The impact of the Part 1 and Part 2, by comparison is predicted to reduce the current extents of the vegetation associations and complexes by less than 6.57% at all scales.

**Table 14 Extents of vegetation associations mapped within the Part 1 project at local and regional taking into consideration YRE Parts 1 and 2 and ULDO**

Vegetation association	Scale	Current extent (ha)	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Current extent within ULDO areas (ha)	Cumulative extent (ha) (%)
949	NW Subregion	17,173.49	33.83 (0.20%)	0.08 (0.0005%)	786.38 (4.58%)	820.28 (4.78%)
	1 km buffer	514.88	33.83 (6.57%)	-	296.37 (57.56%)	330.20 (64.13%)
998	NW Subregion	3,016.23	0.32 (0.01%)	-	82.80 (2.75%)	83.12 (2.76%)
	1 km buffer	95.52	0.32 (0.34%)	-	-	0.32 (0.34%)
1007	NW Subregion	5,048.24	8.99 (0.18%)	45.16 (0.89%)	3,382.81 (67.01%)	3,436.96 (68.08%)
	1 km buffer	659.97	8.99 (1.36%)	5.49 (0.83%)	461.26 (69.89%)	475.74 (72.09%)

**Table 15 Extents of vegetation complexes mapped within the Part 1 project at local and regional taking into consideration YRE Parts 1 and 2 and ULDO**

Vegetation complex	Scale	Current extent (ha)	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Current extent within ULDO areas (ha)	Cumulative extent (ha) (%)
Cottesloe complex – north	NW Subregion	5,950.36	33.83 (0.57%)	0.39 (0.006%)	163.96 (2.76%)	198.17 (3.33%)
	1 km buffer	-	33.83 <sup>1</sup>	-	-	33.83
Cottesloe complex – central and south	NW Subregion	5,841.12	8.51 (0.15%)	-	833.49 (14.27%)	842.00 (14.41%)
	1 km buffer	595.61	8.51 (1.43%)	-	258.15 (43.34%)	266.66 (44.77%)
Quindalup complex	NW Subregion	5,634.59	0.80 (0.01%)	44.85 (0.80%)	3,555.88 (63.11%)	3,601.53 (63.92%)
	1 km buffer	650.84	0.80 (0.12%)	5.49 (0.84%)	499.48 (76.74%)	505.77 (77.71%)

<sup>1</sup> Vegetation mapped within the Part 1 DE is considered to represent the Cottesloe complex – north. This vegetation complex is not mapped within a 1 km buffer of the Part 1 DE.

## 4.2 Threatened and Priority Ecological Communities

### 4.2.1 Receiving environment

Five conservation significant ecological communities were recorded in the DE, these included:

- *Banksia* woodlands of the SCP (TEC)
- *Melaleuca huegelii* – *M. acerosa* (*M. systema*) shrublands on limestone ridges (TEC) (SCP26a)
- Northern Spearwood shrublands and woodlands (PEC) (SCP24)
- *Banksia* dominated woodlands of the SCP IBRA region (PEC)
- Tuart (*Eucalyptus gomphocephala*) woodlands of the SCP (PEC).

Of the 5 conservation significant ecological communities recorded in the DE, only four are present in the DF. A breakdown of community type by vegetation condition rating is provided in Table 16.

**Table 16 Conservation significant ecological communities recorded in the Part 1 DE and DF**

Community ID	Condition rating	Extent (ha)	
		DE	DF
<i>Melaleuca huegelii</i> – <i>M. acerosa</i> ( <i>M. systema</i> ) shrublands (TEC) (SCP26a)	Excellent	0.60	0.51
	Very Good	0.47	0.03
	Good	0.02	
	Degraded	0.04	
	<b>Subtotal</b>	<b>1.12</b>	<b>0.53</b>
<i>Banksia</i> dominated woodlands of the SCP IBRA region (PEC) ( <i>Banksia</i> woodlands of the SCP (TEC)) <sup>1</sup>	Excellent	3.38 (3.38)	2.66 (2.66)
	Very Good	5.04 (5.04)	4.07 (4.07)
	Good	3.70 (3.70)	2.10 (2.10)
	Degraded	4.17	3.20
	Completely Degraded	0.16	0.16
<b>Subtotal</b>	<b>16.45 (12.12)</b>	<b>12.20 (8.84)</b>	
Northern Spearwood shrublands and woodlands (PEC) (SCP24)	Pristine	1.25	1.24
	Excellent	11.97	7.87
	Very Good	2.55	0.86
	Good	0.95	0.61
	Degraded	0.09	-
	Completely Degraded	0.36	-
<b>Subtotal</b>	<b>17.18</b>	<b>10.59</b>	
Tuart ( <i>Eucalyptus gomphocephala</i> ) woodlands of the SCP (PEC)	Degraded	0.32	-
	<b>Subtotal</b>	<b>0.32</b>	<b>-</b>

<sup>1</sup> *Banksia* woodlands (TEC) extent is a subset of the PEC.

### 4.2.1 Direct impact

#### *Melaleuca huegelii* – *M. acerosa* (*M. systema*) shrublands (TEC) (SCP26a)

The *Melaleuca huegelii*-*Melaleuca systema* shrublands of limestone ridges TEC occurs on skeletal soils on ridge slopes and ridge tops with limestone outcropping. The community is highly restricted and known from massive limestone ridges around Yanchep north of Perth, and south of Perth near Lake Clifton.

The interim recovery plan (CALM 2005) identifies approximately 79 occurrences of the TEC covering an estimated extent of 164 ha. A breakdown of extents by land tenure for the NW Subregion and Perth Subregion are provided in Table 17.

The GHD Biological Assessment Report (2018) identified a further 1.28 ha of the *Melaleuca huegelii-Melaleuca systema* shrublands of limestone ridges TEC within the survey area extent, which was not previously identified or included in the interim recovery plan for this community (CALM 2005).

Of the estimated extent of the *Melaleuca huegelii-Melaleuca systema* shrublands of limestone ridges TEC, a large portion (80.5%) is located within National Park and State Forest (Table 17).

