

NorthLinkWA

Perth-Darwin National Highway



EPA Referral

Tonkin Grade Separation

DOC NO / NLWA-01-EN-RP-0003

REV / C

DATE / 6 October 2014

coffey 



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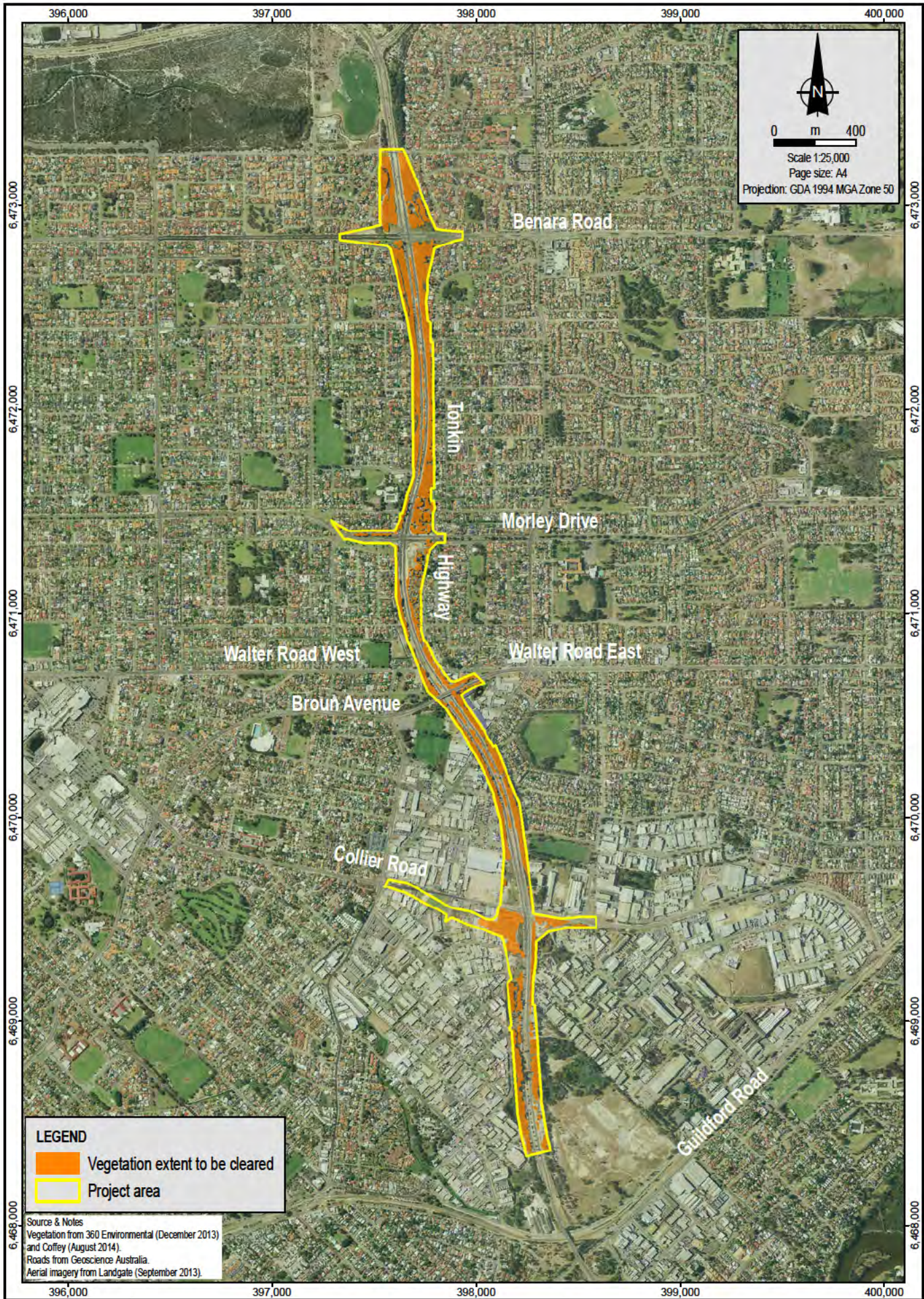
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		Tonkin Grade Separation - EPA Referral		

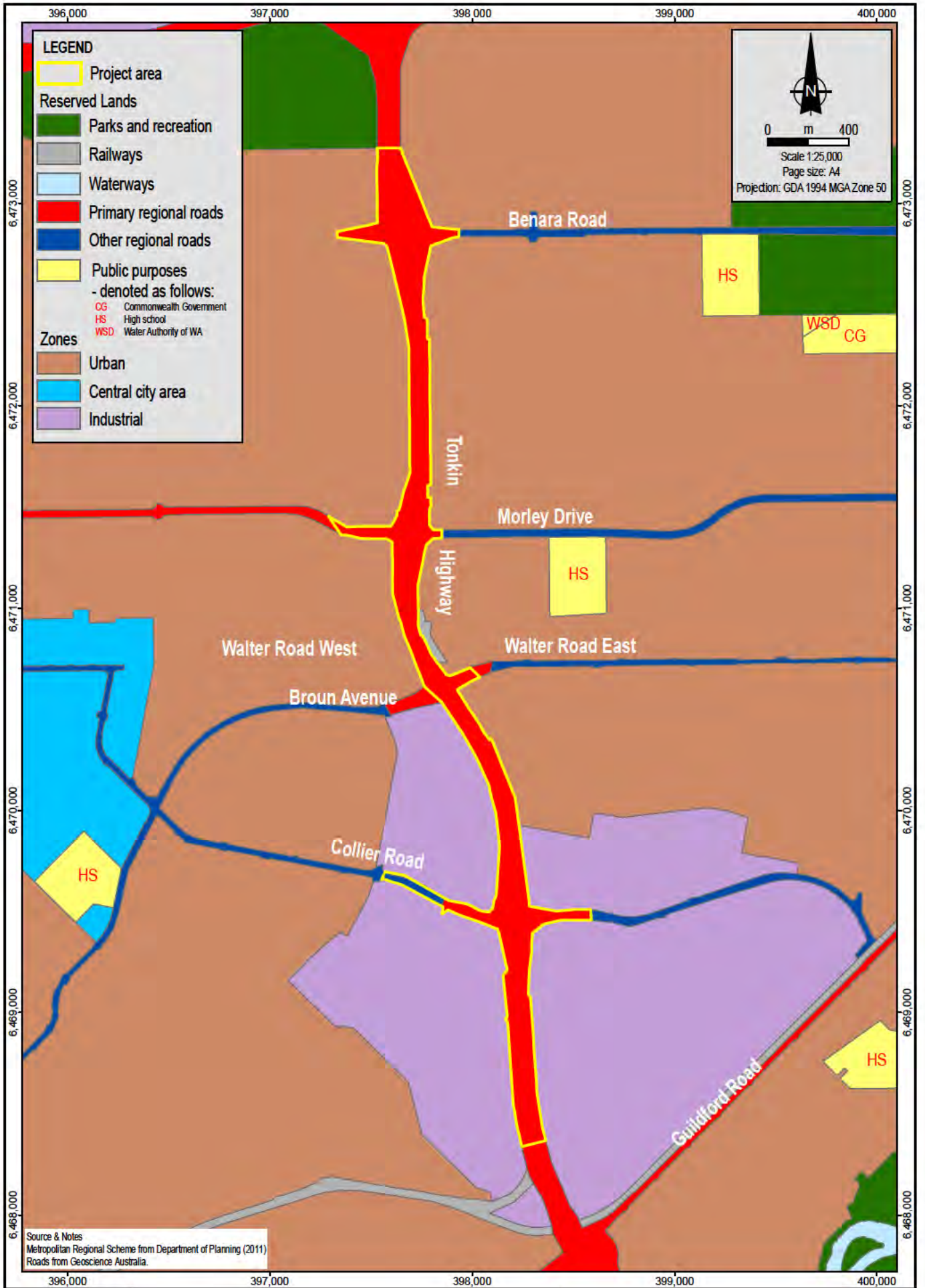



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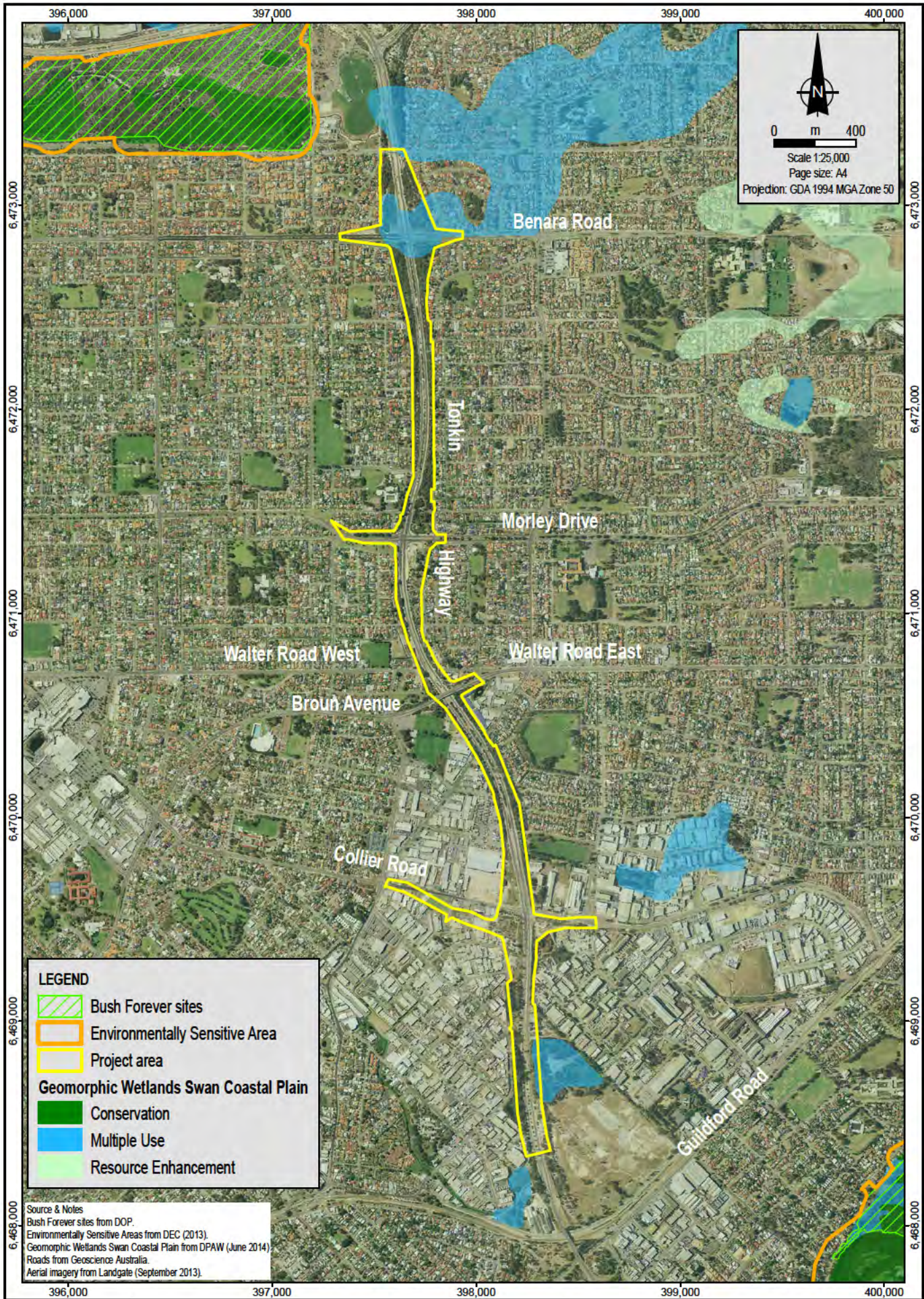
- Vegetation extent to be cleared
- Project area


Source & Notes
 Vegetation from 360 Environmental (December 2013)
 and Coffey (August 2014).
 Roads from Geoscience Australia.
 Aerial imagery from Landgate (September 2013).



Source & Notes
 Metropolitan Regional Scheme from Department of Planning (2011)
 Roads from Geoscience Australia.

	Date: 09.09.2014	Main Roads WA		Figure No: 3
	MOC: 4483AA_04_GIS003_2	Tonkin Grade Separation - EPA Referral		
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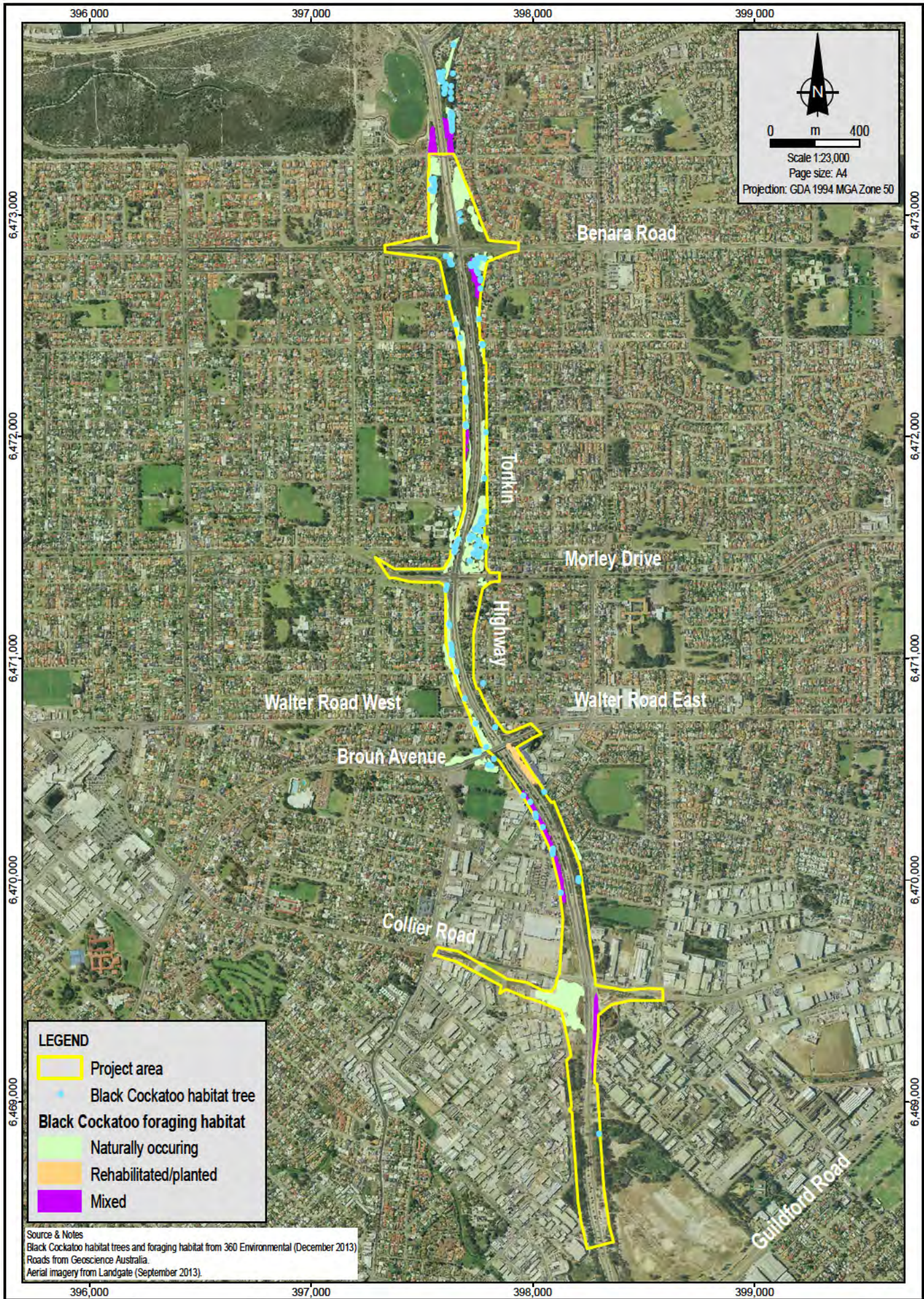
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-  Bush Forever sites
-  Environmentally Sensitive Area
-  Project area

Geomorphic Wetlands Swan Coastal Plain






-  Conservation
-  Multiple Use
-  Resource Enhancement

Source & Notes
 Bush Forever sites from DOP.
 Environmentally Sensitive Areas from DEC (2013).
 Geomorphic Wetlands Swan Coastal Plain from DPAW (June 2014).
 Roads from Geoscience Australia.
 Aerial imagery from Landgate (September 2013).

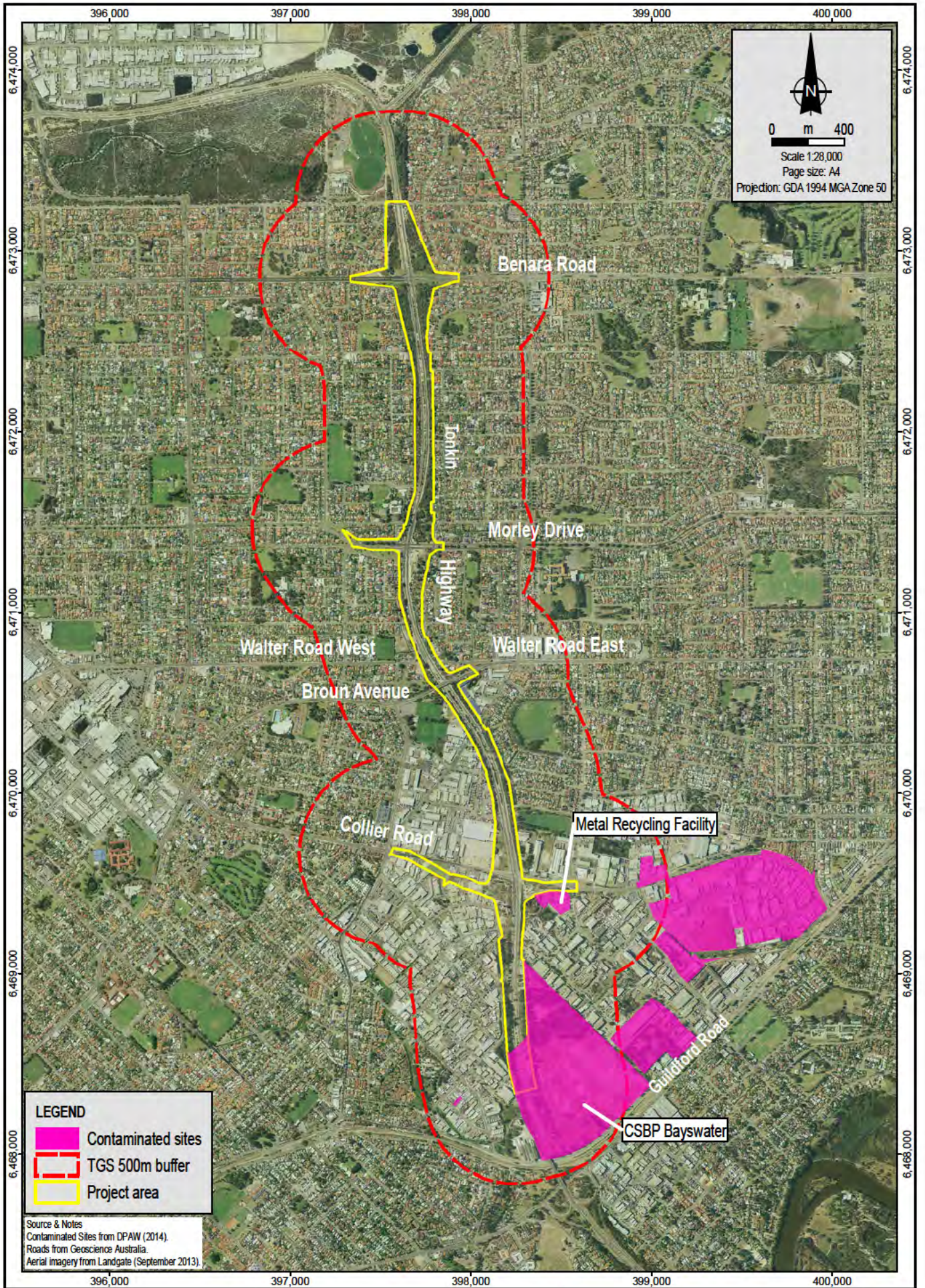


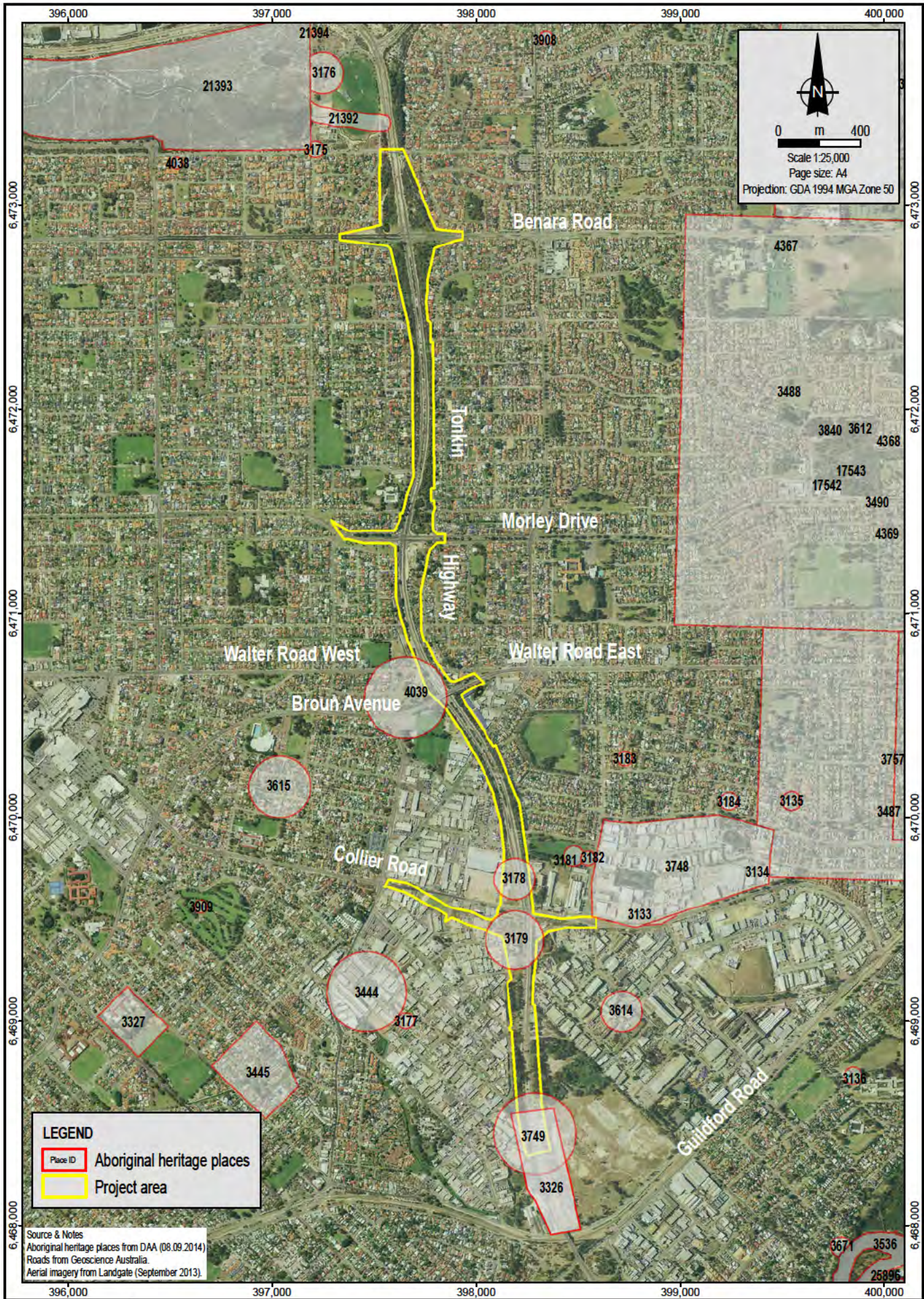

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LEGEND

-  Project area
-  Black Cockatoo habitat tree
- Black Cockatoo foraging habitat**
-  Naturally occurring
-  Rehabilitated/planted
-  Mixed

Source & Notes
 Black Cockatoo habitat trees and foraging habitat from 360 Environmental (December 2013)
 Roads from Geoscience Australia.
 Aerial imagery from Landgate (September 2013).






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 Scale 1:25,000
 Page size: A4
 Projection: GDA 1994 MGA Zone 50

LEGEND

- Place ID Aboriginal heritage places
- Project area

Source & Notes
 Aboriginal heritage places from DAA (08.09.2014)
 Roads from Geoscience Australia.
 Aerial imagery from Landgate (September 2013).



Tonkin Grade Separations

Flora, Vegetation and Fauna Survey

Prepared for:

Main Roads Western
Australia

February 2014

● people ● planet ● professional

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185AB	C CLIENT FINAL	360	-	1 Electronic (email)	7/01/14

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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Main Roads Western Australia (MRWA) in September 2013 to undertake a flora and vegetation assessment for Tonkin Grade Separations (TGS), part of NorthLink. The purpose of the assessment was to identify potential constraints for future road upgrades for TGS, and parts of the Tonkin Highway to the south of TGS, and to assist the preliminary evaluation of potential impacts on fauna, flora and vegetation communities and ecological communities of conservation significance.

The Level 1 flora and vegetation field survey was undertaken during two site visits on 21 September 2013 and 1 October 2013, with a total of two person-days invested in the field survey. A total of 102 taxa (including species, subspecies, varieties and forms) from 82 genera and 34 families were recorded in the survey area.

No plant species listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999*; as Threatened pursuant to the *Wildlife Conservation Act 1950* were recorded in the study area. No Priority Flora as listed by the Department of Parks and Wildlife (DPaW) was recorded during the survey.

Twenty five introduced species were recorded during the survey. None of these species are registered as Weeds of National Significance. One species, **Zantedeschia aethiopica* is listed as Declared Pest and assigned a C3 (management) status under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

A total of 51 mapping units were mapped for the survey area. The vegetation condition ranged from Completely Degraded to Excellent with the majority of the site considered Degraded or worse. One vegetation mapping unit, BaBm (1.4 ha) is likely to represent the Priority Ecological Community 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' listed as a Priority 3 by DPaW.

The DPaW Geomorphic Wetlands Dataset three Multiple Use Wetlands as occurring within the survey area. No Conservation Category or Resource Enhancement Wetlands occur within the survey area.

The Level 1 fauna field survey was undertaken during two site visits on 21 September 2013 and 1 October 2013, with a total of two person-days invested in the field survey.

A total of five broad fauna habitat types were mapped within the survey area. The broad fauna habitats in the survey area generally have a high level of disturbance to them in the form of weeds, introduced animals, rubbish and infrastructure (roads, rail lines and powerlines).

A total of 30 conservation significant species were identified during the desktop review of database searches. Fifteen of the 30 species are considered as 'Unlikely' to occur within the survey area, eight species are considered as 'Possible' to occur, five species

are considered as 'Likely' to occur within the study area and one species was recorded during the survey.

One conservation significant species, Forest Red-tailed Black Cockatoo listed Vulnerable under the EPBC Act and as schedule 1 under the WC Act was recorded in the survey area during the survey.

Permits

This flora survey was conducted under the following licences issued by DPaW; Licence to take flora for scientific or other prescribed purposes: SLO10690 issued to Narelle Whittington and SLO10691 issued to Hayden Ajduk.

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1 Introduction

1.1 The Project

360 Environmental Pty Ltd (360) was commissioned by Main Roads Western Australia (MRWA) in September 2013 to undertake a flora and vegetation assessment for Tonkin Grade Separations (TGS), part of NorthLink. The purpose of the assessment was to identify potential constraints for future road upgrades for TGS, parts of the Tonkin Highway to the south of TGS, and to assist the preliminary evaluation of potential impacts on fauna, flora and vegetation communities and ecological communities of conservation significance.

1.1.1 Objectives

The objectives of the flora and vegetation assessment were to:

- Á Conduct a comprehensive flora and vegetation database and literature review;
- Á Compile an inventory of vascular plant species;
- Á Document the presence of all plant species of conservation significance;
- Á Record the occurrence of introduced plant species;
- Á Assess and map vegetation condition;
- Á Document, describe and map the vegetation associations present; and
- Á Undertake targeted surveys and map locations of conservation significant flora, Threatened Ecological Communities (TECs), Priority Ecological Communities (PECs), Declared plants and environmental weeds.

The objectives of the fauna assessment were to:

- Á Conduct a comprehensive fauna database and literature review;
- Á Document, describe and map the vertebrate fauna and fauna habitats present; and
- Á Identify fauna of conservation significance that may potentially occur within the study area.

1.1.2 Location

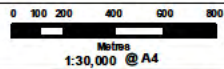
The survey area was 99 ha in size and is located approximately 17 km, north east of the Perth central business district in the Swan Coastal Sandplain Bioregion of Western Australia (Figure 1). The survey area extends from just north of the Tonkin Highway - Guildford Road intersection to the termination of the Tonkin Highway at Reid Highway intersection. The survey area extends further south than the current alignment for TGS,

which extends from just north of the Tonkin Highway - Guildford Road intersection, to the intersection of Tonkin Highway and Collier Road.



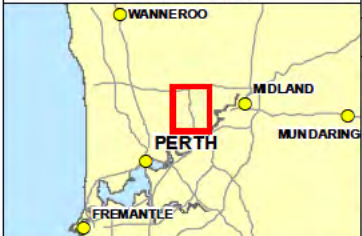
Legend

- Major Roads
- ▭ Project Footprint



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID: 185_f1_sitelocation.mxd DATE: 06-Dec-2013

HORIZONTAL DATUM AND PROJECTION: GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0

Main Roads Western Australia

Tonkin Highway Grade Separation

Figure 1 - Site Location

AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
 LOCALITY MAP SOURCED FROM LANDGATE 2006
 STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
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1.2' Background to the Protection of Flora, Vegetation and Fauna

Flora and fauna is protected formally and informally by various legislative and non-legislative measures, which are as follows:

Legislative protection:

- Á *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Á *Wildlife Conservation Act 1950* (WC Act);
- Á *Environmental Protection Act 1986* (EP Act); and
- Á *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Non-legislative protection:

- Á Western Australian Department of Parks and Wildlife (DPaW) Priority lists for flora, vegetation and fauna;
- Á Weeds of National Significance; and
- Á Recognition of locally significant populations by the DPaW.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix A. Conservation categories for ecological communities are provided in Appendix B.

1.2.1' EPBC Act

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of the Environment (DotE) lists threatened species and communities in categories determined by criteria set out in the Act (www.environment.gov.au/epbc/index.html) (Appendix A and Appendix B).

Projects likely to cause a significant impact on MNES should be referred to DotE for assessment under the EPBC Act.

1.2.2' WC Act

The Western Australian DPaW lists flora and fauna under the provisions of the WC Act as protected according to their need for protection (Appendix A).

Flora is given Declared Rare status when populations are geographically restricted or are threatened by local processes. In addition, under the WC Act, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) is protected throughout the State. Fauna are classified as Schedule 1 to Schedule 4 according to their need for protection.

1.2.3 EP Act

Declared Rare Flora (DRF) and TECs are given special consideration in environmental impact assessments, and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is a clearing principle and assessed during consideration of applications for a NVCP.

1.2.4 BAM Act

Plants may be 'Declared' by the Agriculture Protection Board (APB) under the BAM Act 2007 (WA). Declared Plants are gazetted under three categories (C1-C3), which define the action required. Details of the definitions of these categories are provided in Appendix C. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties (Department of Agriculture and Food Western Australia [DAFWA] 2013).

The Environmental Weed Strategy for Western Australia (EWSWA) (Department of Conservation and Land Management [CALM] 1999) contains criteria for the assessment and ranking of weeds in terms of their environmental impacts, invasiveness and distribution. The Strategy defines environmental weeds as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.'

The DPaW Invasive Plant Prioritization (IPP) Process (DPaW 2013a) was developed to progress the EWSWA (CALM 1999). The prioritisation process focuses on a 'species-led' and 'site-led' approach to set priorities for weed management on DPaW managed lands for each DPaW region of WA. The IPP process is also developed to assist other landholders in their management of weeds.

1.2.5 Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 Weeds of National Significance (WONS). Four major criteria were used in determining WONS:

- The invasiveness of a weed species;
- A weed's impacts;
- The potential for spread of a weed; and
- Socio-economic and environmental values.

Each WONS has a national strategy and a national coordinator, responsible for implementing the strategy. WONS are regarded as the worst weeds in Australia because

of their invasiveness, potential for spread, and economic and environmental impacts (Commonwealth of Australia 2013).

1.2.6' DPaW Priority Lists

The DPaW lists 'Priority' flora and fauna that have not been assigned statutory protection as Declared Rare or 'Scheduled' under the WC Act, but which are under consideration for declaration as DRF or 'Scheduled' fauna.

Flora and fauna assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora and fauna require monitoring every 5-10 years and Priority 5 flora and fauna are subject to a specific conservation program (Appendix A).

The DPaW maintains a list of PECs which identifies ecologically valuable communities that need further investigation before possible nomination for TEC status.

Once listed, a community is a PEC, and when endorsed by the Western Australian Minister of Environment becomes a TEC, and protected as an ESA under *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Appendix B).

1.2.7' Informal Recognition of Flora and Fauna

Certain populations or communities of flora may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, changed fire regimes), and relict populations of such species assume local importance for the DPaW. It is not uncommon for the DPaW to make comment on these species of interest.

2 Biophysical Environment

2.1 Climate

The closest official Bureau of Meteorology (BoM) weather station currently operating is Perth Airport approximately 4 km south of the survey area. The climate is classified as Warm Mediterranean, with mean minima ranging approximately from 8 °C to 17.5°C and maxima from approximately 17.9°C to 31.9°C. Rainfall totals approximately 733.7 mm per annum (BoM 2013).

Perth Airport recorded 788 mm of rain in the 12 months prior to survey (October 2012 – September 2013), 12.5 mm above the long term average rainfall of 775.5 mm for the same period (BoM 2013). The three months prior to survey (July 2013 – September 2013), Perth Airport recorded 452.2 mm of rainfall, 30% above the 348 mm average rainfall for the same period (BoM 2013).

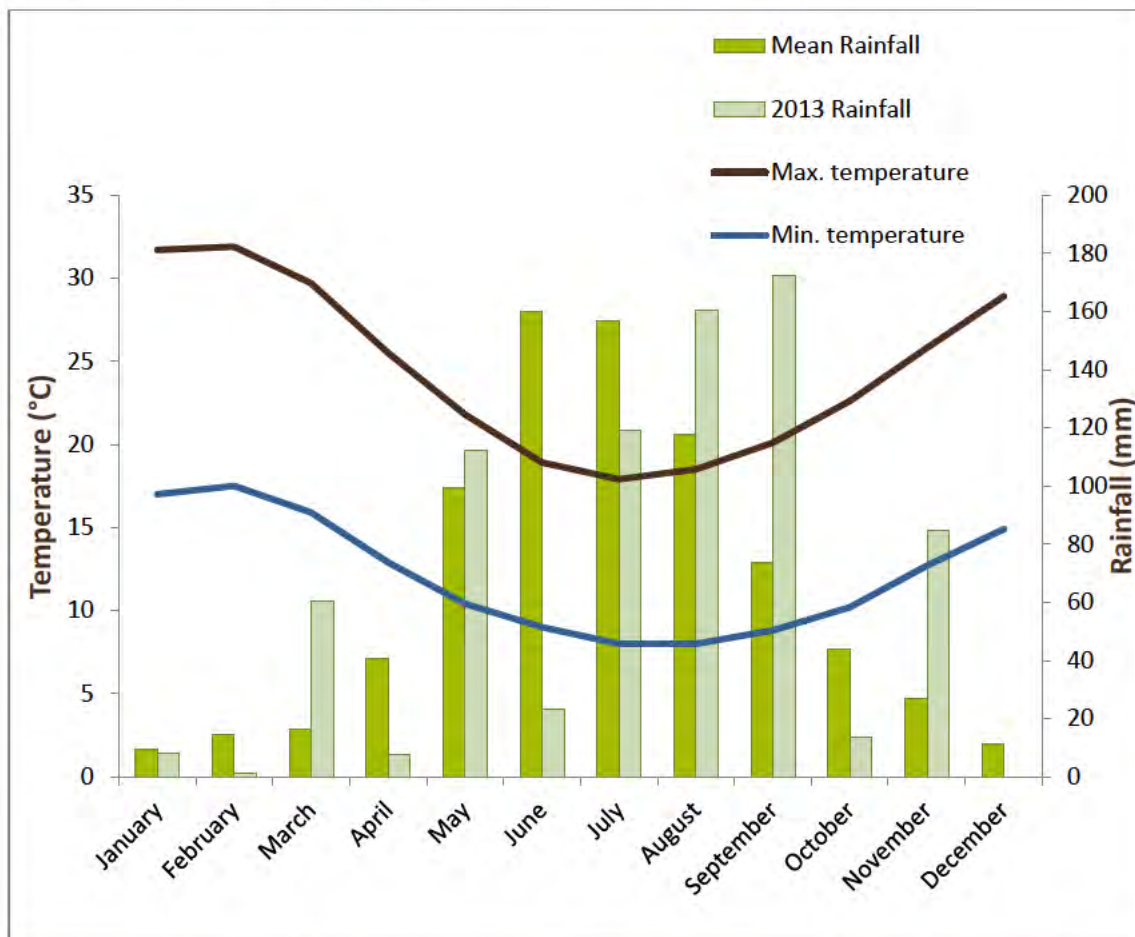


Figure 2: 2013 Rainfall, Mean Rainfall and Temperature for Perth Airport Recorded Between 1944 and 2013 (BoM 2013)

2.2 Geology and Soils

The surface geology at the site is described as Bassendean sand comprising of sand and gravel (DoW 2013b, Gozzard 1986). Aeolian deposits consist of:

- Southern River - sandplain with low dunes and may intervening swamps, iron and humus podzols, peats and clays; and
- Bassendean - sand plains with low dunes and occasional swamps, iron or humus podzols and areas of complex steep dunes.

2.3 Landforms and Hydrology

The DoW Perth Groundwater Atlas indicates the topography is relatively flat, ranging between approximately 15 to 40 m Australian Height Datum (AHD) (DoW 2013a). Elevation gently slopes downwards from North to South with the highest elevation point occurring in the North West and the lowest elevation lowest point in the South West of the survey area. The gradient across the broader area slopes very gently from East to West with a total variation of approximately one to two metres.

No Rivers or watercourses run through the site (DoW 2013a).

2.4 Wetlands

A search of the DotE Protected Matters Search Tool determined that there were no Ramsar wetlands or Nationally Important wetlands on the site (DotE 2013).

Wetlands of the Swan Coastal Plain have been described and mapped by Hill *et al.* (1996) and assigned a management category which reflects their condition and environmental value. There are three categories that wetlands are assigned, 'Conservation Category' (CCW), 'Resource Enhancement' (REW) and 'Multiple Use' (MUW) depending on their condition and environmental values. CCWs are those with the highest level of ecological attributes and functions, followed by REWs then MUWs.

No CCW or REW are located with the survey area. Three MUWs occur on the site (DPaW 2013b) (Figure 3), this category is considered to have few remaining important wetland attributes and functions. MUWs typically do not require specific management measures to maintain their function, although groundwater management is generally required.

2.5 Biogeographic Regionalisation for Australia

The Biogeographic Regionalisation of Australia (IBRA) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (DotE 2013).

The survey area lies within the Swan Coastal Plain Bioregion and Perth subregion (SWA2) of the Interim Biogeographic Regionalisation of Australia (IBRA). The Perth subregion is a low lying coastal plain composed of colluvial and Aeolian sands, alluvial river flats and coastal limestone rising to duricrusted Mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on out-wash plains, and paperbark (*Melaleuca* spp.) in wetland areas (Mitchell *et al* 2002).

2.6 Broad Vegetation Types

Mapping of the vegetation of the Perth region of Western Australia was completed on a broad scale (1:250,000) by Beard (1978). These vegetation units were re-assessed by Shepherd *et al.* (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

There is only one Beard / Shepherd vegetation unit in the survey area. The Shepherd *et al.* (2001) vegetation type (corresponding Beard [1978] type in brackets) is described below, and it's representation within the survey area, subregion, region and state is shown in Table 1:

- Á 1001 (e2Mb cbLi) Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina

Mapping by Heddle *et al.* (1980) identified two vegetation complexes occurring in the survey area:

- Á Bassendean Complex Central and South; and
- Á Southern River Complex.

The Bassendean Complex Central and Bassendean Complex South were estimated to have 27% native vegetation remaining based on the pre-European extent with 0.7% in secure tenure (EPA 2006). More recently the Perth Biodiversity Project (PBP 2013) has mapped native vegetation extent by vegetation complex on the Swan Coastal Plain. It is estimated that 27.7% of Bassendean Complex Central and South remains compared to its pre-European extent with 0.79% in formal protection (PBP 2013).

The Southern River Complex was estimated to have 19.8% native vegetation remaining based on the pre-European extent with 1.5% in secure tenure (EPA 2006). More recently the Perth Biodiversity Project (PBP 2013) has mapped native vegetation extent by vegetation complex on the Swan Coastal Plain. It is estimated that 19.69% of Southern River Complex remains compared to its pre-European extent with 1.31% in formal protection (PBP 2013).

The EPA recognises vegetation complexes that are not well represented in reserves as being significant. Vegetation complexes which have 10%-30% remaining may be considered regionally significant. Proposals that would affect a vegetation complex with 10% or less remaining are likely to be formally assessed by the EPA (EPA 2006).

Table 1: Broad Vegetation Types within the Survey Area their State and Regional Representation (Government of Western Australia 2013)

VEGETATION TYPE	PRE-EUROPEAN AREA (HA)	CURRENT EXTENT REMAINING (HA)	CURRENT EXTENT REMAINING (%)	CURRENT EXTENT % IN IUCN CLASS I-IV RESERVES	EPA CLEARING THRESHOLD LEVEL
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in WA					
1001	57,410.23	14,151.90	24.65	1.14	Below 30% threshold
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in the Swan Coastal Bioregion					
1001	57,410.23	14,151.90	24.65	1.14	Below 30% threshold
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in the Perth Subregion					
1001	57,410.23	14,151.90	24.65	1.14	Below 30% threshold

3 Methods

3.1 General

The flora survey was consistent with a single season Level 1 survey as per the EPA requirements for environmental surveying and reporting for flora and vegetation in Western Australia, as set out in the following documents:

- EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51 (EPA 2004a); and
- EPA Guidance for the Level of Assessment for Proposals affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 region. Guidance Statement No. 10 (EPA 2006).

The fauna survey was compliant with the EPA requirements for the environmental survey and reporting of fauna in Western Australia, as set out in the following documents:

- Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3 (EPA 2002);
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56 (EPA 2004b); and
- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010).

3.2 Flora and Vegetation Survey Methods

3.2.1 Flora and Vegetation Database Review

The desktop study provided background information on the flora and vegetation of the survey area. Searches of the DPaW DRF and Priority Flora databases and DotE EPBC Protected Matters Search Tool were undertaken to identify the potential for MNES, DRF, Priority species, TECs or PECs to occur within 2 km of the central point of the survey area (DPaW 2013c, DPaW 2013d and DotE 2013). These sources were used to compile a list of expected Threatened or Priority species and TECs or PECs that may occur in the survey area.

3.2.2 Flora and Vegetation Field Survey

The field survey was undertaken during two site visits on 21 September 2013 and 1 October 2013, with a total of two person-days invested in the field survey.

The survey included the assessment of relevés and mapping notes. Relevés are unbounded vegetation survey plots with information recorded at each relevé including

landscape features, surface soil colour and texture, bare ground, litter cover, disturbance, fire age, aspect and vegetation condition. Each species of dominant plant at each relevé was recorded, including information on height and percentage cover.

3.2.3 Systematic Searches

In addition to the information collected from the relevés, traverses targeting significant flora were undertaken. For each population of significant flora identified during the field survey, the following was recorded:

- Á Co-ordinate locations (using handheld GPS units);
- Á Description of vegetation association present; and
- Á Estimation of population size.

3.2.4 Taxonomy and Nomenclature

Where field identification of plant taxa was not possible, specimens were collected systematically for later identification utilising resources of the Western Australian Herbarium (WAH).

The species list was checked against FloraBase (WAH 2013) to determine the species' conservation status. Threatened and Priority Flora were verified against the EPBC Act listing of threatened species to determine Commonwealth listing.

Introduced species were checked against the DPaW Invasive Plant Prioritisation Process – Swan Weed Assessment List (DEC 2009), to determine their ranking in terms of environmental impact. The BAM Act Declared Plants list was consulted to determine if any are Declared Plants, and the Weeds of National Significance list to determine any WONS (Australian Weeds Committee 2012).

3.2.5 Vegetation Mapping

The vegetation mapping units were described based on their structure and species composition, as defined by relevé data and field observations. Vegetation was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:3,402 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1).

Vegetation condition was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:10,000 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1). Vegetation condition was assessed based on Bush Forever (Government of Western Australia 2000a) (Appendix D).

3.3 Fauna Survey Methods

3.3.1 Fauna Database Review

Searches of the DotE EPBC Protected Matters Search Tool and DPaW's threatened fauna database were undertaken to identify fauna species of conservation significance

potentially occurring within two kilometres of the site respectively (DotE 2013; DPaW 2013e).

Collectively, these sources were used to compile a list of species that have been previously recorded in the vicinity of the survey area (Appendix E). This list invariably includes some species that do not occur in the survey area, as some fauna have a limited or patchy distribution or a high level of habitat specificity for habitats which are not located in the survey area. Some fauna may also have become locally extinct or were erroneously identified in previous surveys. These fauna were examined and excluded from the list where relevant.

3.3.2 Field Survey

The field survey was undertaken during two site visits on 21 September 2013 and 1 October 2013, with a total of two person-days invested in the field survey.

The purpose of the field survey was to verify the accuracy of the desktop survey and to further delineate and characterise the fauna and faunal assemblages in the survey area. The fauna field survey consisted of a fauna habitat assessment and opportunistic observations.

Broad fauna habitats based on vegetation structure and landforms were identified during the field survey. These fauna habitats were then assessed for their potential to support species of conservation significance and the quality of habitat they provide to a wider suite of fauna.

Fauna were opportunistically observed and recorded during the foot traverse of site. Field staff investigated scats, tracks, burrows and other traces of animals throughout the entire survey area. Where conservation significant species were located, the coordinates were recorded by GPS.

3.3.3 Taxonomy

For species identified in the desktop assessment, where there is doubt to their true taxonomy (through subsequent name changes or taxonomic reviews), an effort was made to determine the current scientific name for each taxon. In some cases, old scientific names may be presented where correct nomenclature could not be determined due to name changes. Some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt. Where there are previously recorded taxa such as this that have the potential to be a conservation significant species, they are discussed specifically in the results and discussion section.

4 Results

4.1 Flora, Vegetation and Fauna Survey Limitations and Constraints

It is important to note the specific constraints imposed on surveys. Constraints are often difficult to predict, as is the extent to which they influence survey effort. Survey constraints of the Flora, Vegetation and Fauna Survey are detailed in Table 2.

Table 2: Limitations and Constraints Associated with the Survey Area

VARIABLE	IMPACT ON SURVEY OUTCOMES
Access	The majority of the site was accessed and traversed. Access to a small section of the survey area was fenced off and inaccessible at the northern end of the survey area (figure 4).
Experience	The personnel who executed these surveys were practitioners suitably qualified in their respective fields: <ul style="list-style-type: none"> •Á Coordinating Botanist: Narelle Whittington (Principle Botanist); •Á Field Staff: Narelle Whittington and Hayden Ajduk (Ecologist); and •Á Data Interpretation and Reporting: Hayden Ajduk
Timing, weather, season.	The survey was conducted during spring after three months of above average rainfall (refer to Section 2.1). Above average rain also occurred in the month just prior to the survey therefore, the seasonal conditions for the survey could be considered adequate. Flora composition changes with time, particularly over the seasons and with seasonal conditions. Fire history also affects the composition of flora. Therefore, botanical surveys completed at different times will have varying results.
Scope: Life forms sampled	The scope of this project included the low level sampling of flora and vegetation and searching for conservation significant species or communities. As a Level 1 Fauna survey was carried out, many species that occur at the site would not have been observed during the survey, particularly small ground-dwelling fauna that are normally found by trapping. All conservation significant

	species previously recorded in the area have been considered. Based on the habitat present, those species deemed to potentially occur in the survey area have been addressed in this report.
Sources of information	The Swan Coastal Plain bioregion has been extensively surveyed; as a result, numerous published and unpublished flora surveys have been undertaken in the area. Relevant DPaW searches were undertaken for the survey area and are listed in sections 3.2.1 and 3.3.1
Completeness	The majority of the survey area was accessible; the time spent conducting the survey was considered adequate. All vegetation associations were sufficiently surveyed; with nine relevés and additional vegetation mapping notes recorded.
Disturbances	The survey area contains a high level of disturbance mainly due to the close proximity to Tonkin Highway, historical clearing, presence of weed species and cleared areas such as tracks.

4.2 Flora Results

4.2.1 Overview of Flora

A total of 102 taxa (including species, subspecies, varieties and forms) from 82 genera and 34 families were recorded in the survey area. The commonly occurring families were; Myrtaceae (25 taxa), Fabaceae (15 taxa), and Poaceae (seven taxa). The most frequently recorded genera were; *Eucalyptus* (six taxa), *Acacia* (five taxa), *Melaleuca* and *Caladenia* (three taxa each). A flora inventory is provided in Appendix F and site data sheets in Appendix G.

4.2.2 Flora of Conservation Significance

No Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the WC Act were recorded during the survey. No Priority species as listed by DPaW were recorded during the survey.

The review of the DPaW database and EPBC searches identified 31 DRF and Priority flora previously recorded in the vicinity of the survey area. This includes 16 taxa listed as DRF and 15 taxa listed as Priority flora by DPaW. Seventeen of the 31 taxa are also listed under the EPBC Act.

The likelihood of these 31 conservation significant taxa occurring in the survey area is shown in Table 3. Two are considered 'Likely' to occur within the survey area and the remaining 29 taxa are 'Unlikely' to occur.

Species with suitable habitat and known from records within five kilometres of the survey area are considered likely to occur whilst species with no suitable habitat in the survey area or known from records greater than five kilometres away are considered unlikely to occur.

One species *Epiblema grandiflorum* var. *cyaneum* is more recently known as *Epiblema grandiflorum*. This taxon is not listed under the WC Act or as a Priority species.

Table 3: Assessment of the likely occurrence of DRF and Priority Flora (as per EPBC and DPaW Database Searches) in the Survey Area

CONSERVATION STATUS ¹	SPECIES	HABITAT INFORMATION (WAH 2013)	SUITABLE HABITAT	CLOSEST RECORD ²	LIKELIHOOD
DRF/Threatened	<i>Caladenia huegelii</i>	Grey or brown sand, clay loam	Yes	<1 km	Likely
DRF/Threatened	<i>Conospermum undulatum</i>	Grey or yellow-orange clayey sand	Yes	<5 km	Likely
DRF/Threatened	<i>Andersonia gracilis</i>	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps	No	>10 km	Unlikely
DRF/Threatened	<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	Grey sand, clay loam. Winter-wet depressions	No	>80 km	Unlikely
DRF/Threatened	<i>Calytrix breviseta</i> subsp. <i>breviseta</i>	Sandy clay. Swampy flats	No	>8 km	Unlikely
P4/Threatened	<i>Centrolepis caespitosa</i>	White sand, clay. Salt flats, wet areas	No	>18 km	Unlikely
DRF/Threatened	<i>Darwinia foetida</i>	Unavailable	-	>25 km	Unlikely
DRF/Threatened	<i>Diuris micrantha</i>	Brown loamy clay. Winter-wet swamps, in shallow water	No	>25 km	Unlikely
DRF/Threatened	<i>Diuris purdiei</i>	Grey-black sand, moist. Winter-wet swamps	No	>10 km	Unlikely
DRF/Threatened	<i>Drakaea elastica</i>	White or grey sand. Low-lying situations adjoining winter-wet swamps	No	>17 km	Unlikely
DRF/Threatened	<i>Drakaea micrantha</i>	White-grey sand	Yes	>17 km	Unlikely
DRF/Threatened	<i>Epiblema grandiflorum</i> var. <i>cyaneum</i>	This taxon is more currently known now as <i>Epiblema grandiflorum</i> (WAH2012). This taxon is not listed under the WC Act or as a Priority	-	-	-

		species			
DRF/Threatened	<i>Grevillea curviloba</i> subsp. <i>incurva</i>	Winter-wet heath	No	> 15 km	Unlikely
DRF/Threatened	<i>Lepidosperma rostratum</i>	Peaty sand, clay	No	> 12 km	Unlikely
DRF/Threatened	<i>Thelymitra dedmaniarum</i> (<i>Thelymitra manginii</i> K.Dixon & Batty ms.)	Granite	No	> 15 km	Unlikely
DRF/Threatened	<i>Thelymitra stellata</i>	Sand, gravel, lateritic loam	No	> 8 km	Unlikely
DRF/Threatened	<i>Ornduffia calthifolia</i> (<i>Villarsia calthifolia</i>)	N/A	No	> 300 km	Unlikely
P1	<i>Anthotium</i> sp. Darling Range (F. Hort & B. Hort 2431)	Yellow, grey or brown clayey sand, loam. Slopes, low plains, drainage lines of swampy flats	Yes	> 40 km	Unlikely
P1	<i>Bolboschoenus medianus</i>	Mud. In water and on river banks	No	< 4 km	Unlikely
P1	<i>Carex tereticaulis</i>	Black peaty sand	No	< 5 km	Unlikely
P1	<i>Dampiera triloba</i>	N/A	-	< 3 km	Unlikely
P1	<i>Hydrocotyle striata</i>	Clay. Springs	No	< 6 km	Unlikely
P2	<i>Acacia benthamii</i>	Sand, typically on limestone breakaways	No	< 4 km	Unlikely
P3	<i>Byblis gigantea</i>	Sandy-peat swamps. Seasonally wet areas	No	< 6 km	Unlikely
P3	<i>Cyathochaeta teretifolia</i>	Grey sand, sandy clay. Swamps, creek edges	No	< 1 km	Unlikely
P3	<i>Isopogon drummondii</i>	White, grey or yellow sand, often over laterite	No	< 3 km	Unlikely

P3	<i>Meionectes tenuifolia</i>	N/A	-	<5 km	Unlikely
P4	<i>Drosera occidentalis</i> subsp. <i>occidentalis</i>	Sandy & clayey soils. Swamps & wet depressions	No	<12 km	Unlikely
P4	<i>Hydrocotyle lemnoides</i>	Swamps	No	> 5 km	Unlikely
P4	<i>Jacksonia sericea</i>	Calcareous & sandy soils	No	> 1 km	Unlikely
P4	<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	Sand, sandy clay. Winter-wet depressions	No	> 4 km	Unlikely

¹Threatened Species are listed under EPBC Act 1999/DRF are listed under the WC act 1950

²Closest record to survey area based on NatureMap search (DPaW 2013f)

4.2.3 Introduced Flora

Twenty five introduced species were recorded during the survey. Their rating against the ecological impact and invasiveness criteria of the DPaW IPP Process (DEC 2009), is presented in Table 4.

None of these species are registered as WONS. One of these species, **Zantedeschia aethiopica* is listed as Declared Plants under the Biosecurity and Agriculture Management Act 2007 (BAM Act). The locations of **Zantedeschia aethiopica* are presented in Figure 5.

Table 4: Introduced Flora Recorded in the Survey Area, Including Their Criteria under the DPaW Invasive Plant Prioritization Process (DEC 2009)

TAXON	CRITERIA (DEC 2009)		
	ECOLOGICAL IMPACT	INVASIVENESS	FEASIBILITY OF CONTROL
<i>*Acacia iteaphylla</i>	Unknown	Rapid	High
<i>*Arctotheca calendula</i>	Medium	Moderate	Low
<i>*Avena barbata</i>	High	High	High
<i>*Briza maxima</i>	Unknown	Rapid	Low
<i>*Chamaecytisus palmensis</i>	Medium	Moderate	Medium
<i>*Cortaderia selloana</i>	High	Rapid	High
<i>*Cynodon dactylon</i>	High	Rapid	Medium
<i>*Ehrharta calycina</i>	Unknown	Moderate	Medium
<i>*Euphorbia terracina</i>	High	Rapid	Medium
<i>*Foeniculum vulgare</i>	Low	Moderate	Unknown
<i>*Fumaria capreolata</i>	High	Rapid	Low
<i>*Gladiolus caryophyllaceus</i>	High	Rapid	Medium
<i>*Hypochaeris glabra</i>	High	Rapid	Low
<i>*Ipomoea indica</i>	High	Moderate	High
<i>*Lagurus ovatus</i>	High	Rapid	Low
<i>*Leptospermum laevigatum</i>	High	Rapid	High
<i>*Lupinus cosentinii</i>	High	Moderate	High
<i>*Oxalis pes-caprae</i>	High	Slow	High
<i>*Schinus terebinthifolius</i>	High	Medium	Medium
<i>*Solanum nigrum</i>	Medium	Rapid	Low
<i>*Sonchus oleraceus</i>	Medium	Rapid	Low
<i>*Trifolium campestre</i>	Unknown	Unknown	Medium
<i>*Typha orientalis</i>	High	Rapid	Low
<i>*Ursinia anthemoides</i>	Unknown	Rapid	Unknown
<i>*Zantedeschia aethiopica</i>	High	Moderate	Low

4.2.4 Vegetation Mapping Units

A total of 51 mapping units were identified in the survey area (Figure 4). The extent of each unit is presented in Table 5.

The vegetation along the route is extremely fragmented and the majority of the vegetation consists of non-endemic species that have been used to revegetate the road verges. In some areas there are mature endemic trees however these are either over non-endemic shrub species or weeds. The term non-endemic has been used for species that are native to Western Australia however, are not within their natural range or typical habitat and in most cases have been planted.

Due to the fragmentation and lack of naturally occurring vegetation communities, all vegetated attributes were mapped, inclusive of isolated trees/shrubs, parkland trees and monocultures. This allows for an accurate and detailed representation of the survey area.

Table 5: Vegetation Mapping units and their Extent in the Survey Area

MAP REFERENCE VEGETATION CODE	VEGETATION MAPPING UNITS	EXTENT IN SURVEY AREA (HA)	REHABILITATION/ PLANTED VS NATURALLY OCCURRING
BaAc (THR3)	Open low woodland of <i>Banksia attenuata</i> and <i>Corymbia calophylla</i> over <i>Adenanthos cygnorum</i> and <i>Acacia pulchella</i>	2.4	Naturally Occurring
MpRc (THR4&7)	Low open forest of <i>Melaleuca preissiana</i> over <i>Acacia pulchella</i> , <i>Astartea</i> sp., <i>Regelia ciliata</i> , <i>Hypocalymma angustifolium</i> , <i>Hakea varia</i> and <i>Baumea juncea</i>	0.35	Naturally Occurring
MpKg (THR9)	<i>Melaleuca preissiana</i> over <i>Kunzea glabrescens</i> and weeds	1.41	Naturally Occurring
AcMn	<i>Adenanthos cygnorum</i> , <i>Melaleuca nesophila</i> , <i>Jacksonia furcellata</i> , <i>Calothamnus quadrifidus</i> and <i>Chamelaucium uncinatum</i>	0.86	Rehabilitated/ Planted
Mp	<i>Melaleuca preissiana</i>	0.09	Naturally Occurring
AfICq	<i>Agonis flexuosa</i> over <i>Calothamnus quadrifidus</i> and <i>Chamelaucium uncinatum</i>	0.39	Rehabilitated/ Planted
CcXp	<i>Corymbia calophylla</i> over <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> , <i>Stirlingia latifolia</i> , <i>Calothamnus quadrifidus</i> , <i>Mesomelaena pseudostygia</i> , <i>Philotheca</i>	0.17	Naturally Occurring

	<i>spicata</i> and <i>Hybanthus calycinus</i>		
Eg	<i>Eucalyptus gomphocephala</i>	0.21	Naturally Occurring
EtEm	<i>Eucalyptus todtiana</i> , <i>E. marginata</i> , <i>E. gomphocephala</i> , <i>Banksia menziesii</i> over <i>Xanthorrhoea preissii</i> , <i>Adenanthos cygnorum</i> and <i>Hypocalymma angustifolium</i>	0.73	Naturally Occurring
Afl	<i>Agonis flexuosa</i>	0.08	Rehabilitated/ Planted
EmAf	<i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia menziesii</i> and <i>Corymbia calophylla</i> over <i>Hibbertia hypericoides</i> , <i>Acacia pulchella</i> , <i>Xanthorrhoea preissii</i> and <i>Jacksonia furcellata</i>	0.75	Naturally Occurring
EcMn (THR1)	<i>Eucalyptus camaldulensis</i> subsp. <i>camaldulensis</i> over <i>Melaleuca nesophila</i> , <i>Acacia iteaphylla</i> , * <i>Chamaecytisus palmensis</i> over grass weeds	2.27	Rehabilitated/ Planted
Ec (THR2)	<i>Eucalyptus camaldulensis</i> subsp. <i>camaldulensis</i> over weeds	1.69	Rehabilitated/ Planted
KgMh	Planted <i>Kunzea glabrescens</i> and <i>Melaleuca huegelii</i>	0.29	Rehabilitated/ Planted
As	<i>Acacia saligna</i>	0.42	Rehabilitated/ Planted
Cc	<i>Corymbia calophylla</i> over weeds	3.92	Naturally Occurring
CcBm	<i>Corymbia calophylla</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> , <i>Acacia saligna</i> over weeds	1.21	Naturally Occurring
Ar	<i>Acacia rostelifera</i>	0.06	Rehabilitated/ Planted
KgCu	Planted <i>Kunzea glabrescens</i> and <i>Chamelaucium uncinatum</i>	0.26	Rehabilitated/ Planted
CcBa	<i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> , <i>Agonis</i>	1.25	Naturally Occurring and Rehabilitated/

	<i>flexuous</i> with Non-endemic trees		Planted
BaBm (THR5, 6&8)	<i>Banksia attenuata</i> , <i>Banksia menziesii</i> over <i>Jacksonia floribunda</i> , <i>Calytrix flavescens</i> , <i>Allocasuarina humilis</i> , <i>Adenanthos cygnorum</i> and <i>Stirlingia latifolia</i>	1.79	Naturally Occurring
BaSl	<i>Banksia attenuata</i> , <i>Banksia menziesii</i> over <i>Stirlingia latifolia</i> and <i>Conostylis setigera</i>	0.32	Naturally Occurring
AfNf	<i>Allocasuarina fraseriana</i> , <i>Corymbia calophylla</i> , <i>Nuytsia floribunda</i> , <i>Banksia ilicifolia</i> , <i>Eucalyptus todtiana</i> over <i>Adenanthos cygnorum</i>	0.34	Naturally Occurring
XpCq	<i>Xanthorrhoea preissii</i> , <i>Calothamnus quadrifidus</i> , <i>Calytrix flavescens</i> and <i>Chamelaucium uncinatum</i>	0.30	Naturally Occurring
CcAh	<i>Corymbia calophylla</i> over <i>Allocasuarina humilis</i> , <i>Melaleuca huegelii</i> and <i>Chamelaucium uncinatum</i>	0.55	Naturally Occurring and Rehabilitated/ Planted
EmJf	<i>Eucalyptus marginata</i> , <i>Banksia attenuata</i> , <i>Corymbia calophylla</i> over <i>Jacksonia furcellata</i> , <i>Xanthorrhoea preissii</i> , <i>Hardenbergia comptoniana</i> and <i>Calothamnus quadrifidus</i> .	0.47	Naturally Occurring
Er	<i>Eucalyptus rudis</i>	0.42	Rehabilitated/ Planted
Gn	Garden	0.26	N/A
CcAfl	<i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> over <i>Acacia saligna</i>	0.57	Rehabilitated/ Planted
MpCc	<i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> over <i>Xanthorrhoea preissii</i> , <i>Hypocalymma angustifolium</i> , <i>Astartea</i> sp., <i>Hibbertia hypericoides</i> , <i>Hakea varia</i> and <i>Hardenbergia comptoniana</i>	0.22	Naturally Occurring
St	<i>Schinus terebinthifolius</i>	0.11	N/A
CcAs	<i>Corymbia calophylla</i> over <i>Acacia saligna</i>	0.16	Naturally Occurring and

			Rehabilitated/ Planted
CcKg	<i>Corymbia calophylla</i> , <i>Agonis flexuosa</i> and <i>Banksia menziesii</i> over <i>Kunzea glabrescens</i>	0.59	Rehabilitated/ Planted (some remnant trees)
MnCu	<i>Melaleuca nesophila</i> and <i>Chamelaucium uncinatum</i>	1.35	Rehabilitated/ Planted
BgCc	<i>Banksia grandis</i> and <i>Corymbia calophylla</i>	0.46	Naturally Occurring
MpBg	<i>Melaleuca preissiana</i> , <i>Banksia grandis</i> , <i>Corymbia calophylla</i> and <i>Banksia prionotes</i> over <i>Regelia ciliata</i> , <i>Hypocalymma angustifolium</i> and <i>Xanthorrhoea preissii</i>	0.41	Naturally Occurring
EtEr	<i>Eucalyptus todtiana</i> and <i>Eucalyptus rudis</i> over <i>Calothamnus quadrifidus</i> and non-endemic <i>Eucalyptus</i>	0.83	Rehabilitated/ Planted (some remnant trees)
MpEr	<i>Melaleuca preissiana</i> and <i>Eucalyptus rudis</i>	0.28	Naturally Occurring
Ah	<i>Allocasuarina humilis</i> over weeds	0.31	Naturally Occurring
AcJf	<i>Adenanthos cygnorum</i> , <i>Jacksonia floribunda</i> , <i>Daviesia divaricata</i> , <i>Scholtzia involucrata</i> and <i>Conostylis aculeata</i>	1.57	Naturally Occurring
AcLi	<i>Adenanthos cygnorum</i> , <i>Leptospermum laevigatum</i> , <i>Chamelaucium uncinatum</i> and * <i>Chamaecytisus palmensis</i>	0.65	Rehabilitated/ Planted
NE	Non-endemic species (Native to WA but not to the site)	7.02	Rehabilitated/ Planted
Kg	<i>Kunzea glabrescens</i>	1.15	Rehabilitated/ Planted
KgCq	<i>Kunzea glabrescens</i> and <i>Calothamnus quadrifidus</i>	2.13	Rehabilitated/ Planted
OW	Open water	0.44	N/A
Non Mapped Areas		57.9	

4.2.5 Vegetation Condition

Vegetation condition ranged from Completely Degraded to Excellent (Figure 5). Historical vegetation clearing, weeds, road infrastructure and the presence of unsealed roads within and adjacent to the survey area were the most frequently observed impacts on native vegetation.

The vegetation along the length of the route is extremely fragmented and the majority of the site consists of non-endemic species that have been planted in revegetation projects along the road verges. All mapping units that are of non-endemic species have been given a Completely Degraded condition rating as they are not naturally occurring vegetation communities and therefore cannot be given a higher rating according to the condition scale. This accounts for the high percentage of area that has been mapped as Completely Degraded.

The extent of each vegetation condition rating and corresponding vegetation association is present in Table 6

Table 6: Vegetation Condition Recorded in the Survey Area

VEGETATION CONDITION	AREA (HA)	PROPORTION OF SURVEY AREA (%)
Excellent	1	1.0
Very Good	0.5	0.5
Good	3.9	4.0
Good to Degraded	1	1.0
Degraded	15.6	15.5
Completely Degraded	76.2	78

4.2.6 Vegetation of Conservation Significance

The review of the DPaW TEC and PEC database searches identified the following TECs and PECs occurring in the surrounding area;

- Á *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (Endangered);
- Á *Banksia attenuata* woodland over species rich dense shrublands (Endangered);
- Á Herb rich saline shrublands in clay pans (Vulnerable);
- Á Low lying *Banksia attenuata* woodlands or shrubland (Priority 3); and
- Á *Banksia ilicifolia* woodlands (Priority 3).

Banksia dominated woodlands of the Swan Coastal Plain IBRA region are listed as Priority 3 communities. The main feature of these *Banksia* woodlands is the presence of

Banksia attenuata and/or *B. menziesii* occurring on deep sands. The mapping unit BaBm is considered to represent this community. The remaining mapping units are not likely to represent any PECs or TECs due to their highly altered state and Degraded condition.

4.2.7 Wetlands

No CCWs or REWs occur onsite, according to DPaW (2013) mapping.

Three MUWs occur on the site (DPaW 2013d) (Figure 3), this category is considered to have few remaining important wetland attributes and functions. MUWs typically do not require specific management measures to maintain their function, although groundwater management is generally required.

4.2.8 Regional Representation

Vegetation mapping units described in the survey area were correlated with the Beard (1975) and Shepherd et al. (2001) broad vegetation types as much as possible by examining similarities in vegetation descriptions (Table 7). Differences exist with the terminology used in the descriptions as they are based on different methods of categorising and characterising vegetation types, and the different spatial scale of the analysis (i.e. region vs. local scale).

Only one of the mapping units, BaBm can be correlated with the Beard (1975) and Shepherd et al. (2001) broad vegetation type. The remaining mapping units described during the survey were severely altered and degraded at the time of the survey. As such, they cannot be correlated with the pre-European vegetation types described by Beard (1975) and Shepherd et al. (2001).

Table 7: Representation of Broad Vegetation Types and Corresponding Vegetation Associations

VEGETATION TYPE AND DESCRIPTION (SHEPHERD <i>ET AL.</i> 2001/BEARD 1975)	CORRESPONDING VEGETATION ASSOCIATION (CURRENT SURVEY)	VEGETATION ASSOCIATION EXTENT IN SURVEY AREA (HA)
1001 (e2Mb cbLi) - Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina	BaBm	1.439

4.3 Fauna Results

4.3.1 Fauna of Conservation Significance

One conservation significant species, the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) listed Vulnerable under the EPBC Act and as Schedule 1 under the WC Act was recorded in the survey area during the survey.

A total of 30 conservation significant species were identified during the desktop review of database searches (Table 8, Appendix E). These comprise two reptile, 18 birds and three mammals. Fifteen of the 30 species are considered as 'Unlikely' to occur within the survey area, eight species are considered as 'Possible' to occur, five species are considered as 'Likely' to occur within the study area and one species was recorded.

The Likelihood of each species is based on the following:

- Á Recorded: Recorded during the field survey or site reconnaissance;
- Á Likely: Suitable habitat is present in the study area and the study area is in the species' known distribution;
- Á Possible: Limited or no suitable habitat is present in study area but is nearby. The species has good dispersal abilities and is known from the general area; and
- Á Unlikely: No suitable habitat is present in study area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however the survey area is outside of the species' known distribution.

Table 8: Conservation Significant Fauna Potentially Occurring in the Survey Area

TAXA	CONSERVATION STATUS	LIKELIHOOD
Reptiles		
Carpet Python (<i>Morelia spilota imbricata</i>)	S4, P4	Possible
Black-striped Snake (<i>Neelaps calonotos</i>)	P3	Possible
Birds		
Australian Black Bittern (<i>Ixobrychus flavicollis australis</i>)	P3	Possible
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	En	Possible
Bar-tailed Godwit	Ma, Mi	Unlikely
Australian Little Bittern (<i>Ixobrychus minutus dubius</i>)	P4	Possible
Grey Plover (<i>Pluvialis squatarola</i>)	IA	Possible
Fork-tailed Swift (<i>Apus pacificus</i>)	Ma, Mi	Possible
Eastern great Egret (<i>Ardea modesta</i>)	Ma, Mi	Likely
Cattle Egret (<i>Ardea ibis</i>)	Ma, Mi	Likely
Peregrine Falcon (<i>Falco peregrinus</i>)	S4	Possible
Bush Stone-curlew (<i>Burhinus grallarius</i>)	P4	Unlikely
Common Sandpiper (<i>Actitis hypoleucos</i>)	Ma, Mi	Unlikely
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	Ma, Mi	Unlikely
Sanderling (<i>Calidris alba</i>)	Ma, Mi	Unlikely

Red Knot (<i>Calidris canutus</i>)	Ma, Mi	Unlikely
Great Knot (<i>Calidris tenuirostris</i>)	Ma, Mi	Unlikely
Curlew Sandpiper (<i>Calidris ferruginea</i>)	Ma, Mi	Unlikely
Red-necked Stint (<i>Calidris ruficollis</i>)	Ma, Mi	Unlikely
Grey Tailed Tattler (<i>Tringa brevipes</i>)	Ma, IA	Unlikely
Common Greenshank (<i>Tringa nebularia</i>)	Ma, Mi	Unlikely
Marsh Sandpiper (<i>Tringa stagnatilis</i>)	Ma, Mi	Unlikely
Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>)	Vu, S1	Recorded
Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>)	Vu, S1	Likely
Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>)	En, S1	Likely
Wood Sandpiper (<i>Tringa glareola</i>)	Ma, Mi	Unlikely
Rainbow Bee-eater (<i>Merops ornatus</i>)	Ma, Mi	Likely
Mammals		
Quenda (<i>Isoodon obesulus fusciventer</i>)	P5	Unlikely
Western Quoll (<i>Dasyurus geoffroyi</i>)	Vu, S1	Unlikely
Water-rat (<i>Hydromys chrysogaster</i>)	P4	Possible

En Listed as Endangered under the *EBPC Act 1999*.

Vu Listed as Vulnerable under the *EBPC Act 1999*.

Mi Listed as Migratory under the *EBPC Act 1999*

Ma Listed as Marine under the *EBPC Act 1999*

S Scheduled under the *WC Act 1950*.

P Listed as Priority by the DPaW

4.3.2 Fauna Assemblages

Fauna previously recorded in the vicinity of the site and fauna recorded in this survey are listed in Appendix E. As a Level 1 survey was conducted, consisting of a site reconnaissance and habitat assessment, a limited number of fauna were recorded during the survey, particularly ground dwelling reptiles and mammals.

4.3.2.1 Recorded Fauna

A total of 23 vertebrate fauna (three reptiles and 20 birds) were recorded during the field survey.

Amphibians

Twelve species of amphibians have been previously recorded in vicinity of the survey area (Appendix E). Common amphibians most likely to occur are the Motorbike Frog (*Litoria moorei*) and Moaning Frog (*Heleioporus eyrei*).

No amphibians were recorded during the fauna assessment.

Reptiles

Fifty five species of reptile have been previously recorded in the vicinity of the survey area (Appendix E). Reptiles likely to be common to the site include the Southwestern Cool Skink (*Acritoscincus trilineatum*), the Two-toed Earless Skink (*Hemiergis quadrilineata*) and the Bobtail (*Tiliqua rugosa rugosa*). Most of these species could utilise the leaf litter for foraging and sheltering.

Three reptile species, Dugite (*Pseudonaja affinis affinis*), *Cryptoblepharus* sp. and Bobtail were recorded during the fauna assessment. These three species are common and widespread on the Swan Coastal Plain (Wilson & Swan 2003).

Birds

One hundred and sixty seven species of birds have been previously recorded in the vicinity of the survey area (Appendix E). Many of these are unlikely to occur at the site, since these records are from a larger area encompassing a wide range of habitats and include rare birds that only occur on a transitory basis. Birds likely to be common to the site include the New Holland Honeyeater (*Phylidonyris novaehollandiae*), Magpie-lark (*Grallina cyanoleuca*) and Australian Raven (*Corvus coronoides*).

Twenty species of bird were recorded during this survey; frequently recorded species included the Pink and Grey Galah (*Eolophus roseicapilla*), Australian Magpie (*Gymnorhina tibicen*) and Australian raven (*Corvus coronoides*).

One species of conservation significance was recorded during the fauna assessment, the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii* subsp. *naso*). The location of which is presented in Figure 6.

Mammals

Twenty five species of mammal have previously been recorded in the vicinity of the survey area (Appendix E). Many of these are unlikely to occur at the site, since these records are from larger areas encompassing a wide range of habitats, and small mammals tend to be habitat-specific.

During the fauna assessment no mammal species were recorded.

4.3.3 Fauna Habitats

Five habitat assessments were undertaken in the survey area (Appendix H) the locations of which are shown in Figure 6. The survey area contains five habitat types:

- Á Scattered trees/woodlands;
- Á Eucalyptus/Banksia Woodland;
- Á Shrublands;
- Á Constructed Wetlands; and
- Á Damplands.

Completely Degraded areas were not assessed for fauna habitat. A summary of the total area of each habitat is presented in Table 9.

Table 9: Summary of Fauna Habitats

HABITAT TYPE	AREA (HA)
Scattered trees/woodlands	17.13
Eucalyptus/Banksia Woodland	11.53
Shrublands	10.14
Constructed Wetlands	0.91
Damplands	0.85
Completely Degraded	56.75

Scattered Trees/ Shrubs

The scattered trees comprises of scattered trees or shrubs including non-native *Eucalyptus* spp., *E. marginata*, *Corymbia calophylla*, *Banksia* spp., *Melaleuca* spp. and *Acacia* spp. over weeds.

The undergrowth in this habitat comprised of mainly introduced species thereby restricting the level of habitat potential for ground dwelling species.

The *Eucalyptus*, *Corymbia* and *Banksia* spp. found in this habitat type provides foraging opportunities for a variety of native birds when flowering and both the flowers and seeds provide foraging opportunities for the Black Cockatoos. The larger *Eucalyptus* and *Corymbia* trees may provide potential breeding habitat for Black Cockatoos.

Eucalyptus and Banksia Woodland

The *Eucalyptus* and *Banksia* woodland typically comprises of *Eucalyptus marginata*, *E. todtiana* and *Corymbia calophylla* woodland over *Banksia* spp. low woodland over *Adenanthos cygnorum* and *Xanthorrhoea preissii* shrublands over *Hibbertia* spp. scattered low shrubs to low open shrubland.

The *Eucalyptus* and *Banksia* woodland has soft sands that provide suitable burrowing habitat for those species which nest, forage or dig in the substrate and high leaf litter ground cover which provides suitable cover for ground dwelling species.

This habitat type provides foraging opportunities for a variety of native birds when flowering and both the flowers and seeds provide foraging opportunities for the Black Cockatoos. The larger *Eucalyptus* and *Corymbia* trees provide potential breeding habitat for Black Cockatoos.

Shrubland

The shrubland habitat consists of a mixture of natural and non-endemic species including *Kunzea glabrescens*, *Acacia* spp., *Adenanthos cygnorum*, *Chamelaucium uncinatum* and

Melaleuca huegelii and *M. nesophila* over weeds. Occasional non-endemic Eucalyptus species may be present. This habitat type included degraded natural areas and rehabilitated areas.

The shrubs found in this habitat type may provide foraging opportunities for a variety of native birds when flowering. The undergrowth in this habitat comprised of mainly introduced species thereby restricting the level of habitat potential for ground dwelling species.

Constructed Wetlands

The constructed wetlands habitat includes areas of open water surrounded by riparian vegetation. Typically associated species are Eucalyptus rudis, Non-native *Eucalyptus* spp. trees over *Typha orientalis* and *Juncus* spp. sedges over weeds.

The constructed wetlands habitat provides suitable foraging and breeding habitat for a variety of wetland bird species.

Damplands Wetlands

The damplands habitat comprised of vegetation associated with wetter areas. Typical species included *Melaleuca preissiana*, *Kunzea glabrescens* and *Hypocalymma angustifolium* over weeds.

The shrubs found in this habitat type may provide foraging opportunities for a variety of native birds when flowering. The undergrowth in this habitat comprised of mainly introduced species thereby restricting the level of habitat potential for ground dwelling species.

Completely Degraded Areas

The Completely Degraded areas are heavily disturbed and contained little native flora or introduced flora. These areas do not have a natural vegetation structure and offer no fauna habitat.

5 Discussion

5.1 Flora of Conservation Significance

No threatened species pursuant to the EPBC Act or to the WC Act were recorded in the survey area. This is despite seventeen species listed as Threatened by the EPBC Act being identified as potentially occurring in the survey area. Of these seventeen species, one is no longer a recognised taxa (*Epiblema grandiflorum* var. *cyaneum*), two are considered likely to occur (*Caladenia huegelii* and *Conospermum undulatum*) and the remaining 14 are considered unlikely to occur due to lack of suitable habitat and/or distance of nearest record.

The Threatened *Caladenia huegelii* is a perennial species persisting as a tuber in the soil and only identifiable when in flower (September to October). The survey was undertaken at the optimum time for the identification for the orchid and the area had received adequate rainfall, given that no specimens were found despite searching suitable habitat within the survey area, it is unlikely that the orchid exists on site.

The threatened *Conospermum undulatum* is a perennial shrub to two metres high and flowers from May to October (WAH 2013). The survey was undertaken at the optimum time for the identification, given that no specimens were found despite searching suitable habitat within the survey area, it is unlikely that it exists on site.

No Priority flora were recorded during the survey. Of the Priority Flora (16 taxa) identified as potentially occurring within the survey area during the desktop assessment none are considered likely to occur. The lack of suitable habitat, distance to nearest records and highly degraded nature of the remaining vegetation were factors considered during this assessment.

5.2 Vegetation of Conservation Significance

As a level 1 Vegetation and Flora survey was undertaken only basic vegetation mapping units were recorded during the survey. The majority of vegetation recorded is considered to be Degraded or severely altered and is not considered of conservation significance. The vegetation mapping unit BaBm (1.4 ha) is likely to represent the PEC 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' listed as a Priority 3 community. A Level 2 survey incorporating statistical analysis would be required to determine its full conservation status and extent.

5.3 Vegetation Condition and Introduced Flora

The vegetation condition within the survey area ranged from Completely Degraded to Excellent with the majority of the site considered to be in a degraded or worse condition (93.5 ha).

The vegetation along the length of the route is extremely fragmented and the majority of the site consists of non-endemic species that have been planted in revegetation projects along the road verges. There are only a few locations that consist of naturally occurring vegetation associations, all other native vegetation is either isolated, associated with non-endemic species or weeds or occur as monocultures.

Historical vegetation clearing, weeds, road infrastructure and the presence of unsealed roads within and adjacent to the survey area were the most frequently observed impacts on native vegetation. These disturbances, along with anthropogenic fires and rubbish dumping were observed to have the greatest impact on the remnant vegetation.

Twenty five introduced species were recorded during the survey. One of these species, **Zantedeschia aethiopica* is listed as declared under the BAM Act 2007.

**Zantedeschia aethiopica* is a rhizomatous (tuber-like), perennial herb growing up to one metre high and is primarily found in wet swampy habitats that can form dense stands (Hussey *et al.* 2007). Under the BAM Act 2007 this species is categorised as C3 (management). Weed species are assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

5.4 Regional Representation

The survey area is mapped as Bassendean Complex Central and South and Southern River Complex.

The Bassendean Complex Central and South was estimated to have 27% native vegetation remaining based on the pre-European extent with 0.7% in secure tenure (EPA 2006). More recently the Perth Biodiversity Project (PBP 2013) has mapped native vegetation extent by vegetation complex on the Swan Coastal Plain. It is estimated that 27.7% of Bassendean Complex Central and South remains compared to its pre-European extent (PBP 2013).

The Southern River Complex was estimated to have 19.8% native vegetation remaining based on the pre-European extent with 1.5% in secure tenure (EPA 2006). More recently the Perth Biodiversity Project (PBP 2013) has mapped native vegetation extent by vegetation complex on the Swan Coastal Plain. It is estimated that 19.69% of Southern River Complex remains compared to its pre-European extent (PBP 2013).

The EPA recognises vegetation complexes that are not well represented in reserves as being significant. Vegetation complexes which have 10%-30% remaining may be considered regionally significant. Proposals that would affect a vegetation complex with 10% or less remaining are likely to be formally assessed by the EPA (EPA 2006). Neither of the complexes that are present on site are below the 10% threshold.

5.5 Geomorphic Wetlands

The three MUWs located in the survey area are heavily modified and in poor condition with few remaining important attributes and functions.

5.6 Fauna Habitat Types

The survey area comprises of five habitat types, Scattered Trees/Woodlands, Eucalyptus/Banksia Woodland, Shrublands, Constructed Wetlands and Damplands. The remainder of the study area is made up of cleared areas and infrastructure. The habitats of the study area generally have a high level of disturbance to them in the form of weeds, introduced animals, rubbish and infrastructure (roads, rail lines and powerlines).

The Scattered Trees/Woodlands, Eucalyptus/Banksia Woodland and Shrublands are of significance, in that they may provide foraging and/or breeding habitat, for the conservation significant Black Cockatoos. If the proposed development requires the clearing of more than one hectare of foraging habitat or clearing of breeding habitat, the proposal may be classified as a high risk of significant impacts and referral under the EPBC Act would be recommended.

5.7 Faunal Assemblage

The proposed development is unlikely to disrupt the fauna assemblage of the survey area as the fauna are generally common and widespread throughout the region and are not dependent upon the survey area.

5.8 Conservation Significant Fauna

One conservation significant species, the Forest Red-tailed Black Cockatoo was recorded during the survey, and three species of conservation significant species are considered as 'Likely' to occur in the study area; Baudins Cockatoo, Carnaby's Cockatoo, Rainbow Bee-eater (*Merops ornatus*). A further eight species were listed as possible however given the highly degraded state and small size of the suitable habitat available it's unlikely these species occur there.

5.8.1 Forest Red-tailed Black Cockatoo

The Forest Red-tailed Black Cockatoo is listed as Vulnerable under the Commonwealth EPBC Act and Schedule 1 under the WC Act. The Forest Red-tailed Black Cockatoo has been previously recorded in the vicinity of the study area (DEC 2011e). Four individuals of this species were recorded foraging the survey area during the survey. The survey area contains suitable foraging, roosting and potential breeding habitat.

5.8.2 Baudins Cockatoo

Baudin's Cockatoo is listed as Vulnerable under the Commonwealth EPBC Act and Schedule 1 under the WC Act. Baudins Cockatoo occurs in tall Karri forests and mixed

Jarrah/Marri forests and woodlands of the south west corner of West Australian (Pizzev and Knight 1997). The survey area contains suitable foraging, roosting and potential breeding habitat.

5.8.3' Carnaby's Cockatoo

Carnaby's Cockatoo is listed as Endangered under the Commonwealth EPBC Act and Schedule 1 under the WC Act. The species was once common, but the population has declined significantly in the last half century (Johnstone & Storr 1998). Carnaby's Cockatoo has been previously recorded in the vicinity of the study area (DPaW 2013e and DPaW 2013f). The study area contains suitable foraging, roosting and potential breeding habitat.

5.8.4' Rainbow Bee-eater

The Rainbow Bee-eater is listed as Migratory under the EPBC Act. This species is one of the most common and widespread birds in Australia with a distribution that covers the majority of Australia (Barrett *et al* 2003). In Western Australia this bird can occur as a 'resident, breeding visitor, postnuptial nomad, passage migrant and winter visitor' (Johnstone & Storr 1998). This species have been previously recorded in the vicinity of the survey area (DPaW). The survey area contains potential foraging habitat and the sandy soil provides suitable nest sites for this species. Due to the widespread distribution of the Rainbow Bee-eater the proposed development will not impact upon the local or regional status of this species.

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7 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

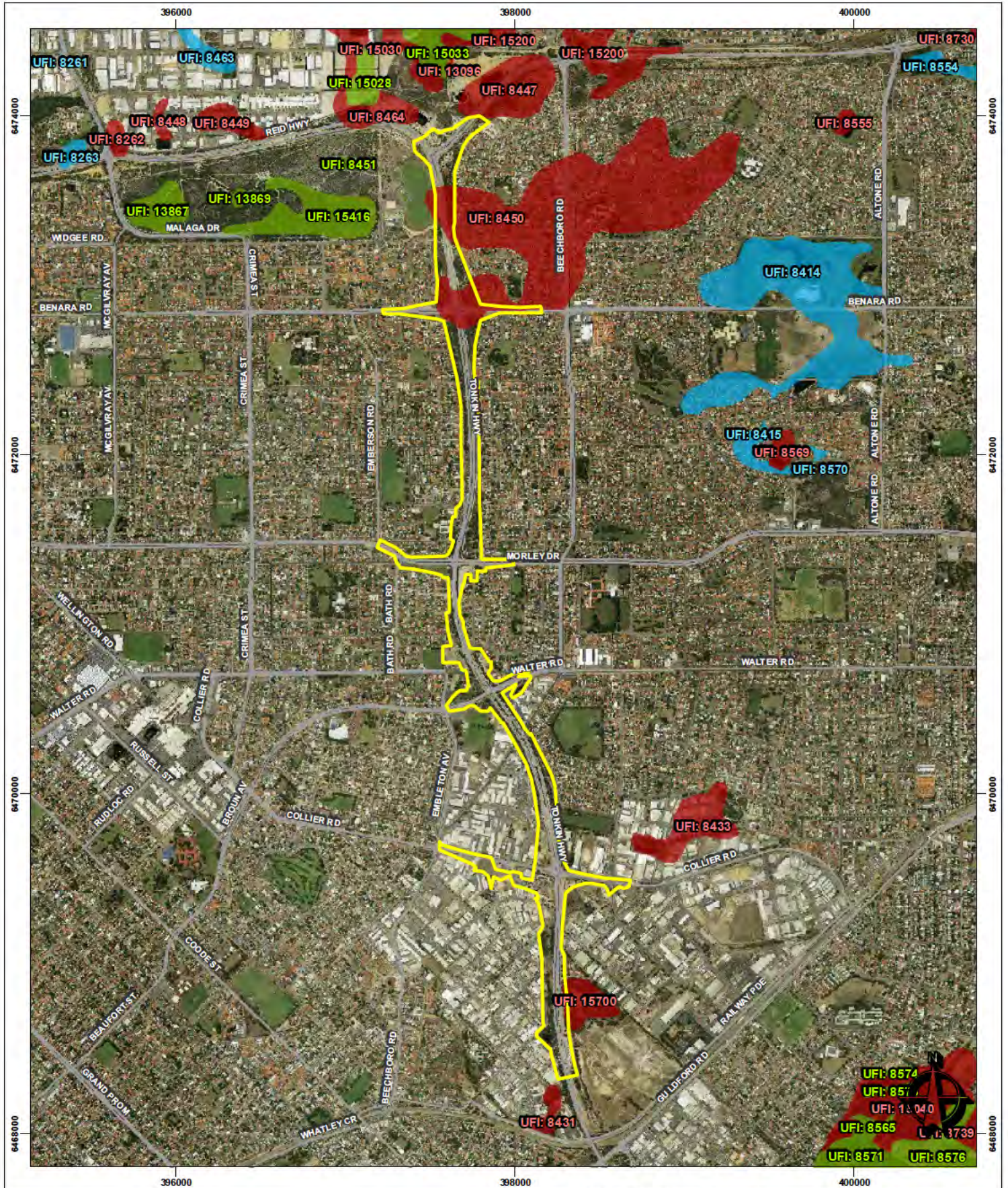
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Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

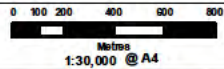
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FIGURES



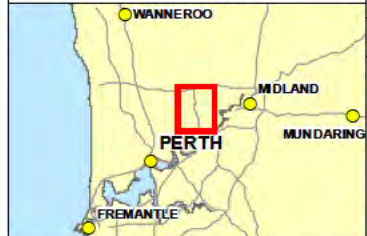
Legend

- Project Footprint
- Major Roads
- Geomorphic Wetlands - Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID: 185_f2_wetlands.mxd DATE: 06-Dec-2013

HORIZONTAL DATUM AND PROJECTION: GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0

Main Roads Western Australia



Tonkin Highway Grade Separation

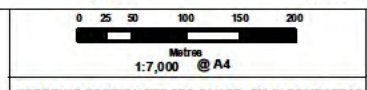
Figure 3 - Wetlands


AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
 LOCALITY MAP SOURCED FROM LANDGATE 2006
 STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 GEOMORPHIC WETLANDS SOURCED DRAW 2013
 K:\Projects\185\185_Tonkin Highway Grade Separation\Figures\Figure 3 - Wetlands.mxd
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Legend

-  Releve
-  Project Footprint





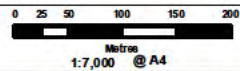
#10 Belemondsey St, West Leederville, 6007 WA t(08) 9388 8360 f(08) 9381 2360 www.360environmental.com.au			
DRAWING ID		DATE	
185 Vegetation Species		4/2/2014	
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	1
Main Roads Western Australia			
Tonkin Highway Grade Separation			
Figure 4a - Vegetation Mapping Units			

NOTE THAT POSITION ERRORS CAN BE +/-5M IN SOME AREAS
 - LOCALITY MAP SOURCED FROM LANDGATE 2013
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
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Legend

-  Relieve
-  Project Footprint



NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS



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DATE
4/2/2014

HORIZONTAL DATUM AND PROJECTION
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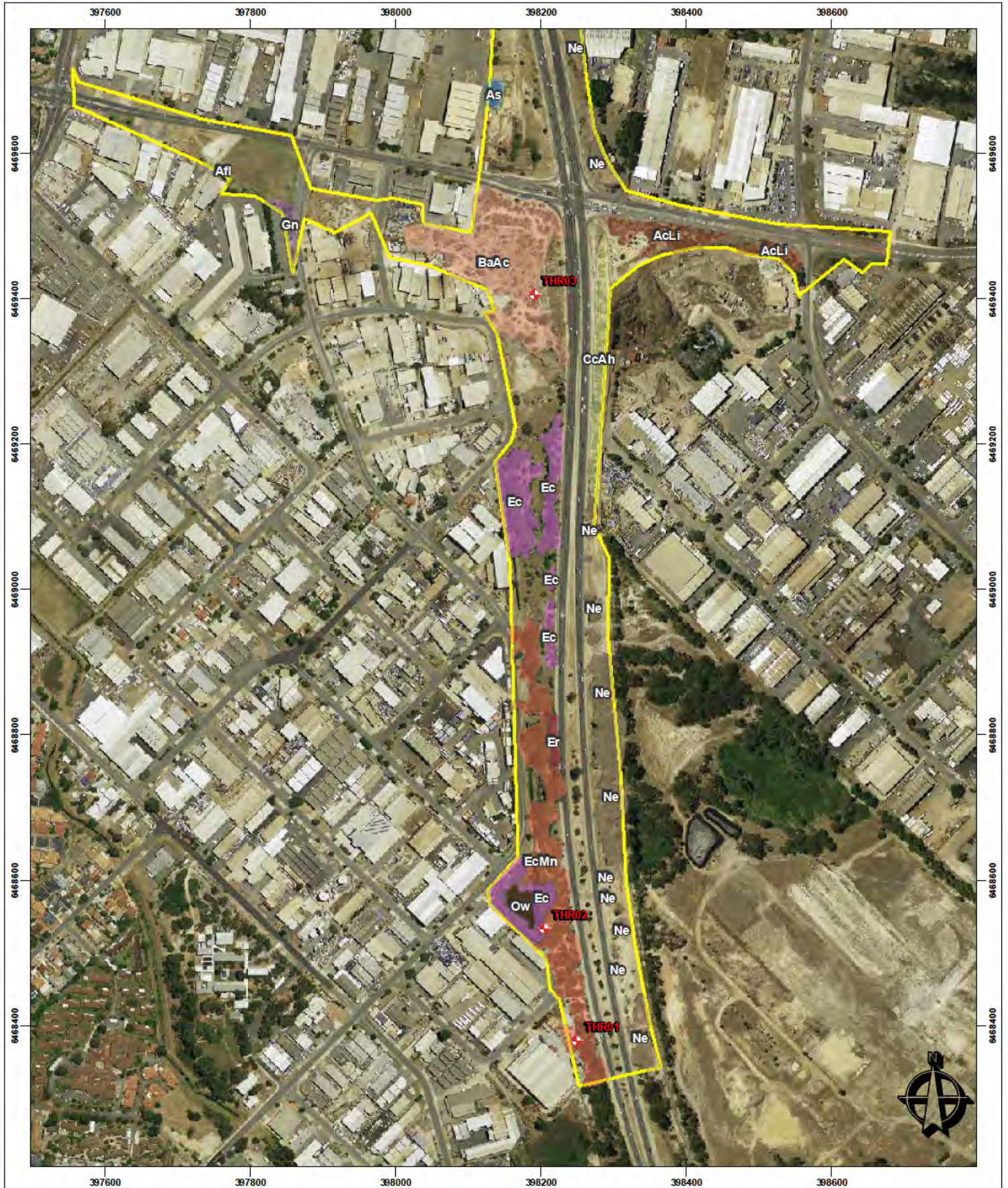
CREATED CS	CHECKED HA	APPROVED RF	REVISION 1
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Main Roads 
Western Australia 



Tonkin Highway Grade Separation

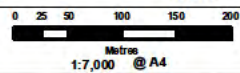
Figure 4b - Vegetation Mapping Units

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS
 - LOCALITY MAP SOURCED FROM LANDGATE 2013
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
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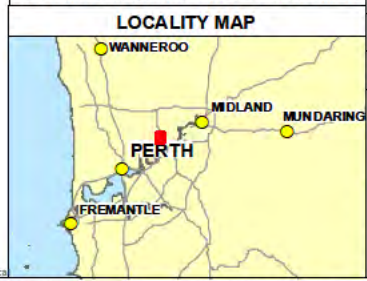


Legend

-  Releve
-  Project Footprint



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS



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DRAWING ID: 185 Vegetation Species
 DATE: 4/2/2014

HORIZONTAL DATUM AND PROJECTION: GDA 1994 MGA Zone 50

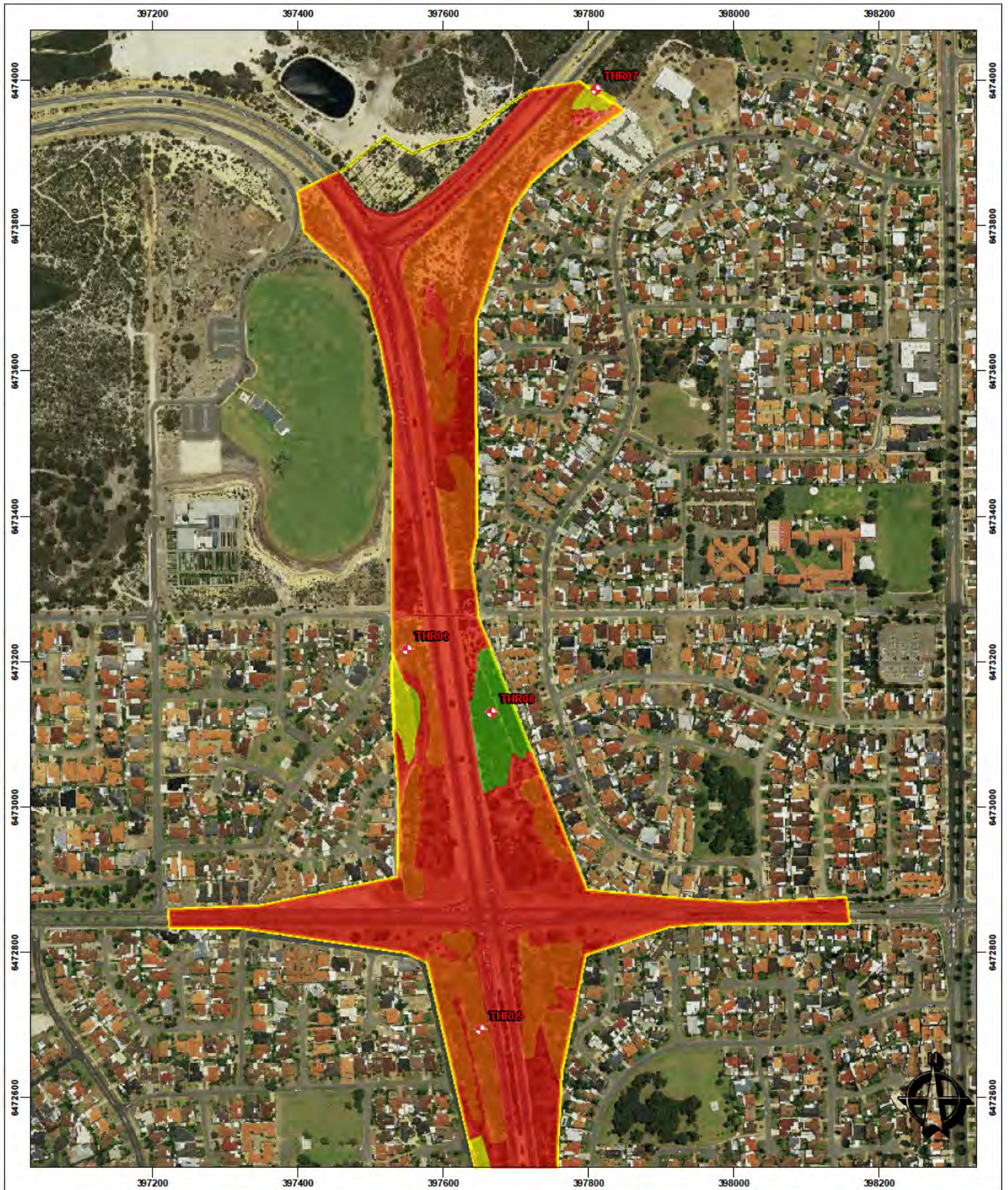
CREATED CS	CHECKED HA	APPROVED RF	REVISION 1
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Main Roads Western Australia 

Tonkin Highway Grade Separation

Figure 4d - Vegetation Mapping Units

NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS
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 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
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<p>◆ Releve</p> <p>▭ Project Footprint</p> <p>Vegetation Condition</p> <p>▨ No Access</p> <p>■ Excellant</p> <p>■ Very Good</p> <p>■ Good</p> <p>■ Good - Degraded</p> <p>■ Degraded</p> <p>■ Completely Degraded</p>	<p>0 25 50 100 150 200</p> <p>Metres</p> <p>1:7,000 @ A4</p> <p>NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS</p> <p>LOCALITY MAP</p>	<p>810 Belemondsey St, West Leederville, 6007 WA</p> <p>t(08) 9388 8360</p> <p>f(08) 9381 2360</p> <p>www.360environmental.com.au</p>			
		<p>DRAWING ID 185 Vegetation Condition</p> <p>DATE 5/12/2013</p> <p>HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50</p> <table border="1"> <tr> <td>CREATED CS</td> <td>CHECKED HA</td> <td>APPROVED RF</td> <td>REVISION 0</td> </tr> </table> <p>Main Roads Western Australia </p> <p>Tonkin Highway Grade Separation</p>		CREATED CS	CHECKED HA
CREATED CS	CHECKED HA	APPROVED RF	REVISION 0		

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP SOURCED FROM LANDGATE 2013

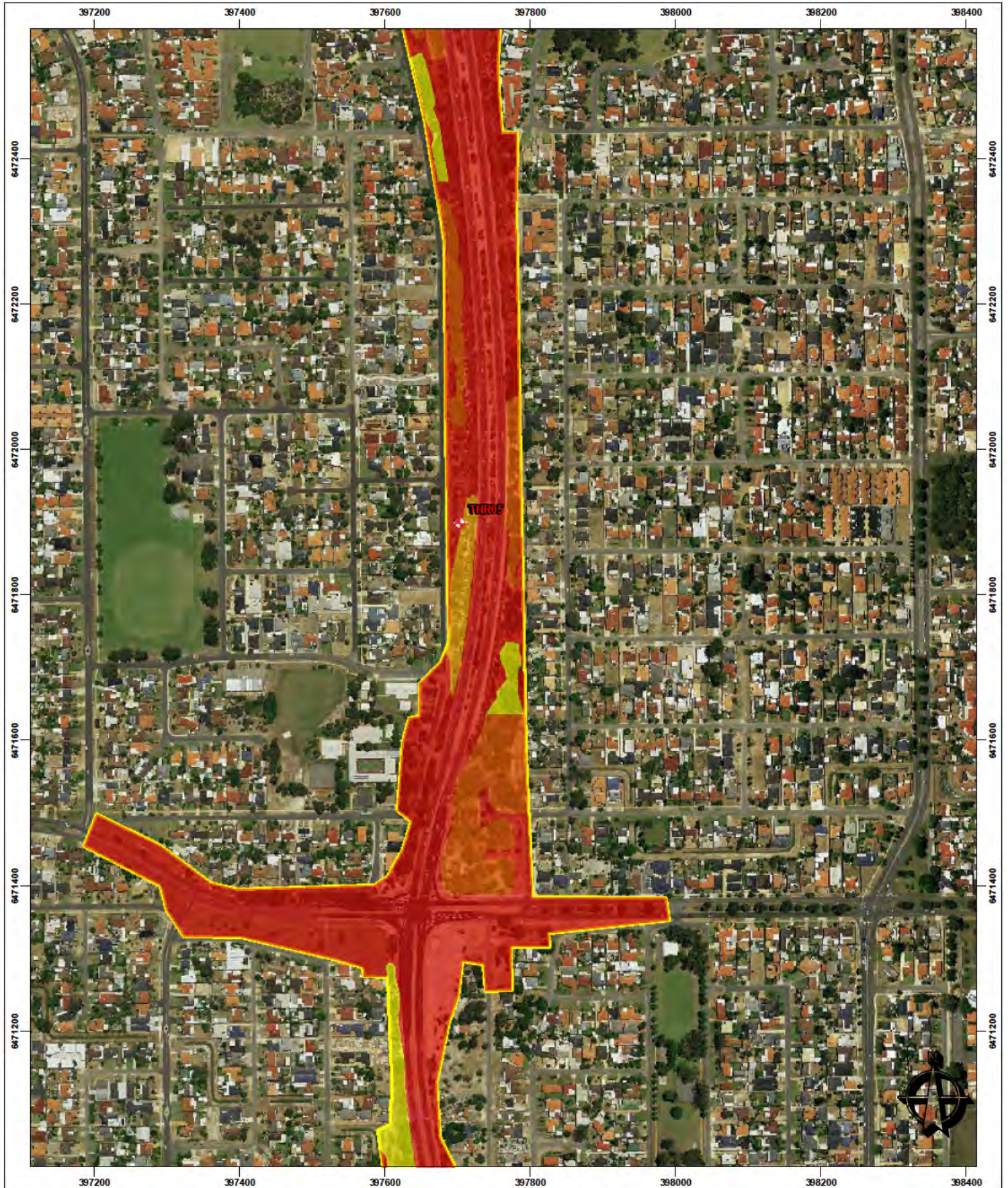
STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008

AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012

© Western Australian Land Information Authority 2013

SLIP ENABLER © Project 1.0 E89 © M. S. West Valley Biological

Figure 5a - Vegetation Condition



<p> Releve Project Footprint </p>	<p> Vegetation Condition No Access Excellant Very Good Good Good - Degraded Degraded Completely Degraded </p>	<p>0 25 50 100 150 200</p> <p>Metres</p> <p>1:7,000 @ A4</p>	<p> #10 Bemondey St, West Leederville, 6007 WA t:(08) 9388 8360 f:(08) 9381 2360 www.360environmental.com.au </p>				
		<p>NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS</p>		<p> DRAWING ID 185 Vegetation Condition </p> <p> DATE 5/12/2013 </p>			
		<p> HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50 </p>					
		<table border="1"> <tr> <td>CREATED CS</td> <td>CHECKED HA</td> <td>APPROVED RF</td> <td>REVISION 0</td> </tr> </table>		CREATED CS	CHECKED HA	APPROVED RF	REVISION 0
CREATED CS	CHECKED HA	APPROVED RF	REVISION 0				
		<p> Main Roads Western Australia </p> <p> Tonkin Highway Grade Separation </p>					
<p> NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS - LOCALITY MAP SOURCED FROM LANDGATE 2013 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012 © Western Australian Land Information Authority 2013 </p>		<p> SLIP ENABLER </p>					
<p> Figure 5b - Vegetation Condition </p>							



◆ Releve
 □ Project Footprint

Vegetation Condition
 ▨ No Access
 ■ Excellant
 ■ Very Good
 ■ Good
 ■ Good - Degraded
 ■ Degraded
 ■ Completely Degraded

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS
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 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
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SLIP ENABLER

0 25 50 100 150 200
 Metres
 1:7,000 @ A4

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP

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185 Vegetation Condition		5/12/2013	
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0