**Table 17 Estimated extent of SCP26a TEC**

Land tenure	NW Subregion	Perth Subregion	Total (ha)
<b>Interim Recovery Plan (CALM 2005)</b>			
Crown Reserve	-	7.50	7.50
Freehold, State	0.40	-	0.40
National Park	26.30	-	26.30
Private Property	6.70	8.00	14.70
Shire Reserve	3.60	-	3.60
State Forest	40.70	65.20	105.90
Unallocated Crown Land	1.40	3.00	4.40
<b>GHD Biological Assessment (2018)</b>			
Freehold	1.28	1.28	1.28
<b>Total</b>	<b>80.38</b>	<b>84.98</b>	<b>164.08</b>

The development of the Part 1 project will remove 1.12 ha of the *Melaleuca huegelii-Melaleuca systema* shrublands of limestone ridges TEC. Based on the current extent (extracted from CALM 2005 and GHD 2018), the project is predicted to reduce the extent of this TEC by up to 1.39% at a regional scale and 0.68% at a bioregional scale (Table 18).

**Table 18 Estimated extent of SCP26a TEC mapped within the Part 1 DE and DF at local and regional scales**

Scale	Estimated extent <sup>1</sup> (ha)	Extent in project (ha)		% of current extent within project		Extent remaining after project developed (ha) (%)	
		DE	DF	DE	DF	DE	DF
Perth subregion	164.08	1.12	0.53	0.68	0.32	162.96 (99.32%)	163.55 (99.68%)
NW subregion	80.38			1.39	0.66	79.26 (98.61%)	79.85 (99.34%)

<sup>1</sup> Estimated extents: CALM (2005) and GHD (2018).

### ***Banksia woodlands of the SCP (TEC) and Banksia dominated woodlands of the SCP IBRA region (PEC)***

The Part 1 DE will result in the loss of 16.45 ha of the *Banksia* dominated woodlands PEC, with 12.12 ha of this vegetation also representing the *Banksia* woodlands of the SCP (TEC). The clearing loss associated with the DE is estimated to contribute a 3.19% reduction in the PEC at a local scale and a 0.09% reduction in the PEC at a regional scale (Table 19).

Of the estimated current extent remaining, there is 8.38% within conservation areas at a local scale and 87.33% within conservation areas at a regional scale (Table 20).



### ***Tuart (*Eucalyptus gomphocephala*) woodlands of the SCP (PEC)***

The Part 1 DE will result in the loss of 0.32 ha of the Tuart (*Eucalyptus gomphocephala*) woodlands PEC. The clearing loss associated with the DE is estimated to contribute a 0.33% reduction in the PEC at a local scale and a 0.01% reduction in the PEC at a regional scale (Table 19).

Of the estimated current extent remaining, there is 79.48% within conservation areas at a local scale and 83.54% within conservation areas at a regional scale (Table 20).

### ***Northern Spearwood shrublands and woodlands (PEC) (SCP24)***

The Part 1 DE will result in the loss of 17.18 ha of the Northern Spearwood shrublands and woodlands (SCP24) PEC. The clearing loss associated with the DE is estimated to contribute a 1.70% reduction in the PEC at a bioregional scale based on the estimated extent provided in TSSC (2016).

**Table 19 Estimated extent of Banksia PEC and Tuart PEC at local and regional scales**

Scale	Pre-European extent <sup>1</sup> (ha)	Current extent <sup>1</sup> (ha)	Remaining (%)	Extent in project (ha)		% of current extent within project		Current extent after project developed (ha)	
				DE	DF	DE	DF	DE	DF
<i>Banksia</i> dominated woodlands of the SCP IBRA region (PEC)									
NW subregion	38,993.53	17,355.02	44.51	16.45	12.2	0.09	0.07	17,338.57 (44.47%)	17,342.82 (44.48%)
1 km buffer	1,208.69	514.88	42.60	16.45	12.2	3.19	2.37	498.43 (41.24%)	502.68 (41.59%)
<i>Tuart (Eucalyptus gomphocephala)</i> woodlands of the SCP (PEC)									
NW subregion	8,468.42	3,650.50	43.11	0.32	0	0.01	<0.01	3,650.18 (43.10%)	3,650.50 (43.11%)
1 km buffer	208.19	95.52	45.88	0.32	0	0.33	0.00	95.20 (45.73%)	95.52 (45.88%)

<sup>1</sup> Pre-European and Current extents: calculated using Native Vegetation Extent (DPIRD-005), Pre-European Vegetation (DPIRD-006).

**Table 20 Estimated extent of Banksia PEC and Tuart PEC in conservation areas**

Scale	Current extent <sup>1</sup> (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
			DBCA	BF	Total (ha)	% of current extent
<i>Banksia</i> dominated woodlands of the SCP IBRA region (PEC)						
NW subregion	17,355.02	44.51	12,131.25	3,024.82	15,156.07	87.33
1 km buffer	514.88	42.60	23.95	19.18	43.13	8.38
<i>Tuart (Eucalyptus gomphocephala)</i> woodlands of the SCP (PEC)						
NW subregion	3,650.50	43.11	1,860.12	1,041.47	2,901.59	79.48
1 km buffer	95.52	45.88	76.23	3.58	79.80	83.54

<sup>1</sup> Current extents: taken from table 19. <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent: calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

## 4.2.2 Cumulative considerations

Regional spatial data was not available to inform a cumulative assessment for TECs or PECs at a local or regional scale. However, based on the interim recovery plan for the *Melaleuca huegelii-Melaleuca systena* shrublands of limestone ridges TEC (CALM 2005) it can be concluded much of the remaining extent occurs within National Park and State Forest (80.5%), with less than 9% located on private property. Similarly, the inferred extents of the Banksia dominated woodlands PEC (and Banksia woodlands of the SCP TEC) and Tuart (*Eucalyptus gomphocephala*) woodlands PEC indicates there is greater than 79% currently contained in conservation areas at a regional scale. Therefore it is reasonable to assume there will remain a relatively high level of protection afforded to these TECs and PECs.

The cumulative extent of TECs and PECs within the Parts 1 and 2 are provided in Table 21.

**Table 21 Cumulative impacts**

Community	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Cumulative extent (ha)
SCP26a TEC	1.12	0.05	1.17
Banksia PEC (TEC) <sup>1</sup>	16.45 (12.12)	12.89 (12.10)	29.34 (24.22)
SCP24 PEC	17.18	15.85	33.02
Tuart PEC	0.32	2.14	2.45

<sup>1</sup> TEC is a subset of the PEC.

## 5. Assessment of impacts – Terrestrial fauna

### 5.1 Fauna habitat

#### 5.1.1 Receiving environment

Eight fauna habitat types as well as highly disturbed areas were recorded in the DE (Table 22). Of the fauna habitat mapped within the DE, approximately 75% was considered high value, with approximately 12.5% considered medium value and the remaining 12.5% considered low value (i.e. highly disturbed areas). Seven of the habitat types were also recorded in the DF.

**Table 22 Fauna habitat types recorded in the Part 1 DE and DF**

Fauna habitat type	Habitat value	Extent (ha)	
		DE	DF
<i>Acacia</i> shrubland	Medium	0.80	0.00
<i>Banksia sessilis</i> over low mixed shrubland	High	17.18	10.59
<i>Eucalyptus</i> woodland	High	0.32	-
Limestone ridgelands	Medium	1.12	0.53
<i>Lomandra</i> herbland on secondary dunes	Medium	7.08	3.76
Mixed <i>Banksia</i> woodland	High	16.45	12.20
Mixed tall shrubland	High	18.38	10.45
Planted <i>Eucalyptus</i> woodland	Medium	0.11	0.11
<b>Subtotal</b>		<b>61.42</b>	<b>37.64</b>
Highly Disturbed	Low	8.76	7.76
<b>Total</b>		<b>70.19</b>	<b>45.40</b>

#### 5.1.2 Direct impacts

The Part 1 project will result in the direct loss of up to 61.42 ha of fauna habitat, although the estimated loss is 37.64 ha based on the DF. The clearing loss associated with the DE is estimated to contribute a 4.84% reduction in fauna habitat at a local scale; and as little as 0.20% and 0.01% at a region and subregional scale (Table 23).

Of the current extent remaining, there is 12.63% within conservation areas at a local scale and 74.60% and 44.81% within conservation areas at regional and bioregional scales (Table 24).

#### 5.1.3 Cumulative considerations

##### *Future residential, commercial and industrial development*

The estimated extent of native vegetation (fauna habitat) that will be impacted by foreseeable future development in the NW Subregion and within 1 km of Part 1 is shown in Table 25.

##### *Part 1 project*

The Part 1 DE comprises 61.42 ha of fauna habitat. Of this 54.88 ha intersect areas likely to support future development, with the remaining 6.54 ha not currently intersecting areas considered for future land development.

### ***Part 2 project***

The Part 2 DE covers 72.86 ha, with 62.30 ha mapped as fauna habitat in varying condition. Therefore, Part 2 will impact an additional 62.30 ha of fauna habitat. Of the 62.30 ha, 5.49 ha is within the Part 1 DE 1 km buffer.

### ***Cumulative impacts***

Table 25 shows the cumulative impacts on the fauna habitat at local and regional scales. The assessment shows there may be substantial pressure on the remaining fauna habitat at a local and regional scale primarily due to future residential, commercial and industrial development. The predicted cumulative impact will result in a 15.11% reduction to fauna habitat at a regional scale and 64.91% reduction to fauna habitat at a local scale. The combined impact of the Part 1 and Part 2, by comparison is predicted to reduce the current extents of fauna habitat by 5.26% at the local scale and 0.40% at the regional scale.

**Table 23 Extent of native vegetation (fauna habitat) at local, regional and bioregional scales**

Scale	Pre-European extent <sup>1</sup> (ha)	Current extent <sup>1</sup> (ha)	Remaining (%)	Extent in project (ha)		% of current extent within project		Current extent after project developed (ha)	
				DE	DF	DE	DF	DE	DF
Perth subregion	1,117,336.012	465,369.279	41.650	61.42	37.64	0.01	0.01	465,307.86 (41.64%)	465,331.64 (41.65%)
NW subregion	77,112.876	30,791.415	39.930	61.42	37.64	0.20	0.12	30,730.00 (39.85%)	30,753.78 (39.88%)
1 km buffer	2,395.809	1,270.373	53.025	61.42	37.64	4.84	2.96	1,208.95 (50.46%)	1,232.73 (51.45%)

<sup>1</sup> Pre-European and Current extents: calculated using Native Vegetation Extent (DPIRD-005), Pre-European Vegetation (DPIRD-006).

**Table 24 Current extent of native vegetation (fauna habitat) in conservation areas**

Scale	Current extent <sup>1</sup> (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
			DBCA	BF	Total (ha)	% of current extent
Perth subregion	465,369.279	41.650	186,970.02	21,553.29	208,523.32	44.81
NW subregion	30,791.415	39.930	16,363.90	6,606.02	22,969.92	74.60
1 km buffer	1,270.373	53.025	105.51	54.96	160.46	12.63

<sup>1</sup> Current extents: taken from table 7. <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent: calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

**Table 25 Extent of native vegetation (fauna habitat) at local and regional scales taking into consideration YRE Parts 1 and 2 and ULDO**

Scale	Current extent (ha)	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Current extent within ULDO areas (ha)	Cumulative extent (ha) (%)
NW Subregion	30,791.415	61.42 (0.20%)	62.30 (0.20%)	4,529.37 (14.71%)	4,653.09 (15.11%)
1 km buffer	1,270.373	61.42 (4.83%)	5.49 (0.43%)	757.63 (59.64%)	824.51 (64.91%)

## 5.2 Ecological linkages

### 5.2.1 Receiving environment

A regional ecological linkage (Link No. 6) runs parallel to the Part 1 DE on its eastern side. The Part 1 DE intersects the western edge of this linkage, however, follows an existing unsealed track zoned 'Other regional roads' under the MRS and connects to Romeo Road. The linkage is currently intersected by Romeo Road in this area (Figure 2).