Main Roads

Tonkin Highway Grade Separation

Figure 5c - Vegetation Condition



Releve	Vegetation Condition
Project Footprint	No Access
<i>Zantedeschia aethiopica</i>	Excellant
	Very Good
	Good
	Good - Degraded
	Degraded
	Completely Degraded

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP

0 25 50 100 150 200
Metres
1:7,000 @ A4

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

DRAWING ID		DATE	
185 Vegetation Condition		5/12/2013	
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0

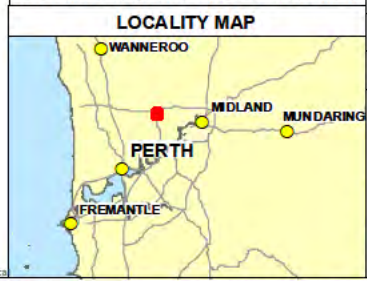
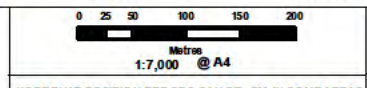
Main Roads **Western Australia**

Tonkin Highway Grade Separation

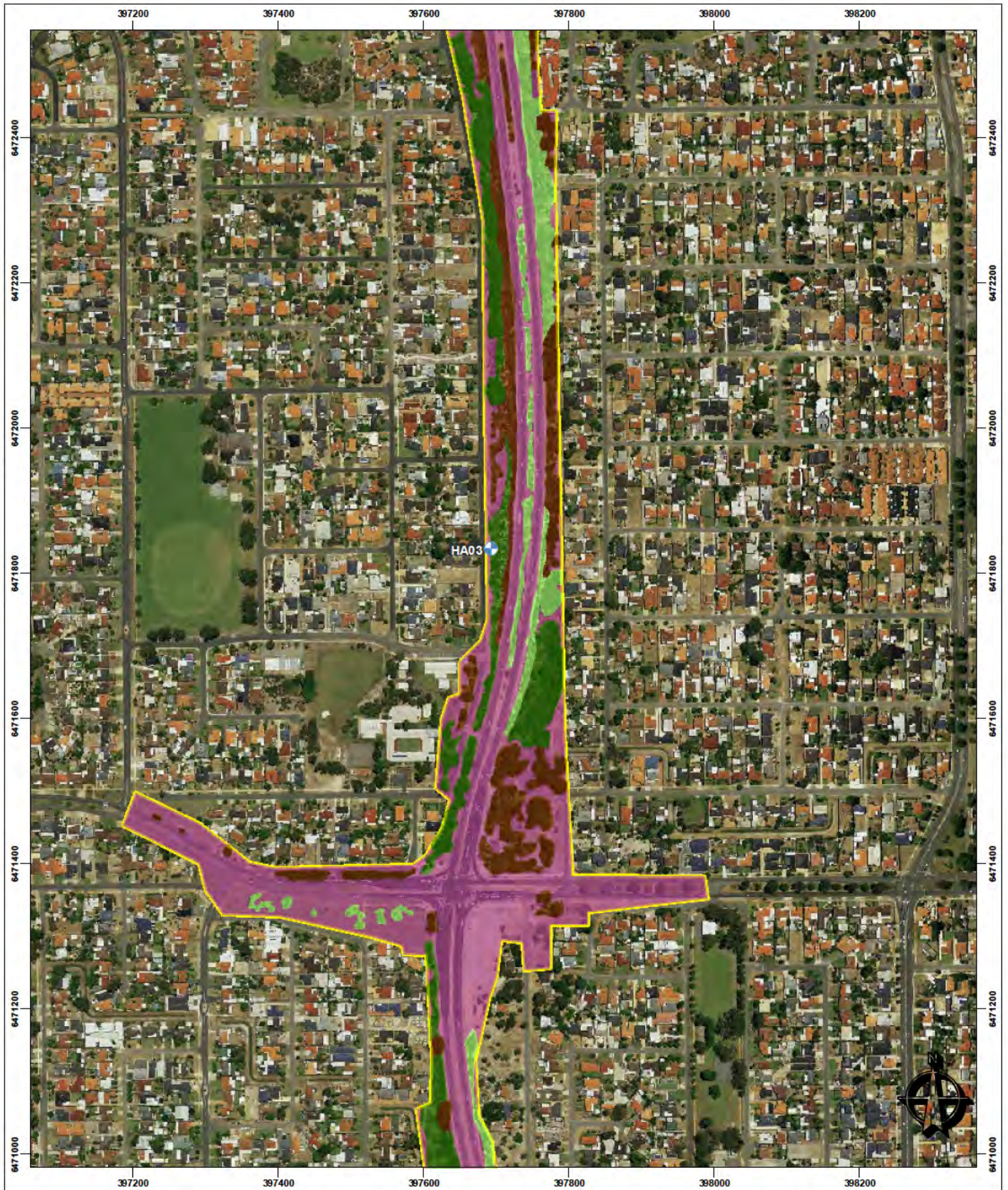
Figure 5d - Vegetation Condition



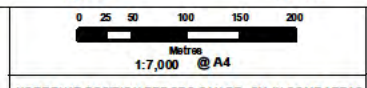
- | | |
|--------------------|------------------------------|
| Project Footprint | Fauna Habitat Mapping |
| Habitat Assessment | Completely Degraded |
| | Constructed Wetland |
| | Dampland |
| | Eucalyptus/Banksia woodland |
| | Scattered Trees/Shrubs |
| | Shrubland |
| | No Access |



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DRAWING ID	DATE		
185 Fauna Habitat	5/12/2013		
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0
Main Roads Western Australia			
Tonkin Highway Grade Separation			
Figure 6a - Fauna Habitat Mapping			

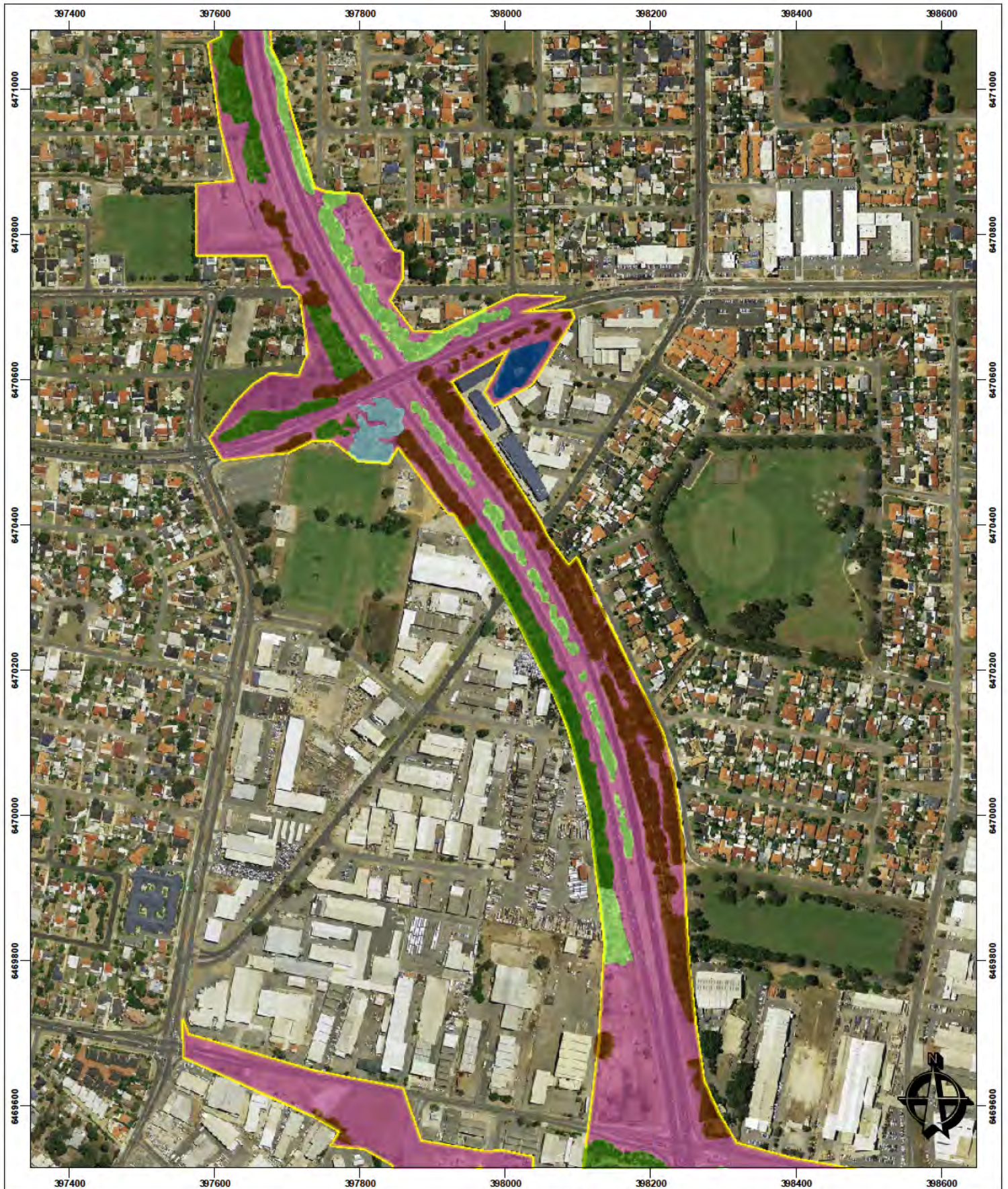


- | | |
|--------------------|------------------------------|
| Project Footprint | Fauna Habitat Mapping |
| Habitat Assessment | Completely Degraded |
| | Constructed Wetland |
| | Dampland |
| | Eucalyptus/Banksia woodland |
| | Scattered Trees/Shrubs |
| | Shrubland |



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DRAWING ID	DATE		
185 Fauna Habitat	5/12/2013		
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	HA	RF	0
Main Roads			
Tonkin Highway Grade Separation			
Figure 6b - Fauna Habitat Mapping			

NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 LOCALITY MAP SOURCED FROM LANDGATE 2013
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Project Footprint

Habitat Assessment

Fauna Habitat Mapping

Completely Degraded

Constructed Wetland

Dampland

Eucalyptus/Banksia woodland

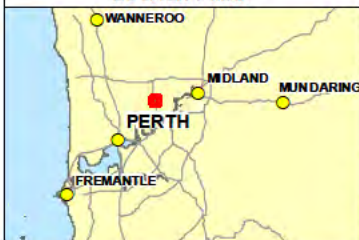
Scattered Trees/Shrubs

Shrubland



NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP



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 f(08) 9381 2360
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DRAWING ID 185 Fauna Habitat	DATE 5/12/2013
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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED CS	CHECKED HA	APPROVED RF	REVISION 0
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Main Roads Western Australia

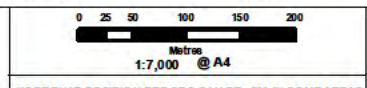
Tonkin Highway Grade Separation

Figure 6c - Fauna Habitat Mapping

NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS
 - LOCALITY MAP SOURCED FROM LANDGATE 2013
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
 © Western Australian Land Information Authority 2013



- | | |
|--------------------|------------------------------|
| Project Footprint | Fauna Habitat Mapping |
| Habitat Assessment | Completely Degraded |
| | Constructed Wetland |
| | Dampland |
| | Eucalyptus/Banksia woodland |
| | Scattered Trees/Shrubs |
| | Shrubland |



a10 Bemondey St, West Leederville, 6007 WA t(08) 9388 8350 f(08) 9381 2360 www.360environmental.com.au	
DRAWING ID 185 Fauna Habitat	DATE 5/12/2013
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50	
CREATED CS	CHECKED HA
APPROVED RF	REVISION 0
Main Roads Western Australia	
Tonkin Highway Grade Separation	
Figure 6d - Fauna Habitat Mapping	

NOTE THAT POSITION ERRORS CAN BE $\pm 5\text{M}$ IN SOME AREAS
 - LOCALITY MAP SOURCED FROM LANDGATE 2013
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
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APPENDIX A

Definition of Declared Rare / Priority / Threatened Flora and Fauna Species

APPENDIX A1

Definitions of Declared Rare / Priority / Threatened Flora

CONSERVATION CODE	DESCRIPTION
X	<p>Presumed Extinct Flora (Declared Rare Flora – Extinct)</p> <p>“Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the <i>Wildlife Conservation Act 1950</i>).”</p>
T	<p>Threatened Flora (Declared Rare Flora – Extant)</p> <p>“Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the <i>Wildlife Conservation Act 1950</i>).”</p> <p>“Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria:</p> <p>CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild;</p> <p>EN: Endangered – considered to be facing a very high risk of extinction in the wild;</p> <p>VU: Vulnerable – considered to be facing a high risk of extinction in the wild.”</p>
P1	<p>Priority One: Poorly-known taxa</p> <p>“Taxa which are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.”</p>
P2	<p>Priority Two: Poorly-known taxa</p> <p>“Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known</p>

	threatening processes.”
P3	<p>Priority Three: Poorly-known taxa</p> <p>“Taxa which are known from collections or sight records from several localities not under imminent threat, or few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.”</p>
P4	<p>Priority Four: Rare, Near Threatened and other taxa in need of monitoring</p> <p>a. Rare. “Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.”</p> <p>b. Near Threatened. “Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.”</p> <p>c. “Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.”</p>
P5	<p>Priority Five: Conservation Dependent taxa</p> <p>“Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.”</p>

Source: Department of Parks and Wildlife (2013). Online: <http://florabase.dpaw.wa.gov.au>.

Á

Categories of Threatened Flora Species

CONSERVATION CODE	DESCRIPTION
Ex	<p>Extinct</p> <p>Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.</p>
ExW	<p>Extinct in the Wild</p> <p>Taxa which is known only to survive in cultivation, in captivity or as a naturalised population</p>

	well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	Critically Endangered Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	Conservation Dependent Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Source: *Environment Protection and Biodiversity Conservation Act 1999*

APPENDIX A2

DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

Environment Protection and Biodiversity Conservation Act 1999 (Cth): Threatened Species and Threatened Ecological Communities Codes

The EPBC Act prescribes seven matters of national environmental significance:-

- Á World Heritage properties
- Á National Heritage places;
- Á Wetlands of international importance;
- Á Threatened species and ecological communities;
- Á Migratory species;

- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Species in the categories ExW, CE, E, V and M (see below), and Threatened Ecological Communities in the CE and E categories are protected as matters of national environmental significance under the *EPBC Act*.

CATEGORY	CODE	DESCRIPTION
Extinct	Ex	Taxa for which there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	ExW	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or not recorded in its known and/or expected habitat at appropriate seasons anywhere in its past range despite exhaustive surveys over a timeframe appropriate to its life cycle and form.
Critically Endangered	CE	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	E	Taxa not critically endangered and facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vulnerable	V	Taxa not critically endangered or endangered and facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	CD	Taxa which are the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within five years.
Migratory	Mi	Taxa that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations, that are included in an international agreement approved by the Minister for the Environment, Heritage and the Arts and that have been placed on the national List of Migratory Species under the provisions of the <i>EPBC Act</i> . At present there are four such agreements: <ul style="list-style-type: none"> • the Bonn Convention • the China-Australia Migratory Bird Agreement (CAMBA) • the Japan-Australia Migratory Bird Agreement (JAMBA) • the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
Marine	Ma	Taxa protected in a Commonwealth Marine Protected Area by virtue of section 248 of the <i>EPBC Act</i> . These taxa include certain seals, crocodiles, turtles and birds, as well as various marine fish. Commonwealth marine areas are matters of national environmental significance under the <i>EPBC Act</i> . An action will require approval if the: <ul style="list-style-type: none"> • action is taken in a Commonwealth marine area and the action

		<p>has, will have, or is likely to have a significant impact on the environment, or</p> <ul style="list-style-type: none"> • An action is taken outside a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment in a Commonwealth marine area¹ <p>The Commonwealth marine area is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters.</p> <p>The Commonwealth marine area stretches from 3 to 200 nautical miles (approximately 5-370 km) from the coast. Marine protected areas are marine areas which are recognised to have high conservation value.</p>
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Western Australian Threatened Fauna Categories

Wildlife Conservation Act 1950 (WA)

CATEGORY	CODE	DESCRIPTION
Schedule 1	S1	Rare or likely to become extinct.
Schedule 2	S2	Presumed extinct.
Schedule 3	S3	Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S4	Other specially protected fauna.

Department of Environment and Conservation Fauna Priority Codes

CATEGORY	CODE	DESCRIPTION
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so. Usually represented on conservation lands.
Priority 5	P5	Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

APPENDIX B

Definition of Threatened and Priority Ecological Communities

DEFINITIONS OF THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Definitions of Threatened Ecological Communities

Presumed Totally Destroyed (PD)

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B);

- A) Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or
- B) All occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii)
 - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 5 years)
 - ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 5 years)
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
 - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes
- C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

Endangered (EN)

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% and either or both of the following apply (i or ii)
 - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term (within approximately 10 years)
 - ii) modification throughout its range is continuing such that in the short term future (within approximately 10 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 10 years)
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
 - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes
- C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).

Vulnerable (VU)

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction in the medium to long term future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences which are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may still be widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Source: Department of Environment and Conservation (2010). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

Definitions of Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in

Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly known ecological communities

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.

Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.

These communities require regular monitoring.

- (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities.

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Source: Department of Environment and Conservation (2010). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

APPENDIX C

Environmental Weeds and Declared Plant Categories

Standard Meanings of Declared Plant Categories

Under the Biosecurity and Agriculture Management Act 2007 (the BAM Act), all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management).

C1 category (Exclusion) - Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.

C2 category (Eradication) – Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.

C3 category (Management) – Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Source: Department of Agriculture and Food, Western Australia. Online:
<http://www.biosecurity.wa.gov.au/western-australian-organism-list-waol>

APPENDIX D

Vegetation Condition Scale

Vegetation Condition Scale

CONDITION SCALE CODE	CONDITION SCALE
P	<p>Pristine (1)</p> <p>Pristine or nearly so, no obvious signs of disturbance</p>
E	<p>Excellent (2)</p> <p>Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.</p>
VG	<p>Very Good (3)</p> <p>Vegetation structure altered, obvious signs of disturbance.</p> <p>For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.</p>
G	<p>Good (4)</p> <p>Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it.</p> <p>For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.</p>
D	<p>Degraded (5)</p> <p>Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.</p> <p>For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.</p>
CD	<p>Completely Degraded (6)</p> <p>The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.</p>

Source: Bush Forever Vegetation Condition Scale as developed by Keighery (1994) and summarized in Bush Forever (Government of Western Australia (2000a)

APPENDIX E

Fauna Recorded In Search Area and Current Survey

Fauna Group	Family	Scientific Name	Common Name	EPBC	W C	D PAW	A	B	C	D
Key: EPBC = Environment Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DEC = Department of Conservation Priority Code, A = Listed in Naturemap (2013), B = DEC Threatened and Priority Fauna Database, C = DoE Protected Matters Search Tool and D = Current Survey.										
Amphibians	HYLIDAE	<i>Litoria adelaidensis</i>	Slender Tree Frog				X			
		<i>Litoria moorei</i>	Motorbike Frog, Bell Frog				X			
	LIMNODYNASTINAE	<i>Heleioporus barycragus</i>	Hooting frog				X			
		<i>Heleioporus eyrei</i>	Moaning Frog				X			
		<i>Heleioporus psammophilus</i>	Sand frog				X			
		<i>Limnodynastes dorsalis</i>	Western Banjo Frog				X			
		<i>Neobatrachus pelobatiodes</i>	Humming frog				X			
	MYOBATRACHIDAE	<i>Crinia glauerti</i>	Clicking Frog				X			
		<i>Crinia georgiana</i>	Quacking Frog				X			
		<i>Crinia insignifera</i>	Squelching Froglet				X			
		<i>Myobatrachus gouldii</i>	Turtle Frog				X			
<i>Pseudophryne guentheri</i>		Crawling Toadlet				X				
	PHASIANIDAE	<i>Argusianus argus</i>					X			
		<i>Coturnix pectoralis</i>	Stubble Quail	Ma			X			
	ACCIPITRIFORMES	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Mi						
	ARDEIDAE	<i>Ardea ibis</i>	Cattle Egret	Mi		IA	X			
		<i>Ardea ibis</i>	Great Egret	Mi						
		<i>Ardea modesta</i>	Eastern Great Egret			IA	X			
		<i>Ardea novaehollandiae</i>	White-faced Heron				X			

Birds		<i>Ardea pacifica</i>	White-necked Heron				X			
		<i>Botaurus poiciloptilus</i>	Australasian Bittern			T	X			
		<i>Ixobrychus flavicollis australis</i>	Australian Black Bittern				X			
		<i>Ixobrychus minutus dubius</i>	Australian Little Bittern			4	X			
		<i>Nycticorax caledonicus</i>	Rufous Night Heron				X			
		ANATIDAE	<i>Anas castanea</i>	Chestnut Teal				X		
			<i>Anas gracilis</i>	Grey Teal				X		X
			<i>Anas platyrhynchos</i>	Mallard				X		
			<i>Anas rhynchotis</i>	Australasian Shoveler				X		
			<i>Anas superciliosa</i>	Pacific Black Duck				X		X
			<i>Aythya australis</i>	Hardhead				X		
			<i>Biziura lobata</i>	Musk Duck				X		
			<i>Chenonetta jubata</i>	Australian Wood Duck,				X		
			<i>Cygnus atratus</i>	Black Swan				X		
			<i>Malacorhynchus</i>	Pink-eared Duck				X		
			<i>Oxyura australis</i>	Blue-billed Duck				X		
			<i>Stictonetta naevosa</i>	Freckled Duck				X		
			<i>Tadorna tadornoides</i>	Australian Shelduck,				X		
			COLUMBIDAE	* <i>Columba livia</i>	Domestic Pigeon				X	
		<i>Ocyphaps lophotes</i>		Crested Pigeon				X		
		<i>Phaps chalcoptera</i>		Common Bronzewing				X		
		* <i>Streptopelia chinensis</i>		Spotted Turtle Dove				X		
		* <i>Streptopelia senegalensis</i>		Laughing Turtle-Dove				X		X
		<i>Cartonema phillydroides</i>		Domestic Pigeon				X		
		CHARADRIIDAE	<i>Charadrius ruficapillus</i>	Red-capped Plover				X		
			<i>Erythrogonys cinctus</i>	Red-kneed Dotterel				X		

	<i>Pluvialis squatarola</i>	Grey Plover			IA				
DIOMEDEIDAE	<i>Diomedea exulans amsterdamensis</i>	Amsterdam Albatross	En, Ma, Mi						
	<i>Diomedea exulans exulans</i>	Tristan Albatross	En, Ma, Mi						
	<i>Diomedea exulans</i>	Wandering Albatross	VU, Ma,						
GALLIFORMES	<i>Leipoa ocellata</i>	Malleefowl	VU, Mi						
LARIDAE	<i>Onychoprion anaethetus</i>	Bridled Tern			IA				
PODICIPEDIDAE	<i>Podiceps cristatus</i>	Great Crested Grebe				X			
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe				X			
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe,				X			
PHALACROCORACIDAE	<i>Phalacrocorax carbo</i>	Great Cormorant				X			
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant				X			
	<i>Phalacrocorax varius</i>	Pied Cormorant				X			
PROCELLARIIDAE	<i>Halobaena caerulea</i>	Blue Petrel				X			
	<i>Pterodroma brevirostris</i>	Kerguelen Petrel				X			
	<i>Pterodroma lessonii</i>	White-headed Petrel				X			
RALLIDAE	<i>Fulica atra</i>	Eurasian Coot				X			X
	<i>Gallinula tenebrosa</i>	Dusky Moorhen				X			
	<i>Gallinula ventralis</i>	Black-tailed Native-hen				X			
	<i>Gallirallus philippensis</i>	Buff-banded Rail				X			
	<i>Porphyrio porphyrio</i>	Purple Swamphen				X			
	<i>Porzana fluminea</i>	Australian Spotted				X			
	<i>Porzana pusilla</i>	Baillon's Crake				X			
	<i>Porzana tabuensis</i>	Spotless Crake				X			
ROSTRATVLIDAE	<i>Rostratula australis</i>	Australian Painted	EN, Mi						
PODARGIDAE	<i>Podargus strigoides</i>	Tawny Frogmouth				X			

APODIDAE	<i>Apus pacificus</i>	Fork-tailed Swift	Mi, Ma			X			
THRESKIORNITHIDAE	<i>Platalea flavipes</i>	Yellow Billed Spoonbill	Ma			X			
	<i>Threskiornis molucca</i>	Australian White Ibis	Ma			X			
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Ma			X			X
ACCIPITRIDAE	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk				X			
	<i>Accipiter fasciatus</i>	Brown Goshawk	Ma			X			
	<i>Aquila audax</i>	Wedge-tailed Eagle				X			
	<i>Circus approximans</i>	Swamp Harrier	Ma			X			
	<i>Elanus axillaris</i>	Black-shouldered Kite				X			
	<i>Haliastur sphenurus</i>	Whistling Kite	Ma			X			
	<i>Aquila morphnoides</i>	Little Eagle				X			
FALCONIDAE	<i>Falco berigora</i>	Brown Falcon		S4		X			
	<i>Falco cenchroides</i>	Nankeen Kestrel;	Ma			X			
	<i>Falco longipennis</i>	Australian Hobby				X			
	<i>Falco peregrinus</i>	Peregrine Falcon			S	X			
TURNICIDAE	<i>Turnix varia</i>	Painted Button-quail				X			
BURHINIDAE	<i>Burhinus grillarius</i>	Bush Stone-curlew			P4	X			
LARIDAE	<i>Anous tenuirostris melanops</i>	Australian lesser noddy	Ma		T	X			
	<i>Sterna fuscata nubilosa</i>	Sooty Tern	Ma			X			
	<i>Sterna nereis nereis</i>	Fairy Tern	Ma			X			
PSITTACIDAE	* <i>Cacatua galerita</i>	Sulphur-crested				X			
	<i>Cacatua leadbeateri</i>	Major Michells				X			
	<i>Cacatua pastinator</i>	Western Long-billed				X			
	<i>Cacatua pastinator</i> subsp. <i>pastinator</i>	Muir's Corella			S				
	<i>Cacatua sanguinea</i>	Little Corella				X			

	<i>*Cacatua tenuirostris</i>	Eastern Long-billed				X		
	<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black	VU	S1		X		X
	<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo	VU	S1	T	X		
	<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	EN	S1	T	X		
	<i>Cyanorhynchus auriceps</i>					X		
	<i>*Trichoglossus haematodus</i>	Rainbow Lorikeet				X		X
	<i>*Glossopsitta concinna</i>	Musk Lorikeet				X		
	<i>Platycercus zonarius</i>	Twenty-eight Parrot; Australian Ringneck				X		X
	<i>Eolophus roseicapilla</i>	Galah						X
	<i>Glossopsitta porphyrocephala</i>	Purple-crowned				X		
	<i>Neophema elegans</i>	Elegant Parrot				X		
	<i>Melopsittacus undulatus</i>	budgerigar				X		
	<i>Platycercus icterotis</i>	Western Rosella				X		
	<i>Platycercus spurius</i>	Red-capped Parrot				X		X
	<i>Polytelis anthopeplus</i>	Regent Parrot				X		
CUCULIDAE	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	Ma			X		
	<i>Chalcites basalis</i>	Horsfield's Bronze	Ma			X		
	<i>Chalcites lucidus</i>	Shining Bronze Cuckoo	Ma			X		
	<i>Cuculus pallidus</i>	Pallid Cuckoo	Ma			X		
STRIGIDAE	<i>Ninox novaeseelandiae</i>	Boobook Owl	Ma			X		
TYTONIDAE	<i>Tyto alba</i>	Barn Owl				X		
HALCYONIDAE	<i>*Dacelo novaeguineae</i>	Laughing Kookaburra				X		
	<i>Todiramphus sanctus</i>	Sacred Kingfisher	Ma			X		X
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater	Mi, Ma		IA	X		
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairy-wren				X		

	<i>Malurus leucopterus</i>	White-winged Fairy-				X		
	<i>Malurus splendens</i>	Splendid Fairy-wren				X		
PARDALOTIDAE	<i>Pardalotus punctatus</i>	Spotted Pardalote				X		
	<i>Pardalotus striatus</i>	Striated Pardalote				X		
ACANTHIZIDAE	<i>Acanthiza apicalis</i>	Broad-tailed Thornbill				X		
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				X		
	<i>Acanthiza inornata</i>	Western Thornbill				X		X
	<i>Gerygone fusca</i>	Western Gerygone				X		
	<i>Sericornis frontalis</i>	White-browed				X		
	<i>Smicrornis brevirostris</i>	Weebill				X		
MELIPHAGIDAE	<i>Acanthorhynchus</i>	Western Spinebill				X		
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked				X		
	<i>Anthochaera carunculata</i>	Red Wattlebird				X		X
	<i>Anthochaera lunulata</i>	Western Little				X		
	<i>Epthianura albifrons</i>	White-fronted Chat				X		
	<i>Lichmera indistincta</i>	Brown Honeyeater				X		
	<i>Lichenostomus virescens</i>	Singing Honeyeater				X		
	<i>Melithreptus brevirostris</i>	Brown-headed				X		
	<i>Phylidonyris nigra</i>	White-cheeked				X		
	<i>Manorina flavigula</i>	Yellow-throated Miner				X		
	<i>Phylidonyris novaehollandiae</i>	New Holland				X		X
PETROICIDAE	<i>Petroica goodenovii</i>	Red-capped Robin				X		
NEOSITTIDAE	<i>Daphoenositta chrysoptera</i>	Varied Sittella				X		
PACHYCEPHALIDAE	<i>Colluricincla harmonica</i>	Grey Shrike-thrush				X		
	<i>Pachycephala pectoralis</i>	Golden Whistler				X		
	<i>Pachycephala rufiventris</i>	Rufous Whistler				X		

DICRURIDAE	<i>Grallina cyanoleuca</i>	Magpie-lark				X			X
	<i>Rhipidura fuliginosa</i>	Grey Fantail				X			
	<i>Rhipidura leucophrys</i>	Willie Wagtail				X			X
CAMPEPHAGIDAE	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Ma			X			X
	<i>Lalage sueurii</i>	White-winged Triller				X			
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow				X			
CRACTICIDAE	<i>Cracticus nigrogularis</i>	Pied Butcherbird				X			
	<i>Cracticus tibicen</i>	Australian Magpie				X			X
	<i>Cracticus torquatus</i>	Grey Butcherbird				X			
	<i>Strepera versicolor</i>	Grey Currawong				X			
CORVIDAE	<i>Corvus bennetti</i>	Little Crow				X			
	<i>Corvus coronoides</i>	Australian Raven				X			X
SYLVIIDAE	<i>Acrocephalus australis</i>	Australian Reed				X			
	<i>Cincloramphus cruralis</i>	Brown Songlark				X			
	<i>Megalurus gramineus</i>	Little Grassbird				X			
ZOSTEROPIDAE	<i>Zosterops lateralis</i>	Silvereye	Ma			X			
HIRUNDINIDAE	<i>Hirundo ariel</i>	Fairy Martin				X			
	<i>Hirundo neoxena</i>	Welcome Swallow	Ma			X			X
	<i>Hirundo nigricans</i>	Tree Martin	Ma			X			
STURNIDAE	<i>Acridotheres tristis</i>	Common myna				X			
	<i>Gracula religiosa</i>					X			
DICAEIDAE	<i>Dicaeum hirundinaceum</i>	Mistletoebird				X			
ESTRILIDAE	<i>Stagonopleura oculata</i>	Red-eared Firetail				X			
PASSERIDAE	* <i>Passer domesticus</i>	House Sparrow				X			

	FRINGILLIDAE	<i>Serinus canarius</i>					X			
	SCOLOPACIDAE	<i>Actitis hypoleucos</i>	Common Sandpiper				IA			
		<i>Calidris acuminata</i>	Sharp-tailed Sandpiper				IA			
		<i>Calidris alba</i>	Sanderling				IA			
		<i>Calidris canutus</i>	Red Knot				IA			
		<i>Calidris tenuirostris</i>	Great Knot				IA			
		<i>Caliclrus ferruginea</i>	Curlew Sandpiper				T			
		<i>Calidris ruficollis</i>	Red-necked Stint				IA			
		<i>Limosa lapponica</i>	Bar-tailed Godwit				IA			
		<i>Tringa brevipes</i>	Grey-tailed Tattler				IA			
		<i>Tringa glareola</i>	Wood Sandpiper				IA			
		<i>Tringa nebularia</i>	Common Greenshank				IA			
		<i>Tringa stagnatilis</i>	Marsh Sandpiper				IA			
	TACHYGLOSSIDAE	<i>Tachyglossus aculeatus</i>	Echidna					X		
	DASYURIDAE	<i>Dasyurus geoffroi</i>	Western Quoll, Chuditch	VU	S1			X		
		<i>Phascogale tapoatafa</i> ssp. (WAM M434)	Wambenger, Southern Brush-tailed Phascogale			S1			X	
	PERAMELIDAE	<i>Isodon obesulus fusciventer</i>	Southern Brown Bandicoot, Quenda				P5	X		
	PHALANGERIDAE	<i>Trichosurus vulpecula</i>	Common Brushtail Possum					X		
	TARSIPEDIDAE	<i>Tarsipes rostratus</i>	Honey Possum					X		
Mammals	MACROPODIDAE	<i>Macropus robustus</i>	Euro					X		
		<i>Macropus fuliginosus</i>	Western Grey Kangaroo					X		
		<i>Macropus irma</i>	Western Brush Wallaby				P4	X		

	MYRMECOBIIDAE	<i>Myrmecobius fasciatus</i>	Numbat			T				
	PSEUDOCHEIRIDAE	<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum	VU						
	VESPERTILIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat				X			
		<i>Chalinolobus morio</i>	Chocolate Bat				X			
		<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat				X			
		<i>Vespadelus regulus</i>	Southern Forest Bat				X			
	MOLOSSIDAE	<i>Austrononus australis</i>	White-striped Freetail-bat							
		<i>Mormopterus planiceps</i>	Southern Freetail-bat							
	MURIDAE	* <i>Mus musculus</i>	House Mouse				X			
		<i>Rattus fuscipes</i>	Western Bush Rat				X			
		<i>Hydromys chrysogaster</i>	Water Rat			4	X			
		* <i>Rattus rattus</i>	Black Rat			P4	X			
	FELIDAE	* <i>Felis catus</i>	Cat				X			
	CANIDAE	* <i>Canis lupus familiaris</i>	Dog				X			
		* <i>Vulpes vulpes</i>	Red Fox				X			
	SUIDAE	* <i>Sus scrofa</i>	Pig				X			
Reptiles	AGAMIDAE	<i>Ctenophorus adelaidensis</i>	Western Heath Dragon				X			
		<i>Pogona minor minor</i>	Western Bearded Dragon				X			
	GEKKONIDAE	<i>Christinus marmoratus</i>	Marbled Gecko				X			
		<i>Hemidactylus frenatus</i>	Asian House Gecko				X			
		<i>Gehrya variegata</i>					X			
	PYGOPODIDAE	<i>Aprasia repens</i>	Sand-plain Worm-lizard				X			
<i>Delma fraseri</i>		Fraser's Delma				X				

		<i>Delma greyii</i>					X			
		<i>Lialis burtonis</i>	Burrton's Legless Lizard				X			
		<i>Pletholax gracilis</i>	Keeled Legless Lizard				X			
		<i>Pygopus lepidopodus</i>	Common Scaly-foot				X			
		<i>Aprasia pulchella</i>					X			
	SCINCIDAE	<i>Acritoscincus trilineatum</i>	Southwestern Cool Skink				X			
		<i>Cryptoblepharus buchanani</i>					X			
		<i>Cryptoblepharus plagiocephalus</i>					X			X
		<i>Ctenotus australis</i>					X			
		<i>Ctenotus fallens</i>					X			
		<i>Ctenotus gemmula</i>	Jewelled Ctenotus			P3	X			
		<i>Ctenotus impar</i>					X			
		<i>Ctenotus labillardieri</i>					X			
		<i>Egernia kingii</i>	King Skink				X			
		<i>Egernia napoleonis</i>	Southwestern Crevice Skink				X			
		<i>Hemiergis peronii</i>					X			
		<i>Hemiergis quadrilineata</i>	Two-toed Earless Skink				X			
		<i>Lerista distinguenda</i>					X			
		<i>Lerista elegans</i>					X			
		<i>Lerista lineopunctulata</i>					X			
		<i>Lerista praepeditia</i>					X			
	<i>Lissolepis luctosa</i>	Western Swamp Skink				X				

	<i>Menetia greyii</i>	Common Dwarf Skink				X			
	<i>Morethia lineoocellata</i>					X			
	<i>Morethia obscura</i>	Woodland Flecked Skink				X			
	<i>Tiliqua occipitalis</i>	Western Blue-tongue				X			
	<i>Tiliqua rugosa</i>	Shingleback; Southwestern Bobtail				X			X
VARANIDAE	<i>Varanus tristis</i>					X			
	<i>Varanus gouldii</i>	Gould's Sand Monitor				X			
TYPHLOPIDAE	<i>Ramphotyphlops australis</i>	Southern Blind Snake				X			
	<i>Ramphotyphlops waitii</i>					X			
BOIDAE	<i>Morelia spilota imbricata</i>	Carpet Python		S4	S	X			
	<i>Antaresia stimsoni stimsoni</i>	Stimsons Python				X			
	<i>Brachyuropis fasciolata</i>	Narrow-banded Shovel-nosed Snake				X			
	<i>Brachyuropis semifasciata</i>	Southern Shovel-nosed Snake				X			
	<i>Demansia psammophis reticulata</i>	Yellow faced whipsnake				X			
ELAPIDAE	<i>Echiopsis curta</i>	Bardick				X			
	<i>Elapognathus coronatus</i>	Crowned Snake				X			
	<i>Neelaps bimaculatus</i>	Black-naped Snake				X			
	<i>Neelaps calonotos</i>	Black-striped Snake			P3	X		X	
	<i>Notechis scutatus</i>	Tiger Snake				X			
	<i>Parasuta gouldii</i>	Gould's Snake				X			

	<i>Parasuta nigriceps</i>					X			
	<i>Pseudechis australis</i>	Mulga Snake				X			
	<i>Pseudonaja affinis affinis</i>	Dugite				X			X
	<i>Pseudonaja mengdeni</i>	Gwardar				X			
	<i>Pseudonaja modesta</i>	Ringed brown snale				X			
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake				X			

APPENDIX F

Flora Taxa Inventory

Flora Taxa Inventory

Family	Taxa
Anarthriaceae	* <i>Schinus terebinthifolius</i>
	<i>Lyginia barbata</i>
Apiaceae	* <i>Foeniculum vulgare</i>
Araceae	* <i>Zantedeschia aethiopica</i>
Asparagaceae	<i>Lomandra hermaphrodita</i>
Asteraceae	* <i>Arctotheca calendula</i>
	* <i>Hypochaeris glabra</i>
	<i>Senecio condylus</i>
	* <i>Sonchus oleraceus</i>
	* <i>Ursinia anthemoides</i>
Casuarinaceae	<i>Allocasuarina fraseriana</i>
	<i>Allocasuarina humilis</i>
	<i>Casuarina obesa</i>
Colchicaceae	<i>Burchardia congesta</i>
Convolvulaceae	* <i>Ipomoea indica</i>
Cyperaceae	<i>Baumea juncea</i>
	<i>Mesomelaena pseudostygia</i>
	<i>Schoenus curvifolius</i>
Dasypogonaceae	<i>Calectasia cyanea</i>
	<i>Dasypogon bromeliifolius</i>
Dilleniaceae	<i>Hibbertia huegelii</i>
	<i>Hibbertia hypericoides</i>
Ericaceae	<i>Conostephium pendulum</i>
	<i>Lysinema ciliatum</i>
Euphorbiaceae	* <i>Euphorbia terracina</i>
Fabaceae	* <i>Acacia iteaphylla</i>
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>
	<i>Acacia pulchella</i>
	<i>Acacia rostellata</i>

	<i>Acacia saligna</i>
	<i>Bossiaea eriocarpa</i>
	* <i>Chamaecytisus palmensis</i>
	<i>Daviesia divaricata</i>
	<i>Gompholobium tomentosum</i>
	<i>Hardenbergia comptoniana</i>
	<i>Jacksonia floribunda</i>
	<i>Jacksonia furcellata</i>
	<i>Kennedia prostrata</i>
	* <i>Lupinus cosentinii</i>
	* <i>Trifolium campestre</i>
Goodeniaceae	<i>Dampiera alata</i>
	<i>Lechenaultia biloba</i>
	<i>Scaevola repens</i>
Haemodoraceae	<i>Anigozanthos humilis</i>
	<i>Conostylis aculeata</i>
Iridaceae	* <i>Gladiolus caryophyllaceus</i>
	<i>Patersonia occidentalis</i>
Loranthaceae	<i>Nuytsia floribunda</i>
Meliaceae	<i>Melia azedarach</i>
Molluginaceae	<i>Macarthuria australis</i>
Myrtaceae	<i>Agonis flexuosa</i>
	<i>Astartea</i> sp.
	<i>Callistemon</i> sp.
	<i>Calothamnus quadrifidus</i>
	<i>Calothamnus sanguineus</i>
	<i>Calytrix flavescens</i>
	<i>Calytrix fraseri</i>
	<i>Chamelaucium uncinatum</i>
	<i>Corymbia calophylla</i>
	<i>Eremaea pauciflora</i>

	<i>Eucalyptus camaldulensis</i>
	<i>Eucalyptus gomphocephala</i>
	<i>Eucalyptus marginata</i>
	<i>Eucalyptus rudis</i>
	<i>Eucalyptus</i> sp.
	<i>Eucalyptus todtiana</i>
	<i>Hypocalymma angustifolium</i>
	<i>Kunzea glabrescens</i>
	* <i>Leptospermum laevigatum</i>
	<i>Melaleuca huegelii</i>
	<i>Melaleuca nesophila</i>
	<i>Melaleuca preissiana</i>
	<i>Regelia ciliata</i>
	<i>Regelia inops</i>
	<i>Scholtzia involucrata</i>
Orchidaceae	<i>Caladenia flava</i>
	<i>Caladenia latifolia</i>
	<i>Caladenia longicauda</i>
	<i>Diuris magnifica</i>
Oxalidaceae	* <i>Oxalis pes-caprae</i>
Papaveraceae	* <i>Fumaria capreolata</i>
Poaceae	<i>Amphipogon turbinatus</i>
	* <i>Avena barbata</i>
	* <i>Briza maxima</i>
	* <i>Cortaderia selloana</i>
	* <i>Cynodon dactylon</i>
	* <i>Ehrharta calycina</i>
	* <i>Lagurus ovatus</i>
Primulaceae	<i>Lysimachia arvensis</i>
Proteaceae	<i>Adenanthos cygnorum</i>
	<i>Banksia attenuata</i>

	<i>Banksia menziesii</i>
	<i>Hakea varia</i>
	<i>Petrophile linearis</i>
	<i>Stirlingia latifolia</i>
Restionaceae	<i>Alexgeorgea nitens</i>
	<i>Desmocladius flexuosus</i>
Rubiaceae	<i>Opercularia vaginata</i>
Rutaceae	<i>Philothea spicata</i>
Solanaceae	* <i>Solanum nigrum</i>
Typhaceae	* <i>Typha orientalis</i>
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>

APPENDIX F

Site Data Sheets

Site THRO1

Described by **ÁIWÁ**
 Date **Á** 21/09/2013 **Á**
 Type **Á** Relevé
 Location **Á** Tonkin Highway
 MGA Zone **Á** 50 398249 mE
 6468378 mN
 Habitat **Á** Artificial bank of road
 Soil **Á** Grey sands
 Veg
 Condition **Á** Good
 Fire Age **Á** >12 years
 Notes **Á** Disturbance: non endemic
 species used or rehab
 Ground Cover: 10%
 Bareground, 0% Logs, 5%
 Twigs, 10% Leaves

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 Á



SPECIES LIST:

Name Á Á	Cover	Height	Specimen Notes
Á <i>Acacia iteaphylla</i>	3%	2m Á	THR01-03
<i>Adenanthos cygnorum</i>			NC
<i>Agonis flexuosa</i>			NC
* <i>Briza maxima</i>	4%	0.4	NC
Á <i>Calothamnus quadrifidus</i> Á			NC
Á <i>Chamaecytisus palmensis</i>			NC
<i>Chamelaucium uncinatum</i>	15%	3m	NC
* <i>Ehrharta calycina</i>	2%	0.5m	NC
* <i>Eucalyptus camaldulensis</i> <i>camaldulensis</i>	5%	10m	THR01-02
<i>Eucalyptus todtiana</i>			NC
* <i>Fumaria capreolata</i>	0.15m		NC
* <i>Hypochaeris glabra</i>	4%	1m	NC
<i>Jacksonia furcellata</i>			NC
* <i>Lagurus ovatus</i>			NC
* <i>Lupinus cosentinii</i>			NC
<i>Melaleuca nesophila</i>	90%	4m	THR01-01
* <i>Ursinia anthemoides</i>	2%	1m	NC

Site THRO2

Described by **AWA** **Á**
 Date **21/09/2013** **Á**
 Type **Relevé** **Á**
 Location **New drainage pond**
 MGA Zone **50 398204 mE**
6468533 mN
 Habitat **Boundary of articial wetland**
 Soil **Dark grey sand**
 Veg
 Condition **Good to Degraded**
 Fire Age **>12 years**
 Notes **Disturbance: Weeds, non endemic**
Ground Cover: 10%
Bareground, 0% Logs, 5%
Twigs, 10% Leaves



SPECIES LIST:

Name	Cover	Height	Specimen Notes
<i>Caladenia latifolia</i>		0.25	NC
<i>Casuarina obesa</i>	15%	10m	NC
* <i>Chamaecytisus palmensis</i>	55%	4m	NC
* <i>Cynodon dactylon</i>	8%	0.3m	NC
* <i>Ehrharta calycina</i>	4%	0.55m	NC
<i>Eucalyptus camaldulensis</i>	30%	15m	THR01-02
* <i>Fumaria capreolata</i>			NC
<i>Hakea varia</i>			NC
* <i>Ipomoea indica</i>			NC
<i>Melia azedarach</i>			NC
* <i>Sonchus oleraceus</i>		0.6m	NC
* <i>Trifolium campestre</i>			NC
* <i>Typha orientalis</i>			NC

Site THRO3

Described by **AWÁ**
 Date **21/09/2013** **Á**
 Type **Relevé**
 Location **Intersection Tonkin and Collier**
 MGA Zone **50 398190 mE**
6469405 mN
 Habitat **Upper slope/surrounding land**
has been cut away
 Soil **Grey sand**
 Veg
 Condition **Degraded**
 Fire Age **1-4 years**
 Notes **Disturbance: Weeds, clearing**
Ground Cover: 10% Bareground,
0% Logs, 3% Twigs, 5% Leaves



SPECIES LIST:

Name	Cover	Height	Specimen Notes
<i>Acacia pulchella</i>		1.2m	NCÁ
<i>Adenanthos cygnorum</i>	5%	2.3m	NC
* <i>Arctotheca calendula</i>			NCÁ
* <i>Avena barbata</i>			NCÁ
<i>Banksia attenuata</i>	10%	5m	NC
<i>Banksia menziesii</i>			NCÁ
* <i>Briza maxima</i>	4%	0.3m	NCÁ
<i>Caladenia longicauda</i>	Á	Á	THRNW04
<i>Corymbia calophylla</i>	2%	5m	NC
* <i>Cynodon dactylon</i>	2%	0.15m	NC
* <i>Ehrharta calycina</i>	90%	1.1m	NC
* <i>Fumaria capreolata</i>	3%	0.7m	NC
* <i>Gladiolus caryophyllaceus</i>	Á	0.4m	NC
* <i>Hypochoeris glabra</i>	3%	1m	NC
<i>Jacksonia floribunda</i>	Á	Á	NC
<i>Macarthuria australis</i>	Á	Á	THNW05
<i>Nuytsia floribunda</i>			NC
<i>Petrophile linearis</i>	Á	Á	NCÁ Á
<i>Stirlingia latifolia</i>	Á	Á	NC
* <i>Ursinia anthemoides</i>		0.25m	NCÁ
<i>Xanthorrhoea preissii</i>	Á	Á	NC

Site THRO4

Described by **ÁIWÁ** **Á**
 Date **Á** 21/09/2013 **Á**
 Type **Á** Relevé **Á**
 Location **Á** Tonkin Highway **Á**
 MGA Zone **Á** 50 397840 mE **Á**
 6470540 mN **Á**
 Habitat **Á** Near state park **Á**
 Soil **Á** Dark brown/grey sand **Á**
 Veg **Á**
 Condition **Á** Very good **Á**
 Fire Age **Á** 4-8 years **Á**
 Notes **Á** Disturbance: weeds **Á**
 Ground Cover: 1% **Á**
 Bareground, 0% Logs, 4% **Á**
 Twigs, 3% Leaves **Á**



SPECIES LIST:

Name Á Á	Cover	Height	Specimen Notes
<i>Acacia pulchella</i>	25%	1.6m	NC
<i>Astartea</i> sp.	10%	1.2m	NC
<i>Baumea juncea</i>	15%	1m	TH04-01
<i>Ehrharta calycina</i>	3%	0.60m	NC
* <i>Fumaria capreolata</i>		0.15m	NC
<i>Hakea varia</i>	2%	1.5m	NC
<i>Hypocalymma angustifolium</i>	4%	0.6m	NC
* <i>Hypochaeris glabra</i>	2%	0.01m	NC
<i>Kennedia prostrata</i>		Cr	NC
<i>Melaleuca preissiana</i>	60%	6m	NC
<i>Xanthorrhoea preissii</i>	2%	1.3m	NC

Site THRO5

Described by ~~Á~~ÁIW~~Á~~
 Date ~~Á~~ 1/10/2013~~Á~~
 Type ~~Á~~ Relevé
 Location ~~Á~~ Tonkin Highway
 MGA Zone ~~Á~~ 50 397704 mE
 6471899 mN
 Habitat Plain
 Soil ~~Á~~ Grey sands
 Veg
 Condition ~~Á~~ Good to Degraded
 Fire Age ~~Á~~ >12 Years
 Notes ~~Á~~ Disturbance: weeds
 Ground Cover: 10%
 Bareground, 0% Logs, 2%
 Twigs, 2% Leaves

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SPECIES LIST:

Name Á	Cover	Height	Specimen Notes
Á Adenanthos cygnorum Á	2%	1.2m	NC
Allocasuarina humilis	2%	1.2m	NC
*Avena barbata	4%	0.45m	NC
Banksia attenuata	5%	6m	NC
Banksia menziesii	5%	6m	NC
*Briza maxima	4%	0.4m	NC
Calytrix flavescens		0.2	NC
Conostylis aculeata		0.2m	NC
Corymbia calophylla	5%	7m	NC
*Ehrharta calycina	50%	1m	NC
*Gladiolus caryophyllaceus		0.8m	NC
Hibbertia hypericoides	3%	0.8m	NC
Jacksonia floribunda	2%	1.2m	NC
Lomandra hermaphrodita		0.2m	NC
Mesomelaena pseudostygia	3%	0.45m	NC
Stirlingia latifolia		0.6m	NC
*Ursinia anthemoides	3%	0.15m	NC Á

Site THRO6

Described by **AIW**
 Date **1/10/2013**
 Type **Relevé**
 Location **Tonkin Highway**
 MGA Zone **50 397550 mE
6473216 mN**
 Habitat **Midslope Banksia woodland**
 Soil **Grey sands**
 Veg
 Condition **Good**
 Fire Age **>12 years**
 Notes **Disturbance: NA
Ground Cover: 6%
Bareground, 0% Logs, 2%
Twigs, 2% Leaves**



SPECIES LIST:

Name	Cover	Height	Specimen Notes
<i>Acacia pulchella</i>	3%	1.1m	NC
<i>Adenanthos cygnorum</i>	3%	2m	NC
<i>Allocasuarina humilis</i>	3%	1.6m	NC
<i>Anigozanthos humilis</i>		0.25m	NC
* <i>Avena barbata</i>	3%	0.6m	NC
<i>Banksia attenuata</i>	6%	6m	NC
<i>Banksia menziesii</i>	8%	6m	NC
* <i>Briza maxima</i>	5%	0.3m	NC
<i>Burchardia congesta</i>		0.5m	NC
<i>Desmocladius flexuosus</i>	1.5%	0.15m	NC
* <i>Ehrharta calycina</i>	5%	1m	NC
<i>Eremaea pauciflora</i>	5%	1.2m	NC
<i>Gompholobium tomentosum</i>		0.45m	NC
<i>Hibbertia huegelii</i>		0.3m	NC
<i>Hibbertia hypericoides</i>	3%	0.6m	NC
<i>Jacksonia floribunda</i>	2%	1.6m	NC
<i>Nuytsia floribunda</i>	2%	8m	NC
<i>Scaevola repens</i>	1.5%	0.05m	NC
<i>Stirlingia latifolia</i>	1%	0.6m	NC

Site THRO7

Described by NWÁ Á
 DateÁ 1/10/2013Á Á
 TypeÁ Relevé
 LocationÁ Reid Highway
 MGA Zone 50 397809 mE
 6473987 mN Á
 HabitatÁ Open woodland/dampland
 SoilÁ Grey sands
 Veg
 ConditionÁ Very Good
 Fire AgeÁ N/A
 NotesÁ Disturbance: Weeds
 Ground Cover: 0% Bareground,
 0% Logs, 6% Twigs, 2% Leaves



SPECIES LIST:

Á Name	CoverÁ	Height	Specimen Notes
<i>Astartea</i> sp.	1.5%	1.2m	NC
* <i>Avena barbata</i>	5%	0.8m	NC
<i>Burchardia congesta</i>	0.45m	NC	
<i>Dampiera alata</i>	0.3m	NC	
<i>Diuris magnifica</i>	0.3m	THR7-01	
* <i>Ehrharta calycina</i>	20%	1.1m	NC
* <i>Euphorbia terracina</i>	1.5%	0.5m	NC
* <i>Gladiolus caryophyllaceus</i>	2%	0.1m	NC
<i>Hypocalymma angustifolium</i>	3%	1.2m	NC
* <i>Hypochoeris glabra</i>	2%	0.01m	NC
<i>Jacksonia furcellata</i>	2%	2m	NC
<i>Lechenaultia biloba</i>	0.3m	NC	
<i>Melaleuca preissiana</i>	10%	7m	NC
<i>Nuytsia floribunda</i>	2%	5m	NC
<i>Regelia ciliata</i>	4%	2m	NC
* <i>Ursinia anthemoides</i>	5%	0.2m	NC
<i>Xanthorrhoea preissii</i>	2%	1.6m	NCÁ

Site THRO8

Described by **AWA**
 Date **1/10/2013**
 Type **Relevé**
 Location **Tonkin Highway**
 MGA Zone **50 397666 mE**
6473130 mN
 Habitat **Mid slope woodland**
 Soil **Grey sands**
 Veg
 Condition **Excellent**
 Fire Age **>12 years**
 Notes **Disturbance: weeds**
Ground Cover: 1%
Bareground, 0% Logs, 4%
Twigs, 3% Leaves



SPECIES LIST:

Name	Cover	Height	Specimen Notes
<i>Alexgeorgea nitens</i>	1%	0.15m	NC
<i>Allocasuarina humilis</i>	7%	1.3m	NC
<i>Amphipogon turbinatus</i>	3%	0.4m	NC
<i>Banksia attenuata</i>	10%	8m	NC
<i>Banksia menziesii</i>	15%	5m	NC
<i>Bossiaea eriocarpa</i>	NC		
<i>Calectasia cyanea</i>	0.4m	NC	
<i>Calytrix flavescens</i>	2%	0.3m	NC
<i>Conostephium pendulum</i>	NC		
<i>Conostylis aculeata</i>	0.35m	NC	
<i>Dampiera alata</i>	2%	0.25m	NC
<i>Eremaea pauciflora</i>	3%	0.8m	NC
<i>Eucalyptus todtiana</i>	7%	10m	NC
* <i>Gladiolus caryophyllaceus</i>	1%	0.8m	NC
<i>Gompholobium tomentosum</i>	0.6m	NC	
<i>Hibbertia huegelii</i>	1%	0.3m	NC
<i>Hibbertia hypericoides</i>	6%	1m	NC
<i>Lomandra hermaphrodita</i>	0.25m	NC	
<i>Lyginia barbata</i>	2%	0.45m	NC
<i>Lysimachia arvensis</i>	1%	0.05m	NC
<i>Nuytsia floribunda</i>	3%	6m	NC
<i>Opercularia vaginata</i>	0.40m	NC	
<i>Patersonia occidentalis</i>	0.35m	NC	
<i>Scaevola repens</i>	1%	0.05m	NC
<i>Schoenus curvifolius</i>	0.4m	NC	
<i>Stirlingia latifolia</i>	1%	0.6m	NC

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Site THRO9

Described by **ÁIWÁ**
 Date **Á** 1/10/2013 **Á**
 Type **Á** Relevé
 Location **Á** Cnr Benara Road
 MGA Zone **Á** 50 397651 mE
 6472693 mN
 Habitat **Á** Tall shrubland, flat
 Soil **Á** Grey sand
 Veg
 Condition **Á** Good
 Fire Age **Á** >12 years
 Notes **Á** Disturbance: weeds
 Ground Cover: 2%
 Bareground, 2% Logs,
 10% Twigs, 5% Leaves



SPECIES LIST:

Name Á Á	Cover	Height	Specimen Notes
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>	1%	1.1m	R4-02
<i>Adenanthos cygnorum</i>			NC
* <i>Avena barbata</i>	5%	0.4m	NC
<i>Calothamnus quadrifidus</i>			NC
<i>Chamelaucium uncinatum</i>	10%	1.7m	NC
* <i>Cynodon dactylon</i>			NC
* <i>Ehrharta calycina</i>	4%	0.8m	NC
* <i>Eucalyptus</i> sp.	3%	7m	NC
* <i>Euphorbia terracina</i>	2%	0.6m	NC
* <i>Fumaria capreolata</i>		0.2m	NC
* <i>Hypochoeris glabra</i>	1%	0.1m	NC
<i>Kunzea glabrescens</i>	80%	4m	R4-01
* <i>Lupinus cosentinii</i>			NC
<i>Melaleuca nesophila</i>			NC
<i>Melaleuca preissiana</i>	2%	5m	NC
* <i>Oxalis pes-caprae</i>			NC

Opportunistic Observations

Acacia rostellata
Acacia saligna
Adenanthos cygnorum
Agonis flexuosa
Allocasuarina fraseriana
Allocasuarina humilis
Astartea sp.
 **Avena barbata*
Banksia attenuata
Banksia menziesii
Burchardia congesta
Caladenia flava
Callistemon sp.
Calothamnus quadrifidus
Calothamnus sanguineus
Calytrix flavescens
Calytrix fraseri
Casuarina obesa
 **Chamaecytisus palmensis*
Chamelaucium uncinatum
Conostylis aculeata
Cortaderia seloana
Corymbia calophylla
Dasypogon bromeliifolius
Daviesia divaricata
 **Ehrharta calycina*
Eucalyptus camaldulensis
Eucalyptus gomphocephala
Eucalyptus marginata
Eucalyptus rudis
Eucalyptus todtiana
 **Euphorbia terracina*
 **Foeniculum vulgare*
 **Fumaria capreolata*
 **Gladiolus caryophyllaceus*
Hakea varia
Hardenbergia comptoniana
Hibbertia hypericoides
Hypocalymma angustifolium
Jacksonia floribunda
Jacksonia furcellata
Kunzea glabrescens
Leptospermum laevigatum
 **Lupinus cosentinii*
Lysinema ciliatum
Macarthuria australis
Melaleuca huegelii
Melaleuca nesophila
Melaleuca preissiana
Mesomelaena pseudostygia
 **Oxalis pes-caprae*
Philothea spicata
Regelia inops

Schinus terebinthifolius
Scholtzia involucreta
Senecio condylus
Solanum nigrum
Stirlingia latifolia
Typha orientalis
Xanthorrhoea preissii
**Zantedeschia aethiopica*

5 HJW a Ybh&V. : `cfUžj Y[YhU]cb`UbX`Zi bU\ UV]hU
a Udd]b[`[Udg`UbUmg]g`a Ya cfUbXi a `

MEMORANDUM

To:	Dominic Boyle	Company:	MRWA
From:	Clinton van den Bergh	Company:	Coffey
Date:	25 August 2014	Document No.:	NLWA-01-EN-ME-0004
Subject:	Tonkin Grade Separations – Flora, Vegetation and Fauna Habitat Mapping Gaps Analysis		

Review of previous studies (360 Environmental, 2014) commissioned by Main Roads Western Australia (MRWA) for a flora, vegetation and fauna assessment of the Tonkin Grade Separations project (the project) identified a small area of land, between Tonkin Highway and Harvest Road (study area; Figure 1; Figure 2), which was not previously surveyed.