The Part 1 DE intersects a local ecological linkage that runs east-west in the Alkimos-Eglinton Precinct (Figure 2). The Part 1 DE intersects the Alkimos PRR, and whilst the Part 1 DE is largely contained within the section zoned 'Railways' under the MRS, several small areas extend into the Alkimos PRR. This local ecological linkage is also intersected by the existing Marmion Avenue and Wanneroo Road.

### 5.2.2 Direct impacts

The Part 1 DE will impact 1.80 ha of regional ecological linkage (Link No. 6). Of the 1.80 ha, 1.36 ha comprises native vegetation in Degraded or better condition with the remaining 0.44 ha comprising scattered natives in Completely Degraded condition.

The Part 1 DE will impact 2.50 ha of the local ecological linkage. Of the 2.50 ha, 1.81 ha is contained within the railway reserve with 0.69 ha extending into the Alkimos PRR. Of the 2.50 ha, 2.06 ha comprises native vegetation in Degraded or better condition with the remaining 0.43 ha comprising scattered natives in Completely Degraded condition. Whilst the Part 1 DE is largely contained within the section zoned 'Railways' under the MRS, it will create an additional barrier within the local ecological linkage.

### 5.2.3 Cumulative considerations

#### *Future residential and industrial development*

The estimated extent of regional ecological linkage (Link No. 6) that will be impacted by foreseeable future development within a 1 km buffer of the Part 1 project is 68.57 ha.

There are no foreseeable impacts to the local ecological linkage by future development within a 1 km buffer of the Part 1 project.

#### *Part 1 project*

The Part 1 DE comprises 1.36 ha of native vegetation in Degraded or better condition that intersects regional ecological linkage (Link No. 6). Of this 1.03 ha is likely to support future development, with the remaining 0.33 ha of native vegetation in Degraded or better condition currently intersecting areas considered for future development.

The Part 1 DE will result in the loss of 2.06 ha of the local ecological linkage. The Part 1 DE will also create an additional barrier within the local ecological linkage.

#### *Part 2 project*

The Part 2 DE does not intersect any regional ecological linkages as shown in the Regional Ecological Linkages for the PMR or local ecological linkages as shown in the City of Wanneroo Local Biodiversity Strategy 2011-2016. However, the Part 2 DE intersects a local ecological linkage shown in the City of Wanneroo Local Biodiversity Strategy 2011-2016. This linkage runs east-west and connects coastal reserves to Yanchep National Park, including Bush Forever Sites No. 289 and 288.

### Cumulative impacts

The Part 1 DE will reduce regional ecological linkage (Link No. 6), however, the Part 1 impact is considered small (1.36 ha) in comparison to future development, which will have a much larger impact on this linkage. However, Link No. 6 includes conservation areas such as Neerabup National Park, Bush Forever Site No. 130 and Yanchep National Park, which will help facilitate its long term protection.

The Part 1 project will also reduce the local ecological linkage, by removing approximately 2.25% of this linkage, with no other foreseeable future development contributing additional impacts. The remaining extent of the Alkimos PRR post-Part 1 development is 89.08 ha.

## 5.3 Black Cockatoos

### 5.3.1 Receiving environment

The Part 1 project is located within the modelled feeding and breeding distribution for Carnaby's Black Cockatoo (DSEWPaC 2012). Suitable breeding and foraging habitat for Carnaby's Black Cockatoo was recorded in the DE; although no breeding habitat was recorded in the DF. Table 26 provides a breakdown of Black Cockatoo breeding and foraging habitat recorded in the DE and DF by value. Roosting habitat was also identified within the DE and DF, however the extents of roosting habitat within the DE and DF have been captured within breeding and foraging extents.

GHD (2018) identified 21 trees of suitable DBH within the DE, of these two trees of suitable DBH occur within the DF. Trees with suitable DBH have not been included in below assessment as local and regional spatial data was not available to inform the assessment.

**Table 26 Black Cockatoo habitat types and value recorded in the Part 1 DE and DF**

Habitat type	Habitat value	Extent (ha)	
		DE	DF
Foraging (Breeding <sup>1</sup> )	High	33.63 (0.32)	22.79
	Medium	0.83	0.83
	Low	17.65	9.73
<b>Total</b>		<b>52.42 (0.32)</b>	<b>33.35</b>

<sup>1</sup> Breeding habitat extent is subset of the foraging habitat extent.

### 5.3.2 Direct impacts

The Part 1 DE will result in the direct loss of up to 0.32 ha of breeding habitat and 52.42 ha of foraging habitat. The direct loss of foraging habitat for the DF is 33.35 ha. The clearing loss associated with the DE is estimated to contribute a 0.33% and 8.59% reduction in breeding and foraging habitat at a local scale, respectively (Table 27). The regional impact of the Part 1 project is estimated to be less than 0.01% for breeding habitat and 0.21% for foraging.

Of the current extent remaining, there is 83.55% and 20.14% of breeding and foraging habitat respectively within conservation areas at a local scale. At a regional scale there is 78.15% and 84.66% of breeding and foraging habitat respectively within conservation areas at (Table 28).

### 5.3.3 Cumulative considerations

#### *Future residential, commercial and industrial development*

The estimated extent of Black Cockatoo breeding and foraging habitat that will support future development in the NW Subregion and within 1 km of Part 1 is shown in Table 29.



### ***Part 1 project***

The Part 1 DE comprises 52.42 ha of Black Cockatoo breeding and/or foraging habitat. Of this 46.60 ha intersects areas likely to support future development, with the remaining 5.83 ha not currently intersecting areas considered for future land development.

### ***Part 2 project***

The Part 2 DE covers 72.86 ha, with 54.79 ha considered suitable Black Cockatoo foraging habitat, with an additional 2.14 ha considered suitable Black Cockatoo breeding and foraging habitat. Therefore, Part 2 will impact an additional 56.93 ha of Black cockatoo breeding and/or foraging habitat. Of the 56.93 ha 5.49 ha is within the Part 1 DE 1 km buffer.

### ***Cumulative impacts***

Table 29 shows the cumulative impacts on Black Cockatoo breeding and foraging habitat at a local and regional scale. Part 1 DE will reduce the available habitat for Black Cockatoo breeding and foraging by 8.59% or less, however, it is considered future development will have a much larger impact on the available habitat for Black Cockatoo, particularly foraging habitat at a local scale (58.04%). The predicted cumulative impact will result in a 4.99% reduction to Black Cockatoo breeding habitat at a regional scale and 0.33% reduction to Black Cockatoo breeding habitat at a local scale.

**Table 27 Extents of Black Cockatoo habitat at local and regional scales**

Habitat type	Corresponding associations	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Extent in project (ha)		% of current extent within project		Current extent after project developed (ha)	
						DE	DF	DE	DF	DE	DF
Breeding	6, 965, 998, 1001, 1011	NW subregion	24,442.23	7,268.01	29.74	0.32	-	0.00	0.00	7,267.69 (29.73%)	7,268.01 (29.74%)
		1 km buffer	208.19	95.52	45.88	0.32	-	0.33	<0.01	95.21 (45.73%)	95.52 (45.88%)
Foraging	6, 949, 965, 998, 1001, 1011	NW subregion	62,772.55	24,441.50	38.94	52.42	33.35	0.21	0.14	24,389.07 (38.85%)	24,408.15 (38.88%)
		1 km buffer	1,416.87	610.40	43.08	52.42	33.35	8.59	5.46	557.97 (39.38%)	577.05 (40.73%)

**Table 28 Current extent of Black Cockatoo habitat in conservation areas**

Habitat types	Scale	Current extent (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
				DBCA	BF	Total (ha)	% of current extent
Breeding	NW subregion	7,268.01	29.74	3,811.58	1,868.53	5,680.11	78.15
	1 km buffer	95.52	45.88	76.23	3.58	79.80	83.55
Foraging	NW subregion	24,441.50	38.94	15,859.31	4,832.20	20,691.52	84.66
	1 km buffer	610.40	43.08	100.18	22.75	122.93	20.14

<sup>1</sup> Current extents: taken from table 7. <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent: calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

**Table 29 Extents of Black Cockatoo habitat at local and regional taking into consideration YRE Parts 1 and 2 and ULDO**

Habitat type	Scale	Current extent (ha)	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Current extent within ULDO areas (ha)	Cumulative extent (ha) (%)
Breeding	NW Subregion	7,268.01	0.32 (0.004%)	2.14 (0.03%)	360.18 (4.96%)	362.63 (4.99%)
	1 km buffer	95.52	0.32 (0.33%)	-	-	0.32 (0.33%)
Foraging	NW Subregion	24,441.50	52.42 (0.21%)	54.79 (0.22%)	1,146.56 (4.69%)	1,253.77 (5.13%)
	1 km buffer	610.40	52.42 (8.59%)	5.49 (0.90%)	296.37 (48.55%)	354.29 (58.04%)

# 6. Assessment of impacts – Landforms

## 6.1 Parabolic dune formation

### 6.1.1 Receiving environment

The Alkimos dune system represents parabolic dunes belonging to the Quindalup dune system. The project intersects parabolic dune formations along its length.

There is 21.48 ha of parabolic dune formations present within the Alkimos PRR and rail reserve associated with the local ecological linkage.

### 6.1.2 Direct impacts

The remaining extent of parabolic dune formations at a local and regional scale is greater than 65.26% of the mapped pre-European extent (Table 30). However, less than 30% of the remaining extent occurs in conservation areas (DCA Legislated Lands and Bush Forever) at both scales (29.82% at a regional scale and 4.28% at a local scale) (Table 31).

Clearing the Part 1 DE will reduce the current parabolic dune formation extent by less than 8.47 ha, which equates to 3.92% at a local scale and 0.24% at a regional scale (Table 30). Of the 8.47 ha, 0.66 ha is within the rail reserve (associated with the local ecological linkage) and 0.10 ha is within the Alkimos PRR, reducing the current parabolic dune formation extent within the Alkimos PRR by 3.55%.

### 6.1.3 Cumulative considerations

#### *Future residential, commercial and industrial development*

The estimated extent of parabolic dune formations that will be impacted by future development in the NW Subregion and within 1 km of the project is shown in Table 32.

#### *Part 1 project*

The Part 1 DE intersects 8.47 ha which currently support parabolic dune formations. Of this, 7.11 ha intersect areas likely to support future development, with the remaining 1.37 ha (supporting current parabolic dune formations) not currently intersecting areas considered for future land development.

#### *Part 2 project*

The Part 2 DE covers 72.86 ha, with 17.45 ha supporting current parabolic dune formations. Therefore, Part 2 will impact an additional 17.45 ha of current parabolic dune formations. Of this 17.45 ha, 0.35 ha is within the Part 1 DE 1 km buffer.

#### *Cumulative impacts*

Table 32 shows the cumulative impacts on parabolic dune formations at a local and regional scales. The Part 1 DE will impact parabolic dune formations, however, it is considered future development will have a much larger impact on the areas supporting current parabolic dune formations at both local and regional scales (71.37% at a local scale and 63.68% at a regional scale).

**Table 30 Extent of parabolic dune formation at local and regional scales**

Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Extent in project (ha)		% of current extent within project		Current extent after project developed (ha) (%)	
				DE	DF	DE	DF	DE	DF
NW subregion	5433.49	3,545.82	65.26	8.47	4.79	0.24	0.14	3,537.34 (65.10%)	3,541.03 (65.17%)
1 km buffer	246.87	216.04	87.51	8.47	4.79	3.92	2.22	207.57 (84.08%)	211.25 (85.57%)

**Table 31 Current extent of parabolic dune formation in conservation areas**

Scale	Current extent <sup>1</sup> (ha)	Remaining (%)	Current extent in conservation areas <sup>2</sup> (ha)			
			DBCA	BF	Total (ha)	% of current extent
NW subregion	3,545.82	65.26	59.76	997.75	1,057.50	29.82
1 km buffer	216.04	87.51	9.24	-	9.24	4.28

<sup>1</sup> Current extents: taken from table 30. <sup>2</sup> DBCA extent: calculated using DBCA – Legislated Lands and Waters (DBCA-011) and DBCA – Lands of Interest (DBCA-012); BF extent: calculated using Bush Forever Areas 2000 (DOP-071) that lies outside of calculated DBCA extent.