To address this gap, members of the NorthLink WA Team, Clinton van den Bergh (Senior Botanist) and John Trainer (Senior Zoologist) undertook a site investigation on 15 August 2014 to identify the flora, vegetation and fauna values within this area to support project approval applications. The site investigation was consistent with the Environmental Protection Authority's (WA) Guidance for the Assessment of Environmental Factors No. 51 and No. 56 for Flora and Vegetation surveys (EPA, 2004a) and Terrestrial Vertebrate Fauna Surveys (EPA, 2004b) in Western Australia and the Commonwealth's Department of the Environment EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPAC, 2012). The results of this investigation are summarised below.

Flora and Vegetation

The flora and vegetation of the study area consists predominantly of weed species or horticultural (planted) species (Plates 1–4). There were 19 native plant species recorded within the study area, 12 of which appeared to be naturally occurring and seven of which were considered to be planted. Another 12 introduced (weed) species were also recorded within the study area. For the full list of flora species recorded see Attachment A.

Native flora recorded from the study area are considered to be isolated and scattered and do not represent a native plant community. However, to be consistent with the current vegetation mapping units within the project previously described and mapped (360 Environmental 2014), the vegetation within the study area has been compared to the existing mapping units (360 Environmental, 2014) to determine the vegetation extent. The vegetation mapping units recorded from within the study area are presented in Figure 1 and discussed below:

MnCu – *Melaleuca nesophila* and *Chamelaucium uncinatum* (planted vegetation unit).

Ec – *Eucalyptus camaldulensis* subsp. *camaldulensis* over weeds (planted vegetation unit).

EtBa – *Eucalyptus todtiana* and *Banksia attenuata* with occasional planted *Eucalyptus* species over scattered *Stirlingia latifolia* shrubs over weed species (mix of naturally occurring and planted vegetation unit).

H – Existing house with planted garden variety trees and shrubs.

The vegetation is severely impacted by housing, historical anthropogenic disturbances and a high density and diversity of weed species. The condition of the vegetation within the study area is considered to be

completely degraded based on the vegetation condition rating scale developed by Keighery (1994), as illustrated in Figure 1, and there is little scope for regeneration without intense management (Keighery 1994).

No Threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or gazetted as Threatened under the *Wildlife Conservation Act 1950* (WC Act) were recorded in the study area. No priority species recognised by Department of Parks and Wildlife (DPaW) (Western Australian Herbarium, 2014).

The likelihood of a threatened or priority species occurring in the study area is considered unlikely due to the degraded and completely degraded condition of the vegetation (Keighery 1994). The 12 weed species recorded from the study area are not considered to be Declared Pests under Section 22 of the *Biosecurity and Agricultural Management Act 2007* (WA) (BAM Act) or are listed as Weeds of National Significance in Western Australia (Commonwealth of Australia, 2012).

Fauna

Given the vegetation characteristics described above, the study area has very limited habitat value and is considered unlikely to support any conservation significant fauna.

While a total of 10 flora species (three introduced and seven native) known to be foraging resources for Black Cockatoos were recorded within the study area, the poor condition of the site and the sporadic nature of individual plants does not meet the criteria for quality foraging habitat for Black Cockatoos as it is under 1 hectare (DSEWPAC, 2012). Furthermore, the investigation did not identify any known breeding resources for Black Cockatoos (Groom, 2011, Chapman, 2007, Valentine and Stock, 2008). The recorded large *Eucalyptus tottiana* and *Eucalyptus camaldulensis* trees do not meet the criteria for potential roost sites, as they were not located in an area of quality foraging habitat (DSEWPAC, 2012). As a result, there is no Black Cockatoo habitat located within the study area.

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Attachments

- A Plates 1 – 4 Photos of the study area
- B Preliminary Flora List
- C Figures 1 & 2

Attachment A – Plates 1 to 4 (photos of the study area)



Plate 1: North alignment

Plate 2: Housing, mid alignment



Plate 3: Mid to south alignment

Plate 4: South alignment

Attachment B – Preliminary Flora List

42 ZAMIACEAE

*Macrozamia riedlei***44 PINACEAE**

Pinus pinaster*124 IRIDACEAE**

Chasmanthe floribunda*163 POACEAE**

**Avena barbata*
Ehrharta calycina*166 PAPAVERACEAE**

Fumaria capreolata*175 PROTEACEAE**

Banksia attenuata
Banksia menziesii
Petrophile linearis
*Stirlingia latifolia***181 DILLENIACEAE**

*Hibbertia hypericoides***201 FABACEAE**

Jacksonia floribunda
Lupinus cosentinii*217 CASUARINACEAE**

Allocasuarina fraseriana
*Allocasuarina humilis***232 OXALIDACEAE**

Oxalis pes-caprae*242 EUPHORBIACEAE**

Euphorbia terracina*281 MYRTACEAE**

Agonis flexuosa (Planted)
Chamelaucium uncinatum (Planted)
Corymbia calophylla
Corymbia maculata (Planted)

Eucalyptus camaldulensis (Planted)

Eucalyptus sp. (Planted)

Eucalyptus todtiana

**Leptospermum laevigatum*

Melaleuca nesophila (Planted)

302 MELIACEAE

**Melia azedarach*

309 MALVACEAE

Brachychiton sp. (Planted)

332 BRASSICACEAE

**Brassica tournefortii*

339 LORANTHACEAE

Nuytsia floribunda

460 ASTERACEAE

**Hypochaeris glabra*

* Indicates introduced (weed) species



397,500 398,000

6,471,500 6,471,500

0 m 60

Scale 1:3,500
Page size: A4
Projection: GDA 1994 MGA Zone 50

LEGEND

- Vegetation extent to be cleared
- Project area
- Study area

Vegetation condition

- Completely degraded

Broad vegetation mapping

- Ec** - *Eucalyptus camaldulensis* subsp. *camaldulensis* over weeds
- EtBa** - *Eucalypts todtiana* and *Banksia attenuata* with occasional planted *Eucalyptus* species over scattered *Stirlingia latifolia* shrubs over weed species.
- MnCu** - *Melaleuca nesophila* and *Chamelaucium uncinatum*
- Existing house with planted garden variety trees and shrubs
- Road



Source & Notes
Vegetation from Coffey (August 2014)
Roads from Geoscience Australia.
Aerial imagery from Landgate (September 2013).



LEGEND

- Additional vegetation extent to be cleared
- Vegetation extent to be cleared
- Project area

Source & Notes
 Vegetation from Coffey (August 2014)
 Roads from Geoscience Australia
 Aerial imagery from Landgate (September 2013).

5 HJW a Ybhi&W'6`UW`7 cW_Uhc`UggYgga Ybhi



360
environmental



**Black Cockatoo
Assessment –
Tonkin Highway**

Prepared for:

**Main Roads Western
Australia**

December 2013

● people ● planet ● professional



Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
185AA	A INTERNAL DRAFT	HA	RF		6/12/13
185AA	B CLIENT REPORT	HA	Client	1 Electronic (email)	6/12/13

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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Main Roads Western Australia in September 2013 to undertake a Black Cockatoo assessment for the Tonkin Highway Separation Project (the Project Area). The survey involved a Black Cockatoo breeding and foraging habitat assessment.

A search of the Australian Governments Department of Environment (DoE) protected matters search tool was used to generate a report to help determine whether matters of national environmental significance, such as Black Cockatoos are likely to occur in the Project Area. The report revealed that the Endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) and Vulnerable Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*) are likely to occur in the Project Area or in the nearby surrounding area.

During the assessment breeding and foraging habitat was recorded in the Project Area. Forest Red-tailed Black Cockatoos were observed foraging in the Project Area during the assessment.

We recorded 148 trees in the Project Area that are of a size that the DoE considers them to be potential breeding trees (also breeding habitat) for Black Cockatoo species as they have the potential to form hollows suitable for Black Cockatoos nesting in the future.

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1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Main Roads Western Australia (MRWA) in September 2013 to undertake a Black Cockatoo assessment for the Tonkin Highway Separation Project (the Project Area) (Figure 1).

The Black Cockatoo assessment involved a foraging and breeding habitat assessment of the site with the purpose of identifying potential areas of Black Cockatoo habitat.

The Project Area is approximately 99 ha in size and stretches from just north of Guildford road Tonkin Highway intersection to the Reid Highway and Tonkin Highway intersection (approximately six km long). The Project Area includes sections of remnant vegetation and rehabilitated vegetation along the road side.

Three species of Black Cockatoo occur in the south-west of Western Australia. All three species are protected under the following State and Commonwealth legislation:

- The Western Australian *Wildlife Conservation Act 1950* (WC Act); and
- The Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the EPBC Act. The Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) are both classified as Vulnerable under the EPBC Act.

Table 1. Conservation Status of Black Cockatoo Species that Potentially Occur in the Study Area.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION CODE	
		EPBC Act	WC Act
Forest Red-tailed Black Cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	S1
Baudin's Cockatoo	<i>Calyptorhynchus baudinii</i>	VU	S1
Carnaby's Cockatoo	<i>Calyptorhynchus latirostris</i>	EN	S1

Key: VU = vulnerable, EN = endangered and S1 = Schedule 1 (Fauna that is rare or is likely to become extinct).

1.2 Black Cockatoo Referral Guidelines

There are also EPBC Act referral guidelines for the three threatened species of Black Cockatoo that occur in the south-west of WA (DSEWPaC 2012a – now Department of the Environment [DoE]). These guidelines are intended to assist proponents in determining whether a proposed action needs to be referred (Table 2). The guidelines also provide among other things, recommendations, as to how the habitat assessment should be undertaken, and this forms the basis of this Black Cockatoo assessment.

1.3 Objective

The objectives of the Black Cockatoo assessment were to:

- Determine the extent of potential Black Cockatoo habitat in the Project Area;
- Record the location and number of potential breeding or actual breeding trees used by the Black Cockatoo species; and
- Record the location and number of any Black Cockatoos observed in the study area.

1.4 Scope of the Study

In order to meet the objectives, the following scope of work was undertaken:

- Background Research;
- Black Cockatoo Foraging assessment;
- Black Cockatoo Breeding assessment; and
- Any Black Cockatoo opportunistic observations in the Project Area.

Table 2. Black Cockatoo Referral Guidelines (see DSEWPaC 2012a).

HIGH RISK OF SIGNIFICANT IMPACTS: REFERRAL RECOMMENDED
<ul style="list-style-type: none"> ● Clearing of any known nesting tree; ● Clearing or degradation of any part of a vegetation community known to contain breeding habitat; ● Clearing of more than 1 ha of quality foraging habitat; ● Clearing or degradation (including pruning the top canopy) of a known night roosting site; and ● Creating a gap of greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting).
MEDIUM RISK OF SIGNIFICANT IMPACTS: REFERRAL RECOMMENDED
<ul style="list-style-type: none"> ● Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat; ● Clearing or disturbance in areas surrounding Black Cockatoo breeding, foraging or night roosting habitat that has the potential to degrade habitat through introduction of invasive species, edge effects, hydrological changes, increased human visitation or fire; ● Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows; and ● Actions with the potential to introduce known plant diseases such as <i>Phytophthora</i> spp. To an area where the pathogen was not previously known.
LOW RISK OF SIGNIFICANT IMPACTS: REFERRAL RECOMMENDED
<ul style="list-style-type: none"> ● Actions that do not affect Black Cockatoo habitat or individuals; and ● Actions whose impacts occur outside the modeled distribution of the three Black Cockatoos.

2 Site Description

2.1 Current land use

The Project Area currently forms part of Tonkin Highway road reserve. This area is currently comprised of four to six lanes of bitumen road, median strip, footpaths and road verge. Numerous elements associated with road management and utilities providers are also located within or adjacent to the road reserve. These include:

- A road overpass (Broun Avenue) and pedestrian overpass (between Benara Road and Reid Highway);
- A Principle Shared Path (PSP) is constructed along the Eastern edge of the road between Guildford Road and Collier Road;
- Noise bunds;
- Signal boxes;
- Lighting infrastructure;
- Several access hatches to utilities infrastructure including telecommunications and water supplies;
- Two drainage sumps (one on the North East and one on the South East corner of the Morley Drive and Tonkin Highway intersection);
- Storm drains (Morley Drive and Tonkin Highway intersection);
- Drainage hole (North East corner of Benara Road and Tonkin Highway intersection);
- Storm drains; and
- Fencing associated with the road itself and with domestic properties located adjacent to the site.

2.2 Biogeographic regionalisation for Australia

The Interim Biogeographic Regionalisation of Australia (IBRA 7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (DSEWPAC 2012b).

The study area is located in the Swan Coastal Plain Bioregion (SWA), which is described as a low lying coastal plain mainly covered with woodlands, dominated by *Banksia* or *Tuart* (*Eucalyptus gomphocephala*) on sandy soils, *Casuarina obesa* on outwash plains, and paperbark (*Melaleuca* spp.) in swampy areas (Mitchell *et al.* 2002). The plain rises in the

east to duricrusted Mesozoic sediments dominated by Jarrah Woodland (Mitchell *et al.* 2002).

The Project Area is located in the Perth (SWA2) subregion of the SWA bioregion (Mitchell *et al.* 2002). The SWA2 subregion is composed of colluvial and aeolian sands, alluvial river flats and coastal limestone composing of heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes and Marri on colluvial and alluvial soils (Mitchell *et al.* 2002).

2.3 Broad Habitat Mapping

The fauna habitat of the Project Area can be broken down into five broad habitats based on the vegetation and its structure. The five broad habitats were:

- Scattered remnant trees/shrubs;
- Eucalyptus/Banksia Woodland;
- Shrublands;
- Constructed Wetlands; and
- Damplands.

Scattered remnant trees/shrubs

This habitat included non-native *Eucalyptus spp.* and natives such as *Eucalyptus marginata* (Jarrah), *Corymbia calophylla* (Marri), *Banksia spp.*, *Melaleuca spp.* and *Acacia spp.* over weeds.

The Eucalypts and *Banksia spp.* found in this habitat type provide flowers and seeds for the Black Cockatoos.

Eucalyptus and Banksia Woodland

The Eucalypts and Banksia woodland includes *E. marginata*, *E. todtiana* and *C. calophylla* woodland over *Banksia spp.* low woodland over *Adenanthos cygnorum* and *Xanthorrhoea preissii* shrublands over *Hibbertia spp.* scattered low shrubs to low open shrubland.

The Eucalypts and *Banksia spp.* found in this habitat have flowers and seeds that are dietary items for the Black Cockatoos. The larger Eucalypt trees provide potential breeding habitat for Black Cockatoos.

Shrubland

The shrubland habitat consists of a mixture of natural and non-endemic species including *Kunzea glabrescens*, *Acacia spp.*, *A. cygnorum*, *Chamelaucium uncinatum* and *Melaleuca huegelii* and *M. nesophila* over weeds. Occasional non-endemic Eucalypt species are present.

Constructed Wetlands

The constructed wetlands habitat includes areas of open water surrounded by riparian vegetation. Species present included *Eucalyptus rudis*, non-native Eucalypts over introduced species such as *Typha orientalis* and *Juncus spp.* sedges over weeds.

Damplands Wetlands

This habitat consisted of vegetation associated with wetter areas. Typical species included *Melaleuca preissiana*, *K. glabrescens* and *Hypocalymma angustifolium* over weeds.

3 Methods

3.1 Background Research

The background research is designed to gather existing data on known feeding and breeding locations of Black Cockatoos. The background research and desktop study included the review of the following:

- WA Department of Parks and Wildlife (DPAW) and DoE websites;
- EPBC Act referral guidelines for three threatened Black Cockatoo species; and
- Reports of previous studies undertaken in the Project Area.

3.2 Black Cockatoo Assessment

3.2.1 Survey Personnel and timing

The Black Cockatoo assessment was conducted on 21 September 2013 and 1st October 2013 by Hayden Ajduk, and involved a foraging and breeding assessment of the Project Area.

3.2.2 Black Cockatoo Foraging Habitat Assessment

The Black Cockatoo foraging assessment of the Project Area was undertaken to determine the extent of foraging habitat for Black Cockatoos. The assessment included:

- General habitat suitability;
- Analysis of dentition marks in seed and nut material if found;
- Opportunistic observations of Black Cockatoos; and

Feeding trees and opportunistic observations were recorded and located using a hand held GPS unit (Appendix B).

3.2.3 Black Cockatoo Breeding Habitat Assessment

In order to determine if breeding habitat (potential breeding or breeding trees) were present, we traversed the Project Area in vegetation that contained species of trees known to be used for nesting e.g. Marri, Jarrah and dead trees. Once located, suitable trees (trees species known to support breeding) were assessed based on criteria found in the SEWPaC Black Cockatoo referral guidelines:

- Diameter at Breast Height (DBH) \geq 500 mm (300 mm for Wando and Salmon Gum); and
- Hollows present and their size greater than 12 cm (entrance diameter).

The diameter of the trees was measured with a DBH tape measure. Trees with a DBH \geq 500 mm are considered to have hollow bearing potential, and as such are deemed potential breeding habitat.

We also recorded the tree height and the location of the tree with a GPS unit. In addition, signs of use, such as droppings and feathers were also searched for under each tree, particularly if hollows were noted

If hollows were present each was assessed with the use of binoculars to determine its suitability for use by Black Cockatoo species as a breeding hollow. Any suitable hollows that were located were assessed to determine if they were being utilised by Black Cockatoo species as a breeding hollow. The assessment method takes into consideration the size and shape of the hollow, chew marks around the entrance, feathers or droppings nearby. The location of potential breeding trees can be found in Appendix B.

4 Results

The following summarises the results of the Black Cockatoo foraging and breeding assessments of the Project Area.

4.1 Background Research

A search of the databases revealed that the Vulnerable Forest Red-tailed Black Cockatoo and Endangered Carnaby's Black Cockatoo are likely to occur within the Project area. Included are some brief descriptions, including some ecological information. These two Black Cockatoos were either recorded during the assessment or are likely to occur in the Project Area (based on the database search results and the foraging and breeding habitat in the Project area).

4.1.1 Carnaby's Black Cockatoo

Carnaby's Black Cockatoo is a large Cockatoo that is 53 to 58 cm in length, with a wingspan of approximately 110 cm, and a mass of 520 to 790 g. Carnaby's Black Cockatoo has a white patch on its cheek, white bands on its tail, and a strong curved bill. Carnaby's Black Cockatoo is also known as the Short-billed Cockatoo. In males, the bill is black and the eye-ring dark-pink. Females have a light grey bill, grey eye-ring, and the cheek patch is less distinctive (Higgins 1999; Johnstone and Storr 1998).

Carnaby's Black Cockatoo is endemic to the south-west of WA, extending from the Murchison River to Esperance, and inland to Coorow, Kellerberrin and Lake Cronin (DEC 2009). There is evidence that the species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Range and into the Tuart forests of the Swan Coastal Plain (Johnstone and Kirkby 2006).

Carnaby's Black Cockatoo primarily breed in the wheatbelt, from the Stirling Ranges north-west to around Three Springs, but they have also been recorded on the coastal plain to the south-west, around Bunbury (Higgins 1999; Saunders 1974).

Carnaby's Black Cockatoo display strong pair bonds. They occur in uncleared or remnant areas of Eucalypt woodland, principally Salmon gum (*Eucalyptus salmonophloia*) or Wandoo (*E. wandoo*), and shrubland or kwongan heath dominated by Hakea and Banksia species. Carnaby's Black Cockatoo nest in the hollows of live or dead smooth-barked Eucalypts (Salmon Gum and Wandoo) but also in Red Morrell (*E. longicornis*), York Gum (*E. loxophleba*), Marri and Tuart (Johnstone and Storr 1998).

On the Swan Coastal Plain, the birds feed on a large variety of plants including the Proteaceae (Banksia and Grevillea), Marri nuts and introduced species – notably Pines (Valentine and Stock 2008).

Carnaby's Black Cockatoo has undergone a dramatic decline in recent years, declining by 50 percent in the past 45 years, one of the main contributing factors being land clearing (DEC 2009). The long-term survival and recovery of this species is linked to the survival

of its habitat – both in breeding areas in the wheatbelt and non-breeding areas (though these areas are changing overtime) such as the Swan Coastal Plain (DEC 2009). In addition, clearing of heathland near breeding sites has reduced the availability of food for breeding pairs and their young (DEC 2009).

4.1.2 Forest Red-tailed Black Cockatoo

The Forest Red-tailed Black Cockatoo is 55–60 cm in length and weighs between 570 - 870 g (Higgins 1999). Males can be distinguished by broad red tail panels that are only visible when taking off or alighting (Higgins 1999). Females on the other hand can be distinguished by yellow or whitish spots on the feathers of the head and upper wing coverts. Their tail feathers are bright red and orange, grading to yellow on the inner margins, and have variable black horizontal barring.

This species is endemic to the South-west humid and semi-humid zones of Western Australia. Historically, It typically inhabited dense Jarrah, Karri and Marri forests which received more than 600 mm average annual rainfall (SEWPaC 2012). Although most records are in Jarrah-Marri forests, the Forest Red-tailed Black Cockatoo has been observed in a range of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt, Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (Abbott 1998a and b).

Forest Red-tailed Black Cockatoos feed predominantly on the seeds of Jarrah and Marri fruits. The other species used for feeding include Blackbutt, Albany Blackbutt (*E. staeri*), Forest Sheoak, Snottygobble and the non-indigenous native Spotted Gum (*E. maculata*) and Cape Lilac (Johnstone and Kirkby 1999).

The Forest Red-tailed Black Cockatoo has declined in range by 25–30% as a result of clearing of the margins of the forests for agriculture in the early 1900s (Mawson and Johnstone 1997) and is projected to further decline by 30% or more between 2005 and 2015 (Chapman 2005).

Key threats to the Forest Red-tailed Black Cockatoo are habitat loss, nest hollow shortage and competition for available nest hollows from other species, and injury or death from the European Honeybee (*Apis mellifera*), illegal shooting (Chapman 2005) and fire (CALM 2006).

4.2 Black Cockatoo Field Assessment

4.2.1 Black Cockatoo Foraging Assessment

Suitable foraging habitat was recorded along the majority of the Project Area and was comprised of two types, Eucalypt woodland and Proteaceous Heath/Woodland (Table 3).

During the assessment Forest Red-tailed Black Cockatoos were observed feeding on introduced Cape Lilac (*Melia azedarach*) within the Project Area (Plate 1).

A total of 17.30 ha of foraging habitat was identified in the Project Area and is presented in Figure 2.



Plate 1. Forest Red-tailed Black Cockatoos feeding on Cape Lilac in the Project Area (Easting: 397728, Northing: 6470710)

Table 3. Black Cockatoo Foraging Resources in the Project Area.

VEGETATION COMMUNITY	DOMINANT FORAGING SPECIES
Eucalypt Woodland	Marri, Jarrah, Coastal Black Butt River Red Gum
Proteaceous Heath/Woodland	<i>Banksia menziesii</i> and <i>B. attenuata</i>

No other signs such as chewed Marri nuts or *Banksia* cones were observed during the assessment.

4.2.2 Black Cockatoo Breeding Habitat Assessment

Breeding habitat is a particularly important aspect for any assessment of the impacts on Black Cockatoos. Breeding habitat for Black Cockatoos is classified as any patch of woodland containing live or dead trees of specific species with a diameter at breast height (DBH) of 500 mm or greater (or 300 mm or greater for Salmon Gum and Wandoo) (DSEWPAC 2012).

A total of 148 trees that have the potential to be used for breeding were recorded within the Project Area i.e. trees with a DBH \geq 500 mm. Of these 148, the majority were Marri (104 or 70%), *E. rudis* (Flooded Gum) (31), *E. gomphocephala* (Tuart) (11) and Jarrah (two). None of these trees had any obvious hollows suitable for breeding and no signs such as feathers or droppings were recorded beneath them.

Though 148 trees measured were \geq 500 mm, the mean size was 656 mm \pm 152 mm (one standard deviation). A substantial proportion of the trees that were \geq 500 mm were planted for rehabilitation, for example on the road verges, and this is somewhat reflected in the size (DBH) of trees recorded.

The locations of the potential breeding trees are illustrated in Figure 2 and the raw survey data is located in Appendix B.

4.3 Black Cockatoo Opportunistic Observations

A small flock of Forest Red-tailed Black Cockatoos were observed foraging in the central section of the site (Plate 1). Forest Red-tailed Black Cockatoos were also heard calling numerous times in the surrounding area.

5 Conclusion and Recommendations

We recorded 148 trees in the Project Area that meet SEWPaC's criteria (≥ 500 mm DBH) for the potential to develop suitable hollows for which Black Cockatoo species can nest in.

Suitable hollows can take from 120–150 years to develop (Pittman *et al.* 2007). The size of the tree (DBH) is a good indication of the hollow-bearing potential of the tree (Whitford 2002). Trees approaching 680 mm DBH are close to developing suitable hollows. Trees smaller than 680 mm DBH are considered to have the potential to develop hollows and are therefore also important resources for Carnaby's Black Cockatoos.

The majority of the breeding trees recorded were Marri (70%) that were considered young and were the result of rehabilitation. This is highlighted by the fact that of the 148 potential suitable breeding trees recorded and only 27 trees had a DBH greater than 800mm and the a mean size of $656 \text{ mm} \pm 152 \text{ mm}$ (one standard deviation).

In addition to the breeding habitat, 17.30 ha of suitable foraging habitat was identified in the Project Area. Despite the presence of suitable foraging species, no indirect foraging evidence in the way of chewed Marri nuts or Banksia cones was observed. The lack of foraging evidence could be explained by the high level of disturbance associated with heavy vehicle traffic along Tonkin Highway.

However, Red-tailed Black Cockatoos were observed foraging on the Cape Lilac trees in the Project area.

The results of the Black Cockatoo habitat assessment suggest that the Project Area contains a range of low to good quality Black Cockatoo habitat due to the presence of foraging species and the presence of potential breeding trees.

Based on this assessment it is recommended that a commonwealth referral, under the EPBC Act will be required for the proposed disturbance footprint as part of the development process.

As a result of the scope of work undertaken, the following is recommended:

- Under the EPBC Act and in accordance with the SEWPaC 'EPBC Act referral guidelines for three threatened Black Cockatoo species' a referral submission should be made as there is a high risk the development of the proposed disturbance footprint will result in a significant impact to Black Cockatoo species;
- That areas in the identified in the remainder of the property during the reconnaissance survey as being potential Black Cockatoo Habitat be retained and conserved in future planning; and
- Any proposed work outside disturbance footprint that will likely impact on Black Cockatoos will require a separate detailed breeding and foraging assessment be undertaken by a Black Cockatoo specialist to further assess the hollows and

foraging evidence within the remainder of the property in detail to determine the value to Black Cockatoo species.

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6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of biological results other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the Site that is the subject of this report. However, due to the characteristics of the Site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the Site may be necessary.

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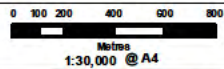
APPENDIX A

Figures



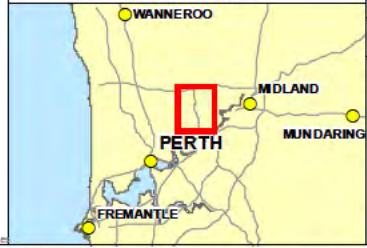
Legend

- Major Roads
- ▭ Project Footprint



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID	DATE
185_f1_sitelocation.mxd	06-Dec-2013

HORIZONTAL DATUM AND PROJECTION
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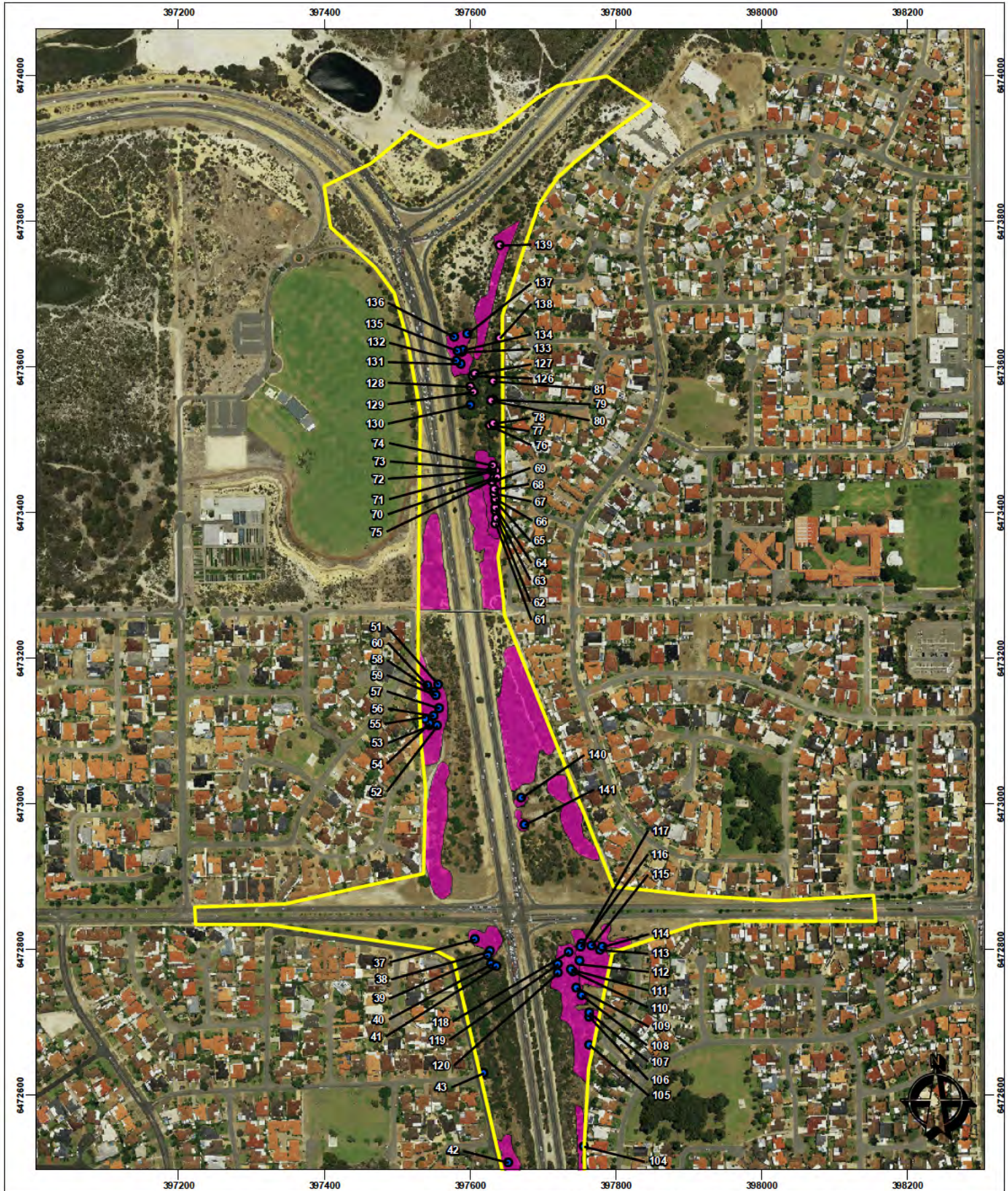
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Main Roads Western Australia

Black Cockatoo Assessment

Figure 1 - Site Location

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 LOCALITY MAP SOURCED FROM LANDGATE 2006
 STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
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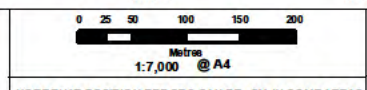


Project Footprint

Black Cockatoo Foraging Habitat

Potential Cockatoo Breeding Habitat

- *Corymbia calophylla*
- *Eucalyptus gomphocephala*
- *Eucalyptus marginata*
- *Eucalyptus rudis*

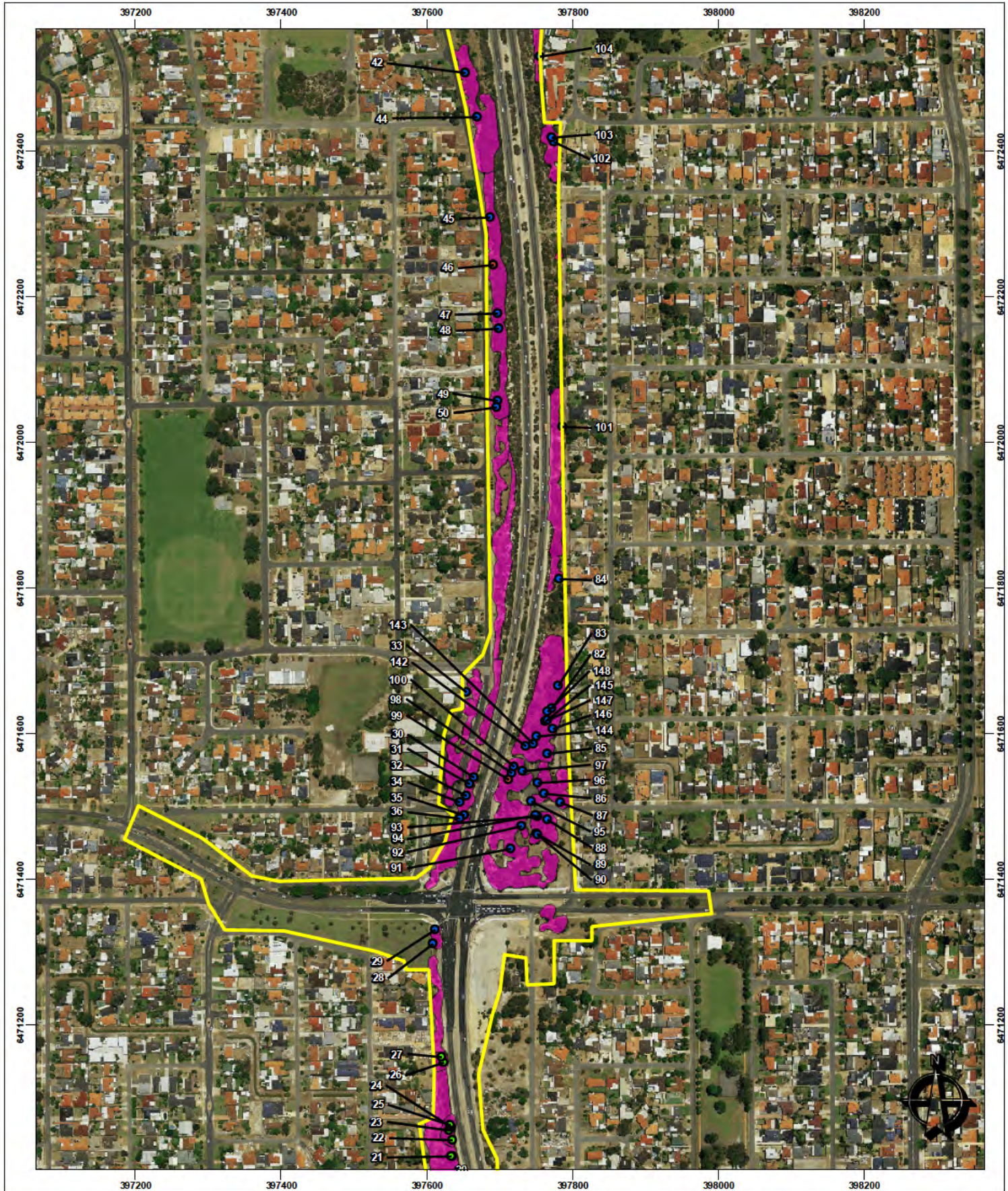


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Black Cockatoo Assessment Figure 2a - Foraging and Breeding Habitat	

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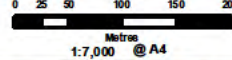
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- Project Footprint
- Black Cockatoo Foraging Habitat

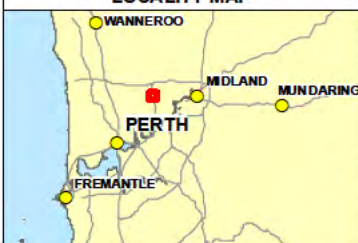
Potential Cockatoo Breeding Habitat

- *Corymbia calophylla*
- *Eucalyptus gomphocephala*
- *Eucalyptus marginata*
- *Eucalyptus rudis*



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LOCALITY MAP



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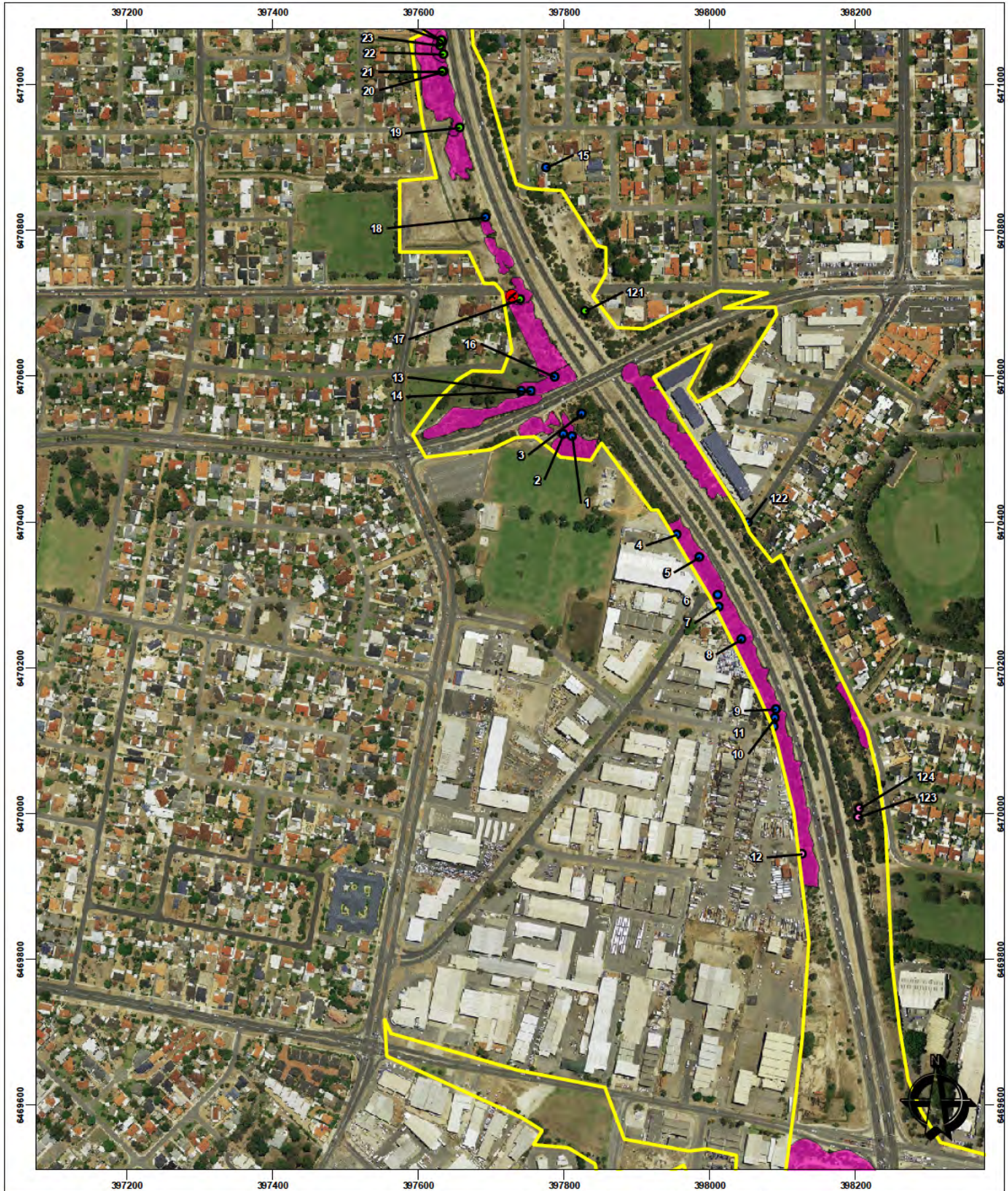
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Main Roads Western Australia

Black Cockatoo Assessment

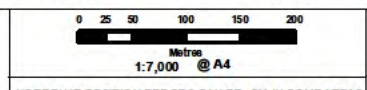
Figure 2b - Foraging and Breeding Habitat

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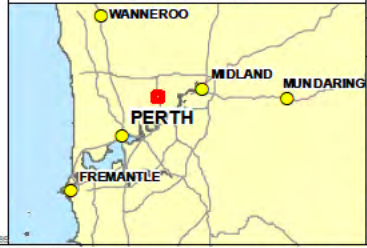


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- Project Footprint**
- Project Footprint
 - Black Cockatoo Foraging Habitat
 - Forest Red-Tailed Black Cockatoo
- Potential Cockatoo Breeding Habitat**
- Corymbia calophylla*
 - Eucalyptus gomphocephala*
 - Eucalyptus marginata*
 - Eucalyptus rudis*



NOTE THAT POSITION ERRORS CAN BE $\pm 5\text{M}$ IN SOME AREAS



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Main Roads Western Australia			
Black Cockatoo Assessment Figure 2c - Foraging and Breeding Habitat			



Project Footprint

Black Cockatoo Foraging Habitat

Potential Cockatoo Breeding Habitat

- Corymbia calophylla*
- Eucalyptus gomphocephala*
- Eucalyptus marginata*
- Eucalyptus rudis*



NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



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185 Cockatoo Habitat	5/12/2013

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

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Main Roads Western Australia

Black Cockatoo Assessment

Figure 2d - Foraging and Breeding Habitat

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APPENDIX B

Black Cockatoo Potential Breeding Tree Data

MGA Zone 50					MGA Zone 50				
Tree ID	Species	DBH mm	Eastings*	Northings*	Tree ID	Species	DBH mm	Eastings*	Northings*
1	<i>Corymbia calophylla</i>	650	397812	6470517	75	<i>Eucalyptus rudis</i>	720	397637	6473448
2	<i>Corymbia calophylla</i>	540	397800	6470520	76	<i>Eucalyptus rudis</i>	640	397628	6473519
3	<i>Corymbia calophylla</i>	540	397825	6470548	77	<i>Eucalyptus rudis</i>	580	397634	6473519
4	<i>Corymbia calophylla</i>	580	397956	6470382	78	<i>Eucalyptus rudis</i>	600	397632	6473522
5	<i>Corymbia calophylla</i>	550	397987	6470351	79	<i>Eucalyptus rudis</i>	580	397632	6473554
6	<i>Corymbia calophylla</i>	560	398011	6470300	80	<i>Eucalyptus rudis</i>	780	397629	6473553
7	<i>Corymbia calophylla</i>	520	398013	6470283	81	<i>Eucalyptus rudis</i>	520	397632	6473579
8	<i>Corymbia calophylla</i>	570	398045	6470239	82	<i>Corymbia calophylla</i>	800	397771	6471633
9	<i>Corymbia calophylla</i>	530	398092	6470142	83	<i>Corymbia calophylla</i>	960	397781	6471664
10	<i>Corymbia calophylla</i>	690	398090	6470130	84	<i>Corymbia calophylla</i>	550	397782	6471812
11	<i>Corymbia calophylla</i>	520	398089	6470119	85	<i>Corymbia calophylla</i>	550	397765	6471571
12	<i>Eucalyptus rudis</i>	690	398127	6489944	86	<i>Corymbia calophylla</i>	720	397761	6771516
13	<i>Corymbia calophylla</i>	560	397742	6470580	87	<i>Corymbia calophylla</i>	650	397783	6471504
14	<i>Corymbia calophylla</i>	560	397756	6470579	88	<i>Corymbia calophylla</i>	700	397765	6471481
15	<i>Corymbia calophylla</i>	650	397776	6470886	89	<i>Corymbia calophylla</i>	750	397751	6471461
16	<i>Corymbia calophylla</i>	600	397788	6470598	90	<i>Corymbia calophylla</i>	800	397752	6477146
17	<i>Eucalyptus gomphocephala</i>	1120	397740	6470706	91	<i>Corymbia calophylla</i>	1010	397716	6471441
18	<i>Corymbia calophylla</i>	710	397693	6470818	92	<i>Corymbia calophylla</i>	800	397730	6471472
19	<i>Eucalyptus gomphocephala</i>	540	397657	6420941	93	<i>Corymbia calophylla</i>	750	397753	6471486
20	<i>Eucalyptus gomphocephala</i>	530	397635	6471018	94	<i>Corymbia calophylla</i>	700	397749	6471487
21	<i>Eucalyptus gomphocephala</i>	640	397034	6471018	95	<i>Corymbia calophylla</i>	750	397744	6471506

22	<i>Eucalyptus gomphocephala</i>	560	397635	6471041	96	<i>Corymbia calophylla</i>	630	397753	6471531
23	<i>Eucalyptus gomphocephala</i>	630	397631	6471054	97	<i>Corymbia calophylla</i>	560	397732	6471548
24	<i>Eucalyptus gomphocephala</i>	840	397634	6471059	98	<i>Corymbia calophylla</i>	510	397717	6471545
25	<i>Eucalyptus gomphocephala</i>	960	397632	6471061	99	<i>Eucalyptus marginata</i>	600	397713	6471536
26	<i>Eucalyptus gomphocephala</i>	520	397624	641147	100	<i>Corymbia calophylla</i>	780	397720	6471554
27	<i>Eucalyptus gomphocephala</i>	930	397621	6471155	101	<i>Corymbia calophylla</i>	550	397787	6472020
28	<i>Corymbia calophylla</i>	580	397608	6471310	102	<i>Corymbia calophylla</i>	780	397775	6472412
29	<i>Corymbia calophylla</i>	660	397612	6471329	103	<i>Corymbia calophylla</i>	110	397771	6472417
30	<i>Corymbia calophylla</i>	660	397665	6471538	104	<i>Corymbia calophylla</i>	520	397756	6472529
31	<i>Corymbia calophylla</i>	640	397659	6471530	105	<i>Corymbia calophylla</i>	640	397764	6472668
32	<i>Corymbia calophylla</i>	630	397654	6471513	106	<i>Corymbia calophylla</i>	620	397764	6472706
33	<i>Corymbia calophylla</i>	530	397655	647655	107	<i>Corymbia calophylla</i>	610	397764	6472713
34	<i>Corymbia calophylla</i>	670	397645	6471505	108	<i>Corymbia calophylla</i>	830	397753	6472736
35	<i>Corymbia calophylla</i>	710	397651	6471487	109	<i>Corymbia calophylla</i>	580	397746	6472747
36	<i>Corymbia calophylla</i>	640	397645	6471483	110	<i>Corymbia calophylla</i>	610	397741	6472769
37	<i>Corymbia calophylla</i>	1370	397606	6472813	111	<i>Corymbia calophylla</i>	540	397738	6472771
38	<i>Corymbia calophylla</i>	730	397628	6472797	112	<i>Corymbia calophylla</i>	550	397751	6472783
39	<i>Corymbia calophylla</i>	520	397625	6472791	113	<i>Corymbia calophylla</i>	540	397779	6472799
40	<i>Corymbia calophylla</i>	600	397629	6477779	114	<i>Corymbia calophylla</i>	680	397782	6472803
41	<i>Corymbia calophylla</i>	850	397636	6472776	115	<i>Corymbia calophylla</i>	520	397767	6472805
42	<i>Corymbia calophylla</i>	760	397653	6472506	116	<i>Corymbia calophylla</i>	610	397754	6472807
43	<i>Corymbia calophylla</i>	750	397618	6472629	117	<i>Corymbia calophylla</i>	580	397752	6472803
44	<i>Corymbia calophylla</i>	710	397670	6472445	118	<i>Corymbia calophylla</i>	590	397736	6472795
45	<i>Corymbia calophylla</i>	820	397687	6472307	119	<i>Corymbia calophylla</i>	610	397720	6472779
46	<i>Eucalyptus marginata</i>	940	397692	6472243	120	<i>Corymbia calophylla</i>	580	397721	6472768

47	<i>Corymbia calophylla</i>	550	397697	6472176	121	<i>Eucalyptus gomphocephala</i>	910	397830	6470689
48	<i>Corymbia calophylla</i>	560	397699	6472155	122	<i>Corymbia calophylla</i>	540	398053	6470398
49	<i>Corymbia calophylla</i>	510	397697	6472056	123	<i>Eucalyptus rudis</i>	610	398205	6469994
50	<i>Corymbia calophylla</i>	530	397696	6472047	124	<i>Eucalyptus rudis</i>	780	398206	6470006
51	<i>Corymbia calophylla</i>	980	397556	6473163	125	<i>Eucalyptus rudis</i>	800	398300	6468856
52	<i>Corymbia calophylla</i>	540	397555	6473106	126	<i>Eucalyptus rudis</i>	620	397603	6473586
53	<i>Corymbia calophylla</i>	580	397545	6473107	127	<i>Eucalyptus rudis</i>	520	397606	6473589
54	<i>Corymbia calophylla</i>	530	397545	6473110	128	<i>Eucalyptus rudis</i>	530	397601	6473572
55	<i>Corymbia calophylla</i>	550	397538	6473115	129	<i>Eucalyptus rudis</i>	610	397605	6473565
56	<i>Corymbia calophylla</i>	950	397551	6473120	130	<i>Corymbia calophylla</i>	580	397600	6473547
57	<i>Corymbia calophylla</i>	660	397557	6473131	131	<i>Corymbia calophylla</i>	720	397588	6473603
58	<i>Corymbia calophylla</i>	550	397551	6473152	132	<i>Corymbia calophylla</i>	950	397582	6473607
59	<i>Corymbia calophylla</i>	570	397554	6773148	133	<i>Corymbia calophylla</i>	520	397589	6473619
60	<i>Corymbia calophylla</i>	1010	397542	6473161	134	<i>Corymbia calophylla</i>	550	397591	6473623
61	<i>Eucalyptus rudis</i>	860	397635	6473383	135	<i>Corymbia calophylla</i>	560	397583	6473621
62	<i>Eucalyptus rudis</i>	620	397636	6473391	136	<i>Corymbia calophylla</i>	910	397578	6473640
63	<i>Eucalyptus rudis</i>	800	397635	64734002	137	<i>Corymbia calophylla</i>	550	397596	6473645
64	<i>Eucalyptus rudis</i>	570	397635	6473406	138	<i>Eucalyptus rudis</i>	680	397640	6473639
65	<i>Eucalyptus rudis</i>	530	397635	6473415	139	<i>Eucalyptus rudis</i>	510	397641	6473766
66	<i>Eucalyptus rudis</i>	580	397635	647417	140	<i>Corymbia calophylla</i>	870	397670	6473007
67	<i>Eucalyptus rudis</i>	700	397633	6473425	141	<i>Corymbia calophylla</i>	570	397675	6472971
68	<i>Eucalyptus rudis</i>	880	397634	6473431	142	<i>Corymbia calophylla</i>	600	397736	6471582
69	<i>Eucalyptus rudis</i>	550	397630	6473441	143	<i>Corymbia calophylla</i>	720	397747	6471584
70	<i>Eucalyptus rudis</i>	550	397633	6473448	144	<i>Corymbia calophylla</i>	640	397751	6471595
71	<i>Eucalyptus rudis</i>	510	397630	6473456	145	<i>Corymbia calophylla</i>	540	397762	6471615

72	<i>Eucalyptus rudis</i>	710	397636	6773456	146	<i>Corymbia calophylla</i>	590	397773	6471606
73	<i>Eucalyptus rudis</i>	620	397630	6473458	147	<i>Corymbia calophylla</i>	520	397766	6471617
74	<i>Eucalyptus rudis</i>	840	397632	6473464	148	<i>Corymbia calophylla</i>	550	397766	6471629

5 HJW a Ybhi&X. 'DfY`]a]bUfmg]hY`]bj Ygh][U]cb`



Tonkin Grade Separation
Project

Preliminary Site
Investigation on
Contamination

Prepared for:
Main Roads Western
Australia

April 2014

● people ● planet ● professional

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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Main Roads Western Australia ('Main Roads') to undertake a Preliminary Site Investigation on contaminated sites that may affect the Tonkin Grade Separation (TGS) Project which forms a portion of the Northlink, WA. The TGS project involves grade separation and associated works at the intersections of Tonkin Highway with Collier Road, Morley Drive and Benara Road. It has been identified that seven sites within 500 m of the Project Area are registered contaminated sites under the *Contaminated Sites Act 2003*. This investigation has been undertaken to characterise the potential for residual contamination from these contaminated sites and to assess its potential to impact the Project Area.