**Table 32 Extents of parabolic dune formation at local and regional taking into consideration YRE Parts 1 and 2 and ULDO**

Scale	Current extent (ha)	Current extent within Part 1 DE (ha) (%)	Current extent within Part 2 DE (ha) (%)	Current extent within ULDO areas (ha)	Cumulative extent (ha) (%)
NW Subregion	3,545.82	8.47 (0.24%)	17.45 (0.49%)	2,231.93 (62.95%)	2,257.85 (63.68%)
1 km buffer	216.04	8.47 (3.92%)	0.35 (0.16%)	145.35 (67.28%)	154.18 (71.37%)

# 7. Conclusions

## 7.1 Significance of direct impacts from the Part 1 project

At a local level, the Part 1 project has a more significant impact than when compared to a regional scale. This outcome is not unexpected given the existing development in the immediate area and a lack of conservation areas within a 1 km buffer of the Part 1 project. Whereas when the regional context is considered, the significance of these impacts are reduced.

The development of the Part 1 project is not expected to reduce any of the vegetation associations and complexes (and associated fauna habitat) mapped with the Part 1 DE below 30% of their pre-European extents. Most of these vegetation associations and complexes occur within conservation areas within the Perth subregion and therefore are afforded some level of protection.

The Part 1 project will remove State and Federally listed TECs and PECs. Where local and regional data was available to inform this assessment, the Part 1 project will reduce the known extents by less than 1% at the largest scale investigated. While this impact is relatively small, given the level of protection afforded to these communities the regulator may still consider any impact significant.

The Part 1 project will impact on regional and local ecological linkages. The associated loss of vegetation with respect to the regional ecological linkage is relatively small and not anticipated to adversely affect the function of the linkage. The introduction of an additional barrier within the local ecological linkage is likely to reduce its function. However, will not create a barrier of greater than 500 m between viable natural areas. Furthermore, there are existing barriers within the linkage therefore the cumulative impact of the Part 1 project is likely to be reduced.

The development of the Part 1 project will impact on parabolic dune formations. The associated loss of the dune formations is relatively small (less than 0.25% at a regional scale) and is not anticipated to adversely affect the function at this scale.

## 7.2 Cumulative considerations with respect to significance of the Part 1 project impacts

The Draft Perth and Peel@3.5million identified the NW subregion as one of the fastest growing areas in the Perth and Peel regions. It is anticipated that this will be the case over the long-term (to 2050) as the subregion has a significant supply of undeveloped Urban and Urban Deferred zoned land available, predominately within the coastal urban growth corridor. The Draft Perth and Peel@3.5million also notes that to provide the capacity to accommodate projected population growth, transit corridors should be identified as a priority for increased density.

The proposed urban growth in the NW subregion, (acknowledging not all is approved at a State level under environmental assessment) will have significant environmental impacts. However, it is reasonable to assume strategic growth will continue, with increasing need/demand for transport networks. The contribution of the YRE project to the various environmental impacts considered in this report are minimal by comparison to the proposed urban growth.