Of the seven identified contaminated sites it was determined that three sites have potential source-pathway-receptor linkages that could pose a contamination risk to the TGS project:

- Southern portion of Tonkin Highway Reserve within the Project Area. This area contains a contamination hot spot with soil impacted by pyritic cinders. Groundwater contaminants include iron, fluoride and manganese;
- Former Cresco/CSBP Site Bayswater, adjacent east of the southern portion of the Project Area. Groundwater contaminants include heavy metals, fluoride, chloride and ammonia above Domestic Non-Potable criteria; and
- Former metal recycling facility at the corner of Tonkin Highway and Collier Road. Groundwater contaminants including petroleum hydrocarbons and heavy metals remain above Freshwater and Domestic Non-Potable guidelines.

Heavy metal contaminated soil in the southern portion of the Tonkin Highway Reserve presents a high risk to TGS project workers through direct contact with potential contaminants during site works and, if not appropriately managed, also presents a risk to users of the highway and bike path.

Groundwater in the Project Area south of Collier Road is potentially contaminated as a result of the three aforementioned contaminated sites. Groundwater depth in this area is indicated to range from 2 to 10 m below ground level. Excavation below groundwater level and dewatering of contaminated groundwater within the Project Area has the potential to impact construction and maintenance workers during TGS upgrade works. There are potential long-term risks to road users, recreational bike pathway users and environmental receptors such as the Swan River.

In addition to the contaminated sites in proximity of the Project Area, potential acid sulfate soils present a risk of generating acid conditions and contaminants at the site where disturbance of natural soils and/or de-watering occurs.

Based upon the results of the investigation and in the context of the conclusions above, it is recommended that a Site Management Plan (SMP) is prepared in accordance with the DER's *Contaminated Sites Management Series* in order to appropriately manage contaminants in soil and groundwater beneath the site.

Due to the presence of contaminants at certain locations within the TGS Project Area, appropriate handling and disposal of soils and groundwater will be required in order to mitigate risks to human health and the environment.

360 Environmental does not have details of how soil and groundwater will be disturbed during TGS works. Further details of the proposed TGS works will be required to develop the SMP.

An investigation of acid sulfate soils should also be undertaken to assess areas of proposed soil and groundwater disturbances. The investigation should be followed by the development of an Acid Sulfate Soils and Dewatering Management Plan (ASSDMP) to appropriately manage the handling and treatment of soils and dewatering effluent.

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1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Main Roads Western Australia ('Main Roads') to undertake a Preliminary Site Investigation (PSI) on contaminated sites that may affect the Tonkin Grade Separation (TGS) project (herein referred to as 'the Project Area') (Figure 1). The TGS project involves grade separation and associated works at the intersections of Tonkin Highway with Collier Road, Morley Drive and Benara Road. It has been identified that several sites within proximity of the Project Area are registered contaminates sites under the *Contaminated Sites Act 2003*.

This investigation has been undertaken to characterise the potential for residual contamination from the contaminated sites that have been identified and to assess the potential impacts on the Project Area. 360 Environmental understand that the PSI report will guide the development of an environmental impact assessment for the project.

1.2 Objectives

The objective of the investigation was to gather information in relation to contaminated sites to facilitate the environmental assessment and approval of the project. This has been done by gaining an understanding of how registered contaminated sites within and in proximity of the road alignment may impact on the proposed development and what environmental management may be required in relation to contaminated land issues.

1.3 Scope of Work

Work centred on producing a PSI that can be used to support the environmental impact assessment for the project. PSI documents are normally produced as the first step in assessing the potential for a site to be contaminated. Typically they provide background information that facilitates a focused and thorough assessment of the nature and extent of contamination on a site. This PSI does not wholly conform to this approach. It does, however, gather similar information in order to resolve whether the identified sites have the potential to impact on the project.

An initial assessment found that there are seven sites within 500 m of the alignment. This PSI document provides a description of each of these seven sites based on information available through searches of government databases. Only those sites where there is a potential for them to impact on the project has been considered in detail within this PSI.

A focus has been on gathering information to determine if residual contamination in the soil or groundwater may pose a potential impact to the project.

The PSI describes what work has been done on each site, whether the site has been remediated and to what degree, and the residual contamination that may be present. A review of the proposed road works has been undertaken to determine whether these works might potentially disturb residual contamination. This report broadly describes how contaminated land issues should be managed where it is considered that there is the potential for the project to disturb contamination.

1.4 Site Identification

The location of the Project Area is shown on Figure 1 and summarised in Table 1.

Table 1: Site Identification

STREET ADDRESS	Tonkin Highway including the intersections of the Collier Road, Morley Drive and Benara Road.
SUBURBS	Bayswater, Morley and Noranda
LOCAL GOVERNMENT	City of Bayswater
ZONING	Primary Regional Roads (City of Bayswater Town Planning Scheme 24)
BOUNDARY COORDINATES	-31.867333, 115.916667 (north), -31.921186, 115.926452 (south)

The site comprises the land identified for the TGS project. The Project Area contains one classified contaminated site beneath the existing highway reserve and a further six registered contaminated sites were identified within 500m of the Project Area forming the basis of this investigation.

1.5 TGS Project Works

360 Environmental understands that the TGS project will involve the grade separations of the intersections of Tonkin Highway with Collier Road, Morley Drive and Benara Road, together with associated works in order to improve freight capacity and efficiency, reduce congestion, improve road safety, maximise sustainability and improve amenity for community and road users. It is understood that the first stage project scope includes:

- Full diamond interchanges at Collier Road and Morley Drive;
- A bridge taking Benara Road over Tonkin Highway with no connections; and
- Tonkin Highway remaining as two lanes in each direction.

It is considered likely that this section of Tonkin Highway will be widened to 6 lanes as part of the TGS project. 360 Environmental understands the main areas of earthworks will occur at the diamond interchanges at Collier Road and Morley Drive and the bridge at the Benara Road. Earthworks will likely include geotechnical works and retaining structures associated with grade separations and bridges including retaining structures, ground anchors, excavations and approach embankments. At this stage 360 Environment does not have details of proposed excavation areas, depths or methods.

2 Review of Contaminated Sites

A search of the Department of Environment Regulation (DER)'s Contaminated Sites Database was performed on 29 January 2014 to identify known contaminated sites that have the potential to impact on the TGS project. It was considered that sites further than 500 m from the Project Area do not have the potential to affect the project and as such only sites within 500 m (Figure 2) have been assessed. Appendix A provides details of the Contaminated Sites Database Basic Summary of Records results.

One classified site was identified within the southern Project Area and a further six classified contaminated sites were identified within 500 m of the Project Area. Details of the seven contaminated sites are provided in Table 2. These sites are discussed in further detail in the following section.

Three sites were selected for review of the detailed summary of records held by the DER. These sites were selected due to their proximity to the Project Area and due to their location with respect to groundwater flow in the Project Area.

Table 2: Contaminated Sites within 500m of Project Area

SITE	LOCATION	CONTAMINATED SITE CLASSIFICATION
Tonkin Highway Reserve	Within southern Project Area	Contaminated – remediation required
Former Cresco/CSBP Site Bayswater	Adjacent, east of Project Area	Contaminated – remediation required
Former Metal Recycling Facility	Adjacent to Project Area, south-east corner of Tonkin Hwy and Collier Road intersection	Remediated for restricted use
Former Service Station	Collier Road Bassendean, 350 m east of Project Area	Contaminated – remediation required
Former CSBP Bassendean	Tonkin Industrial Estate, 450 m east of Project Area	Remediated for restricted use
Motor Vehicle Workshop	Jackson Rd Bassendean, 450 m east of Project Area	Remediated for restricted use
Former Pest Control Depot	Bassendean Road Bayswater, 300 m west of Project Area	Remediated for restricted use

2.1 Tonkin Highway Reserve

2.1.1 Basic Summary of Records

A search of the DER's Contaminated Sites Database provided a Basic Summary of Records for 24 land parcels (17,600 m²) within Tonkin Highway Reserve (in the south of the Project Area) which forms one historical site classified as 'Contaminated - Remediation Required' (Appendix A). Based on this classification

the site has been restricted for use as 'Industrial and Commercial Landuse - Highway Reserve only, no pedestrian access'.

The site was classified in December 2006 due to its former use as a fertiliser production plant established in 1928 by Cresco. The plant operated until 1970 but this portion of the land was sold in 1964 to the Industrial Lands Development Authority for the purpose of developing Tonkin Highway. The site is described as having widespread heavy metal contamination due its former land use.

2.1.2 Detailed Summary of Records

Due to the contaminated site being located within the Project Area a detailed summary of records for the Tonkin Highway Reserve site was requested from DER. The detailed summary of records was provided on 12 March 2014 and is included in Appendix B. The summary of records identifies three previous environmental reports relevant to this investigation:

- Parsons Brinckerhoff (2004) Stage 1 Cinders Delineation - Tonkin Highway Reserve Bayswater;
- Parsons Brinckerhoff (2005) Ecological and Human Health Risk Assessment - Tonkin Highway Reserve Bayswater; and
- Main Roads WA (2006) Letter Report: MRWA response to DEC queries regarding Tonkin Highway Reserve ecological and health risk assessment.

Copies of these reports were provided by DER and have been reviewed and summarised below. These reports indicate that the risk of adverse impact on human health is low due to lack of complete exposure pathways associated with the contaminated soils within the Tonkin Highway Reserve. It is noted that the risk assessments were based on the scenario of soils remaining undisturbed beneath hardstand. The soils have not been remediated on the condition that a management plan is developed in the event of future site works occurring.

2.1.3 Stage 1 Cinders Delineation (PB, 2004)

In January 2004, Parsons Brinckerhoff (PB) was commissioned by Main Roads to undertake an investigation to determine the extent and severity of pyritic cinders suspected to be buried within the location which was historically a portion of Lot 10, Railway Parade in Bayswater. Pyritic cinders are the by-product of sulfuric acid manufacturing and are linked heavy metals such as iron, copper, zinc, lead, mercury and arsenic.

The report identified that the site contained fine to medium grained yellow sands, coffee rocks and clays with cinders present in areas from surface level to 8 metres below ground level (mbgl).

The report found that cinders distribution primarily coincided with two historical disposals pits, one located in the south-east of the site and the second located in the north-east of site with the total cinder volume across the two disposal pits estimated

at 5,500 m³ (Figure 3). Cinders in the south eastern disposal area stretch to the west of the site.

The report identified that the majority of cinder material contained 6-20% iron oxide concentrations by weight. Total sulfur concentrations of the cinders ranged from 30 to 12,000 mg/kg and sulfate values of the cylinders ranged between 140 and 500 mg/kg. The discrepancy between the total sulfur values and sulfate values indicate that it is possible for sulfides to be present in the cinders and therefore the cinders may contain acid generating potential. The laboratory sampling component of the investigation focused on aluminium, arsenic, cadmium, cobalt, chromium, copper, iron, manganese, lead and zinc.

Arsenic was present in concentrations exceeding DER (2010) Health Investigation Level E (HIL-E – parks recreational open space and playing fields) and HIL-F (industrial/commercial land use) criteria. Cobalt, chromium, cadmium, manganese, nickel and zinc were detected above DER (2010) Ecological Investigation Levels (EIL) primarily in immediate vicinity of the two identified cinder disposal locations.

The report identified a risk to human health and environment through exposure to the arsenic through excavation works which would be likely associated with upgrades to Tonkin Highway. Localised groundwater flow was identified to be in a west to south-west direction with complexities in flow due to localised conditions hydraulically-down gradient of site.

2.1.4 Ecological and Human Health Risk Assessment (PB, 2005)

Following on from the 2004 cinders investigation PB were engaged by Main Roads in 2005 to conduct a site-specific Ecological and Human Health Risk Assessment on the Tonkin Highway Reserve within/adjacent to the former Cresco/CSBP site. The report details the Site-Specific Risk Assessment to identify important contamination issues and to assess the immediate and potential risk of the cinders within the Tonkin Highway Reserve to the environment and human receptors. The report identified groundwater flow to be in a south to south-west direction.

In addition to the conclusions drawn in the Stage 1 report, PB made the following additional conclusions and recommendations:

- The remaining surface soils on the site do not exceed the Department of Environment and Conservation (DEC, 2003) HIL-F;
- HIL-F trigger values were exceeded for arsenic in one soil bore at depth 5.5 to 7.0 mbgl. A site management plan would be required to manage the potential impacts if this soil was to be disturbed during future earthworks;
- Groundwater impacts at the site potentially pose an unacceptable risk to irrigation use from domestic bores downstream. 75% of bores exceed DEC (2003) Long-Term Irrigation (LTI) and drinking water (DW) guidelines for iron and a number of bores containing fluoride, manganese, iron and pH levels above LTI guidelines, potentially due to naturally occurring iron in Perth groundwater; and

- Ground disturbing activities on the site have the potential to expose pyritic cinders (including acid sulfate soil materials). The contaminant mobilisation could potentially impact on the Swan River ecosystem.

2.1.5 Letter Report (Main Roads, 2006)

A letter report was produced in 2006 by Main Roads to address the DEC's concerns regarding assessment levels in previous environmental investigations which did not consider the recreational land use associated with a bike path. In response to this query, an additional 8 soil bores were tested to 1.5 mbgl to provide risk assessments based on the assumption that soils were not disturbed for excavation purposes.

The additional sampling identified arsenic in one location in the northern pit above HIL-E levels with a concentration of 205 mg/kg at location BH48 between 1.0 and 1.8 mbgl. Resampling at BH48 occurred and arsenic locations remained below 110 mg/kg which was within health investigation levels for recreational land use.

Arsenic was also detected at concentrations that exceed HIL-E criteria in the southern cinders pit with sample HAUG2/S4 ranging from 205-320 mg/kg. The southern cinders pit is located approximately 100 metres south of the Project Area whereas the northern pit is located within the Project Area (Figure 3).

The report concluded that no further concentrations in the northern pit exceeded HIL-E and therefore was unlikely to pose a human health risk to users of the bike path. The concentrations outside of the Project Area in the southern pit represented low level exceedance were at depth of 0.5 mbgl and protected by cyclone fence and therefore there was no direct pathway mechanism noted for contamination to human users.

The report identified there was the potential for recreational users of the bike path to be exposed to shallow soils if they strayed from the bike path, or through inhalation of dust due to excavation at the site.

2.1.6 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1953 was undertaken to assess land use and developmental changes over time for the Tonkin Highway Reserve site and also for the Cresco/CSBP Bayswater site (Appendix C). The site history is summarised in Table 3.

Table 3: Aerial Photograph Review – CSBP Bayswater and Tonkin Highway Reserve

YEAR	DESCRIPTION
1953	Site is cleared, some industry to east corner with some surface water observed on Site.
1974	Significant development of unidentified industry in the east of Site and in the surrounding lands.
1995	No significant changes to the site. Tonkin Highway visible to the west of Site.
2008	Site demolished and cleared with the exception of road/access way from north-south through centre of Site.

2.2 Former Cresco/CSBP Site Bayswater

2.2.1 Basic Summary of Records

A search of the DER's Contaminated Sites Database provided Basic Summary of Records details of two lots (Lot 10 Railway Parade and Lot 7 Mooney Street Bayswater) adjacent to the east of the southern Project Area which forms one historical site classified as 'Contaminated - Remediation Required' (Appendix A). Based on this classification the site has been restricted for industrial/commercial use.

The 37.1 hectare site was classified in December 2006 due to its former use as a fertiliser production plant established in 1928 by Cresco. CSBP purchased Cresco's WA operations in 1970 and all manufacturing at the site ceased in 1993. The fertiliser production plant was decommissioned has been subjected to extensive soil and groundwater investigations carried out between 2003 and 2013.

Investigations have identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding HILs and EILs. Groundwater investigations have identified heavy metal contamination including arsenic, lead, chromium, and copper.

2.2.2 Detailed Summary of Records

Due to the contaminated site being located adjacent to the Project Area a detailed summary of records for the former Cresco/CSBP site was requested from DER. The detailed summary of records was provided on 17 February 2014 and is included in Appendix B. The summary of records identifies numerous environmental reports for the site:

- Assessment of Ammonia Removal Technologies, February 2005;

- 27 x Audit Report, Dust – Jun 2006, Jul 2006, Aug 2006, Dec 2006, Jan 2007, Feb 2007, Mar 2007, Apr 2007, Feb 2008, Mar 2008, Apr 2008, May 2008, Jul 2008, Aug 2008, Sep 2008, Oct 2008, Nov 2008, Feb 2009, Mar 2009, Apr 2009, May 2009, Jun 2009, Jul 2009, Aug 2009, Sep 2009, Oct 2009 and Dec 2009;
- Groundwater and Surface Water Monitoring Event- February 2013;
- Proposed Management Plan for Classification of Concrete Blocks – June 2006;
- Lower Superficial Aquifer Bores Groundwater Sampling- November 2012;
- Additional Well Installation, Groundwater and Surface Water Monitoring June 2012;
- Groundwater and Surface Water Monitoring Event- March 2012;
- Bayswater Water Quality Review 2003-2011- August 2013;
- Final Detailed Site Investigation, CSBP Booklet, October 2011;
- Final Validation Report for Remediation Areas, Booklet, October 2011;
- Direct Toxicity Assessment Using Resident Species, May 2005;
- Potential Impacts of Bayswater Main Drain on Swan River – April 2004;
- Preliminary Site Investigation, March 2007;
- Validation Sampling, Underground Storage Tank, May 2005;
- Final Remediation Works, Public Environmental Review, September 2004;
- Final Remediation Works, Public Environmental Review, August 2004;
- Groundwater Interception System – Preliminary Operating Strategy, November 2003;
- Investigation of the Water Quality of Domestic Bores, June 2003;
- Interim Report: Off-Site Groundwater Investigation- Former Cresco Site, Railway Parade, May 2003; and
- Interim Mandatory Auditor's report, 2-4 (Lot 10) Railway Parade and Lot 7 Mooney Street (August 2013).

The Interim Mandatory Auditor's Report was considered the most relevant report for review, summarising the most relevant environmental works to date. This report was provided by the DER and has been reviewed and summarised below.

2.2.3 Interim Mandatory Auditor's Report (Australian Environmental Auditors 2013)

Charles Barber of Australian Environmental Auditors undertook a Mandatory Auditor's Report (MAR) in 2013. A number of environmental and remediation works

have been undertaken at the site from 1983 to 2013 and the auditor has reviewed all documents that were made available, either for the purpose of providing relevant background information or for endorsement in accordance with the requirements of this audit. These documents are outlined in Section 2.2.2. The purpose of the environmental investigations undertaken by PB was to demonstrate the site at Lot 10 Railway Parade and Lot 7 Mooney Street Bayswater were suitable for development under their current “general industry” land use zoning. The facility operated as a fertiliser production plant and was established in 1928 by Cresco who built the Bayswater Works to produce single superphosphate, sulfuric acid and other small volume chemicals. By-products and residues produced, particularly iron oxide cinders and superphosphate effluent, were disposed of on-site in accordance with the standards at the time. CSBP purchased Cresco’s WA operations in 1970 and all manufacturing at the site ceased in 1993. A portion of the site that contained a significant area of buried cinders was acquired by Main Roads WA in 1964 to form the Tonkin Highway Reserve which is discussed in Section 1.5.

Extensive environmental investigations commenced at the site in the 1980s and a number of potential contaminants were identified. PB have been the primary environmental assessor of the site and identified heavy metals in soils and groundwater and identified a preferential pathway connecting site contaminants with the Swan River through the Bayswater Main Drain at certain times of the year.

PB identified that the key potential contaminants consisted of select heavy metals in soil above guideline values (HIL-F) and groundwater with low pH, ammonia and fluoride above Domestic Non-Potable (DNP) guidelines. Asbestos containing materials (ACM), predominantly in the form of broken sheeting fragments, were also identified on-site during the demolition of various site buildings and associated infrastructure.

Based upon the investigation data, PB identified the need to remediate contaminated soil and groundwater to facilitate future redevelopment of the site as well as to comply with the ministerial conditions placed on the site. As such, it was deemed that remediation of a large quantity of buried contaminated soil providing the source of groundwater contamination would have a positive effect on groundwater quality on and around the site.

Remediation via excavation and removal of cinders material and associated impacted soil to landfill occurred in two phases: from March 2006 to April 2007; and from April 2008 to November 2009.

85,800 m³ of soil and fill material was excavated and disposed to landfill. The Auditor stated that remediation conditions of the site have been achieved, however limited locations continued to report as contamination “hot-spots” above HIL-F assessment criteria. Remaining contaminants on site were arsenic, lead and copper. The Auditor concluded that based on the method of final validation and volume of material removed “there is a low potential for the remaining hot spots to serve as a risk to human health or constitute significant ongoing source of contamination to groundwater.”

Remediation associated with ACM on-site was not reported. It is not known whether residual ACM and potentially impacted soils were removed from the site.

Potential groundwater contaminants post-remediation were reported above the WA DoH 2006 Domestic Non-Potable (DNP) groundwater use criteria and include aluminium, zinc and fluoride. Low pH levels have also been observed on-site. The groundwater plume appears to be stable and attenuation is noted on the edge of the plume. The plume is present for aluminium, zinc, fluoride and low pH across a radius of approximately 500 m from the centre of site of the CSBP Bayswater Site and directly influences the TGS Project Area as presented in Appendix D.

Surface water monitoring was been completed at the Bayswater Main Drain and the Bayswater Main Drain Outfall site. The historical use of fertilizers and chemical production at the site has contributed to minimal measurable impact on the nutrient load emanating from the site to the Swan River.

2.2.4 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1953 was undertaken to assess land use and developmental changes over time for the Tonkin Highway Reserve site and also for the Cresco/CSBP Bayswater site (Appendix C). The site history is summarised in Table 3.

2.3 Former Metal Recycling Facility

2.3.1 Basic Summary of Records

A search of the DER's Contaminated Sites Database provided Basic Summary of Records details of Lot 9 on Deposited Plan 33567 which is a historical site classified as 'Remediated for restricted use (Appendix A). The 17,500 m² site located adjacent to the Project Area on the southern side of Collier Road near the intersection of Tonkin Highway was classified in February 2011. Based on its classification the site has been restricted to commercial/industrial use. The site should not be developed for a more sensitive use such as recreational open space; residential use or childcare centres without further contamination assessment. Groundwater abstracted for use on site should be chemically tested for its suitability for use.

Heavy metals and polychlorinated biphenyls (PCBs) exist in the soils along the southern perimeter of the site and potentially in some soils under reinforced concrete on the site. The site was originally reported because it was historically used as a metal recycling facility from around 1983-2004, a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating, Activities, Industries and land uses (DEC, 2004).

2.3.2 Detailed Summary of Records

Due to the contaminated site being located adjacent to the Project Area a detailed summary of records for the former metal recycling facility site was requested from DER. The detailed summary of records was provided on 29 January 2014 and is

included in Appendix B. The summary of records identifies the following 15 environmental reports related to the site:

- Proposal Nonferral Metals Recycling Facility Site Contamination Assessment and Management Plan (Bowman Bishaw Gorham, May 1994);
- Towards Environmental Guidelines: A Progress Report (Geo & Hydro, October 1996);
- Final Report, Environmental Review Bassendean WA (Nonferral, November 1999);
- Assessment of Water, Sediment and Fish Quality in the Bayswater drains and adjacent Swan River, DEC, (April/May 2003);
- End-of-Life Tyre Management: Storage Options, Final Report for the Ministry for the Environment (MWH, July 2004);
- Interim Report Bassendean Scrap Metal Yard Fire (Metalcorp Recyclers, December 2004);
- Smorgons Steels Fire, 6 December to 9 December 2004, 34 Jackson Street Bayswater (Smorgon Steel, December 2004);
- Sediment Investigation of Compensating Basin Post December 2004 Fire, Smorgon Steel Group Recycled Metal Yard, Bayswater, WA (ENV, March 2005);
- Preliminary Groundwater Investigation Smorgon Steel Group Recycled Metal Yard, Bayswater WA (ENV, May 2005);
- Local Recovery Committee Sampling & Analysis Data Summary Report Former Recycling Yard, 34 Jackson Street, Bayswater WA (ENV, June 2005);
- Preliminary Ash & Surface Soil Investigation- Smorgon Steel Group Recycled Metal Yard Bayswater WA (ENV, June 2005);
- Site Investigation Fire Footprint Area, Scrap Metal Recycling Yard, 34 Jackson Street Bayswater (ATA Environmental, August 2006);
- Post Remediation Validation Report – Scrap Metal Recycling Yard, 34 Jackson Street Bayswater (ATA, September 2006);
- Environmental Site Assessment and Remediation/Validation (Ace Environmental, August 2008); and
- Environmental Site Assessment and Remediation/Validation (Ace Environmental, November 2010).

The November 2010 Environmental Site Assessment and Remediation/Validation report produced by Ace Environmental was considered the most relevant report for review, summarising the environmental works completed. This report was provided by the DER and has been reviewed and summarised below.

2.3.3 Environmental Site Assessment and Remediation/Validation (Ace Environmental, November 2010)

From 2007 to 2010 Ace Environmental undertook an Environmental Site Assessment of Part Lot 9 (No. 34) Jackson Street Bayswater, Western Australia for Capital Recycling. The City of Bayswater placed a condition that an MAR was required before the DEC could reclassify the Site, but the City of Bayswater later removed the condition and consequently this report was resubmitted to the DEC as evidence of the site being remediated.

The site has been used to stockpile scrap metal since 2002 and has operated as a recycling facility since 2004. On 6 December 2004 a significant fire burnt through the stockpiles. The fire was extinguished by the Department of Environmental (DOE) Pollution Response Unit and the Fire and Emergency Services Authority.

The Detailed Site Investigation (DSI) identified the following potential sources of contamination.

- Former battery stacking and breaking area;
- Weighbridge; and
- Workshop area.

Potential contaminants were identified based on the DOE (2004) guidelines for 'Potentially Contaminating Activities, Industries and Land uses' with the report summarising that:

- The methodology and data were of sufficient standard to ensure that the site does not pose a risk to human health and the environment;
- No asbestos containing material (ACM) was identified on the site;
- TPH (C₁₅-C₃₆) was detected in two soil samples at concentrations exceeding the EIL. All other soil samples were reported below laboratory limits of detection or at concentrations less than investigation limits;
- PCBs and metals (Pb, As, Cd, Cu, Ni and Zn) in soils remain in concentrations which exceed the Ecological Investigation Levels (EILs) in the south-east of site; and
- BTEX, polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), PCBs and metals with the exception of cadmium and copper were either reported below laboratory limits of detection or below relevant guidelines for all groundwater samples.

Based on the results of the DSI, Ace Environmental did not consider that on-going monitoring was required for the site. The soil was remediated and validated to levels below the EILs and HIL-Fs and groundwater impacts were minor and not considered a significant risk to human health or surrounding ecological receptors.

As a result of Ace Environmental's assessment and remediation works, the DEC reclassified the site as 'Remediated for restricted use'.

2.3.4 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1953 was undertaken to assess land use and developmental changes over time for the site (Appendix C). The site history is summarised in Table 4.

Table 4: Aerial Photograph Review – Former Metal Recycling Facility

YEAR	DESCRIPTION
1953	The site is cleared, potential wetland features on lot.
1974	Extensive clearing on site and development of car park, shed and pond. Drainage or irrigation feature from swamp to north of lot. No site use can be identified.
1995	Significant earthworks, pond is now filled and appears to be rubble in centre of site. The site is being used as a metal recycling facility.
2013	Large scale excavations/processing and stockpiling on site.

2.4 Former Service Station – 335 Collier Road Bassendean

2.4.1 Basic Summary of Records

A search of the DER's Contaminated Sites Database provided Basic Summary of Records details for Lot 125 on Plan 17160, 335 Collier Road Bassendean. The site was classified in October 2008 as 'Contaminated – remediation required' due to contamination associated with its former use as a service station. Petrol and diesel hydrocarbon concentrations are present in soil and levels which exceed health based investigation levels and in groundwater at levels which exceed aquatic ecosystem levels for freshwater. Free phase hydro-carbons were identified in groundwater. The DER understands that at the time of classification, air sparging remediation techniques were in use at the site and a validation report was yet to be submitted to the DER.

The site is not considered to have the potential to impact the TGS Project Area as no source-pathway-receptor linkages could be identified (see Section 4.4). The former service station is located 350 m east of the Project Area. Groundwater flow (discussed in detail in Section 3.4) between the former service station site and the TGS Project Area is indicated to be in a south-easterly direction (Figure 4), away from the Project Area. Consequently, detailed summary of records were not requested for these facilities.

2.4.2 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1965 was undertaken to assess land use and developmental changes over time for the site (Appendix C). The site history is summarised in Table 5.

Table 5: Aerial Photograph Review – Former Service Station

YEAR	DESCRIPTION
1965	Uncleared land with minor unsealed road on site.
1981	Site cleared.
1995	Service station in the south-east of the sites and another 5 buildings (affected sites).
2010	No change is observed.

2.5 Former CSBP Site Bassendean

2.5.1 Basic Summary of Records

A search of the DER's Contaminated Sites Database provided Basic Summary of Records details for 7 land parcels (39.2 hectares) within the Tonkin Industrial Estate belonging to the former CSBP Bassendean Site. The land was classified in February 2012 as 'Remediated for restricted' use due to contamination associated with its historical use for the manufacturing of fertilizers. Land use at the site is restricted to commercial/industrial land use and groundwater abstraction is not permitted.

The site was subject to soil and groundwater monitoring to comply with conditions imposed under the *Environmental Protection Act 1986*. The most recent groundwater monitoring data, collected in March 2011, showed the presence of acidity at levels below pH 3.6, heavy metals (i.e. arsenic, aluminium, copper, lead, selenium, and zinc), fluoride, chloride and ammonia contamination at concentrations exceeding the criteria set out in the Department of Health guideline 'Contaminated Sites Reporting Guideline for Chemicals in Groundwater' (Department of Health, 2006) which are the relevant assessment levels for non-potable domestic uses. Contaminated groundwater appears to be migrating off-site to the south.

The site is not considered to have the potential to influence the TGS Project Area due to its location 450 metres east, the lack of direct source-pathway-receptors linkages (see Section 4.4), and the south to south-east regional groundwater flow direction. Consequently, detailed summary of records were not requested for these facilities.

2.5.2 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1953 was undertaken to assess land use and developmental changes over time for the site (Appendix C). The site history is summarised in Table 6.

Table 6: Aerial Photograph Review – Former CSBP Bassendean Site

YEAR	DESCRIPTION
1953	Site is partially cleared with small dam, building and minor roadway to the east of the site.
1964	Small sheds developed in centre of the CSBP site. Larger sheds developed outside of the Site boundaries to the east.
2000	The CSBP site remains cleared but not developed with a sealed pad visible in the east.
2010	Significant re-developments of the site with 13 shed in eastern portion of Site. Sealed road to north of Site.

2.6 Former Motor Vehicle Workshop – Jackson Street Bassendean

2.6.1 Basic Summary of Records

A search of the DER Contaminated Sites Database provided Basic Summary of Records details for Lots 9 and 11 Jackson Road and Lot 201 Railway Parade Bassendean. The site was classified under the *Contaminated Sites Act 2003* in September 2012 as 'Remediated for restricted use' due to former site activities including fuel and waste storage and operation as a motor vehicle workshop. The site is restricted to commercial/industrial use and groundwater abstraction is not permitted.

Hydrocarbons were identified hydrocarbons in soils exceeding the EILs and possible HIL-Fs in the location of two former USTs. Contamination was observed in soil at 4 mbgl representing the approximate depth of groundwater, suggesting that hydrocarbon contamination to groundwater is also likely.

Remedial activities were undertaken at the site in 1999 with approximately 1,000 m³ of soil was bio-remediated and returned to site. During these works, an additional two underground storage tanks were uncovered and removed during the remediation works. Hydrocarbon impacted soil remained on-site along the eastern boundary with further excavation and removal not possible due to the proximity of buildings on the adjoining lot.

A sump was identified on the boundary of Lot 11 Jackson Street and Lot 200 Railway Parade. It was removed in 2000 and following a series of soil excavations

were completed, each confirming that hydrocarbons remained at the site above the EILs and potentially HIL-Fs.

Groundwater monitoring was been undertaken at the site on a periodical basis from 1999-2012. The most recent groundwater monitoring event, conducted in April 2012, found that concentrations of naphthalene exceeded Aquatic Ecosystems, Fresh Water (FW) guidelines and ethyl benzene exceeded DNP criteria as published in 'Assessment Levels for Soil, Sediment and Water' (DEC, February 2010). Since the site classification in 2010, concentrations of total recoverable hydrocarbons (TRH) have increased in some monitoring wells and continue to exceed Groundwater Intervention Values (Netherlands Ministry for Housing, Spatial Planning and Environment, 2000). The available groundwater monitoring results do not provide evidence that natural attenuation is occurring. On-going monitoring of groundwater quality is required, to monitor plume behaviour, and ensure that the hydrocarbon contamination plume does not migrate, undetected, beyond the collective boundaries of Lot 11, 200 and 201.

The motor vehicle workshop contains a number of on-going contamination issues however no source-pathway-receptor linkages can be identified (see Section 4.4) between the motor vehicle workshop site and TGS Project Area 450 m to the west. Regional groundwater flow is in a south-east direction (Figure 4). Due to the absence of source-pathway-receptor linkages it is considered that this site does not pose a liability to the TGS Project Area. Consequently, detailed summary of records were not requested for these facilities.

2.6.2 Historical Aerial Photographs

A review of selected historical aerial photographs dating back to 1953 was undertaken to assess land use and developmental changes over time for the site (Appendix C). The site history is summarised in Table 7.

Table 7: Aerial Photograph Review – Motor Vehicle Workshop

YEAR	DESCRIPTION
1953	2 sheds developed to the east corner of site. Remainder of site undeveloped.
1974	4 additional sheds to north-east of site. Western portion of site remains undeveloped. Residential property well established to the south of the site.
1985	Development of car park and large rectangular building in western portion/centre of Site.
2013	Site and surrounds remain relatively unchanged.

2.7 Former Pest Control Depot - 20 Bassendean Road Bayswater

2.7.1 Basic Summary of Records

A search of the DER Contaminated Sites Database provided Basic Summary of Records details for 20 Bassendean Road Bayswater. The site was classified under the *Contaminated Sites Act 2003* in January 2014 as 'Remediated for restricted use' due to former land use as a pest control depot. The land use of the site is restricted to commercial/industrial use.

The site has been used as a pest control depot since the 1980s. The City of Bayswater identified surface soil contamination in 1989 and required the removal of 150 mm of surface soil. The site was investigated in 1996 as part of a preliminary sampling program initiated by the Water and Rivers Commission, targeting pest control operators in the Perth. The assessment found that pesticides were present in groundwater beneath the site, and that pesticides in groundwater were migrating off-site to the south. Further investigation was carried in 2013 and found no contaminants above DNP guidelines remaining in groundwater beneath the site or off-site to the south and concluded that the site is free from pesticide contamination as a result of natural attenuation. The DER recommended that further assessment of potential contamination should be undertaken before any change in land use to a more sensitive land use in future.

No source-pathway-receptor linkages can be identified between the former pest control depot site and the TGS Project Area 300 m to the east (see Section 4.4). Groundwater flow is indicated to be in a southerly direction. Due to the absence of source-pathway-receptor linkages it is considered that this site does not pose a liability to the TGS Project Area. Consequently, detailed summary of records were not requested for the site.

3 Landform, Geology and Hydrogeology

3.1 Topography and Surface Hydrogeology

The Project Area slopes at a low gradient from north (35 m AHD) to south (15 m AHD) over a distance of approximately 5 km. The southern portion of the Project Area in proximity of the seven classified contaminated sites is relatively flat. It is expected that surface water runoff would follow the natural contours of the site and flow towards the southern boundary.

The Bayswater Main Drain receives water from four surface water drainage systems within the greater Bayswater area and comprises a combination of open earth and closed pipe constructions. It follows the path of the Tonkin Highway and discharges into the Swan River.

3.2 Regional Soils and Geology

The Geological Survey of Western Australia (1986) Environmental Geology Mapping describe the regional soils as light grey surface sands, yellow at depth, fine to medium grained, sub-rounded quartz, moderately well sorted of aeolian origin. The sands are thin Bassendean Sands over Guilford Formation.

3.3 Acid Sulfate Soils

The site is shown on the DER (2014) Online Risk Mapping databases of Acid Sulfate Soils (ASS) as predominantly moderate to low risk for ASS disturbance with small portion of the site classified as medium to high ASS disturbance risk occurring at depths less than 3 m (Figure 6).

Should any site works require natural soil disturbance (excluding fill) greater than 100 m³ or excavation from below the water table in the areas identified as high risk, a detailed ASS investigation will be required prior to conducting any excavation or dewatering works.

3.4 Hydrogeology

The Project Area is underlain by the superficial Swan aquifer. The aquifer consists mainly of quartz sands, especially in the Bassendean Sand, and calcareous sands and limestone in the Tamala Limestone.

The online Perth Groundwater Atlas (DOW 2014) indicates that the regional groundwater flows in a south-south-easterly direction towards the Swan River, conforming approximately to the topography (Figure 4). It is noted that previous environmental investigations within proximity of the southern portion of the Project Area (as discussed in Section 2) have identified groundwater flow directions ranging from south-east to south-west. The depth to groundwater across the Project Area averages approximately 10 mbgl with the greatest depth to groundwater identified in the northern and middle portions of the Project Area.

Groundwater levels were monitored at several on-site and off-site bores at the former CSBP Bassendean site by PB from 2003-2011. PB identifies groundwater as ranging from 2 to 6 mbgl in the southern portion of Project Area based on a series of groundwater monitoring events.

3.5 WIN Database Review

The Department of Water (DOW) Water Information Network (WIN) lists registered groundwater wells in Western Australia. A search was undertaken for registered wells within a 500 metre radius of the Project Area by 360 Environmental on 2 April 2014. The DOW search results are summarised in Appendix E and locations of wells are provided in Figure 5. A total of 67 groundwater wells were identified within a 500 metres of the site.

Twelve of the registered wells are for domestic use. A further five wells are listed as investigation or monitoring network wells. Seven groundwater bores are for industrial, production or project purposes. The purpose of the remaining bores is not listed.

It should be noted that the information provided is only indicative of registered groundwater wells. The DER estimates that the majority of domestic garden irrigation wells are unregistered in the Perth Metropolitan Region (i.e. that do not fall within statutory licensing requirements).

4 Conceptual Site Model

4.1 Contaminant Sources

Potential contaminant sources include:

- Á Area of Tonkin Highway Reserve in the southern portion of the Project Area impacted by pyritic cinders;
- Á Former metal recycling facility at the corner of Tonkin Highway & Collier Rd;
- Á Former Cresco/CSBP Bayswater Site;
- Á Former motor vehicle workshop;
- Á Former CSBP Bassendean Site;
- Á Former Service Station;
- Á Former Pest Control Depot; and
- Á Disturbance of potential Acid Sulfate Soils

Potential contaminants identified at the site and the areas they are associated with are summarised in Table 8.

Table 8: Potential Contamination Sources

LOCATION	CONTAMINANT	RATIONALE
Tonkin Highway Reserve (in southern Project Area)	Heavy metals (arsenic, cobalt, chromium, cadmium, manganese, nickel and zinc) in soil (pyritic cinders) Iron, fluoride and manganese in groundwater	Cinder from former Cresco site use in road construction. Arsenic exceeds HIL-F. Cobalt, chromium, cadmium, manganese, nickel and zinc exceed EILs. Iron exceeds DW guideline. Iron, fluoride and manganese exceed LTI guidelines
Former Cresco/CSBP Site Bayswater, adjacent east of southern portion of Project Area	Heavy metals, fluoride, chloride, ammonia, acidity, asbestos	Analytes identified in previous consultant's reports are associated with the sites operation as a former chemical and fertilizer manufacturing plant. Limited "hot spots" above HIL-F.
Former Metal Recycling Facility, corner of Tonkin Hwy and Collier Rd	TPH (C ₁₅ -C ₃₆) PCBs and Metals (Pb, As, Cd, Cu, Ni and Zn)	Site history as metal recycling facility and possible contamination due to historical fire with contaminants remaining in soil above DEC (2010) EIL levels and in groundwater exceeding FW Guidelines and DNP Guidelines
Former Motor Vehicle Workshop, 450 m east of Project Area	Hydrocarbons (Petrol and Diesel)	Site history as a motor vehicle workshop.
Former CSBP Site Bassendean, 450 m east of Project Area	Groundwater contamination remains above assessment levels for non-potable domestic use for the below contaminants: Acidity, Heavy metals (arsenic, cadmium, copper, lead, selenium, nickel and zinc), Fluoride, Chloride, Ammonia	Site history as a former fertilizer manufacturing plant.
Former Service Station, 350 m east of Project Area	Petroleum hydrocarbon contamination to soil and water.	Site history as a former service station with petroleum hydrocarbons concentrations in soil exceeding HILs and FW guidelines in groundwater
Former Pest Control Depot, 300 m west of Project Area	No contaminants remaining.	No potential contaminants remaining in groundwater or soil based on 2013 investigation.
Acid Sulfate Soils (Medium to high risk areas are identified in Figure 6)	Sulfuric acid production releasing metals, nutrients and acidity into the soil and groundwater system.	Dewatering operations and disturbance of natural soils below groundwater level associated with road development.

4.2 Receptors

4.2.1 On-site Human Receptors

On-site human receptors may include:

- Future TGS workers during earthworks and dewatering;
- Future road maintenance workers; and
- Road users, cyclists and pedestrians (where contaminated soils are excavated and remain exposed at the ground surface).

4.2.2 Surrounding Human Receptors

Land within 500 m of the northern portion of the Project Area is primarily zoned residential with some parks and recreation and public purpose zonings. Land within 500 m of the southern portion of the Project Area is primarily zoned industrial. A description of surrounding land use is provided in Table 9.

Table 9: Surrounding Land Use

FEATURE	EVALUATION CRITERIA
North	Mixed commercial, industrial and residential properties
East	Industrial properties. Five classified Contaminated Sites identified within the 500 metres.
South	A major road reserve forms the southern boundary of the Project Area. Industrial properties, classified contaminated site on the southern portion of the highway reserve
West	Major road easement, industrial properties and residential properties.

Surrounding human occupation and land use that may be impacted by TGS project works include:

- Workers to north, south, east and west in the surrounding industrial precinct where potentially impacted groundwater is abstracted;
- Residents to north, south, east and west where potentially impacted groundwater is abstracted; and
- Recreational users of the Swan River (that may be impacted by groundwater and drain water).

4.2.3 On-Site Ecological Receptors

No significant ecological receptors have been identified on-site.

4.2.4 Surrounding Ecological Receptors

A search of the DEC (2010) Geomorphic Wetland Database has indicated that the closest wetland of environmental significance is Gobba Lake, located approximately 1 km to the south of the Project Area and classified in the Geomorphic Wetland Database as a resource enhancement area. The Swan River, a conservation category wetland is located 1.6 km to the south of the TGS site. Two additional wetlands were identified to the immediate east and south west of site. These are intermittent in nature and are classified as 'dampland multiple use' and are not considered to be of environmental significance. The nearest terrestrial ecosystems to the Project Area (Bush Forever Site 307) are 400 m away and are not anticipated to be influenced by the TGS project.

4.3 Pathways

Potential pathways for contaminants include:

Groundwater

According to the Perth Groundwater Atlas (online) the depth to groundwater across the Project Area averages approximately 10 mbgl and in the southern portion of the Project Area is approximately 8 mbgl. However PB investigations (2003-2011) identify groundwater as ranging from 2-6 mbgl in the southern Project Area (adjacent to the former Cresco/CSBP site).

Groundwater may act as a pathway carrying contaminants to the Project Area from hydraulically up-gradient source sites. Regional groundwater is thought to travel in a south-easterly direction throughout the underlying sands with localised conditions in the south of the Project Area indicating groundwater flows in a south to south-westerly direction.

Where groundwater is used for irrigation it may be exposed to humans and the environment. Groundwater may also be encountered by utility maintenance workers and workers involved in the earthworks stage of the TGS project.

Groundwater has the potential to carry contaminants from the Project Area to down-gradient human and ecological receptors. Contaminants of potential concern from the Project Area include heavy metals from the disturbance of existing cinder deposits or through oxidation of acid sulfate soils.

Surface Water

Run-off from contaminated soil and shallow groundwater is likely to leave the site through the Bayswater Main Drain and flow along the western side of the Tonkin Highway Reserve and eventually into the Swan River.

Soil

Soil may be encountered by earthworks contractors during removal of the existing road surface, during the earthworks stage of the TGS project and by utility maintenance workers prior to and after the TGS works.

4.4 Source-Pathway-Receptor Linkages

A schematic Conceptual Site Model (CSM) has been developed taking into account potential contamination sources, receptors and connecting pathways. The CSM is provided in Appendix F. Table 10 summarises the sources of potential environmental concern, pathways, receptors and the associated exposure risks.

Table 10: Source-Pathway-Receptor Linkages

SOURCE	RECEPTOR	PATHWAY	CONTAMINANTS	RISK
Tonkin Highway Reserve – pyritic cinders	TGS project workers	Direct contact with soil	Arsenic	High
		Direct contact with groundwater, dewatering, use of groundwater for dust suppression, irrigation etc.	Fe, F, Mn	Moderate
	Road, walkway and bike path users	Direct contact with soil	Arsenic	Moderate
	Wetlands Gobba Lake (1km south) and Swan River (1.6 km south)	Groundwater	Fe, F, Mn	Moderate
		Surface water (Bayswater Main Drain)	Fe, F, Mn	Moderate
	Residential users of groundwater (i.e. irrigation, grey water use)	No significant residential land use hydraulically down-gradient	Fe, F, Mn	No risk
Industrial users of groundwater (i.e. irrigation, grey water use)	Groundwater flow to industrial land users hydraulically down-gradient of site	Fe, F, Mn	Moderate	
Former Cresco/CSBP Fertilizer Production Plant Site Bayswater	TGS project workers	Direct contact with groundwater, dewatering, use of groundwater for dust suppression, irrigation etc. No direct contact with off-site soil	pH, Al, As, Fe, Ni, TN, TP, F and SO ₄	Moderate
	Road and bike path users	No direct contact with off-site soil or groundwater	pH, Al, As, Fe, Ni, TN, TP, F and SO ₄	No risk
	Down-gradient wetlands	NA: Source site is not Project Area		
	Off-site users of groundwater	NA: Source site is not Project Area		
Former Metal Recycling Facility – PCBs and metals in soil and groundwater exceed EILs.	TGS project workers	Direct contact with groundwater, dewatering, use of groundwater for dust suppression, irrigation etc. No direct contact with off-site soil	TPH, PCBs. Pb, As, Cd, Cu, Ni, Zn	Low
	Road and bike path users	No direct contact with off-site soil or groundwater	TPH, PCBs. Pb, As, Cd, Cu, Ni, Zn	Moderate
	Down-gradient wetlands	NA: Source site is not Project Area		
	Off-site users of groundwater	NA: Source site is not Project Area		
Former Motor Vehicle Workshop	TGS project workers, road users.	No pathways identified due to location 450 m cross-gradient	Petroleum hydrocarbons	Low
Former Service Station	TGS project workers, road users.	No pathways identified due to location 350 m cross-gradient	Petroleum hydrocarbons	No risk
Former CSBP Site Bassendean	TGS project workers, road users.	No pathways identified due to location 450 m cross-gradient	Acidity, As, Cd, Cu, Pb, Se, Ni, Zn, F, Cl, NH ₃	No risk
Pest Control Depot	TGS project workers, road users.	No pathways identified due to location 300 m cross-gradient	-	No risk
Acid Sulfate Soils high and moderate risk areas – Entire Project Area	TGS project workers	Direct contact with acidified soil, with mobilised contaminants	Metals, nutrients, acidity	Moderate
		Direct contact with groundwater, dewatering, use of groundwater for dust suppression, irrigation etc.	Metals, nutrients, acidity	Moderate
	Road, walkway and bike path users	Direct contact with soil	Metals, nutrients, acidity	Moderate
	Wetlands Gobba Lake (1km south) and Swan River (1.6 km south)	Direct contact with groundwater	Metals, nutrients, acidity	Moderate
	Residential users of groundwater	Groundwater flow to residential land users hydraulically down-gradient of site	Metals, nutrients, acidity	Moderate
	Industrial users of groundwater	Groundwater flow to industrial land users hydraulically down-gradient of site	Metals, nutrients, acidity	Moderate
	Infrastructure on-site and hydraulically down-gradient of soil disturbance and dewatering locations	Direct contact with soil	Metals, acidity	Moderate
Direct contact with groundwater on-site and hydraulically down-gradient of the Project Area		Metals, acidity	Moderate	

5 Conclusions and Recommendations

Seven contaminated sites classified under the Contaminated Sites Act (2003) are located within 500 m of the Project Area. Of these sites it was identified that three sites have potential source-pathway-receptor linkages that could pose a contamination risk to the TGS project:

- **A** Southern portion of Tonkin Highway Reserve within the Project Area. This area contains a contamination hot spot with soil impacted by pyritic cinders. Groundwater contaminants include iron, fluoride and manganese;
- **A** Former Cresco/CSBP Site Bayswater, adjacent east of the southern portion of the Project Area. Groundwater contaminants include heavy metals, fluoride, chloride and ammonia above Domestic Non-Potable criteria; and
- **A** Former metal recycling facility at the corner of Tonkin Highway and Collier Road. Groundwater contaminants including petroleum hydrocarbons and heavy metals remain above Freshwater and Domestic Non-Potable guidelines.