## 8. References

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# Appendices

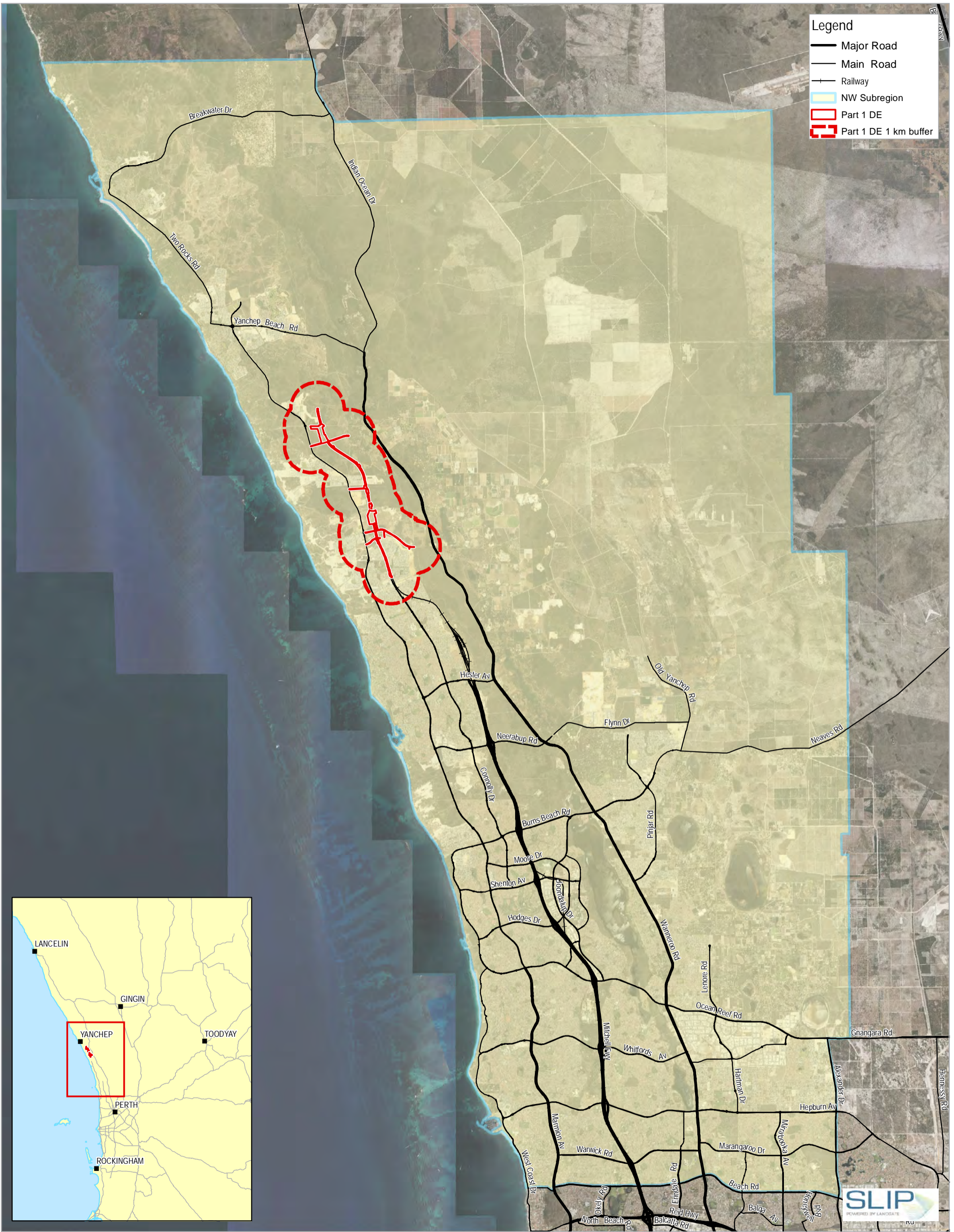
# **Appendix A – Figures**

**Figure 1 Project locality and scales**

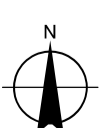
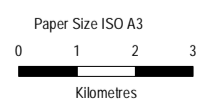
**Figure 2 Local and regional context**

**Figure 3 Cumulative considerations**





- Legend**
- Major Road
  - Main Road
  - Railway
  - NW Subregion
  - Part 1 DE
  - Part 1 DE 1 km buffer



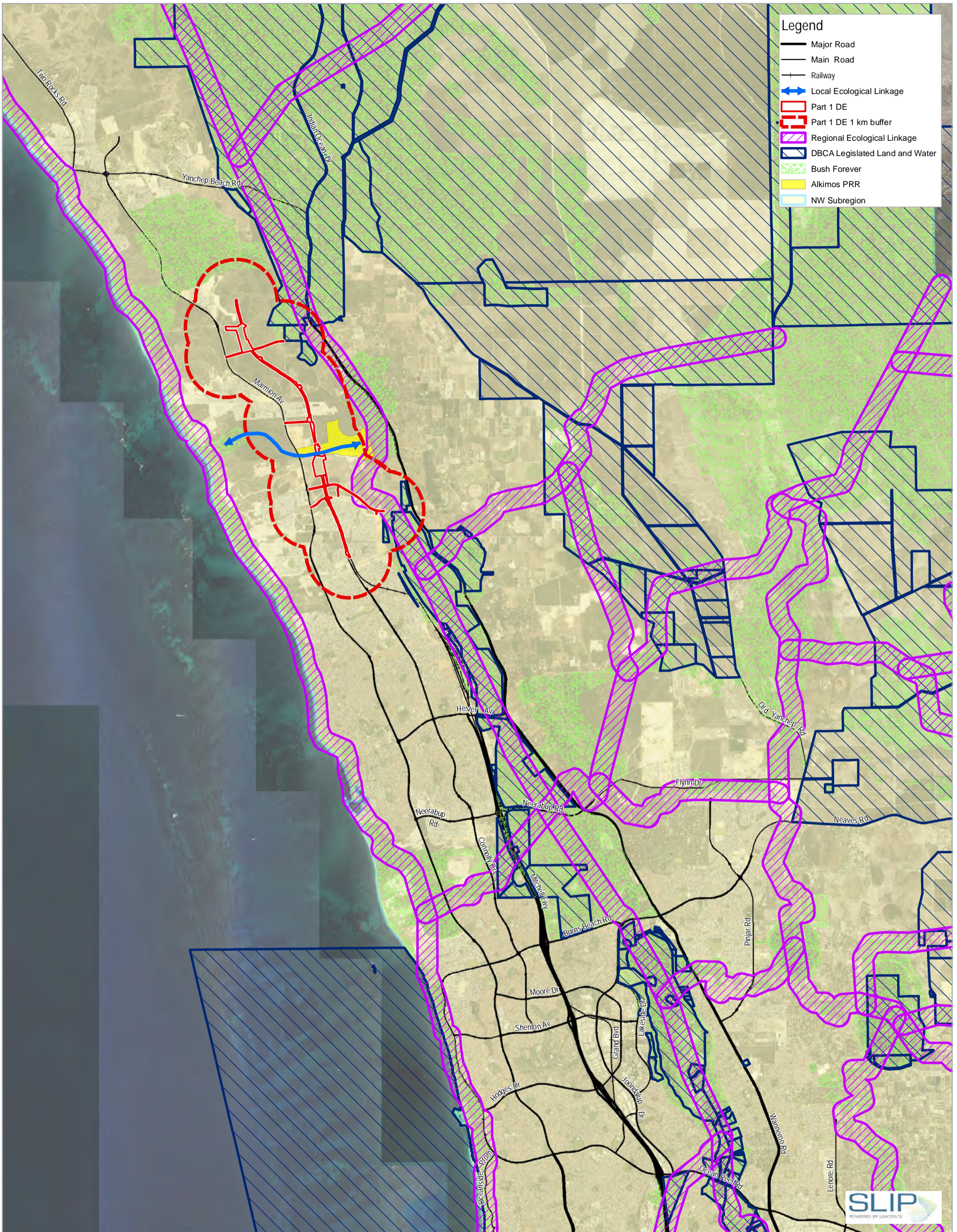
Public Transport Authority  
Yanchep Rail Extension

Project No. 61-3706200  
Revision No. 0  
Date 16/05/2018

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

Project locality and scales

**FIGURE 1**

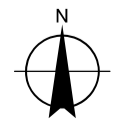


**Legend**

- Major Road
- Main Road
- Railway
- ↔ Local Ecological Linkage
- ▭ Part 1 DE
- ▭ Part 1 DE 1 km buffer
- ▭ Regional Ecological Linkage
- ▭ DBCA Legislated Land and Water
- ▭ Bush Forever
- ▭ Alkimos PRR
- ▭ NW Subregion