Heavy metal contaminated soil in the southern portion of the Tonkin Highway Reserve presents a high risk to TGS project workers through direct contact with potential contaminants during site works and, if not appropriately managed, also presents a risk to users of the highway and bike path.

Groundwater in the Project Area south of Collier Road is potentially contaminated as a result of the three aforementioned contaminated sites. Groundwater depth in this area is indicated to range from 2 to 10 m below ground level. Excavation below groundwater level and dewatering of contaminated groundwater within the Project Area has the potential to impact construction and maintenance workers during TGS upgrade works. There are potential long-term risks to road users, recreational bike pathway users and environmental receptors such as the Swan River.

In addition to the contaminated sites in proximity of the Project Area, potential acid sulfate soils present a risk of generating acid conditions and contaminants at the site where disturbance of natural soils and/or de-watering occurs.

Based upon the results of the investigation and in the context of the conclusions above, it is recommended that a Site Management Plan (SMP) is prepared in accordance with the DER's *Contaminated Sites Management Series* in order to appropriately manage contaminants in soil and groundwater beneath the site.

Due to the presence of contaminants at certain locations within the TGS Project Area, appropriate handling and disposal of soils and groundwater will be required in order to mitigate risks to human health and the environment.

360 Environmental does not have details of how soil and groundwater will be disturbed during TGS works. Further details of the proposed TGS works will be required to develop the SMP.

An investigation of acid sulfate soils should also be undertaken to assess areas of proposed soil and groundwater disturbances. The investigation should be followed by the development of an Acid Sulfate Soils and Dewatering Management Plan (ASSDMP) to appropriately manage the handling and treatment of soils and dewatering effluent.

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses (“client’s information”) provided by the client and other individuals and entities. In most cases where client’s information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client’s information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client’s information is contingent upon the accuracy, exhaustiveness and currency of the client’s information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client’s information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this page, without the prior written consent of 360 Environmental Pty Ltd.

7 References

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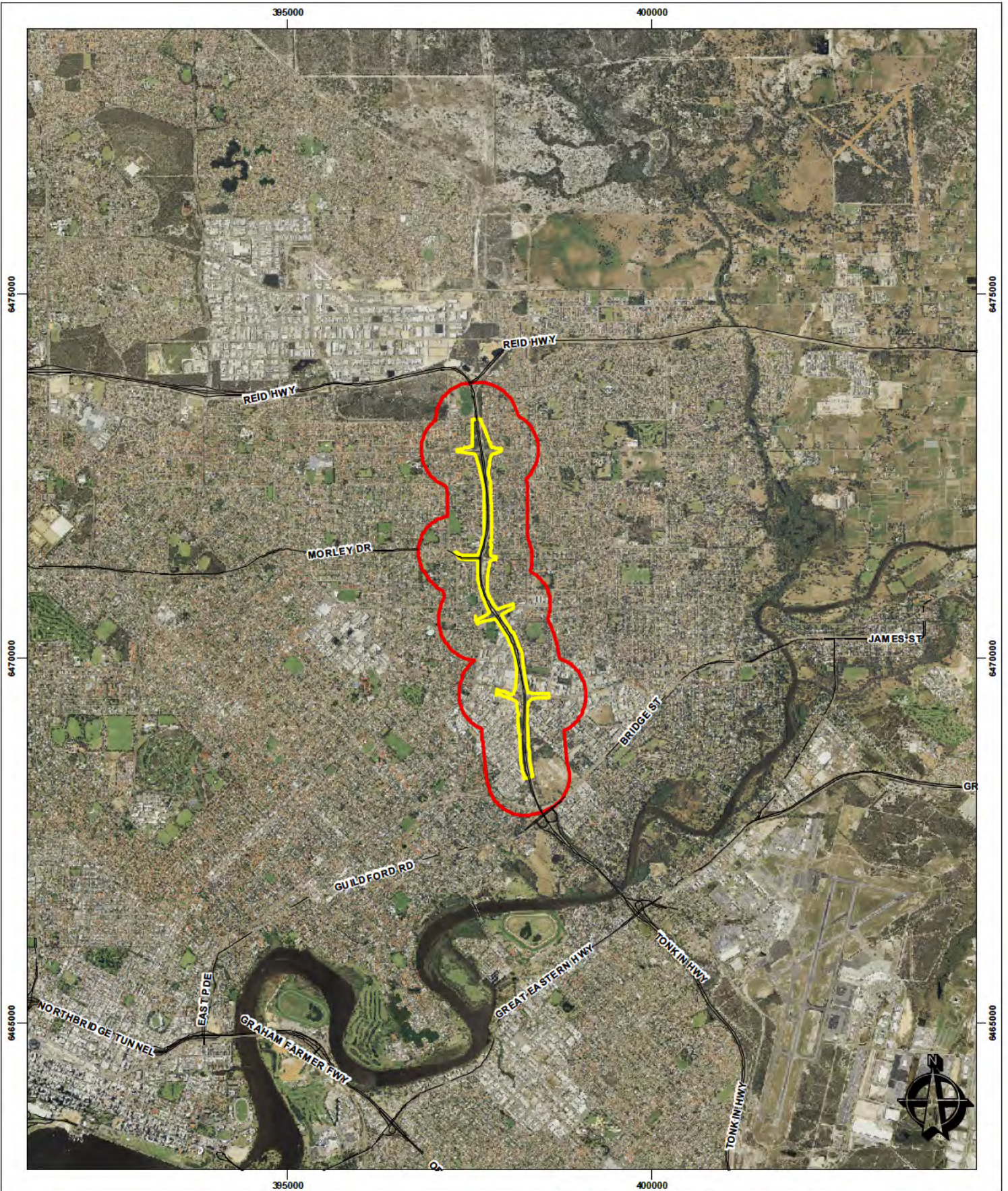
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Parsons Brinckerhoff, 2005, Ecological and Human Health Risk Assessment, Tonkin Highway Road Reserve (Railway Parade) Bayswater

Parsons Brinckerhoff, 2011 Final Detailed Site Investigations, CSBP Bayswater, WA

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FIGURES



Legend

- Project Area
- Area for Consideration (500m boundary)
- Major Roads



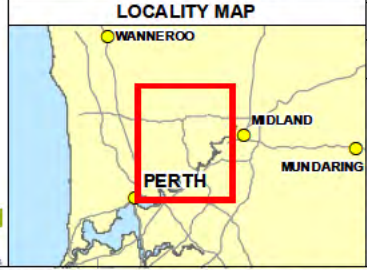
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DRAWING ID	DATE
345_f1_project_area.mxd	11-Apr-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway
 Contaminated Site Investigation Report



LOCALITY MAP SOURCED FROM LANDGATE 2006
 CONTAMINATED SITES SOURCED DEC 2013

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Figure 1 - Tonkin Grade Separation Project Area



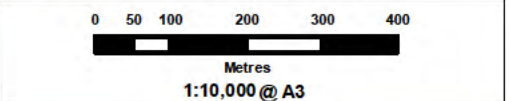
- Legend**
- TGS Site
 - 500m buffer
- Contaminated Sites Classification**
- Contaminated - remediation required
 - Remediated for restricted use

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2009
 - CONTAMINATED SITES SOURCED DER 2013
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2013
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SLIP ENABLER

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LOCALITY MAP



DRAWING ID	DATE
345_figure2_contamination.mxd	04-Feb-2014

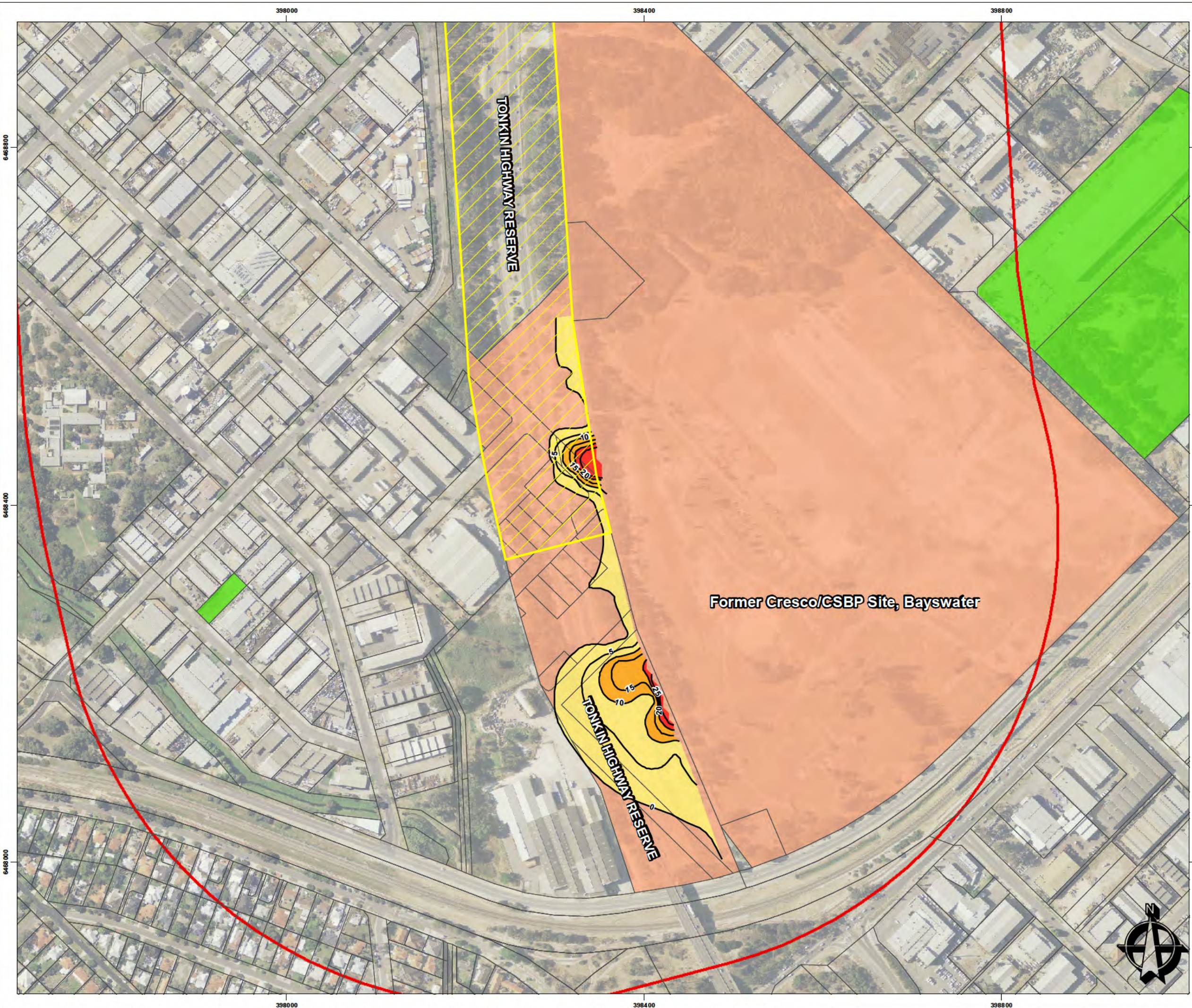
HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	MRo	SB	1

Main Roads Western Australia
 Tonkin Highway

TGS Contamination

Figure 2- Contaminated Sites within 500m of Project Area



- Legend**
- Project Area
 - 500m Radius
 - Cadastral Boundaries
- Contaminated Sites Classification**
- Contaminated - remediation required
 - Remediated for restricted use
- Pyritic Cinders / Iron Oxide Concentration (%Fe2O3)**
- 0 - 10
 - 10 - 20
 - 20 - 30

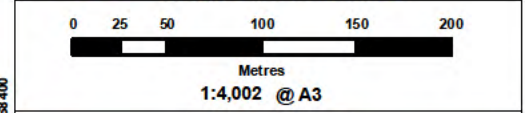
Note: Cinders distribution sourced from Parsons Brinckerhoff 2004

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2009
 - CONTAMINATED SITES SOURCE DER 2013
 - CINDERS DISTRIBUTION ADAPTED FROM PARSONS BRINCKERHOFF 2004 (2145033A)
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2013
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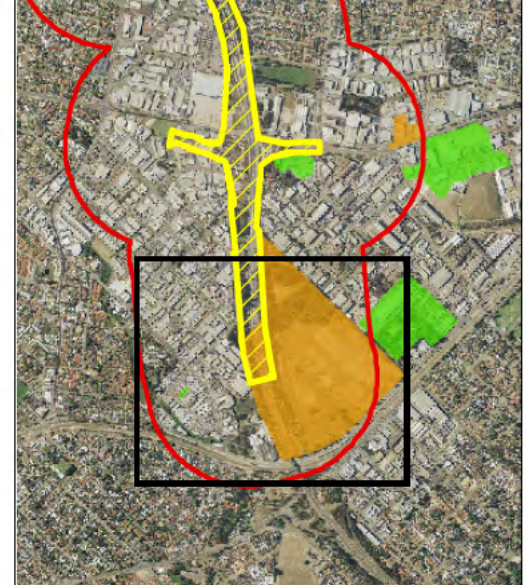
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LOCALITY MAP



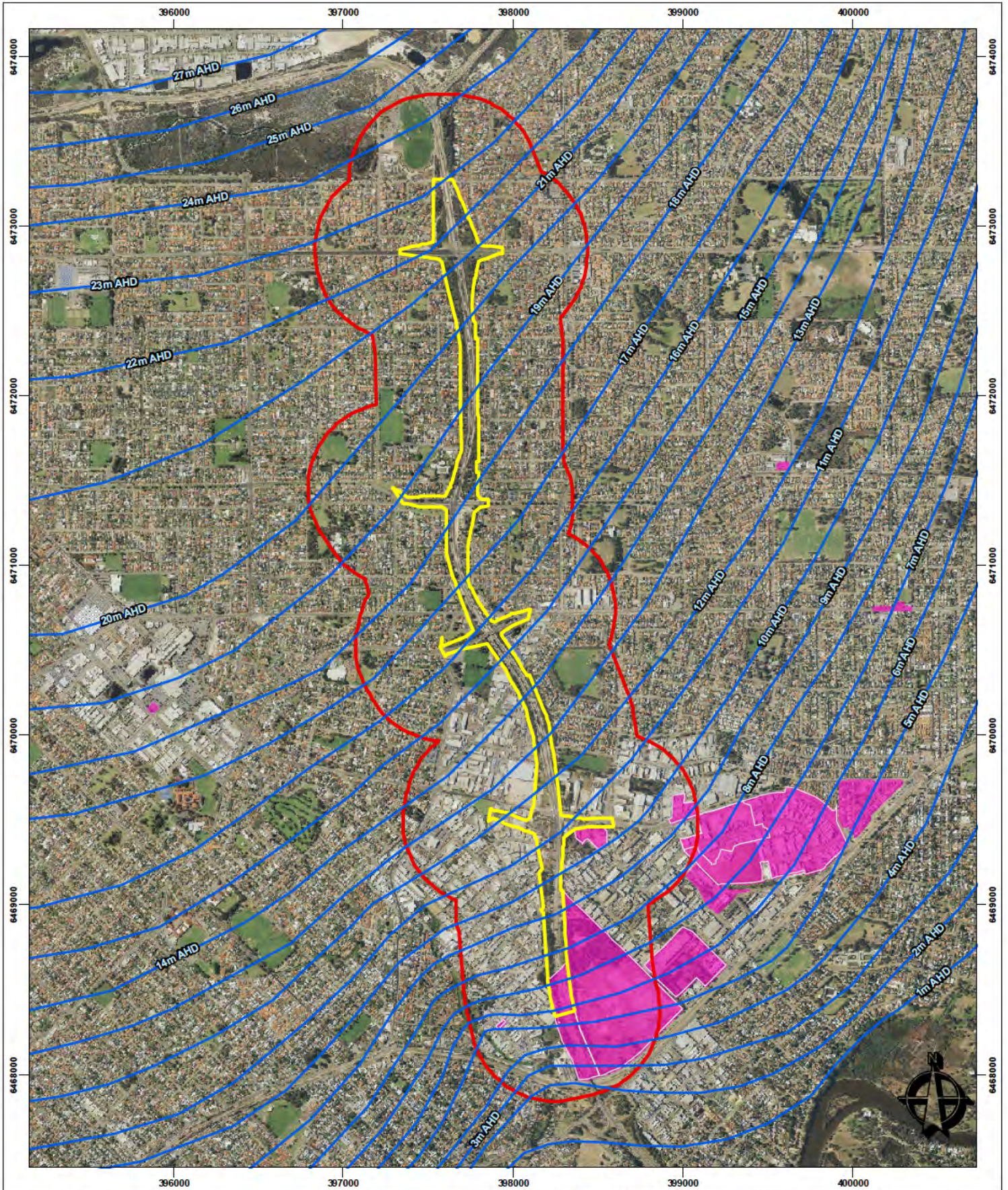
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345_figure8_Cinders_distribution.mxd	01-Apr-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS/JJ	MRo	SB	1

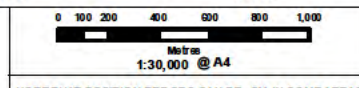
Main Roads Western Australia
 Tonkin Highway
 Contaminated Site Investigation Report

Figure 3 - Tonkin Hwy Reserve Pyritic Cinders Distribution



Legend

- Project Area
- Proposed Clearing Footprint (500m boundary)
- Contaminated Sites
- Groundwater Contour (Min)



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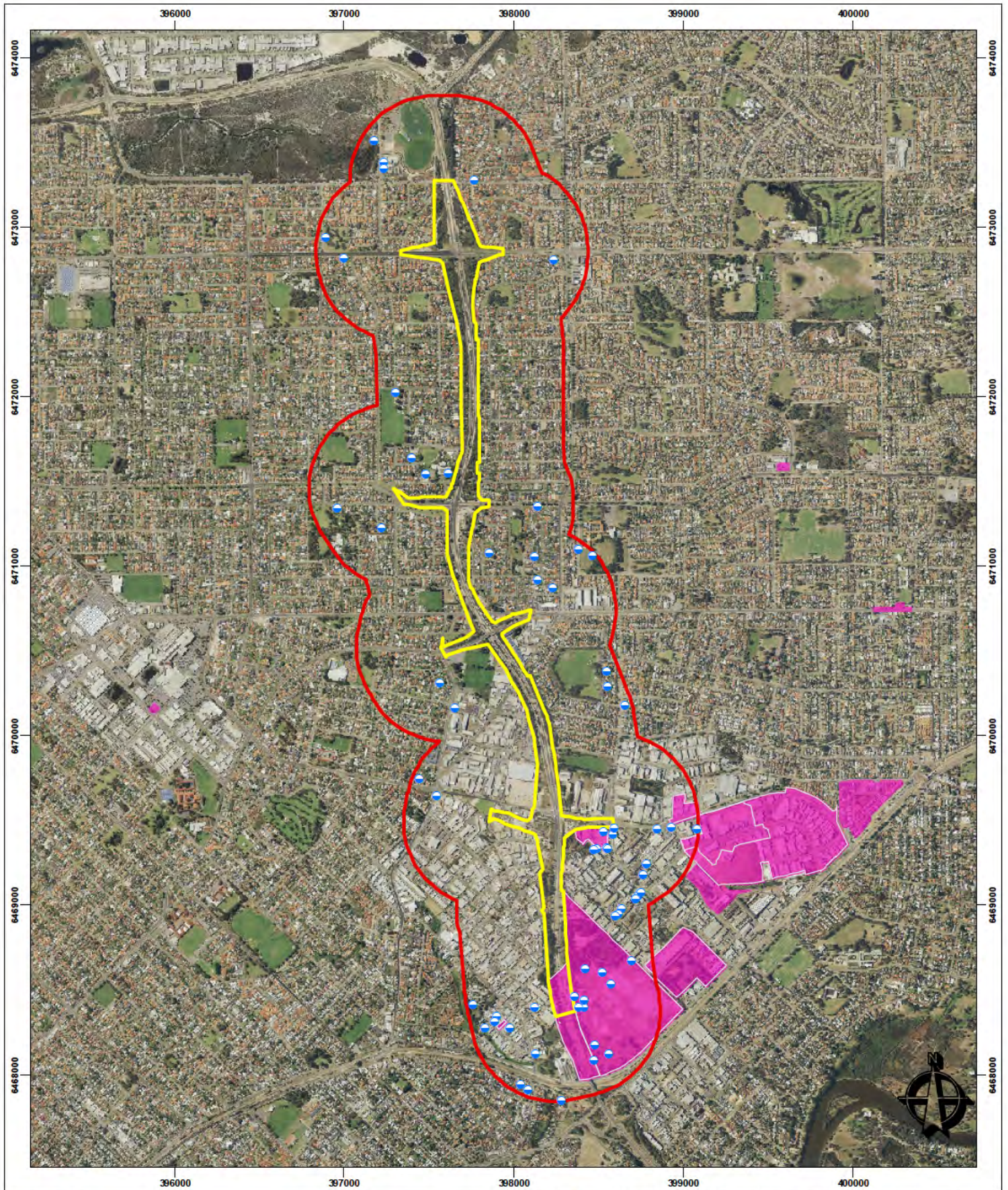
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DATE 11-Apr-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

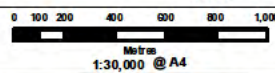
Main Roads Western Australia
 Tonkin Highway
 Contaminated Site Investigation Report

Figure 4 - Regional Groundwater Flow

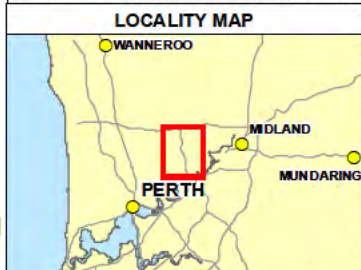


Legend

- Project Area
- Proposed Clearing Footprint (500m boundary)
- Contaminated Sites
- Registered Groundwater Wells



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS



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DRAWING ID	DATE
345_f5_groundwater_bores.mxd	11-Apr-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

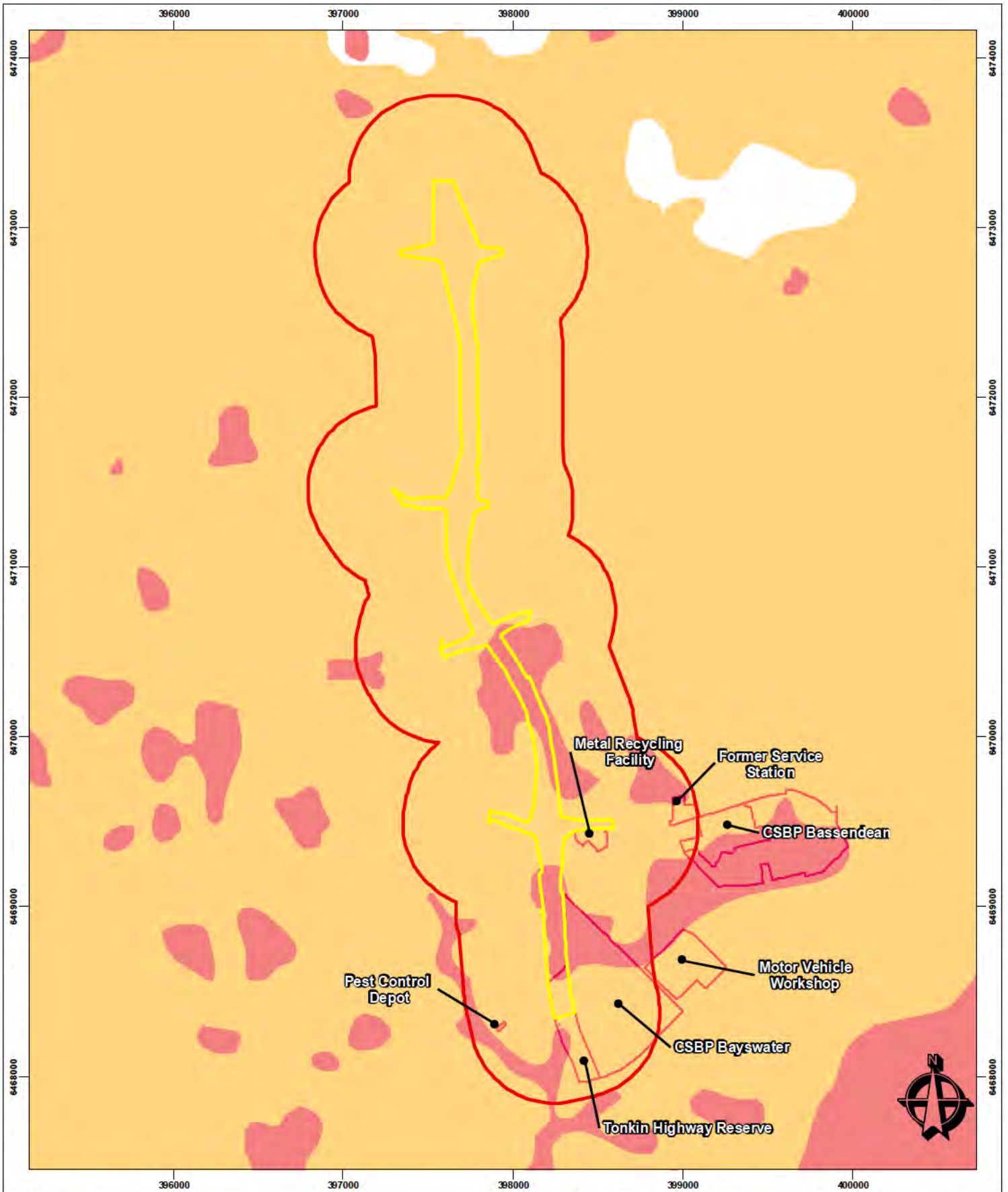
Main Roads Western Australia
 Tonkin Highway
 Contaminated Site Investigation Report

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- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - CONTAMINATED SITES SOURCED DEC 2013
 - GROUNDWATER BORES SOURCED DOW 2010

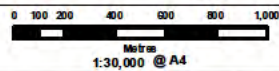
K:\Project\5.0_DWA\Project from 1 July 2013\45 - Tonkin Grade Separation Figures

Figure 5 - Department of Water Bore Records



Legend

- Project Area
 - Proposed Clearing Footprint (500m boundary)
 - Contaminated Sites
- Acid Sulfate Soils Disturbance Risk**
- High to moderate risk
 - Moderate to low risk



NOTE THAT POSITION ERRORS CAN BE +5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID 345_f6_ass.mxd	DATE 11-Apr-2014
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HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Site Investigation Report

Figure 6 - Acid Sulfate Soils Risk Mapping

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LOCALITY MAP SOURCED FROM LANDGATE 2006
 CONTAMINATED SITES SOURCED DEC 2013
 ASS SOURCED DEC 2010

K:\Project\5.0.0\WAI\Project\ from 1 July 2013\345 - Tonkin Grade Separation Figures

APPENDICES

APPENDIX A

DER Contaminated Sites Database Search Results



Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:33:31PM, 29/01/2014

Search Results

This response relates to a search request received for:

335 Collier Rd
Bassendean WA 6054

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	335 Collier Rd Bassendean WA 6054
Lot on Plan Address	Lot 125 On Plan 17160
Parcel Status	<p>Classification: 08/10/2008 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination: Hydrocarbon plume exists under the forecourt and the S-SW portion of the Source Site.</p> <p>Restrictions on Use: Other than for analysis, groundwater abstraction is not permitted at this Source Site because of the nature and extent of groundwater contamination.</p> <p>Reason for Classification: This Site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003'. The Site classification is based on information submitted to DEC by March 2008.</p> <p>This Site has historically been used as a service station, a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Land uses' (Department of Environment, 2004).</p> <p>Several assessments have been carried out since 1995. The assessments found that hydrocarbons (such as from petrol) were present in soils at concentrations exceeding Health-based Investigation Levels for commercial and industrial Sites, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).</p> <p>Hydrocarbons (such as from petrol and diesel) were also present in groundwater at concentrations exceeding Aquatic Ecosystems - Freshwater, as published in 'Assessment</p>

Disclaimer

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:33:31PM, 29/01/2014

Levels for Soil, Sediment and Water' (Department of Environment, 2003) and Dutch Intervention Guidelines 2000.

Free-phase hydrocarbons were detected on the surface of the groundwater.

As a plume of hydrocarbons have been detected off-Site, further groundwater investigations are required to delineate the lateral and vertical extent of the groundwater impact at the Site and off-Site, and the Site is considered a 'Source Site' under the Act.

A suitable Risk Assessment has not been carried out to determine the potential risk posed by the substances of concern at the Source Site to human health, the environment or any environmental value. As a Risk Assessment has not been carried out, DEC cannot comment on the suitability of the Source Site for any use.

DEC understands that remediation using air sparging is still in progress. A validation report has yet to be submitted to DEC.

As remedial works are in progress but not yet completed, the Source Site is classified as 'Contaminated-remediation required.'

As the former service station is a Source Site, future reports on investigation, assessment, monitoring or remediation of the Site which are submitted to DEC will need to be accompanied by a Mandatory Auditor's Report, in accordance with regulation 31(1)(b) of the Contaminated Sites Regulations 2006.

When further investigation or monitoring results for the Source Site are submitted to DEC, these will be reviewed and the Source Site may be reclassified.

Other than for analysis, groundwater abstraction is not permitted at this Source Site because of the nature and extent of groundwater contamination.

DEC, in consultation with Department of Health, has classified this Source Site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the Source Site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

Under the Contaminated Sites Act 2003, this Site has been classified as "Contaminated - remediation required". An instrument affecting land which comprises all or part of this Site will not be registered or accepted for registration, unless the CEO of the Department of Environment & Conservation consents to the registration in writing. For further information on the contamination status of this Site, or this restriction please contact the Contaminated Sites section of the Department of Environment & Conservation.

Certificate of Title
Memorial

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Department of **Environment Regulation**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:33:31PM, 29/01/2014

Current Regulatory
Notice Issued

Type of Regulatory Notice: Nil

Date Issued: Nil

General

No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:32:53PM, 29/01/2014

Search Results

This response relates to a search request received for:

329 Collier Rd
 Bassendean WA 6054

This parcel belongs to a site that contains 2 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	329 Collier Rd Bassendean WA 6054
Lot on Plan Address	Lot 124 On Plan 17160
Parcel Status	<p>Classification: 08/10/2008 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Hydrocarbon plume exists under 335 Collier Rd (the Source Site). It appears the plume has moved in a SW direction and has spread onto the neighbouring property (329 Collier Rd) as well as Collier Road and its associated road reserves.</p> <p>Restrictions on Use:</p> <p>Other than for analysis, groundwater abstraction is not permitted at this Affected Site because of the nature and extent of groundwater contamination.</p> <p>Reason for Classification:</p> <p>This Site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003'. The Site classification is based on information submitted to DEC by March 2005.</p> <p>This Site (the Affected Site) is affected by contamination which has migrated from 335 Collier Rd, Bassendean (the Source Site), which was formerly used as a service station.</p> <p>The Source Site has historically been used as a service station, a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Land uses' (Department of Environment, 2004).</p> <p>A number of contamination assessments were conducted on the Source Site since 1995. The assessments found that hydrocarbons (such as from petrol and diesel) were also</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:32:53PM, 29/01/2014

present in groundwater, under the Source Site and under the Affected Site, at concentrations exceeding Aquatic Ecosystems - Freshwater, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003) and Dutch Intervention Guidelines 2000.

Free-phase hydrocarbons were detected on the surface of the groundwater under the Source Site.

As a plume of hydrocarbons have been detected extending beneath the Affected Site, further groundwater investigations are required to delineate the full lateral and vertical extent of the groundwater impact.

DEC understands that remediation using Air Sparging is still in progress on the Source Site, however a validation report has yet to be submitted to DEC.

As the Affected Site has been shown to be contaminated, and remediation is required to reduce unacceptable risks to human health, the environment or any environmental value to acceptable levels, the Affected Site is classified as 'Contaminated - remediation required'.

When further information regarding the contamination status of the Affected Site is submitted to DEC, it will be reviewed and the Affected Site may be reclassified.

Other than for analysis, groundwater abstraction is not permitted at this Affected Site because of the nature and extent of groundwater contamination.

DEC, in consultation with Department of Health, has classified this Affected Site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the Affected Site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

Under the Contaminated Sites Act 2003, this Site has been classified as "Contaminated - remediation required". For further information on the contamination status of this Site, please contact the Contaminated Sites section of the Department of Environment & Conservation.

Type of Regulatory Notice: Nil

Date Issued: Nil

Certificate of Title
Memorial

Current Regulatory
Notice Issued

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Department of **Environment Regulation**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

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General

No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:31:51PM, 29/01/2014

Search Results

This response relates to a search request received for:

34 Jackson St
Bayswater WA 6053

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	34 Jackson St Bayswater WA 6053
Lot on Plan Address	Lot 9 On Plan 33567
Parcel Status	<p>Classification: 28/02/2011 - Remediated for restricted use</p> <p>Nature and Extent of Contamination:</p> <p>Heavy metals and polychlorinated biphenyls exist in the soils along the perimeter of the site and in some soils under re-inforced concrete on site.</p> <p>Restrictions on Use:</p> <p>The land use of the site is restricted to commercial/industrial use. The site should not be developed for a more sensitive use such as recreational open space; residential use or childcare centres without further contamination assessment.</p> <p>Groundwater abstracted for use on site should be chemically tested for its suitability for use.</p> <p>Reason for Classification:</p> <p>This site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003'. The site classification is based on information submitted to DEC by November 2010.</p> <p>The site is a Source Site and has historically impacted the compensating basin to the south of the site with heavy metals.</p> <p>The site was originally reported because it was historically used as a metals recycling facility from around 1983 to 2004, a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004).</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:31:51PM, 29/01/2014

In December 2004 a fire occurred within the scrap metal stockpiles located on the northern portion of the site. A number of soil and groundwater investigations and stages of remedial works have since been undertaken to clean the site up for continued use as industrial premises.

This site is currently used as an industrial recycling facility, mainly for crushing and screening of construction and demolition materials for reuse as road base aggregate, a land use that also has the potential to cause contamination or include potentially contaminating activities.

Environmental investigations carried out between May 2005 and September 2006 found that heavy metals, hydrocarbons, pesticides and polychlorinated biphenyls (PCBs) were present in soils beneath the fire footprint area at concentrations exceeding Ecological Investigation Levels (EIL) and/or Health-based Investigation Levels for commercial and industrial sites (HIL-F), as published in 'Assessment Levels for Soil, Sediment and Water' (DEC 2010). Subsequent investigations on the southern portion of the site in 2007 returned similar results.

Two stages of remedial works have been undertaken, the first on the fire footprint area and more recently on the southern part of the site. Both periods of remediation consisted of the excavation and removal of impacted soils to the appropriate landfill facilities.

Excavations under the fire footprint area were commissioned to a depth of 0.3m with deeper excavations at known hydrocarbon impacted areas. It is reported however that the excavations extended to the natural soils across the whole remediation area. This cannot be adequately substantiated by information currently held on DEC records.

The excavations in the southern portion of the site were in an area south of the building but did not extend to the stockpile area on the southern fence line.

DEC is aware that imported fill (derived from crushed construction and demolition waste) was used to backfill the remediation excavations and layers of fill were identified in the soils prior to the fire occurring. Construction and demolition waste has a high potential to contain asbestos containing materials (ACM) and organo-chlorine pesticides. DEC is aware that insufficient samples were collected to validate the imported fill that was used to backfill the remediation excavations and the status of the original fill material remains unknown.

Some areas of impacted soil identified during the investigations remain at the site, these include a portion to the north-east and an area of the southern fire footprint which could not be excavated due to the presence of re-inforced concrete, the fence line to the west and north of the site and an area normally covered by stockpiles on the southern boundary.

Groundwater investigations undertaken in August 2006 and October 2007, found that hydrocarbons (such as from petrol/diesel/oil) and heavy metals were present in

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:31:51PM, 29/01/2014

Certificate of Title Memorial
Current Regulatory Notice Issued
General

groundwater at concentrations exceeding Freshwater Guidelines and Domestic Non-Potable Groundwater Use Guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (DEC 2010).

No groundwater investigations have been carried out at the site since 2007 and the current quality of groundwater is unknown.

Based on the available information, and consistent with historical advice from DEC, the site appears suitable for commercial/industrial land use, but may not be suitable for more sensitive land uses (e.g. residential housing, day care centres).

As minor amounts of impacted soil remains in isolated areas of the site but the majority of the site has been remediated such that it is suitable for the current commercial landuse, but may not be suitable for a more sensitive landuse, the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification has been placed on the Certificate of Title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

DEC, in consultation with the Department of Health, has classified this site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being or is proposed to be abstracted, DEC recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use.

Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment & Conservation.

Type of Regulatory Notice: Nil

Date Issued: Nil

No other information relating to this parcel.

Disclaimer

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:30:44PM, 29/01/2014

Search Results

This response relates to a search request received for:

20 Bassendean Rd
Bayswater WA 6053

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	20 Bassendean Rd Bayswater WA 6053
Lot on Plan Address	Lot 337 On Plan 3404
Parcel Status	<p>Classification: 07/01/2014 - Remediated for restricted use</p> <p>Nature and Extent of Contamination:</p> <p>Soils beneath the site are impacted by pesticides. The impacted soils are contained beneath bitumen and concrete hardcover.</p> <p>Restrictions on Use:</p> <p>The land use of the site is restricted to commercial/industrial use; which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as recreational open space; residential use or childcare centres without further contamination assessment and/or remediation.</p> <p>Excavation or disturbance of soils beneath the site is restricted until further chemical testing and an assessment of the risk to site users is undertaken. A site-specific health and safety plan should be developed and implemented to address the risks to the health of any workers undertaking intrusive works.</p> <p>Reason for Classification:</p> <p>This site was reported to the Department of Environment Regulation (DER) prior to the commencement of the 'Contaminated Sites Act 2003' (the Act). The site classification is based on information submitted to DER by December 2013.</p> <p>The site has been used as a Pest Control Depot since the 1980s. Pest Control Depots are listed as a land use that has the potential to cause contamination, as specified in the</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:30:44PM, 29/01/2014

guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004).

The site was initially investigated in 1996 as part of a preliminary sampling program initiated by the former Water and Rivers Commission (WRC), targeting pest control operators in the Perth metropolitan area. The assessment found that pesticides were present in groundwater beneath the site, as well as beneath other properties off-site to the south, at concentrations exceeding Australian Drinking Water and Freshwater Aquatic Ecosystems guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation (DEC), 2010).

No soil investigations were carried out during the 1996 WRC investigations. DER understands that the City of Bayswater identified surface soil contamination at the site in 1989, and required the removal of the top 150 mm of soil. At the time of classification, no soil investigation results have been reported to DER. However, the site has since been paved, and any remaining impacted soils are therefore contained beneath the bitumen and concrete, limiting exposure to the impacted soils.

Groundwater investigations at the site, and on affected land to the south, were carried out in May 2013. The investigations found no potential contaminants remaining in groundwater beneath the site and off-site to the south above Domestic Non-potable Groundwater Use Guidelines, as published in 'Assessment Levels for Soil, Sediment and Water' (DEC, 2010). These are relevant criteria given the local beneficial use of groundwater for garden irrigation and other non-potable uses. The groundwater monitoring event has demonstrated that groundwater beneath the site is free from pesticide contamination as a result of natural attenuation.

The investigations and risk assessment works were the subject of an independent review by an accredited contaminated sites auditor who provided a Mandatory Auditor's Report (MAR) dated December 2013. The MAR recommended that the site is suitable for continued commercial/industrial land use. DER accepts the findings of the MAR.

Based on the information provided, the site appears suitable for continued commercial/industrial use, but may not be suitable for more sensitive land uses (such as but not limited to residential housing or child care centres).

As the site is contaminated and has been remediated such that it is suitable for the current commercial/industrial land use, but may not be suitable for a more sensitive land use, the site is classified as 'remediated for restricted use'.

DER notes that the site continues to be used as a [pest control depot, which is a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004). For this reason, DER recommends that further assessment of potential contamination should be undertaken before any change in land use to a more sensitive land use (such as

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:30:44PM, 29/01/2014

Certificate of Title Memorial
Current Regulatory Notice Issued
General

residential, primary school or childcare centre) in the future.

DER, in consultation with Department of Health, has classified this site based on the information available to DER at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DER, and as such, the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, DER recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use.

Action Required:

Further assessment of potential contamination should be undertaken before any change in land use to a more sensitive land use (such as residential, primary school or childcare centre).

Due to the presence of pesticides in soil, a site-specific health and safety plan should be developed and implemented to address the risks to the health of any workers undertaking intrusive works.

Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment Regulation.

Type of Regulatory Notice: Nil

Date Issued: Nil

An appeal against the site classification was lodged on 18/07/2011. Please refer to Contaminated Sites Committee for further information on appeals.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:31:15PM, 29/01/2014

Search Results

This response relates to a search request received for:

11 Jackson St
Bassendean WA 6054

This parcel belongs to a site that contains 3 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	11 Jackson St Bassendean WA 6054
Lot on Plan Address	Lot 11 On Diagram 75400
Parcel Status	<p>Classification: 13/09/2012 - Remediated for restricted use</p> <p>Nature and Extent of Contamination:</p> <p>Hydrocarbons (such as from diesel/oil) are present in soil in the vicinity of the water table (approximately 4m below surface) near the boundary between Lot 11 and Lot 200.</p> <p>Hydrocarbons are present in groundwater as a plume extending in a south westerly direction near the boundary of Lot 11 with Lots 200 and 201.</p> <p>Restrictions on Use:</p> <p>The land use of the site is restricted to commercial/industrial use and should not be developed for a more sensitive use such as residential.</p> <p>Other than for analytical testing or remediation groundwater abstraction is not permitted at this site.</p> <p>Reason for Classification:</p> <p>This site was originally reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003', and was reported again as per reporting obligations under section 11 of the Act on 28 May 2007. The site classification was based on information submitted to DEC by September 2009. These reasons for Classification have been updated to reflect additional technical information submitted to DEC by June 2012.</p> <p>Prior to 2000, Lot 11 and former Lot 12 Jackson Street, Bassendean formed part of an</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:31:15PM, 29/01/2014

industrial premises, owned by the same company. Activities at the two lots included fuel and waste oil storage and motor vehicle workshops, land uses that have the potential to cause contamination, as specified in the guideline, 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004).

During 2000, Lot 12 was subdivided to form Lot 200 (178) and Lot 201 (182) Railway Parade, Bassendean. Lot 11 was sold by the original company on 23 March 2000, and Lot 200 was sold on 21 March 2002. As at March 2010, Lot 201 was still owned by the original company.

A contamination assessment was initially carried out at Lot 11 Jackson Street, Bassendean in December 1998 to establish whether residual hydrocarbon impact remained in soil where two underground storage tanks (UST's) were previously located.

The soil investigation conducted in December 1998 identified hydrocarbons (such as from petrol/diesel/oil) in soils at concentrations exceeding Ecological Investigation Levels (EILs) and, in the absence of specification analysis, possibly Health-based Investigation Levels for commercial/industrial sites (HIL-F), as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). This hydrocarbon impact was present at four metres below ground level (bgl), in the vicinity of the water table, suggesting that groundwater contamination was likely to be present. Concentrations of hydrocarbons from at least six soil samples collected at groundwater level indicated the presence of hydrocarbons (such as petrol or diesel) in soils at Lot 11 Jackson Street, Bassendean.

Remedial activities were undertaken at Lot 11 Jackson Street, Bassendean in February and March 1999. This comprised the excavation of approximately 1000m³ of impacted soil. While conducting these excavations, two waste oil UST's were uncovered and removed. Excavated soil was bioremediated (landfarmed) on site, to levels acceptable for commercial-industrial land use, and the soil was subsequently re-used on-site.

Validation sampling within the excavation showed that hydrocarbon impacted soil (above EILs and possibly HIL-F) remained in isolated locations along the eastern boundary of Lot 11 (adjacent to Lot 200) at depths between 3.5 and 4.1mbgl. Further excavation was not possible in this area, due to the proximity of buildings on Lot 200.

Groundwater investigations in 1999 identified concentrations of dissolved-phase hydrocarbons at one of four groundwater monitoring wells, exceeding Groundwater Intervention Values (Netherlands Ministry for Housing, Spatial Planning and Environment, 2000).

Further soil remediation activities were undertaken in 2000 near the boundary of Lot 11 Jackson Street and Lot 200 Railway Parade, Bassendean. A sump, located on Lot 200 Railway Parade, was removed along with approximately 50m³ of surrounding soil in February 2000. Validation sampling indicated that hydrocarbon impacted soil remained on site. A further 160m³ of soil was excavated from Lot 200 Railway Parade and Lot 11

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

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Jackson Street, Bassendean in March 2000. Validation sampling from the base and walls of the excavation identified hydrocarbons (such as from petrol/diesel/oil) remained at concentrations exceeding EILs and possibly HIL-F, as published in 'Assessment Levels for Soil Sediment and Water' (Department of Environment, 2003) in the vicinity of the water table. The excavation was backfilled with imported fill from a sand quarry.

Further soil sampling was undertaken in June 2008 on the boundary of Lot 11 Jackson Street and Lot 200 Railway Parade, Bassendean. Five soil bores were located in a south westerly direction (along the boundary between the two lots) and south of the previous investigations around the former sump area. A total of five soil samples were collected and submitted for laboratory analysis. Hydrocarbons (such as from petrol/diesel/oil) were present in soils at concentrations exceeding EILs and possibly HIL-F, as published in 'Assessment Levels for Soil Sediment and Water' (Department of Environment, 2003) in the vicinity of the water table.

Groundwater monitoring has been conducted periodically between 1999 and 2012. The most recent groundwater monitoring results (for June 2008) available to DEC at the time of classification identified the presence of hydrocarbons in groundwater beneath all three lots at concentrations exceeding Groundwater Intervention Values (Netherlands Ministry for Housing, Spatial Planning and Environment, 2000).

The most recent groundwater monitoring event, conducted in April 2012, found that concentrations of naphthalene exceeded Aquatic Ecosystems, Fresh Water guidelines and ethylbenzene exceeded Domestic Non-potable Groundwater Use criteria as published in 'Assessment Levels for Soil, Sediment and Water' (DEC, February 2010). Since the site classification in 2010, concentrations of total recoverable hydrocarbons have increased in some monitoring wells and continue to exceed Groundwater Intervention Values (Netherlands Ministry for Housing, Spatial Planning and Environment, 2000).

The available groundwater monitoring results do not provide evidence that natural attenuation is occurring. Ongoing monitoring of groundwater quality is required, to monitor plume behaviour, and ensure that the hydrocarbon contamination plume does not migrate, undetected, beyond the collective boundaries of Lot 11, 200 and 201.

Based on the information provided, the site appears suitable for continued commercial/industrial use, but may not be suitable for more sensitive land uses such as residential housing.

As the site is contaminated and has been remediated such that it is suitable for commercial/industrial land use, but may not be suitable for a more sensitive land use, the site is classified 'remediated for restricted use'.

In the event that ongoing groundwater monitoring shows that the hydrocarbon plume is likely to migrate beyond the collective boundaries of Lots 11, 200 and 201, further (active) remediation will be required, and the site will be reclassified accordingly.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:31:15PM, 29/01/2014

Certificate of Title Memorial
Current Regulatory Notice Issued
General

DEC, in consultation with the Department of Health, has classified this site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

Under the Contaminated Sites Act 2003, this Site has been classified as "Remediated for restricted use". For further information on the contamination status of this Site, please contact the Contaminated Sites section of the Department of Environment & Conservation.

Type of Regulatory Notice: Nil

Date Issued: Nil

No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:45:37PM, 29/01/2014

Search Results

This response relates to a search request received for:

6 Railway Pde
Bayswater WA 6053

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	6 Railway Pde Bayswater WA 6053
Lot on Plan Address	Lot 100 On Diagram 55519
Parcel Status	<p>Classification: 01/12/2007 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Heavy metal contamination, including arsenic, lead, chromium, and copper, is present within soils in the western and northern areas of the site. Groundwater beneath the site is contaminated with heavy metals including arsenic, lead, chromium, copper and fluoride.</p> <p>Restrictions on Use:</p> <p>Future development restricted to industrial/commercial use.</p> <p>Reason for Classification:</p> <p>The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of "The Contaminated Sites Act 2003". The site classification is based on information submitted to the Department by December 2005.</p> <p>The site forms the main part of land that has historically been used as a fertilizer manufacturing plant, a land use that can cause soil and groundwater contamination. The remainder of the former fertilizer plant site extends to the west and northwest of the site.</p> <p>The site investigation was carried out as part of the decommissioning and redevelopment of the site for commercial and industrial redevelopment. The site has been subjected to extensive soil and groundwater investigations carried out between 2003 and 2005. Investigations have identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Health Investigation Levels (HIL), as set down in draft Department of Environment (DoE) Guideline "Assessment Levels for Soil, Sediments and</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:45:37PM, 29/01/2014

Groundwater" November 2003 and other heavy metal contamination exceeding Ecological Investigation Levels (EIL) as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003. An extensive groundwater investigation carried out between 2003 and 2005 identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Long Term Irrigation Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.

The Bayswater Main Drain located 200m southwest of the site receives groundwater from the north and east and discharges directly to the Swan River estuary. An investigation of outflow from the Bayswater Main Drain identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Marine Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.

The site is being remediated in accordance with a Soil Remediation and Validation Plan (October 2005) although remedial works and validation investigations have not yet been completed. Remediation involves excavation and off-site disposal of contaminated soils, and extraction and treatment of contaminated groundwater.

As previous soil and groundwater investigations have identified and delineated contamination within the site and the site is still subject to remediation the site has been classified as "Contaminated - Remediation Required". A comment cannot be made on the suitability of the site as a whole for the existing or future land use.

DEC has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, DEC recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.

Under the Contaminated Sites Act 2003, this site has been classified as "contaminated - remediation required". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment Regulation.

Type of Regulatory Notice: Nil

Date Issued: Nil

Certificate of Title
Memorial

Current Regulatory
Notice Issued

Disclaimer

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Government of **Western Australia**
Department of **Environment Regulation**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:45:37PM, 29/01/2014

General

No other information relating to this parcel.

Disclaimer

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 11:08:00AM, 04/02/2014

Search Results

This response relates to a search request received for:

80 May Holman Dr
Bassendean WA 6054

This parcel belongs to a site that contains 38 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	80 May Holman Dr Bassendean WA 6054
Lot on Plan Address	Lot 836 On Plan 57538
Parcel Status	<p>Classification: 08/04/2010 - Remediated for restricted use</p> <p>Nature and Extent of Contamination:</p> <p>Following soil remediation there is heavy metal contamination in deeper soils and groundwater.</p> <p>Restrictions on Use:</p> <p>The Site is suitable for commercial and industrial land use only.</p> <p>Reason for Classification:</p> <p>The Site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the Contaminated Sites Act 2003. The Site classification is based on information submitted to the Department by July 2006.</p> <p>The Site was historically used for the manufacture of fertiliser, a land use that has the potential to cause contamination as per the guideline "Potentially Contaminating Activities, Industries and Land Uses" (Department of Environment, October 2004).</p> <p>The Site was subject to a soil and groundwater investigation undertaken to comply with conditions that had been imposed under Ministerial Statement (ref: MINE082) dated October 1989 and thereafter in subsequent revisions of the Ministerial Statement, most recently MINE 701 dated 2005.</p> <p>The Site was subject to staged soil and groundwater investigation and remediation between 2003 and 2005, carried out in accordance with the standards set out in DEC's</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 11:08:00AM, 04/02/2014

"Contaminated Sites Management Series" of guidelines.

The Ministerial Statement required the remediation of contaminated soils within the Site. The approved remediation strategy comprised the excavation of up to 250,000 m³ of pyritic cinders with building rubble. DEC understands that, due to groundwater dewatering restrictions at the site, contaminated soils may remain within both Stage 1 and Stage 2 areas of the Site, at a depth below the groundwater level.

The excavated pyritic cinders with building rubble were retained within a purpose built containment cell, lined and capped with compacted clay and set at levels 2m above seasonal high groundwater levels. The containment cell is located in land to the south of the Site. Soil remediation works were completed in April 2005 and subsequent validation testing of near surface soils demonstrated that the Site was suitable for commercial and industrial uses.

The Ministerial Statement required the investigation and management of groundwater contamination known to be present within the Site. A groundwater monitoring program was conducted between January 2003 and March 2006 from monitoring locations to the north (i.e. up-hydraulic gradient) and south (down hydraulic gradient) of the site and beyond the site boundary.

Groundwater monitoring conducted during and immediately following soil remediation works showed the presence of heavy metal and fluoride contamination. The most recent groundwater monitoring data collected in March 2006 showed the presence of arsenic and heavy metals at levels exceeding Freshwater Ecosystems Criteria as published in guideline "Assessment Levels for Soil, Sediment and Water" (Department of Environment, draft November 2003) but below relevant health assessment levels. The nearest sensitive freshwater receptor is the Swan River located 5km to the south. Based on the proximity of the Site to the Swan River and the contaminant levels present in groundwater, the risk to the environment and environmental values is considered to be low.

As the soils and groundwater within the Site have been successfully remediated to a condition suitable for commercial and industrial land uses but the Site is not suitable for more sensitive land uses such as residential or public open space uses, the Site has been classified as "Remediated for Restricted Use" restricting the land use to commercial and industrial land uses.