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



Public Transport Authority  
 Yanchep Rail Extension

Local and regional context

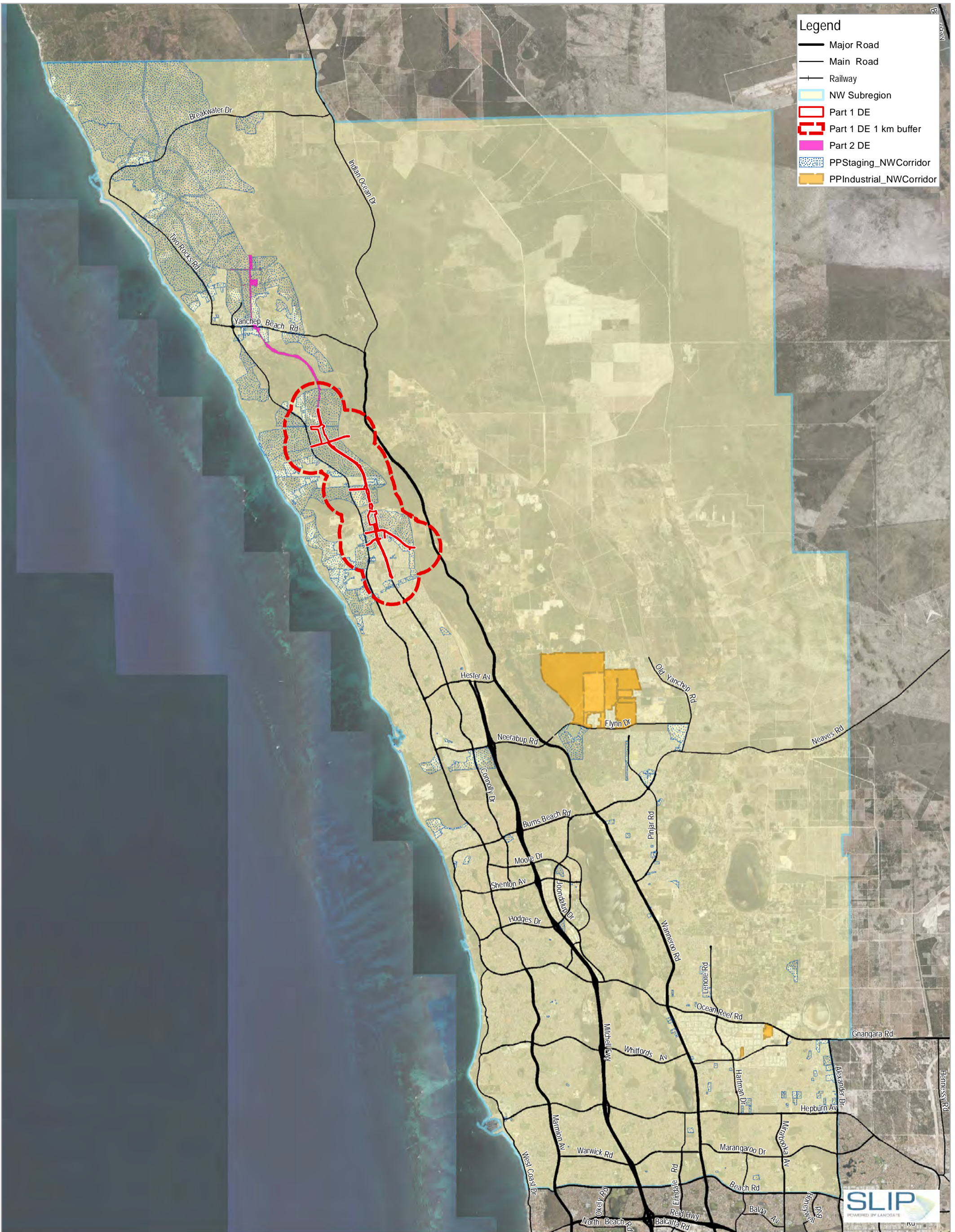
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 Revision No. 0  
 Date 16/05/2018

FIGURE 2

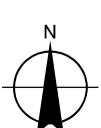
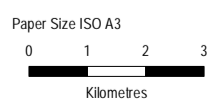
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Data source: Geoscience Australia: GeoData Topo 250k Series III; Landgate: Roads - 20160617; Railway - 20170906; Imagery: DBCA: DBCA Legislated Lands and Waters; Regional Ecological Linkages: DOP; Bush Forever: PTA; Part 1 DE, Part 1 DE 1 km buffer, NW Subregion. Created by: krawlinson





- Legend**
- Major Road
  - Main Road
  - Railway
  - NW Subregion
  - Part 1 DE
  - Part 1 DE 1 km buffer
  - Part 2 DE
  - PP Staging\_NW Corridor
  - PP Industrial\_NW Corridor



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



Public Transport Authority  
 Yanchep Rail Extension

Project No. 61-3706200  
 Revision No. 0  
 Date 16/05/2018

Cumulative considerations

**FIGURE 3**

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 Print date: 01 Jun 2018 - 16:48

Data source: Geoscience Australia: GeoData Topo 250k Series III; Landgate: Roads - 20160617; Railway - 20170906; Imagery: DBCA: DBCA Legals Lands and Waters; Regional Ecological Linkages: DoP; Bush Forever: PTA: Part 1 DE, Part 1 DE 1 km buffer, NW Subregion. Created by: krawlinson

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49174/[https://projects.ghd.com/oc/WesternAustralia1/ptametronetenvironme/Delivery/Documents/6137062-REP-3\\_YRE Biological Factors Additional Information.docx](https://projects.ghd.com/oc/WesternAustralia1/ptametronetenvironme/Delivery/Documents/6137062-REP-3_YRE%20Biological%20Factors%20Additional%20Information.docx)

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	J Tindiglia	D Farrar		D Farrar		1/06/2018
1	J Tindiglia	D Farrar		D Farrar		6/06/2018
2	J Tindiglia	D Farrar		D Farrar		8/06/2018
3	J Tindiglia	D Farrar		D Farrar		14/06/2018

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