DEC, in consultation with the Department of Health, has classified this Site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being, or is proposed to be, abstracted, DEC recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 11:08:00AM, 04/02/2014

Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this Site has been classified as "Remediated for restricted use". For further information on the contamination status of this Site, please contact the Contaminated Sites section of the Department of Environment & Conservation.
Current Regulatory Notice Issued	<p>Type of Regulatory Notice: Nil</p> <p>Date Issued: Nil</p>
General	No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 11:11:28AM, 04/02/2014

Search Results

This response relates to a search request received for:

Lot 835 On Plan 66168
Bassendean WA 6054

This parcel belongs to a site that contains 7 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Lot 835 On Plan 66168 Bassendean WA 6054
Lot on Plan Address	Lot 835 On Plan 66168
Parcel Status	<p>Classification: 08/02/2012 - Remediated for restricted use</p> <p>Nature and Extent of Contamination: Acidity, heavy metals (i.e. arsenic, cadmium, copper, lead, selenium, nickel and zinc), fluoride, chloride and ammonia are present in groundwater beneath the site.</p> <p>Restrictions on Use: Other than for analytical testing or remediation, groundwater abstraction is not permitted at this site because of the nature and extent of groundwater contamination.</p> <p>Land use at the site is restricted to commercial/industrial land use excluding sensitive use such as child care centres and schools.</p> <p>Reason for Classification: The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003' (the Act). The site classification is based on information submitted to DEC by September 2011.</p> <p>This site is part of a larger development area, known as the Tonkin Industrial Estate (the Estate), in the western portion of Lot 9002 identified as Lot K on Deposited Plan 70638. Tonkin Industrial Estate was historically used for the manufacture of fertiliser, a land use that has the potential to cause contamination as per the guideline 'Potentially Contaminating Activities, Industries and Land Uses' (Department of Environment, October 2004).</p> <p>The Estate was subject to soil and groundwater investigations undertaken to comply with</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 11:11:28AM, 04/02/2014

conditions that had been imposed under Part IV of the 'Environmental Protection Act 1986' in Ministerial Statement No. 82 dated October 1989 and in subsequent revisions of the Ministerial Statement, most recently Ministerial Statement No. 701 dated 25 November 2005.

The Ministerial Statements required the investigation, remediation and management of soil contamination (pyritic cinders, process and other demolition wastes) known to have been historically deposited as fill over the entire Estate. Approximately 250,000m³ of contaminated pyritic cinders and demolition wastes were encapsulated within a purpose built containment cell in the eastern portion of Lot 9002. The containment cell is lined and capped with compacted clay and set at an elevation two metres above seasonal high groundwater levels. The containment of waste within the cell was completed in April 2005. In February 2006, a soil validation report was submitted to DEC confirming that contaminated soils were successfully remediated and contained within the cell.

The Ministerial Statements also required the investigation and management of groundwater contamination known to be present within the Estate. Regular monitoring of groundwater has been conducted since January 2003 and ongoing monitoring is required.

The most recent groundwater monitoring data, collected in March 2011, showed the presence of acidity at levels below pH 3.6, heavy metals (i.e. arsenic, aluminium, copper, lead, selenium, and zinc), fluoride, chloride and ammonia contamination at concentrations exceeding the criteria set out in the Department of Health guideline 'Contaminated Sites Reporting Guideline for Chemicals in Groundwater' (Department of Health, 2006) which are the relevant assessment levels for non-potable domestic uses. Contaminated groundwater appears to be migrating off-site to the south and affecting other land parcels. Therefore, this site is considered a source site.

As the site has been remediated such that it is suitable for the proposed commercial landuse, but may not be suitable for a more sensitive landuse, the site is classified as 'remediated for restricted use'.

DEC, in consultation with the Department of Health, has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited.

Action Required

Ongoing monitoring and further groundwater investigations are required to delineate the extent of groundwater contamination to the south of the site.

As the site is part of a source site, future reports on investigation, assessment, monitoring or remediation of the site that are submitted to DEC will need to be accompanied by a Mandatory Auditor's Report, in accordance with regulation 31(1)(b) of the Contaminated

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 11:11:28AM, 04/02/2014

	Sites Regulations 2006.
Certificate of Title Memorial	Under the 'Contaminated Sites Act 2003', the person responsible for the remediation of a source site is also responsible for remediation of any related Affected sites.
Current Regulatory Notice Issued	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment & Conservation.
General	<p>Type of Regulatory Notice: Nil</p> <p>Date Issued: Nil</p> <p>No other information relating to this parcel.</p>

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:28:10PM, 29/01/2014

Search Results

This response relates to a search request received for:

Lot 50 On Plan 9542
 Bayswater WA 6053

This parcel belongs to a site that contains 24 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Lot 50 On Plan 9542 Bayswater WA 6053
Lot on Plan Address	Lot 50 On Plan 9542
Parcel Status	<p>Classification: 01/12/2006 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc contamination is present with soils within the area along the Tonkin Highway reserve from the intersection the Railway Parade to Bassendean Road located approximately 600m to the north.</p> <p>Restrictions on Use:</p> <p>Industrial / Commercial Landuse - Highway Reserve only, no pedestrian access.</p> <p>Reason for Classification:</p> <p>The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of "The Contaminated Sites Act 2003". The site classification is based on information submitted to the Department by March 2006.</p> <p>The land forms the western part of land that has historically been used for the manufacture of fertiliser, a land use that can cause contamination. The remainder of the former fertilizer plant site extends to the east and north of the site.</p> <p>A site investigation was carried out as part of a proposal to remediate the Tonkin Highway Reserve and was commenced in March 2004. The investigation identified the presence of widespread heavy metal contamination including arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc exceeding Ecological Investigation Levels (EIL) as set down in draft Department of Environment (DoE) Guideline "Assessment Levels for</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:28:10PM, 29/01/2014

	<p>Soil, Sediments and Groundwater" November 2003 and arsenic exceeding Health Investigation Levels (HIL), as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.</p> <p>An ecological and health risk assessment has been carried out to derive appropriate remediation objectives, although the conclusions from the risk assessment have not been finally agreed with DEC and remediation of the site has not commenced. As the risks posed by the site to future users and the underlying groundwater have not been adequately assessed, a comment cannot be made on the suitability of the site as a whole for the existing or future land use. Further risk assessment works are required to confirm remediation objectives so that remediation of the site can commence. As site investigations have identified and delineated soil contamination within the site but remediation activities have not commenced the site has been classified as "Contaminated - Remediation Required".</p> <p>DEC has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, DEC recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.</p>
Certificate of Title Memorial	<p>Under the Contaminated Sites Act 2003, this site has been classified as "Contaminated - remediation required". For further information on the contamination status of this site, please contact the Contaminated Sites section of the Department of Environment & Conservation.</p>
Current Regulatory Notice Issued	<p>Type of Regulatory Notice: Nil</p> <p>Date Issued: Nil</p>
General	<p>No other information relating to this parcel.</p>

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Contaminated Sites Act 2003 Basic Summary of Records Search Response

Report Generated at: 2:29:53PM, 29/01/2014

Search Results

This response relates to a search request received for:

10 Railway Pde
Bayswater WA 6053

This parcel belongs to a site that contains 2 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	10 Railway Pde Bayswater WA 6053
Lot on Plan Address	Lot 10 On Diagram 40330
Parcel Status	<p>Classification: 01/12/2006 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Heavy metal contamination, including arsenic, lead, chromium, and copper, is present within soils in the western and northern areas of the site. Groundwater beneath the site is contaminated with heavy metals including arsenic, lead, chromium, copper and fluoride.</p> <p>Restrictions on Use:</p> <p>Future development restricted to industrial/commercial use.</p> <p>Reason for Classification:</p> <p>The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of "The Contaminated Sites Act 2003". The site classification is based on information submitted to the Department by December 2005.</p> <p>The site forms the main part of land that has historically been used as a fertilizer manufacturing plant, a land use that can cause soil and groundwater contamination. The remainder of the former fertilizer plant site extends to the west and northwest of the site.</p> <p>The site investigation was carried out as part of the decommissioning and redevelopment of the site for commercial and industrial redevelopment. The site has been subjected to extensive soil and groundwater investigations carried out between 2003 and 2005. Investigations have identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Health Investigation Levels (HIL), as set down in draft Department of Environment (DoE) Guideline "Assessment Levels for Soil, Sediments and</p>

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report Generated at: 2:29:53PM, 29/01/2014

Groundwater" November 2003 and other heavy metal contamination exceeding Ecological Investigation Levels (EIL) as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003. An extensive groundwater investigation carried out between 2003 and 2005 identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Long Term Irrigation Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.

The Bayswater Main Drain located 200m southwest of the site receives groundwater from the north and east and discharges directly to the Swan River estuary. An investigation of outflow from the Bayswater Main Drain identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Marine Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.

The site is being remediated in accordance with a Soil Remediation and Validation Plan (October 2005) although remedial works and validation investigations have not yet been completed. Remediation involves excavation and off-site disposal of contaminated soils, and extraction and treatment of contaminated groundwater.

As previous soil and groundwater investigations have identified and delineated contamination within the site and the site is still subject to remediation the site has been classified as "Contaminated - Remediation Required". A comment cannot be made on the suitability of the site as a whole for the existing or future land use.

DEC has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, DEC recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.

Under the Contaminated Sites Act 2003, this site has been classified as "Contaminated - remediation required". An instrument affecting land which comprises all, or part of, this site will not be registered or accepted for registration, unless the CEO of the Department of Environment & Conservation consents to the registration in writing. For further information on the contamination status of this site, please contact the Contaminated Sites section of the Department of Environment & Conservation.

Type of Regulatory Notice: Nil

Date Issued: Nil

Certificate of Title
Memorial

Current Regulatory
Notice Issued

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 2:29:53PM, 29/01/2014

General

No other information relating to this parcel.

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APPENDIX B

DER Contaminated Sites Database Detailed Summary of Records



Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:54:10PM, 17/02/2014

Receipt No: DER26874

Search Results

This response relates to a search request received for:

10 Railway Pde
Bayswater, WA, 6053

This parcel belongs to a site that contains 2 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	10 Railway Pde Bayswater, WA, 6053
Lot on Plan Address	Lot 10 On Diagram 40330
Parcel Status	<p>Classification: 01/12/2006 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Heavy metal contamination, including arsenic, lead, chromium, and copper, is present within soils in the western and northern areas of the site. Groundwater beneath the site is contaminated with heavy metals including arsenic, lead, chromium, copper and fluoride.</p> <p>Restrictions on Use:</p> <p>Future development restricted to industrial/commercial use.</p> <p>Reason for Classification:</p> <p>The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of "The Contaminated Sites Act 2003". The site classification is based on information submitted to the Department by December 2005.</p> <p>The site forms the main part of land that has historically been used as a fertilizer manufacturing plant, a land use that can cause soil and groundwater contamination. The remainder of the former fertilizer plant site extends to the west and northwest of the site.</p> <p>The site investigation was carried out as part of the decommissioning and redevelopment of the site for commercial and industrial redevelopment. The site has been subjected to extensive soil and groundwater investigations carried out between 2003 and 2005. Investigations have identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Health Investigation Levels (HIL), as set down in draft Department of Environment (DoE) Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003 and other heavy metal contamination exceeding Ecological Investigation Levels (EIL) as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003. An extensive groundwater investigation carried out between 2003 and 2005 identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Long Term Irrigation Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.</p> <p>The Bayswater Main Drain located 200m southwest of the site receives groundwater from the north and east and discharges directly to the Swan River estuary. An investigation of outflow from the Bayswater Main Drain identified heavy metal contamination including arsenic, lead, chromium, and copper contamination exceeding Marine Water assessment criteria as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.</p> <p>The site is being remediated in accordance with a Soil Remediation and Validation Plan (October 2005) although remedial works and validation investigations have not yet been completed. Remediation involves excavation and off-site disposal of contaminated soils, and extraction and treatment of contaminated groundwater.</p> <p>As previous soil and groundwater investigations have identified and delineated contamination within</p>

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:54:10PM, 17/02/2014

	<p>the site and the site is still subject to remediation the site has been classified as "Contaminated - Remediation Required". A comment cannot be made on the suitability of the site as a whole for the existing or future land use.</p> <p>DEC has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, DEC recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.</p>
Certificate of Title Memorial	<p>Under the Contaminated Sites Act 2003, this site has been classified as "Contaminated - remediation required". An instrument affecting land which comprises all, or part of, this site will not be registered or accepted for registration, unless the CEO of the Department of Environment & Conservation consents to the registration in writing. For further information on the contamination status of this site, please contact the Contaminated Sites section of the Department of Environment & Conservation.</p>
Current Regulatory Notice Issued	<p>Type of Regulatory Notice: <i>Nil</i></p> <p>Date Issued: <i>Nil</i></p>
Certificate of Contamination Audit	<p>Date Issued: <i>Nil</i></p>
Environmental Reports	<ol style="list-style-type: none"> 1. Assessment of Ammonia Removal Technologies for the Former Cresco Site, Bayswater. (PB, February 2005) Report Author: Parsons Brinckerhoff. [Report Date: 01/02/2005, Receival Date: 17/10/2013] 2. Audit Report: Dust - April 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 28 May 2008) Report Author: Parsons Brinckerhoff. [Report Date: 28/05/2008, Receival Date: 17/10/2013] 3. Audit Report: Dust - April 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 02 July 2009) Report Author: Parsons Brinckerhoff. [Report Date: 02/07/2009, Receival Date: 17/10/2013] 4. Audit Report: Dust - August 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 04 November 2008) Report Author: Parsons Brinckerhoff. [Report Date: 04/11/2008, Receival Date: 17/10/2013] 5. Audit Report: Dust - August 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 15 December 2009) Report Author: Parsons Brinckerhoff. [Report Date: 15/12/2009, Receival Date: 17/10/2013] 6. Audit Report: Dust - December 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 19 February 2010) Report Author: Parsons Brinckerhoff. [Report Date: 19/02/2010, Receival Date: 17/10/2013] 7. Audit Report: Dust - February 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 01 April 2008) Report Author: Parsons Brinckerhoff. [Report Date: 01/04/2008, Receival Date: 17/10/2013] 8. Audit Report: Dust - February 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 16 June 2009) Report Author: Parsons Brinckerhoff. [Report Date: 16/06/2009, Receival Date: 17/10/2013] 9. Audit Report: Dust - July 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 10 November 2008)

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:54:10PM, 17/02/2014

Environmental Reports

Report Author: Parsons Brinckerhoff.

[Report Date: 10/11/2008, Receival Date: 17/10/2013]

10. Audit Report: Dust - July 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 21 October 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 21/10/2009, Receival Date: 17/10/2013]

11. Audit Report: Dust - June 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 08 August 2008)

Report Author: Parsons Brinckerhoff.

[Report Date: 08/08/2008, Receival Date: 17/10/2013]

12. Audit Report: Dust - June 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 02 November 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 02/11/2009, Receival Date: 17/10/2013]

13. Audit Report: Dust - March 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 23 April 2008)

Report Author: Parsons Brinckerhoff.

[Report Date: 23/04/2008, Receival Date: 17/10/2013]

14. Audit Report: Dust - March 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 16 June 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 16/06/2009, Receival Date: 17/10/2013]

15. Audit Report: Dust - May 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 22 June 2008)

Report Author: Parsons Brinckerhoff.

[Report Date: 22/06/2008, Receival Date: 17/10/2013]

16. Audit Report: Dust - May 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 02 July 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 02/07/2009, Receival Date: 17/10/2013]

17. Audit Report: Dust - November 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 12 March 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 12/03/2009, Receival Date: 17/10/2013]

18. Audit Report: Dust - November 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 13 January 2010)

Report Author: Parsons Brinckerhoff.

[Report Date: 13/01/2010, Receival Date: 17/10/2013]

19. Audit Report: Dust - October 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 12 March 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 12/03/2009, Receival Date: 17/10/2013]

20. Audit Report: Dust - October 2009 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 13 January 2010)

Report Author: Parsons Brinckerhoff.

[Report Date: 13/01/2010, Receival Date: 17/10/2013]

21. Audit Report: Dust - September 2008 Final Remediation Works for the former Cresco site, Bayswater (Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 12 March 2009)

Report Author: Parsons Brinckerhoff.

[Report Date: 12/03/2009, Receival Date: 17/10/2013]

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

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Environmental Reports

22. Audit Report: Dust - September 2009 Final Remediation Works for the former Cresco site, Bayswater(Assessment No 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 15 December 2009)
Report Author: Parsons Brinckerhoff.
[Report Date: 15/12/2009, Receival Date: 17/10/2013]
23. CSBP Bayswater Groundwater and Surface Water Monitoring Event - February 2013. (PB, 30 July 2013)
Report Author: Parsons Brinckerhoff.
[Report Date: 30/07/2013, Receival Date: 17/10/2013]
24. Monthly Audit Report: Dust December (2006) Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 28 January 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 28/01/2007, Receival Date: 17/10/2013]
25. Proposed Management Plan for the Classification of concrete blocks found within class IV excavations at the CABP Bayswater Site (PB, 14 June 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 14/06/2006, Receival Date: 17/10/2013]
26. Monthly Audit Report: Dust April (2007) Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 30 August 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 30/08/2007, Receival Date: 16/10/2013]
27. Monthly Audit Report: Dust April Final Remediation Works for the former Cresco site, Bayswater (Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 23 October 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 23/10/2006, Receival Date: 16/10/2013]
28. Monthly Audit Report: Dust August Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 29 November 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 29/11/2006, Receival Date: 16/10/2013]
29. Monthly Audit Report: Dust February (2007) Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 28 August 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 28/08/2007, Receival Date: 16/10/2013]
30. Monthly Audit Report: Dust January (2007) Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 24 August 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 24/08/2007, Receival Date: 16/10/2013]
31. Monthly Audit Report: Dust July Final Remediation Works for the former Cresco site, Bayswater (Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 09 November 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 09/11/2006, Receival Date: 16/10/2013]
32. Monthly Audit Report: Dust June Final Remediation Works for the former Cresco site, Bayswater (Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 09 November 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 09/11/2006, Receival Date: 16/10/2013]
33. Monthly Audit Report: Dust March (2007) Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 13 August 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 13/08/2007, Receival Date: 16/10/2013]

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34. Monthly Audit Report: Dust November Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 19 December 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 19/12/2006, Receival Date: 16/10/2013]
35. Monthly Audit Report: Dust October Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 08 January 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 08/01/2006, Receival Date: 16/10/2013]
36. Monthly Audit Report: Dust Report March Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 23 October 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 23/10/2006, Receival Date: 16/10/2013]
37. Monthly Audit Report: Dust September Final Remediation Works for the former Cresco site, Bayswater(Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 24 October 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 24/10/2013, Receival Date: 16/10/2013]
38. Monthly Audit Report: May Final Remediation Works for the former Cresco site, Bayswater (Assessment No. 1477) Conformance to Ministerial Conditions (Parsons Brinckerhoff, 23 October 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 23/10/2006, Receival Date: 16/10/2013]
39. Additional Detailed Site Investigations, Sampling & Analysis Plan, CSBP Bayswater, WA (Parsons Brinckerhoff, 26th Of June 2009)
Report Author: Wesfarmers CSBP Ltd.
[Report Date: 26/06/2009, Receival Date: 04/09/2013]
40. Asbestos In Soils, Site Remediation & Validation Plan (Parsons Brinckerhoff, 19th July 2013)
Report Author: Parsons Brinckerhoff.
[Report Date: 19/07/2013, Receival Date: 04/09/2013]
41. Assessment Of Ammonium Attenuation, Former Cresco Site, Bayswater, WA (Parsons Brinckerhoff, 7th Of November 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 07/11/2011, Receival Date: 04/09/2013]
42. Assessment Of Crushed Concrete From Super Bin 1 Shed For reuse, Former Cresco Site, Bayswater, WA (Parsons Brinckerhoff, 30th of May 2013)
Report Author: Parsons Brinckerhoff.
[Report Date: 30/05/2013, Receival Date: 04/09/2013]
43. Assessment Of Crushed Concrete From Super Bin 1 Shed, Former Cresco Site, Bayswater, WA (Parsons Brinckerhoff, 7th of August 2009)
Report Author: Parsons Brinckerhoff.
[Report Date: 07/08/2007, Receival Date: 04/09/2013]
44. Assessment of Potential Organochlorine And Organophosphorus Pesticide Impacts On Crushed Concrete From Super Bin 1 Shed For Reuse, Former Cresco Site, Bayswater,WA (Parsons Brinckerhoff, 18th Of July 2013)
Report Author: Parsons Brinckerhoff.
[Report Date: 18/07/2013, Receival Date: 04/09/2013]
45. Auditors Comments For Areas, N,M,D and Super Bin 2, Cresco Site, Booklet 1 Of 2 ,Bayswater, WA (Parsons Brinckerhoff, 21st Of May 2010)
Report Author: Parsons Brinckerhoff.
[Report Date: 21/05/2010, Receival Date: 04/09/2013]
46. Auditors Comments For Areas, N,M,D and Super Bin 2, Cresco Site, Booklet 2 Of 2 ,Bayswater, WA (Parsons Brinckerhoff, 21st Of May 2010)
Report Author: Parsons Brinckerhoff.
[Report Date: 21/05/2010, Receival Date: 04/09/2013]

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Environmental Reports

47. CSBP Bayswater - Lower Superficial Aquifer Bores Groundwater Sampling Results March 2012 (Parsons Brinckerhoff, 29th of November 2012)

Report Author: Parsons Brinckerhoff.
[Report Date: 29/11/2012, Receival Date: 04/09/2013]

48. CSBP Bayswater Additional Well Installation, Groundwater & Surface Water Monitoring Event - June 2012 & Down Gradient Groundwater Monitoring September 2012 (Parsons Brinckerhoff, 24th of July 2013)

Report Author: Parsons Brinckerhoff.
[Report Date: 24/07/2013, Receival Date: 04/09/2013]

49. CSBP Bayswater Groundwater & Surface Water Monitoring Event - March 2012 (Parsons Brinckerhoff, 24th of July 2013)

Report Author: Parsons Brinckerhoff.
[Report Date: 24/07/2013, Receival Date: 04/09/2013]

50. CSBP Bayswater Water Quality Review 2003 - 2011, Western Australia (Parsons Brinckerhoff, 13th Of August 2013)

Report Author: Parsons Brinckerhoff.
[Report Date: 13/08/2013, Receival Date: 04/09/2013]

51. Final Detailed Site Investigation, CSBP Booklet 1 of 5, Bayswater, WA, (Parsons Brinckerhoff,6th Of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 06/10/2011, Receival Date: 04/09/2013]

52. Final Detailed Site Investigation, CSBP Booklet 2 of 5, Bayswater, WA, (Parsons Brinckerhoff,6th Of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 06/10/2011, Receival Date: 04/09/2013]

53. Final Detailed Site Investigation, CSBP Booklet 3 of 5, Bayswater, WA, (Parsons Brinckerhoff,6th Of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 06/10/2011, Receival Date: 04/09/2013]

54. Final Detailed Site Investigation, CSBP Booklet 4 of 5, Bayswater, WA, (Parsons Brinckerhoff,6th Of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 06/10/2011, Receival Date: 04/09/2013]

55. Final Detailed Site Investigation, CSBP Booklet 5 of 5, Bayswater, WA, (Parsons Brinckerhoff,6th Of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 06/11/2011, Receival Date: 04/09/2013]

56. Final Validation Report For Remediation Areas, Booklet 1 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 04/10/2011, Receival Date: 04/09/2013]

57. Final Validation Report For Remediation Areas, Booklet 2 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 04/11/2011, Receival Date: 04/09/2013]

58. Final Validation Report For Remediation Areas, Booklet 3 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 04/10/2011, Receival Date: 04/09/2013]

59. Final Validation Report For Remediation Areas, Booklet 4 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 04/10/2011, Receival Date: 04/09/2013]

60. Final Validation Report For Remediation Areas, Booklet 5 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)

Report Author: Parsons Brinckerhoff.
[Report Date: 04/10/2011, Receival Date: 04/09/2013]

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Environmental Reports

61. Final Validation Report For Remediation Areas, Booklet 6 of 6 CSBP Bayswater, WA (Parsons Brinckerhoff, 4th of October 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 04/11/2011, Receival Date: 04/09/2013]
62. Former Cresco Site, Bayswater Soil Remediation And Validation Plan. (Parsons Brinckerhoff, 30th Of March 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 30/03/2007, Receival Date: 04/09/2013]
63. Groundwater Recovery & Lime Dosing System Summary In Support Of ministerial Condition M5 - 2 Version 2, Booklet 1 of 3, (Parsons Brinckerhoff, 25th Of November 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 25/11/2011, Receival Date: 04/09/2013]
64. Groundwater Recovery & Lime Dosing System Summary In Support Of ministerial Condition M5 - 2 Version 2, Booklet 2 of 3, (Parsons Brinckerhoff, 25th Of November 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 25/11/2011, Receival Date: 04/09/2013]
65. Groundwater Recovery & Lime Dosing System Summary In Support Of ministerial Condition M5 - 2 Version 2, Booklet 3 of 3, (Parsons Brinckerhoff, 25th Of November 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 25/11/2011, Receival Date: 04/09/2013]
66. Interim Validation Report For Metals In Remediation Areas - CSBP Bayswater, WA Booklet 1 of 3 (Parson Brinckerhoff, 1st of July 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 01/07/2007, Receival Date: 04/09/2013]
67. Interim Validation Report For Metals In Remediation Areas - CSBP Bayswater, WA Booklet 2 of 3 (Parson Brinckerhoff, 1st of July 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 01/07/2007, Receival Date: 04/09/2013]
68. Interim Validation Report For Metals In Remediation Areas - CSBP Bayswater, WA Booklet 3 of 3 (Parson Brinckerhoff, 1st of July 2007)
Report Author: Parsons Brinckerhoff.
[Report Date: 01/07/2013, Receival Date: 04/09/2013]
69. Preliminary Site Investigation, CSBP Bayswater, WA November 2007 (Parson Brinckerhoff, January 2008)
Report Author: Parsons Brinckerhoff.
[Report Date: 07/01/2008, Receival Date: 04/09/2013]
70. Review Of Asbestos Works, Relating To The Historical Demolition And Removal Of On-Site Infrastructure, CSBP, Cresco Site, Bayswater,WA (Parsons Brinckerhoff, 11th Of March 2011)
Report Author: Parsons Brinckerhoff.
[Report Date: 11/03/2011, Receival Date: 04/09/2013]
71. Wesfarmers CSBP Limited Bayswater Project Soil Contamination Assessment, (Revision 2), Volume 1 of 2, (Wesfarmers CSBP limited, 1st Of October 1999)
Report Author: Wesfarmers CSBP Ltd.
[Report Date: 01/10/1999, Receival Date: 04/09/2013]
72. Wick St Compensating Basin Soil Sampling - Lot 7, Mooney St, Bayswater, Wa (Parsons Brinckerhoff, 3rd Of July 2013)
Report Author: Parsons Brinckerhoff.
[Report Date: 03/07/2013, Receival Date: 04/09/2013]
73. Annual Groundwater Monitoring Review June 2004 - June 2005, Former Cresco Site, Railway Parade Bayswater (Parsons Binckerhoff, January 2006)
Report Author: Parsons Brinckerhoff.
[Report Date: 30/01/2006, Receival Date: 09/09/2011]
74. Bayswater Main Drain Contaminant Flux Investigation, 2003 -2005, (Parsons Brinckerhoff, July 2005)
Report Author: Parsons Brinckerhoff.
[Report Date: 14/07/2005, Receival Date: 09/09/2011]

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<p>Environmental Reports</p>	<p>75. CSBP Ecotoxicity Project, Direct Toxicity Assessment Using Resident Species (Parsons Brinckerhoff, May 2005) Report Author: Parsons Brinckerhoff. [Report Date: 02/05/2005, Receival Date: 09/09/2011]</p> <p>76. Potential Impacts of Bayswater Main Drain on the Swan River - Metal Bioaccumulation in Mussels (Parsons Brinckerhoff, April 2004) Report Author: Parsons Brinckerhoff. [Report Date: 04/05/2005, Receival Date: 09/09/2011]</p> <p>77. Preliminary Site Investigation, Lot 10 Railway Parade, Bayswater (Parsons Brinckerhoff, March 2007) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 27/04/2007, Receival Date: 01/05/2007]</p> <p>78. Validation Sampling, Underground Storage Tank, Former Cresco Site, Bayswater, WA (Parsons Brinckerhoff, May 2005) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 27/04/2005, Receival Date: 01/05/2005]</p> <p>79. Final Remediation Works for the Former Cresco Site, Bayswater, Public Environmental Review (Parsons Brinckerhoff, September 2004) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 01/09/2004, Receival Date: 01/09/2004]</p> <p>80. Final Remediation Works for the Former Cresco Site, Bayswater, Public Environmental Review August 2004 (Parsons Brinckerhoff, August 2004) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 04/08/2004, Receival Date: 05/08/2004]</p> <p>81. Groundwater Interception System - Preliminary Operating Strategy, CSBP Former CRESCO Site (Parsons Brinckerhoff, November 2003) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 09/12/2003, Receival Date: 09/12/2003]</p> <p>82. Final Report: An Investigation of the Water Quality of Domestic Bores in the Vicinity of the Former Cresco Site, Railway Parade, Bayswater (Parsons Brinckerhoff, June 2003) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 19/06/2003, Receival Date: 20/06/2003]</p> <p>83. Interim Report: Off-Site Groundwater Investigation - Former Cresco Site, Railway Parade, Bayswater (Parsons Brinckerhoff, May 2003) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 15/05/2003, Receival Date: 15/05/2003]</p>
<p>Auditor Reports</p>	<p>1. Interim Mandatory Auditor's Report, 2-4 (Lot 10) Railway Parade and Lot 7 Mooney Street, Bayswater WA. (EA, 29 August 2013) Report Author: Charlie Barber. [Report Date: 29/08/2013, Receival Date: 06/09/2013]</p>
<p>General</p>	<p>No other information relating to this parcel.</p>

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:53:48PM, 12/03/2014

Receipt No: DER28874

Search Results

This response relates to a search request received for:

Lot 50 On Plan 9542
Bayswater, WA, 6053

This parcel belongs to a site that contains 24 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Lot 50 On Plan 9542 Bayswater, WA, 6053
Lot on Plan Address	Lot 50 On Plan 9542
Parcel Status	<p>Classification: 01/12/2006 - <i>Contaminated - remediation required</i></p> <p>Nature and Extent of Contamination:</p> <p>Arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc contamination is present with soils within the area along the Tonkin Highway reserve from the intersection the Railway Parade to Bassendean Road located approximately 600m to the north.</p> <p>Restrictions on Use:</p> <p>Industrial / Commercial Landuse - Highway Reserve only, no pedestrian access.</p> <p>Reason for Classification:</p> <p>The site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of "The Contaminated Sites Act 2003". The site classification is based on information submitted to the Department by March 2006.</p> <p>The land forms the western part of land that has historically been used for the manufacture of fertiliser, a land use that can cause contamination. The remainder of the former fertilizer plant site extends to the east and north of the site.</p> <p>A site investigation was carried out as part of a proposal to remediate the Tonkin Highway Reserve and was commenced in March 2004. The investigation identified the presence of widespread heavy metal contamination including arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc exceeding Ecological Investigation Levels (EIL) as set down in draft Department of Environment (DoE) Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003 and arsenic exceeding Health Investigation Levels (HIL), as set down in draft DoE Guideline "Assessment Levels for Soil, Sediments and Groundwater" November 2003.</p> <p>An ecological and health risk assessment has been carried out to derive appropriate remediation objectives, although the conclusions from the risk assessment have not been finally agreed with DEC and remediation of the site has not commenced. As the risks posed by the site to future users and the underlying groundwater have not been adequately assessed, a comment cannot be made on the suitability of the site as a whole for the existing or future land use. Further risk assessment works are required to confirm remediation objectives so that remediation of the site can commence. As site investigations have identified and delineated soil contamination within the site but remediation activities have not commenced the site has been classified as "Contaminated - Remediation Required".</p> <p>DEC has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status may have changed since this time, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, DEC recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.</p>
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "Contaminated - remediation required". For further information on the contamination status of this site, please contact the Contaminated Sites section of the Department of Environment & Conservation.

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

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Current Regulatory Notice Issued	Type of Regulatory Notice: Nil Date Issued: Nil
Certificate of Contamination Audit	Date Issued: Nil
Environmental Reports	<ol style="list-style-type: none">1. Ecological and Human Health Risk Assessment, Tonkin Highway Road Reserve (Railway Parade) Bayswater (Parsons Brinckerhoff, November 2005) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 01/11/2005, Receival Date: 01/12/2006]2. Letter Report: MRWA response to DEC queries regarding Tonkin Highway Road Reserve ecological and health risk assessment (Main Roads, November 2006) Report Author: Main Roads. [Report Date: 06/11/2006, Receival Date: 06/11/2006]3. Stage 1 Cinders Delineation- Tonkin Highway Reserve Bayswater (Parsons Brinckerhoff, March 2004) Report Author: PPK - Parsons Brinckerhoff. [Report Date: 01/03/2004, Receival Date: 01/06/2005]
Auditor Reports	No reports.
General	No other information relating to this parcel.

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:55:16PM, 12/03/2014

Receipt No: DER28874

Search Results

This response relates to a search request received for:

34 Jackson St
Bayswater, WA, 6053

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	34 Jackson St Bayswater, WA, 6053
Lot on Plan Address	Lot 9 On Plan 33567
Parcel Status	<p>Classification: 28/02/2011 - Remediated for restricted use</p> <p>Nature and Extent of Contamination:</p> <p>Heavy metals and polychlorinated biphenyls exist in the soils along the perimeter of the site and in some soils under re-inforced concrete on site.</p> <p>Restrictions on Use:</p> <p>The land use of the site is restricted to commercial/industrial use. The site should not be developed for a more sensitive use such as recreational open space; residential use or childcare centres without further contamination assessment.</p> <p>Groundwater abstracted for use on site should be chemically tested for its suitability for use.</p> <p>Reason for Classification:</p> <p>This site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003'. The site classification is based on information submitted to DEC by November 2010.</p> <p>The site is a Source Site and has historically impacted the compensating basin to the south of the site with heavy metals.</p> <p>The site was originally reported because it was historically used as a metals recycling facility from around 1983 to 2004, a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004).</p> <p>In December 2004 a fire occurred within the scrap metal stockpiles located on the northern portion of the site. A number of soil and groundwater investigations and stages of remedial works have since been undertaken to clean the site up for continued use as industrial premises.</p> <p>This site is currently used as an industrial recycling facility, mainly for crushing and screening of construction and demolition materials for reuse as road base aggregate, a land use that also has the potential to cause contamination or include potentially contaminating activities.</p> <p>Environmental investigations carried out between May 2005 and September 2006 found that heavy metals, hydrocarbons, pesticides and polychlorinated biphenyls (PCBs) were present in soils beneath the fire footprint area at concentrations exceeding Ecological Investigation Levels (EIL) and/or Health-based Investigation Levels for commercial and industrial sites (HIL-F), as published in 'Assessment Levels for Soil, Sediment and Water' (DEC 2010). Subsequent investigations on the southern portion of the site in 2007 returned similar results.</p> <p>Two stages of remedial works have been undertaken, the first on the fire footprint area and more recently on the southern part of the site. Both periods of remediation consisted of the excavation and removal of impacted soils to the appropriate landfill facilities.</p> <p>Excavations under the fire footprint area were commissioned to a depth of 0.3m with deeper excavations at known hydrocarbon impacted areas. It is reported however that the excavations</p>

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:55:16PM, 12/03/2014

extended to the natural soils across the whole remediation area. This cannot be adequately substantiated by information currently held on DEC records.

The excavations in the southern portion of the site were in an area south of the building but did not extend to the stockpile area on the southern fence line.

DEC is aware that imported fill (derived from crushed construction and demolition waste) was used to backfill the remediation excavations and layers of fill were identified in the soils prior to the fire occurring. Construction and demolition waste has a high potential to contain asbestos containing materials (ACM) and organo-chlorine pesticides. DEC is aware that insufficient samples were collected to validate the imported fill that was used to backfill the remediation excavations and the status of the original fill material remains unknown.

Some areas of impacted soil identified during the investigations remain at the site, these include a portion to the north-east and an area of the southern fire footprint which could not be excavated due to the presence of re-inforced concrete, the fence line to the west and north of the site and an area normally covered by stockpiles on the southern boundary.

Groundwater investigations undertaken in August 2006 and October 2007, found that hydrocarbons (such as from petrol/diesel/oil) and heavy metals were present in groundwater at concentrations exceeding Freshwater Guidelines and Domestic Non-Potable Groundwater Use Guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (DEC 2010).

No groundwater investigations have been carried out at the site since 2007 and the current quality of groundwater is unknown.

Based on the available information, and consistent with historical advice from DEC, the site appears suitable for commercial/industrial land use, but may not be suitable for more sensitive land uses (e.g. residential housing, day care centres).

As minor amounts of impacted soil remains in isolated areas of the site but the majority of the site has been remediated such that it is suitable for the current commercial land use, but may not be suitable for a more sensitive land use, the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification has been placed on the Certificate of Title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

DEC, in consultation with the Department of Health, has classified this site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being or is proposed to be abstracted, DEC recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use.

Certificate of Title Memorial

Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment & Conservation.

Current Regulatory Notice Issued

Type of Regulatory Notice: Nil

Date Issued: Nil

Certificate of Contamination Audit

Date Issued: Nil

Environmental Reports

1. Pt Lot 9 (No. 34) Jackson Street Bayswater WA, Environmental Site Assessment and Remediation/Validation (Ace Environmental, November 2010)
Report Author: Ace Environmental Pty Ltd.
[Report Date: 01/11/2010, Receival Date: 08/11/2010]

2. 34 Jackson Street, Bayswater, Western Australia. Environmental Site Assessment and Remediation/Validation (ACE Environmental, August 2008)
Report Author: Ace Environmental Pty Ltd.
[Report Date: 01/08/2008, Receival Date: 28/11/2008]

Disclaimer

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Contaminated Sites Act 2003 Detailed Summary of Records Search Response

Report generated at 01:55:17PM, 12/03/2014

Environmental Reports

3. Towards Environmental Guidelines: A Progress Report (Geo & Hydro, October 1996).
Report Author: Geo & Hydro Environmental Management Pty Ltd.
[Report Date: 01/10/1996, Receival Date: 27/05/2007]
4. Post Remediation Validation Report - Scrap Metal Fire Footprint 34 Jackson Street, Bayswater (ATA, September 2006)
Report Author: ATA Environmental.
[Report Date: 01/09/2006, Receival Date: 20/10/2006]
5. Site Investigation Fire Footprint Area, Scrap Metal Recycling Yard, 34 Jackson Street Bayswater (ATA Environmental, August 2006)
Report Author: ATA Environmental.
[Report Date: 17/08/2006, Receival Date: 28/09/2006]
6. Smorgons Steels Fire, 6 December to 9 December 2004, 34 Jackson Street Bayswater (Smorgon Steel, December 2004)
Report Author: Metalcorp Recyclers Pty Ltd.
[Report Date: 09/12/2004, Receival Date: 01/06/2006]
7. Local Recovery Committee Sampling & Analysis Data Summary Report Former Recycling Yard, 34 Jackson Street, Bayswater WA (ENV, June 2005)
Report Author: ENV Australia.
[Report Date: 23/06/2005, Receival Date: 24/06/2005]
8. Preliminary Ash & Surface Soil Investigation- Smorgon Steel Group Recycled Metal Yard Bayswater WA (ENV, June 2005)
Report Author: ENV Australia.
[Report Date: 01/06/2005, Receival Date: 22/06/2005]
9. Preliminary Groundwater Investigation Smorgon Steel Group Recycled Metal Yard, Bayswater WA (ENV, May 2005)
Report Author: ENV Australia.
[Report Date: 01/05/2005, Receival Date: 01/05/2005]
10. Sediment Investigation of Compensating Basin Post December 2004 Fire, Smorgon Steel Group Recycled Metal Yard, Bayswater, WA (ENV, March 2005)
Report Author: ENV Australia.
[Report Date: 29/03/2005, Receival Date: 30/03/2005]
11. Interim Report Bassendean Scrap Metal Yard Fire (Metalcorp Recyclers, December 2004).
Report Author: Metalcorp Recyclers Pty Ltd.
[Report Date: 16/12/2008, Receival Date: 16/12/2004]
12. End-of-Life Tyre Management: Storage Options, Final Report for the Ministry for the Environment (MWH, July 2004)
Report Author: MWH Australia Pty Ltd .
[Report Date: 01/07/2004, Receival Date: 01/07/2004]
13. Assessment of Water, Sediment and Fish Quality in the Bayswater drains and adjacent Swan River, April/May 2003(DOE, September 2003).
Report Author: Department of Environment & Conservation.
[Report Date: 01/09/2003, Receival Date: 01/09/2003]
14. Final Report, Environmental Review Bassendean WA (Nonferral, November 1999).
Report Author: Nonferral Pty Ltd.
[Report Date: 29/11/1999, Receival Date: 02/04/2002]
15. Proposal Nonferral Metals Recycling Facility Site Contamination Assessment and Management Plan (Bowman Bishaw Gorham, May 1994)
Report Author: Bowman Bishaw Gorham.
[Report Date: 01/05/1994, Receival Date: 01/05/1994]

Auditor Reports

No reports.

General

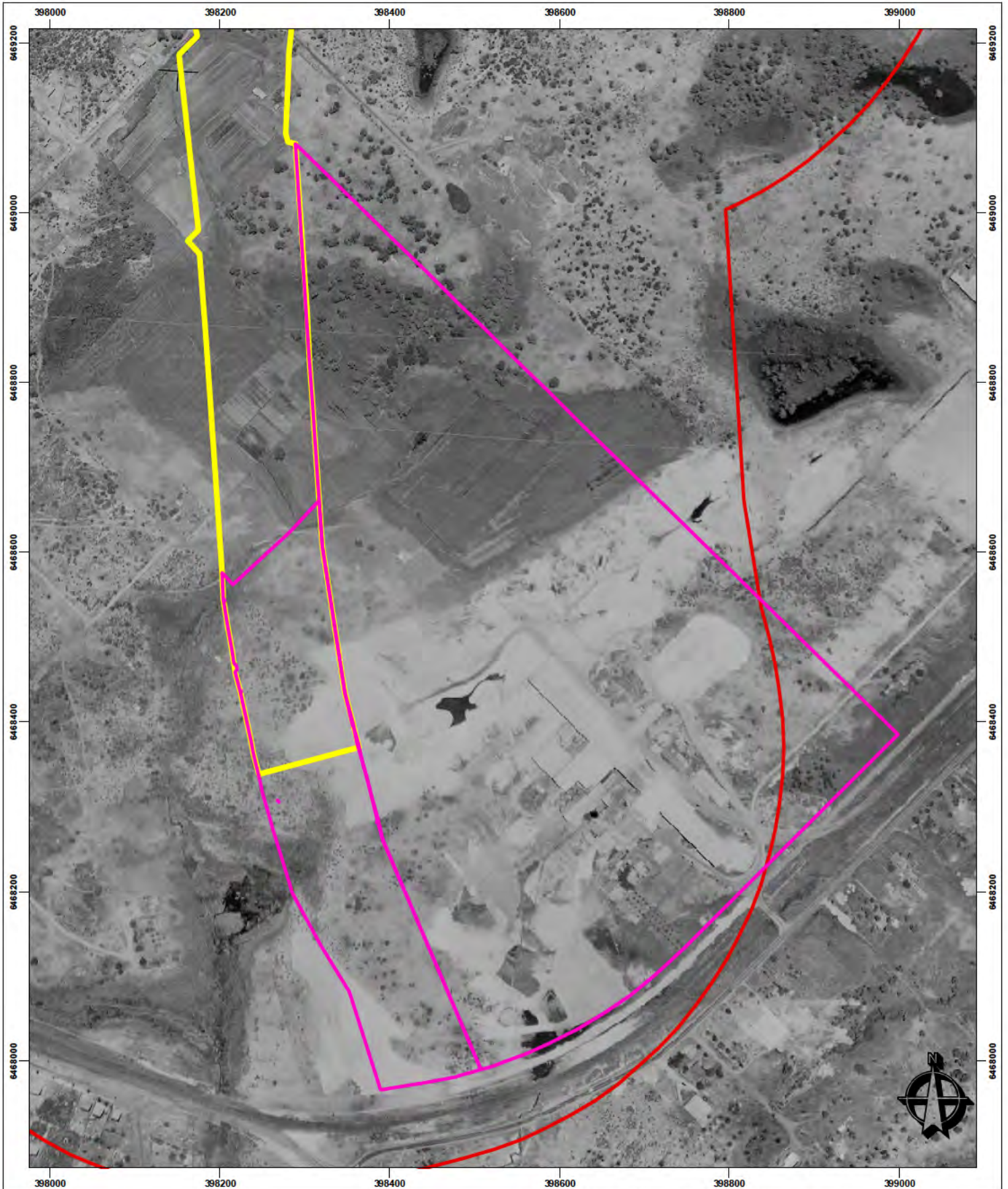
No other information relating to this parcel.

Disclaimer

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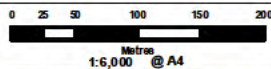
APPENDIX C

Historical Aerial Photographs



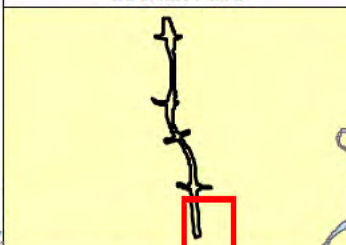
Legend

- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE +5M IN SOME AREAS

LOCALITY MAP



360 Environmental
 a10 Bemoondsey St, West Leederville, 6007 WA
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 www.360environmental.com.au

DRAWING ID	DATE
345_17a_bayswater.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

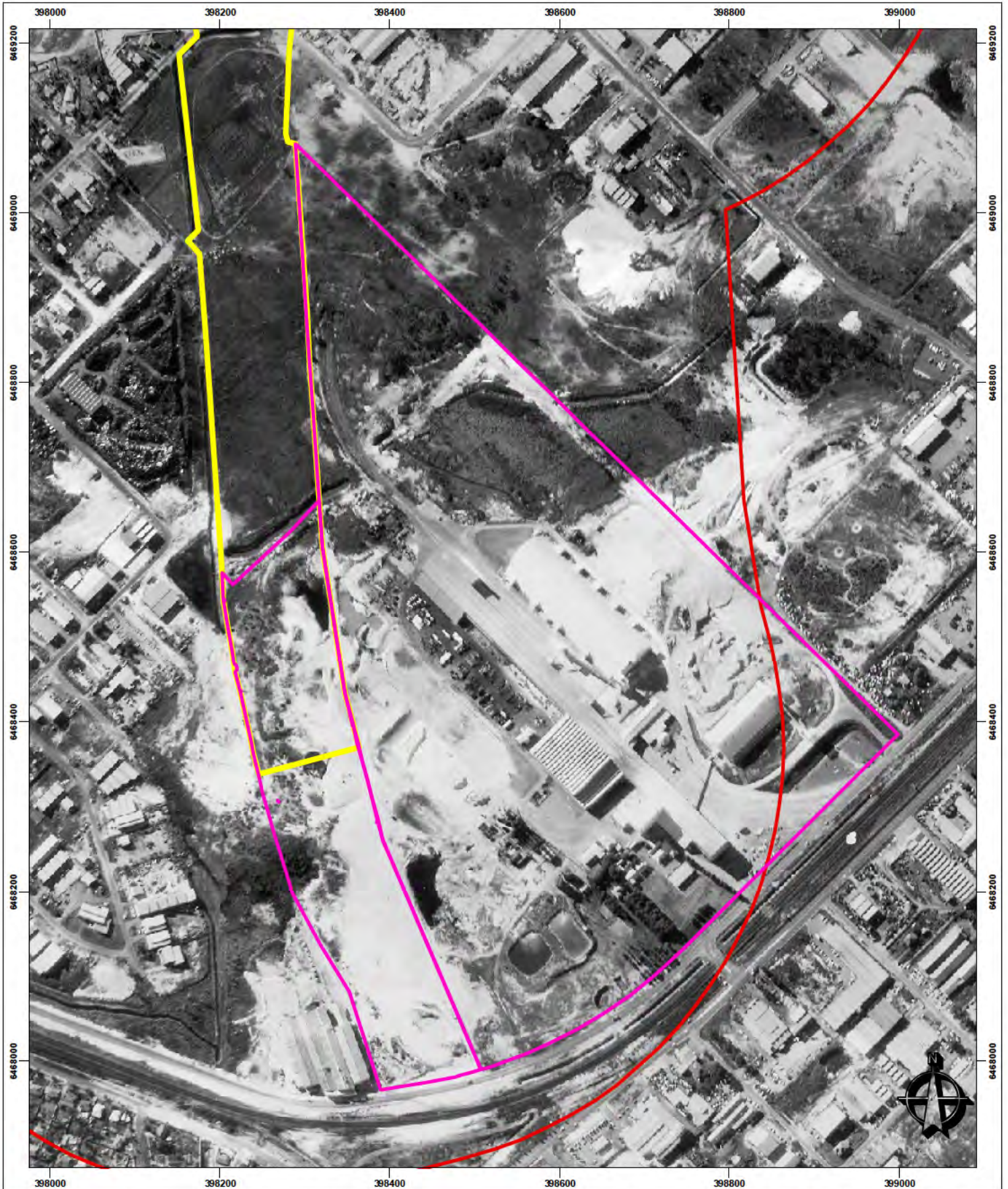
CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway 

Contaminated Sites Investigation
CSBP Bayswater and
Tonkin Highway Road Reserve
Historical Imagery 1953

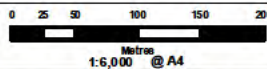
Powered by **SLIP ENABLER**

- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - MAGERY SOURCED LANDGATE SLIP 1563 IN 2014



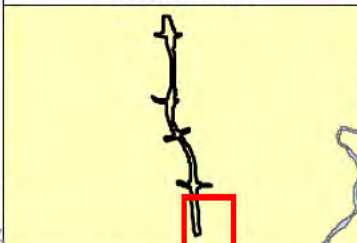
Legend

- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

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DRAWING ID	DATE
345_17a_bayswater.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

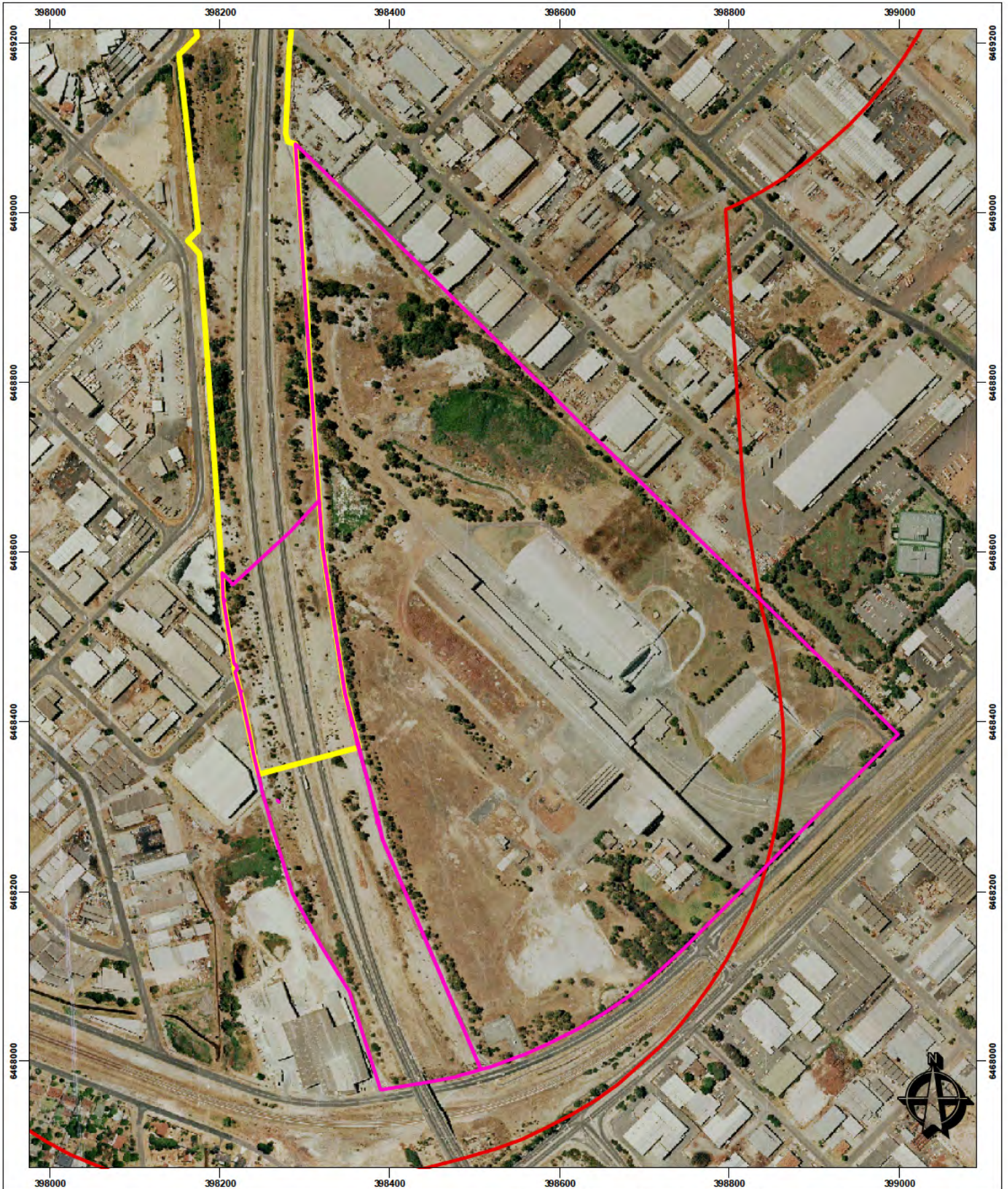
Main Roads Western Australia
Tonkin Highway



Contaminated Sites Investigation
CSBP Bayswater and
Tonkin Highway Road Reserve
Historical Imagery 1974

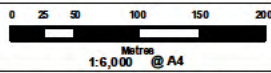
- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - MAGERY SOURCED LANDGATE SLIP 1974 IN 2014

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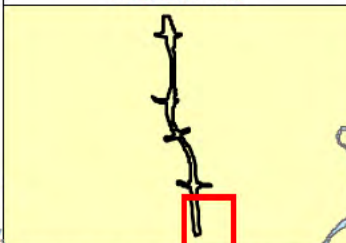
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- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



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LOCALITY MAP



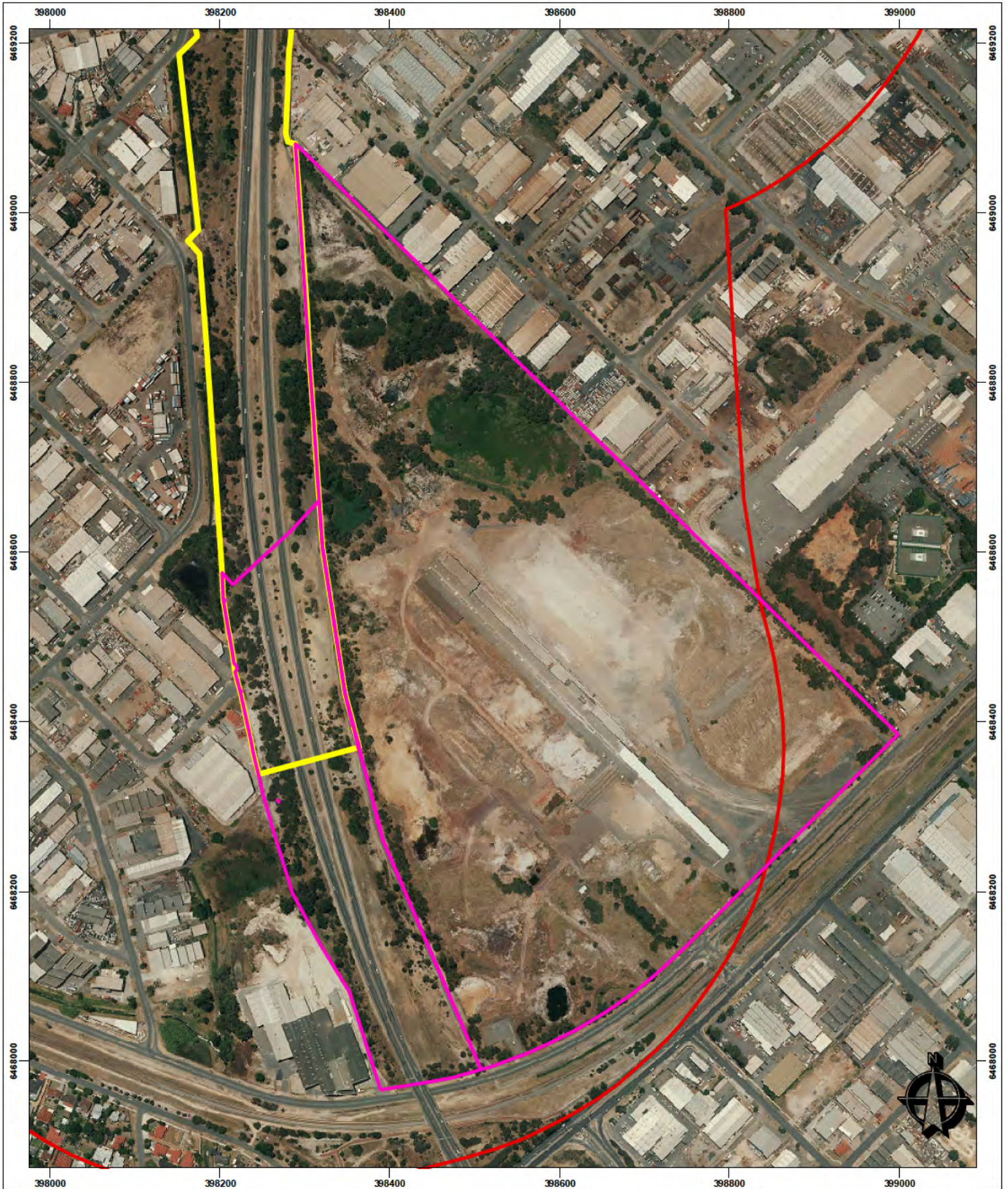
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HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
Contaminated Sites Investigation
 CSBP Bayswater and
 Tonkin Highway Road Reserve
 Historical Imagery 1995

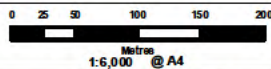
- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1995 IN 2014

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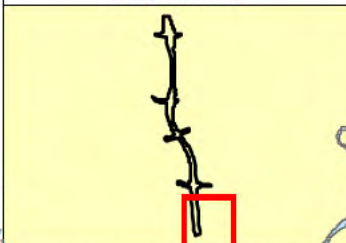
Legend

- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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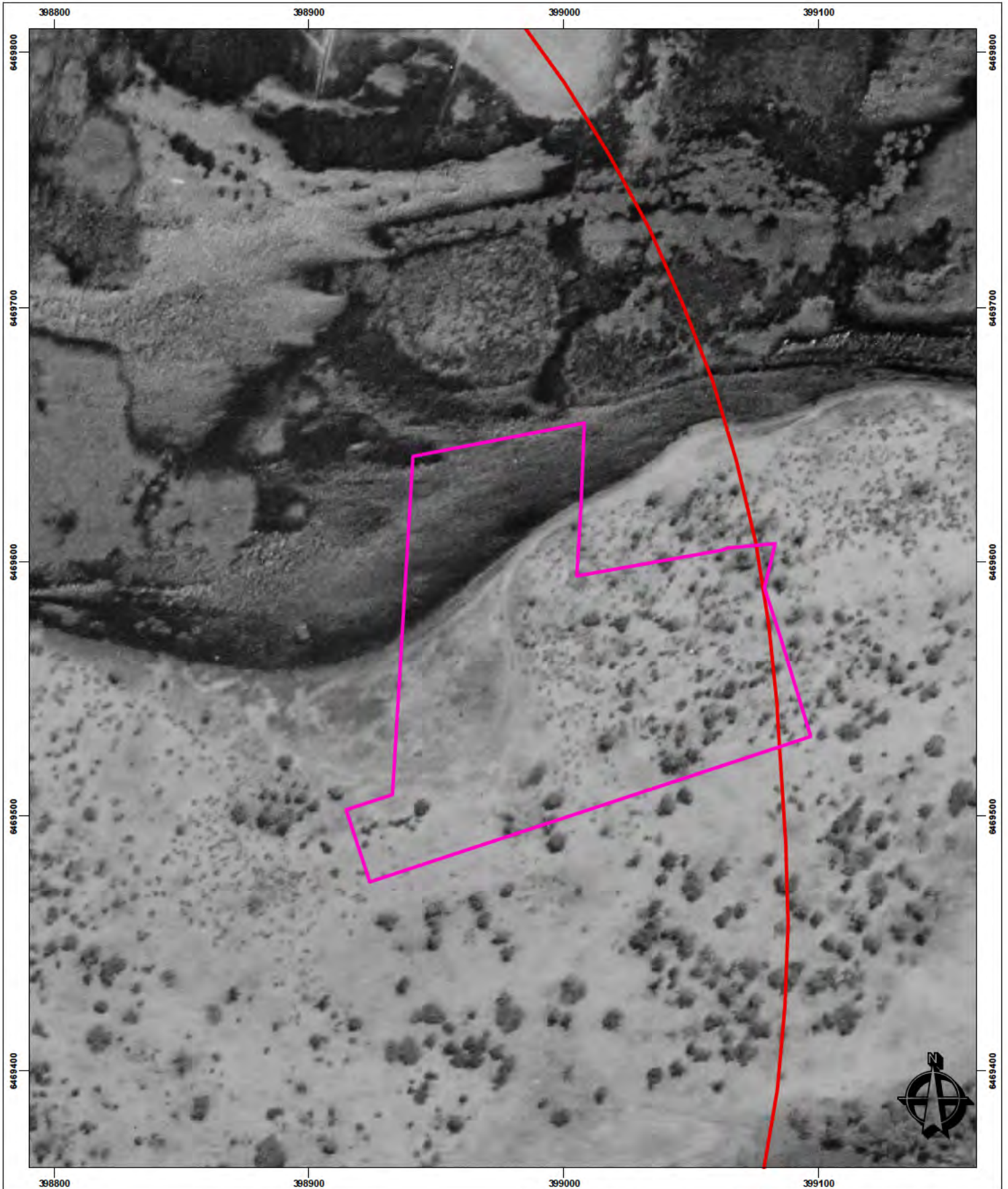
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GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway

Contaminated Sites Investigation
CSBP Bayswater and
Tonkin Highway Road Reserve
Historical Imagery 2008

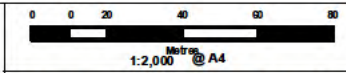
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- LOCALITY MAP SOURCED FROM LANDGATE 2008
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 2008 IN 2014



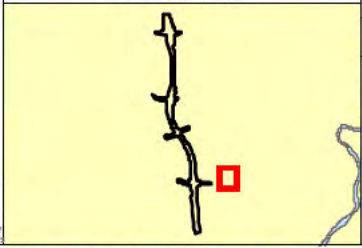
Legend

- Site Location
- Proposed Clearing Footprint (500m boundary)
- Contaminated Sites



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LOCALITY MAP



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DRAWING ID	DATE
345_f4a_service_station.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway

Contaminated Sites Investigation

Former Service Station
Historical Imagery 1953

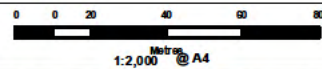
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 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - MAGERY SOURCED LANDGATE SLIP 1953 IN 2014

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 K:\Projects\015.0 SWA\Projects\1811 July 2013\345 - Tonkin Highway - Contaminated Sites Investigation\Figure



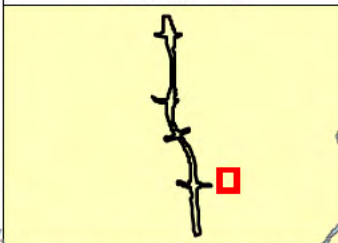
Legend

- Site Location
- Proposed Clearing Footprint (500m boundary)
- Contaminated Sites



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID	DATE
345_f4c_service_station.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway

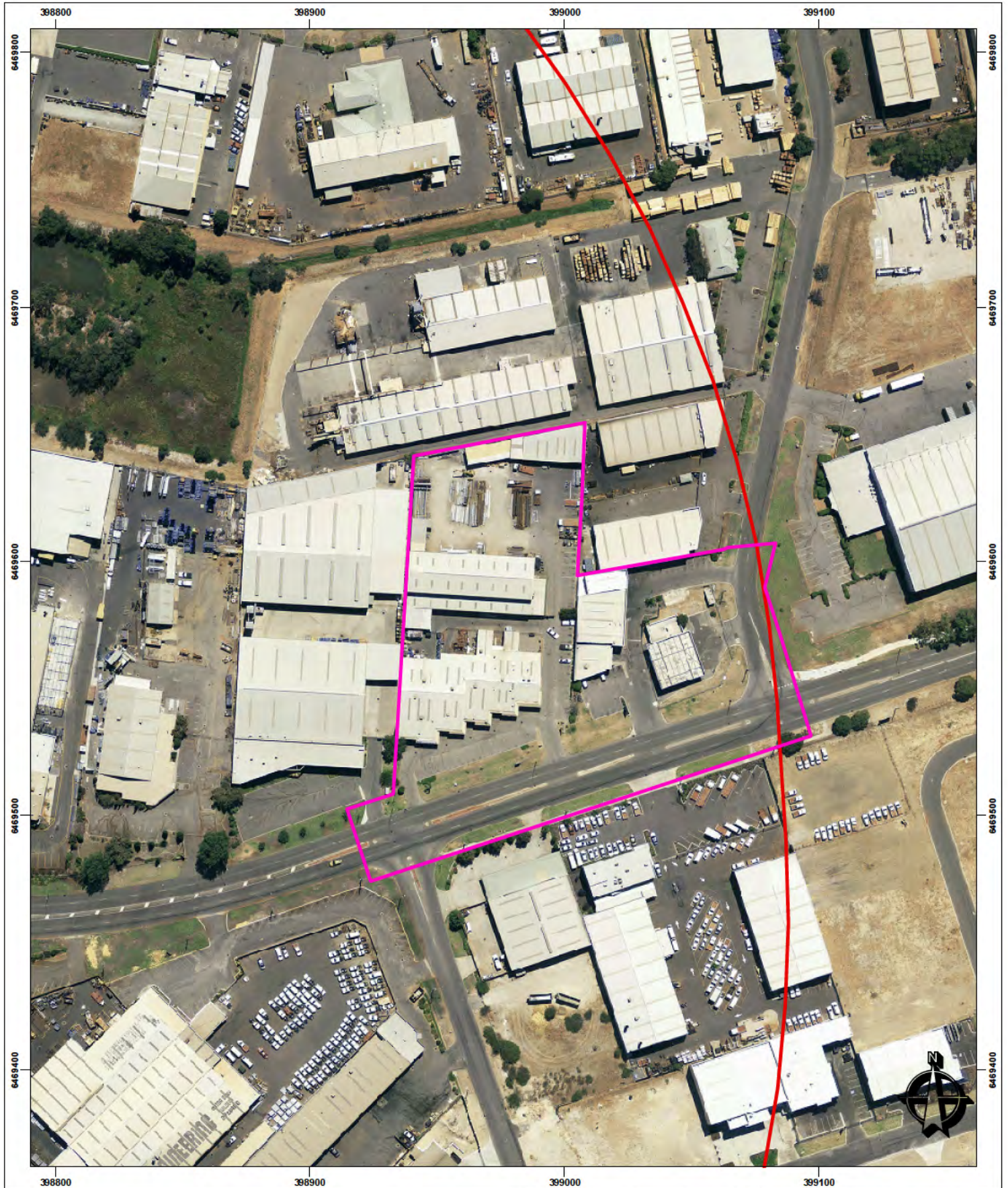
Contaminated Sites Investigation

Former Service Station
Historical Imagery 1995

- LOCALITY MAP SOURCED FROM LANDGATE 2006
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 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1561 IN 2014

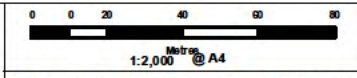
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K:\Projects\015.0 SWA\Projects from 1 July 2013\345 - Tonkin Highway - Contaminated Sites Investigation\Figure



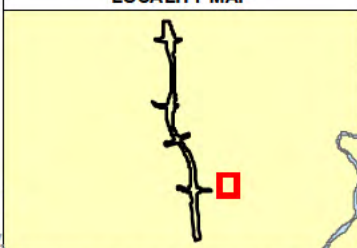
Legend

- Site Location
- Contaminated Sites
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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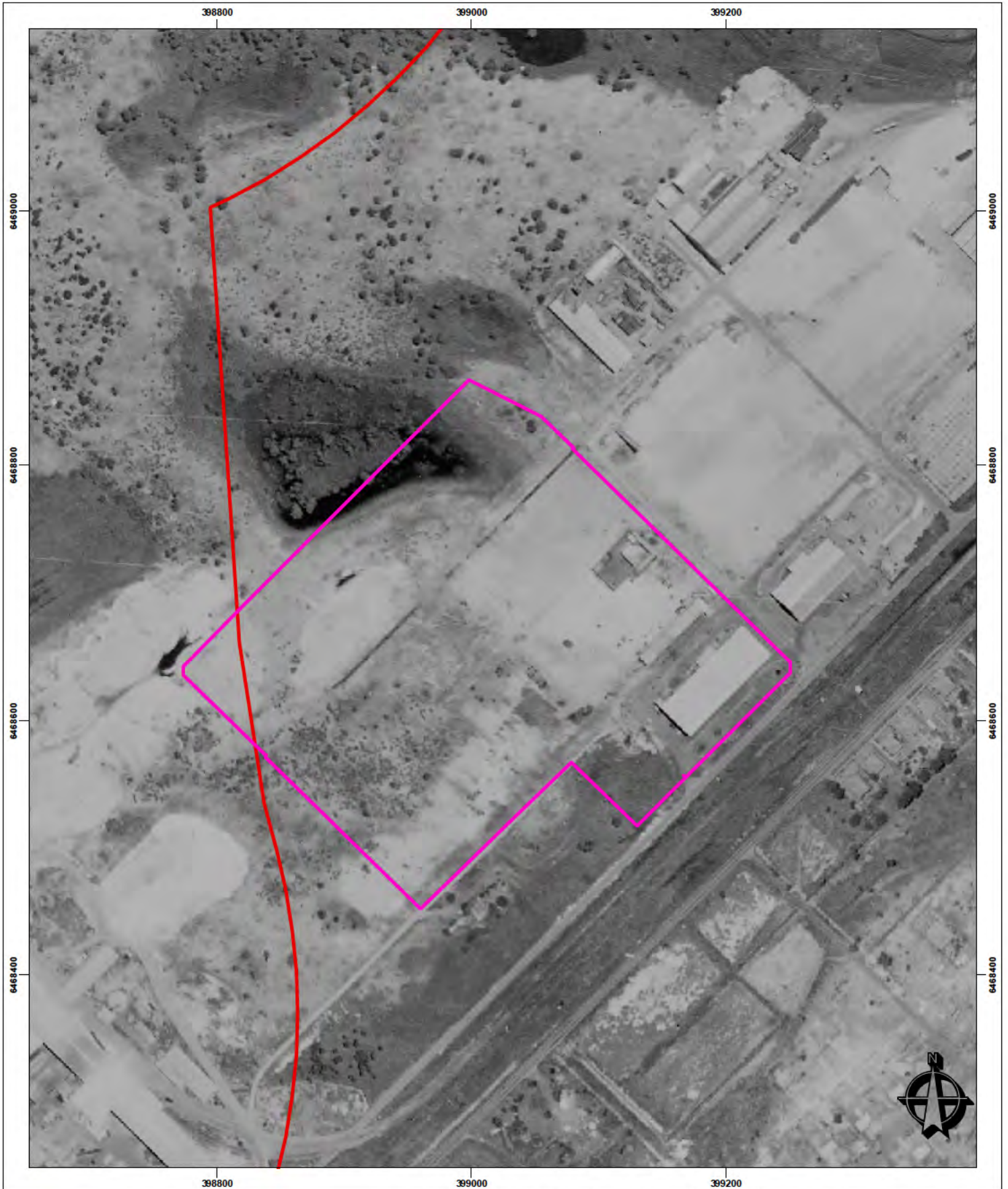
360 Environmental
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DRAWING ID 345_f4d_service_station.mxd
DATE 18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

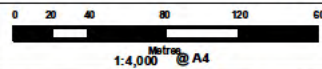
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CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation
 Former Service Station
 Historical Imagery 2010



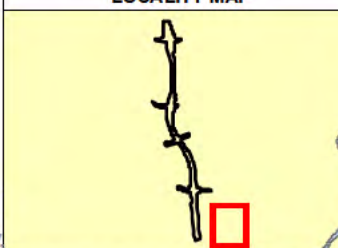
Legend

- Site Location
- Contaminated Sites
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP




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DRAWING ID	DATE
345_f6a_motor_vehicle.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway

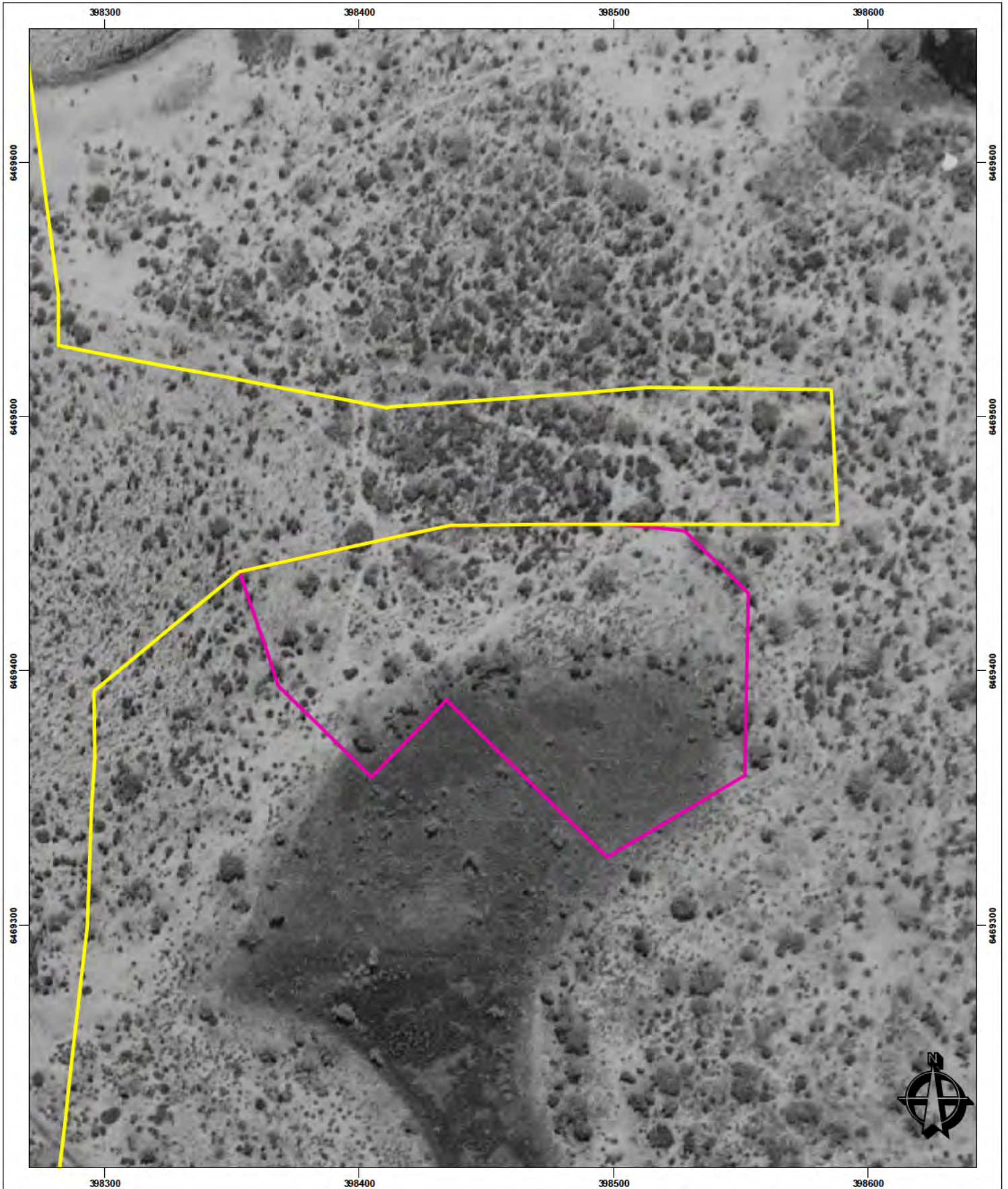


Contaminated Sites Investigation

Motor Vehicle Workshop
Historical Imagery 1953

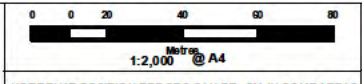
- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1953 IN 2014

Powered by **SLIP ENABLER**
 K:\Projects\015.0 SWA\Projects from 1 July 2013\345 - Tonkin Gravel Deposition\Figure



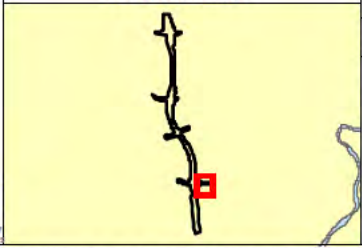
Legend

- Site Location
- Contaminated Sites



360 Environmental
 a10 Bemoondsey St, West Leederville, 6007 WA
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 www.360environmental.com.au

LOCALITY MAP



DRAWING ID	DATE
345_f3a_metal_recycling_mxd	18-Mar-2014
HORIZONTAL DATUM AND PROJECTION	
GDA 1994 MGA Zone 50	

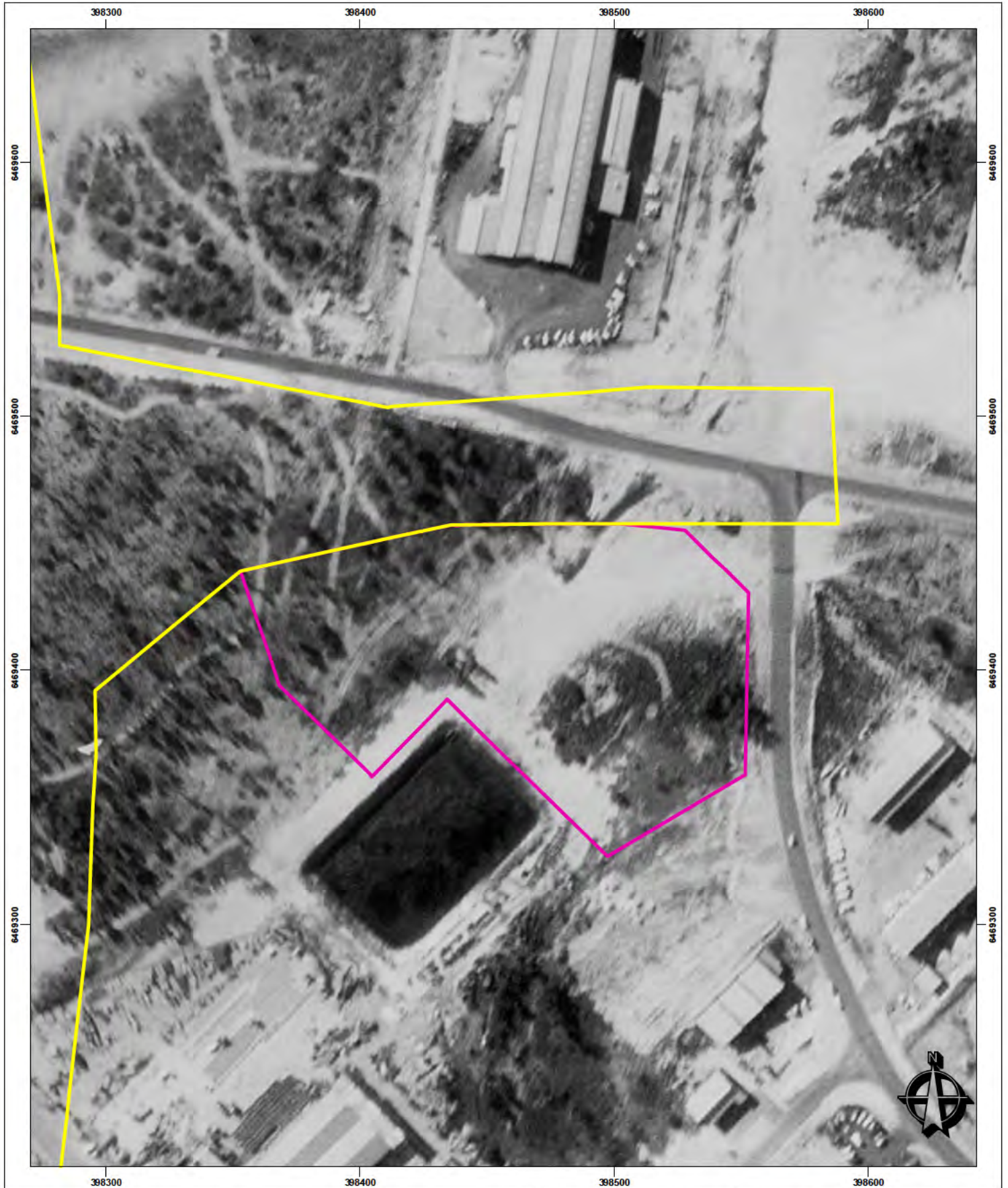
CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation

Metal Recycling Facility
Historical Imagery 1953

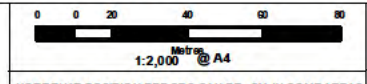
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 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1953 IN 2014

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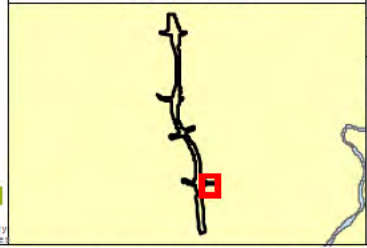
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- Site Location
- Contaminated Sites



NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID	DATE
345_f3b_metal_recycling_mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

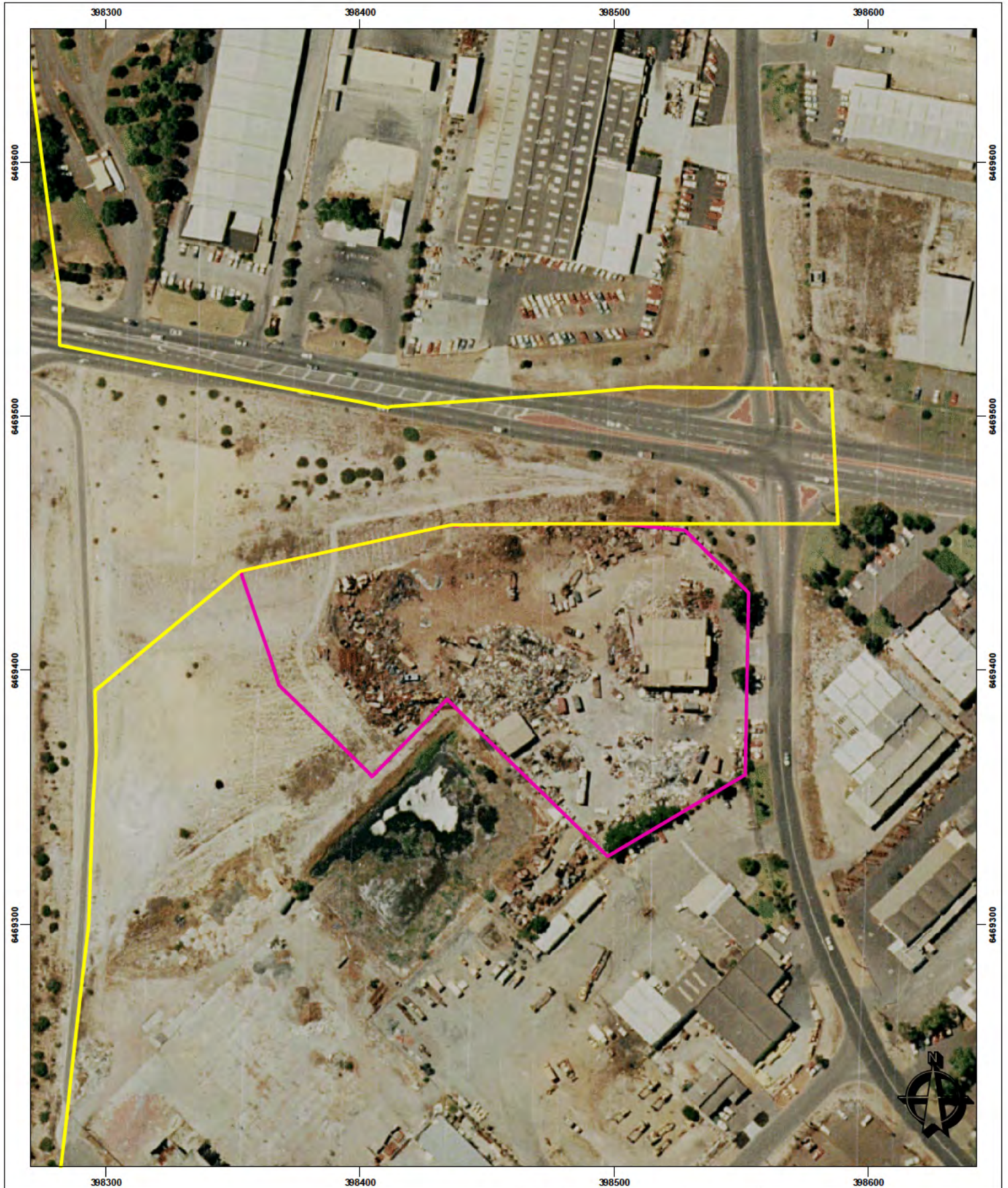
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CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation

Metal Recycling Facility
 Historical Imagery 1974

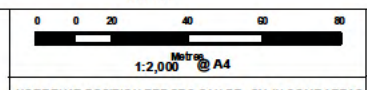
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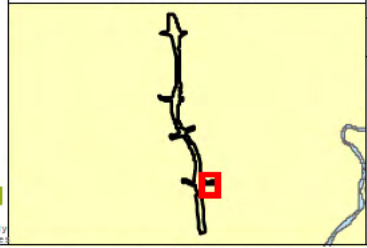
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- Site Location
- Contaminated Sites



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HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation

Metal Recycling Facility
 Historical Imagery 1995

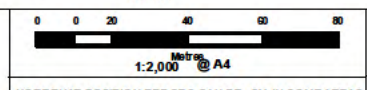
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 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1995 IN 2014

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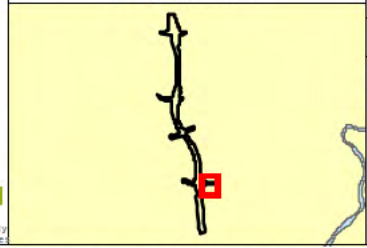
Legend

- Site Location
- Contaminated Sites



NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

LOCALITY MAP



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DRAWING ID: 345_f3c_metal_recycling_mxd DATE: 18-Mar-2014

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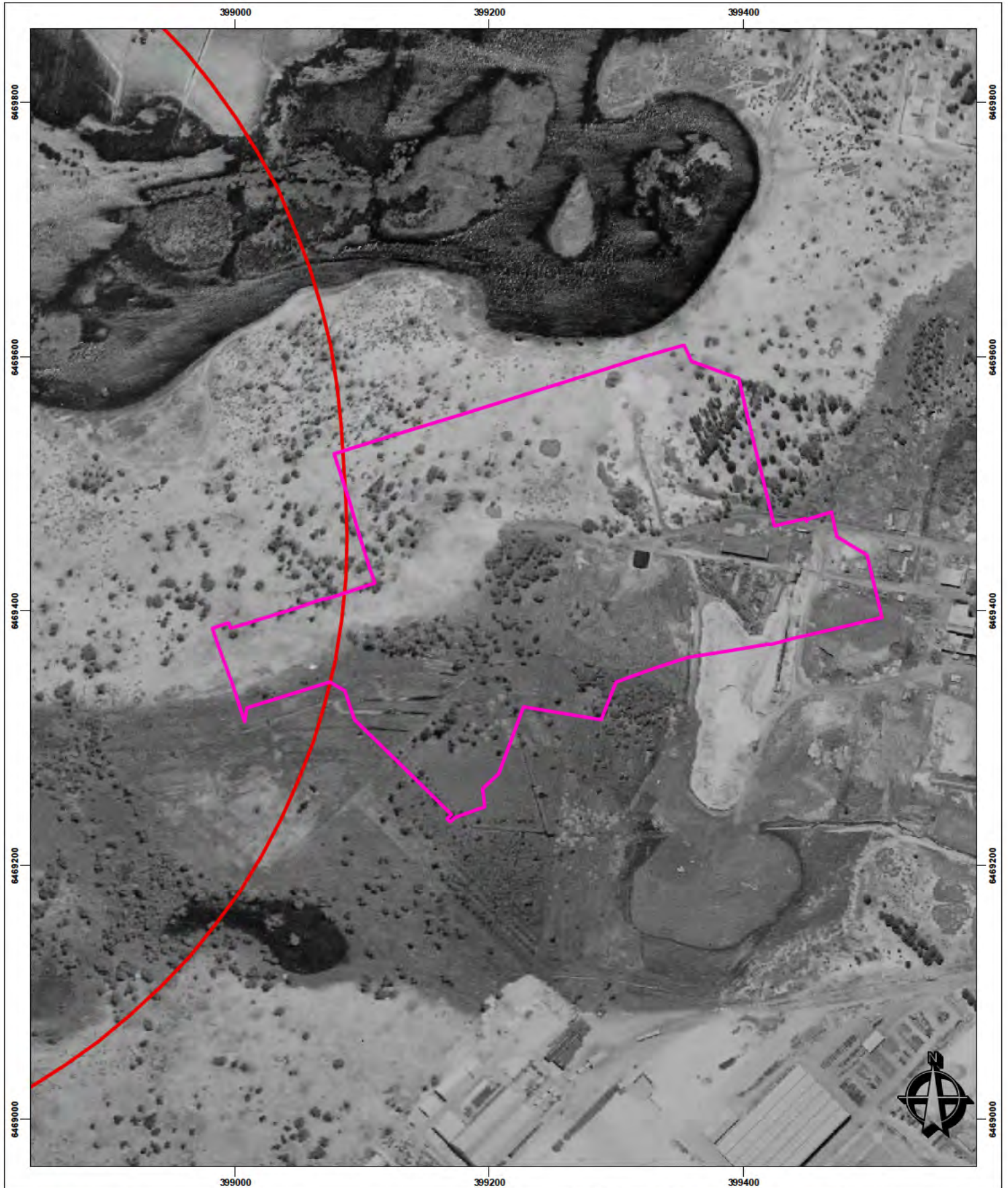
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Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation

Metal Recycling Facility
 Historical Imagery 2013

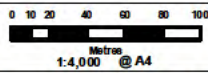
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 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 2013 IN 2014

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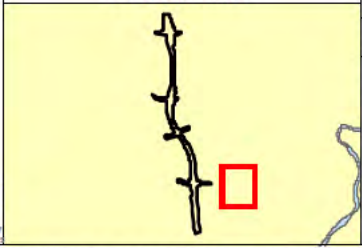
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- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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345_f5a_csbp_bassedeau.mxd	18-Mar-2014

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

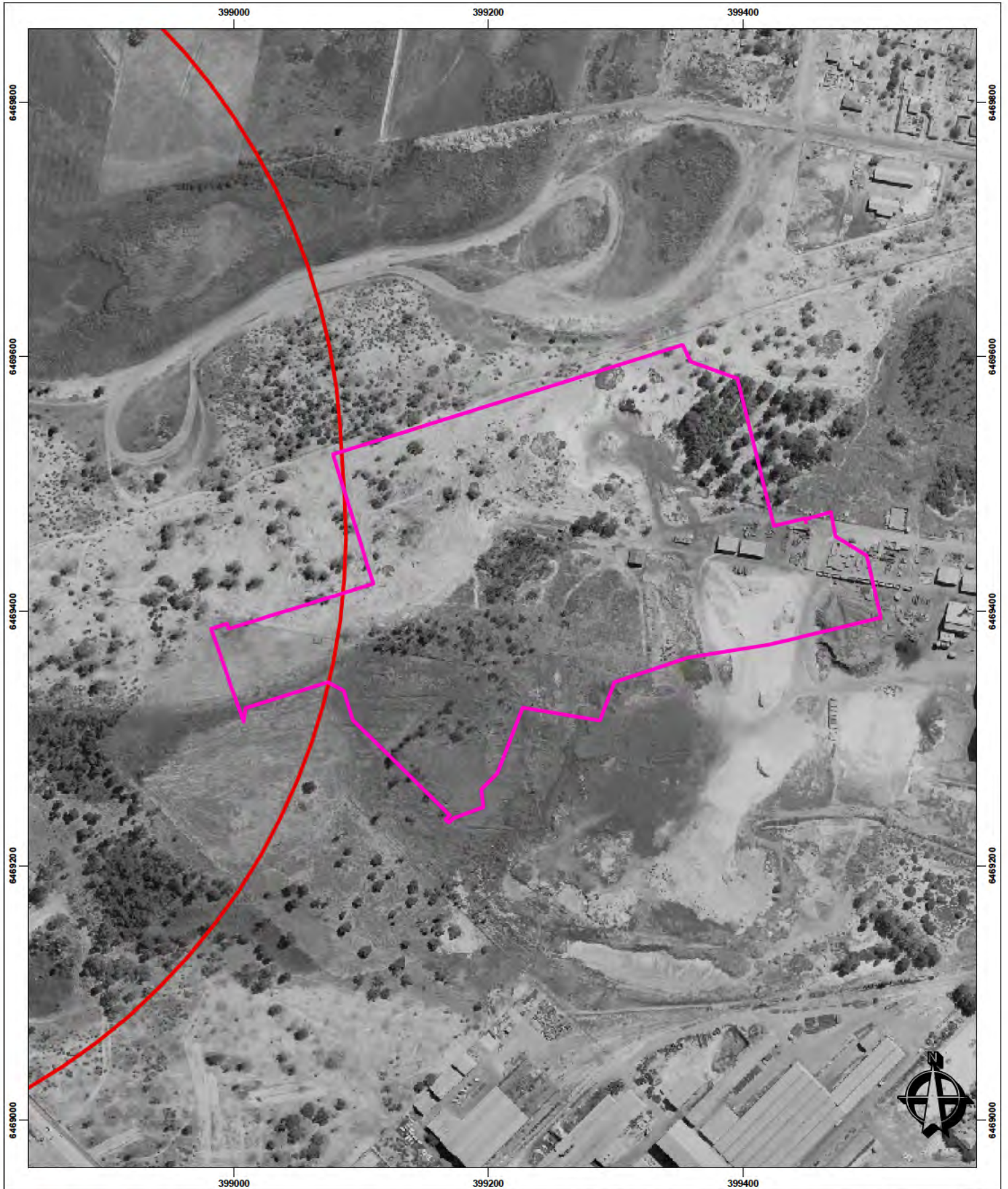
Main Roads Western Australia
Tonkin Highway

Contaminated Sites Investigation

CSBP Bassendean
Historical Imagery 1953

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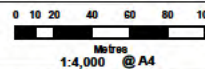
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- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)

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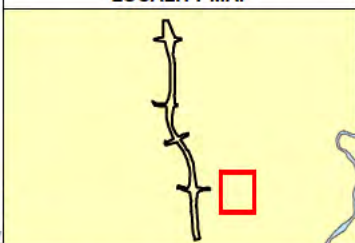
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345_f5b_csbp_bassedeau.mxd	20-Mar-2014
HORIZONTAL DATUM AND PROJECTION	
GDA 1994 MGA Zone 50	

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
Tonkin Highway

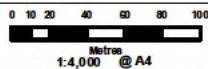
Contaminated Sites Investigation

CSBP Bassedeau
Historical Imagery 1965



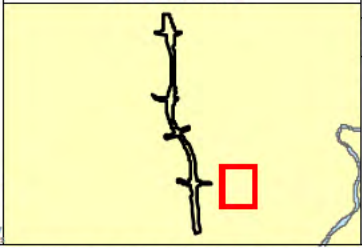
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- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS

LOCALITY MAP



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CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

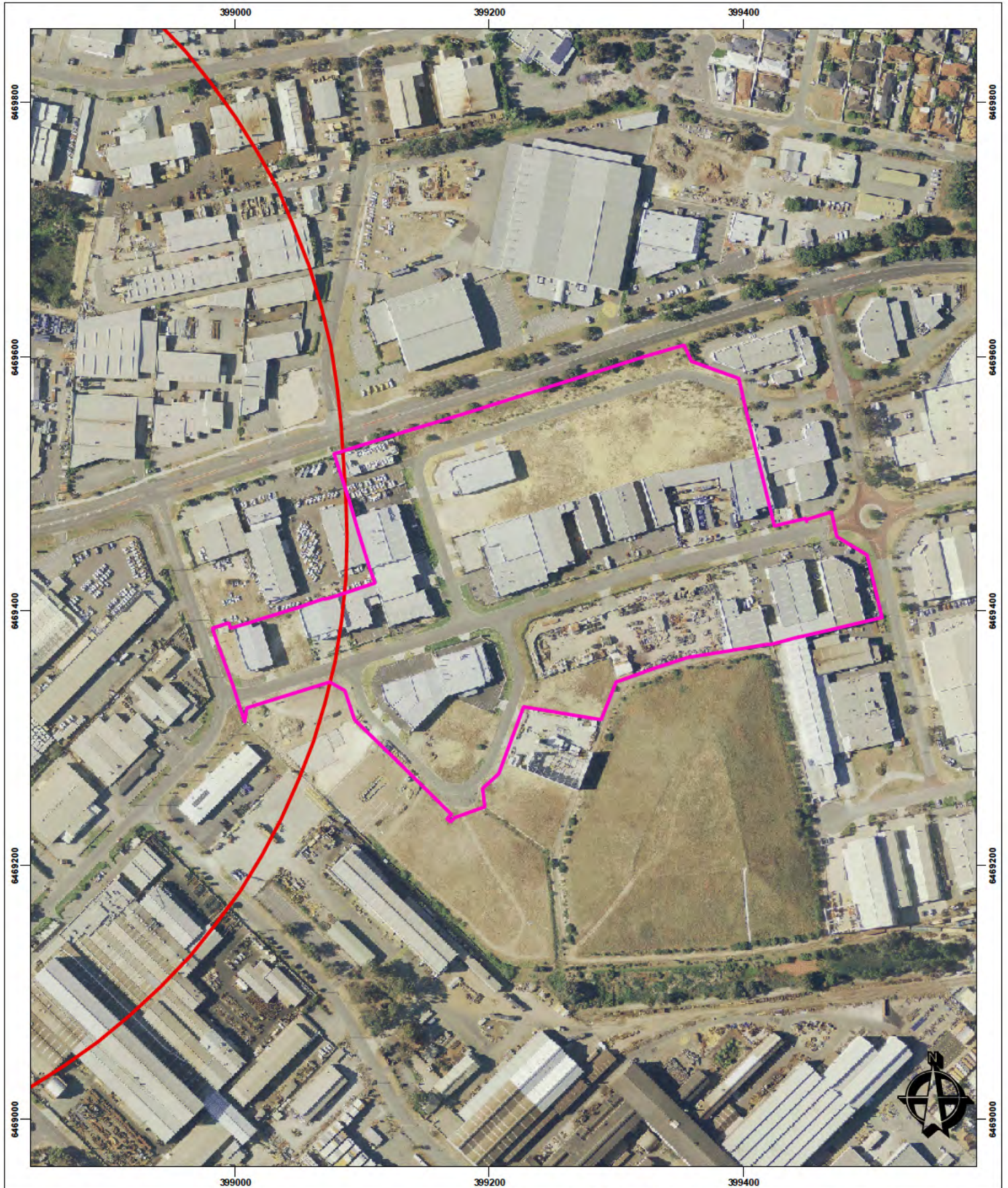
Main Roads Western Australia
 Tonkin Highway

Contaminated Sites Investigation

CSBP Bassedeian
 Historical Imagery 1985

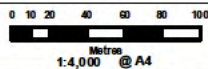
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 - CONTAMINATED SITES SOURCED DER 2014
 - IMAGERY SOURCED LANDGATE SLIP 1985 IN 2014

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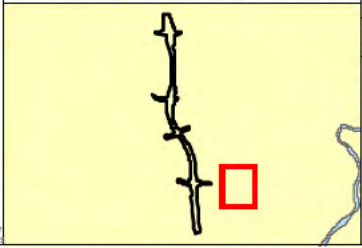
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- Contaminated Sites
- Site Location
- Proposed Clearing Footprint (500m boundary)



NOTE THAT POSITION ERRORS CAN BE +5M IN SOME AREAS

LOCALITY MAP



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HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	DR	SB	0

Main Roads Western Australia
 Tonkin Highway
 Contaminated Sites Investigation

CSBP Bassendean
 Historical Imagery 2013

- LOCALITY MAP SOURCED FROM LANDGATE 2006
 - STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
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 - IMAGERY SOURCED LANDGATE SLIP 1965 IN 2014

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APPENDIX D

Groundwater Plume Delineation

APPENDIX E

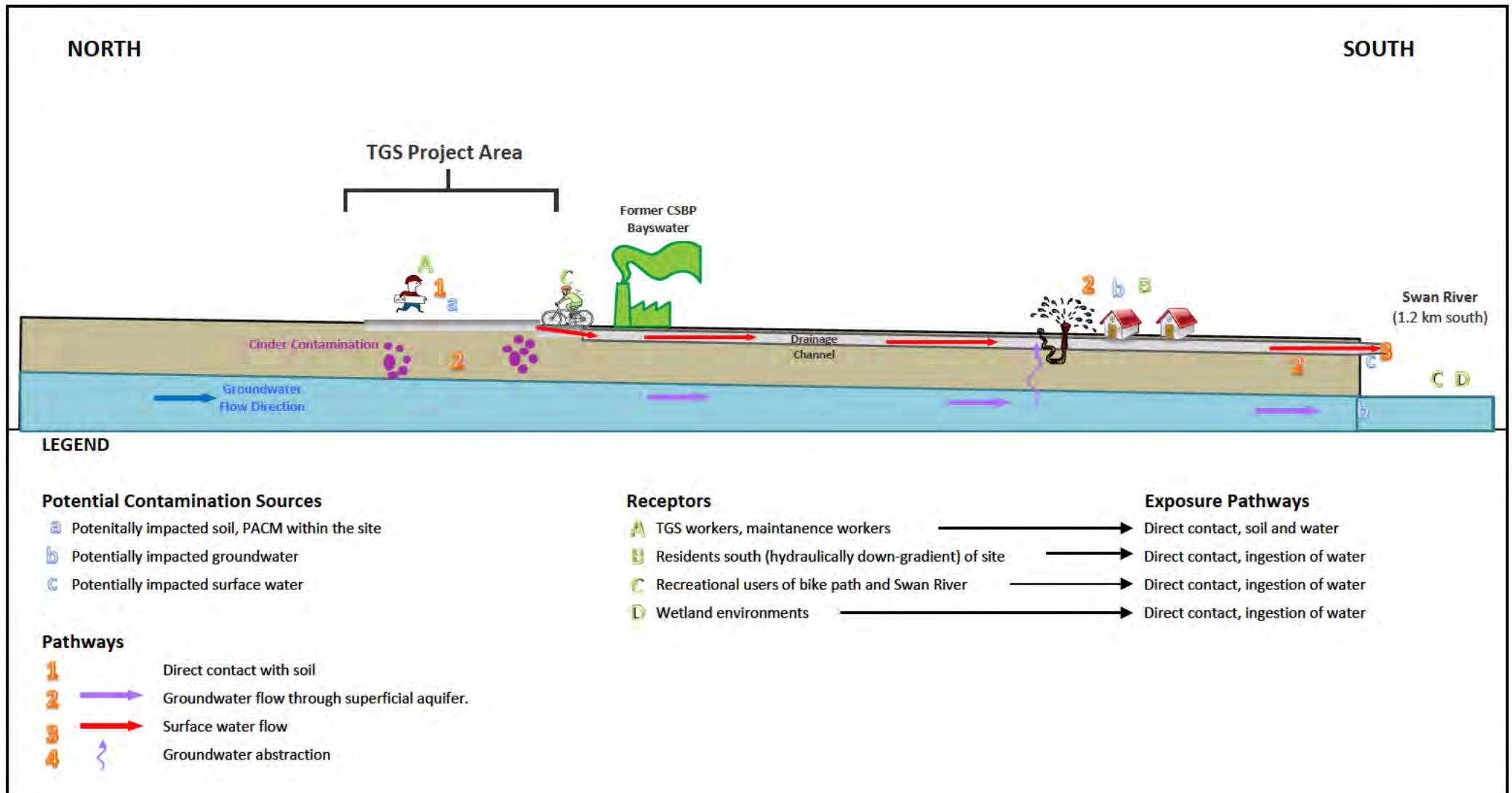
Department of Water WIN Database Review

Department of Water WIN Database - 500 m radius from TGS Project Area

AWRC_REF	EASTING	NORTHING	OWN_ASSET	PURPOSE_CU	STATUS_CUR
61604422	397613	6471546	No Current Owner	Irrigation	Operating
61604424	398382	6471099	No Current Owner	Irrigation	
61604449	398410	6468393	No Current Owner	Industry	
61604450	398414	6468432	No Current Owner		
61604451	398414	6468432	No Current Owner		
61604553	397300	6472021	No Current Owner	Irrigation	
61604691	397653	6470163	No Current Owner		
61604696	398464	6471055	No Current Owner		
61604699	397476	6471542	No Current Owner		
61604702	397758	6468407	No Current Owner		
61604779	396959	6471339	No Current Owner		
61604780	398140	6470918	No Current Owner		
61604781	397854	6471077	No Current Owner		
61604782	397394	6471636	No Current Owner		
61604885	398652	6470172	No Current Owner	Garden Irrigation	Operating
61604893	397443	6469741	No Current Owner	Garden Irrigation	Operating
61604931	398728	6469053	No Current Owner	Industry	Operating
61605004	396995	6472819	No Current Owner	Domestic/Household/Garden Irrigation	Operating
61605007	398083	6467909	No Current Owner	Garden Irrigation	Operating
61605017	398280	6467843	No Current Owner	Garden Irrigation	
61605024	397220	6471226	No Current Owner		
61605107	398545	6469335	No Current Owner	Garden Irrigation	
61605108	398586	6469414	No Current Owner	Garden Irrigation	
61605109	398846	6469444	No Current Owner	Garden Irrigation	
61605110	398781	6469243	No Current Owner	Dust suppression	Operating
61605205	397899	6468339	Department of Water	Project bore	
61605206	397884	6468309	Department of Water	Project bore	
61605207	397974	6468269	Department of Water	Project bore	
61605208	397829	6468269	Department of Water	Project bore	
61609696	396888	6472935	No Current Owner	Irrigation	Capped
61610386	397539	6469639	Department of Water	Groundwater Assessment Network	Not operating
61610388	397559	6470309	Department of Water	Groundwater Assessment Network	Not operating
61610474	398139	6471349	Department of Water	Monitoring/Groundwater Assessment Network	Operating
61610475	397763	6473277	Department of Water	Monitoring/Groundwater Assessment Network	Operating
61611313	398036	6467942	Private Owner		Operating
61611375	397173	6473508	Department of Water	Monitoring	Operating
61612200	398549	6469329	No Current Owner		Not operating
61612201	398589	6469449	No Current Owner		Not operating
61612202	398929	6469459	No Current Owner		Not operating
61612203	398764	6469179	No Current Owner		Not operating
61612204	398749	6469069	No Current Owner		Not operating
61615047	398489	6469330	Department of Water	Monitoring/Groundwater Assessment Network/Observation	Operating
61615048	398469	6469322	Department of Water	Monitoring/Groundwater Assessment Network	Operating
61615933	398356	6468451	No Current Owner		
61615951	398543	6470376	No Current Owner		Operating
61615966	398231	6470866	No Current Owner	Garden Irrigation	Operating
61615967	398119	6471052	No Current Owner		Operating
61615998	398549	6470287	No Current Owner	Garden Irrigation	Operating
61616014	398234	6472804	No Current Owner		
61616050	399079	6469443	No Current Owner	Investigation	Unknown
61616075	398419	6468619	No Current Owner		
61616076	398379	6468389	No Current Owner		
61616077	398689	6468669	No Current Owner		
61616078	398559	6468119	No Current Owner		
61616102	398119	6468389	No Current Owner		
61616104	398129	6468119	No Current Owner		
61616105	398519	6468599	No Current Owner		
61616106	398569	6468529	No Current Owner		
61616111	398529	6469429	No Current Owner		
61620155	398637	6468974	Private Owner		
61620156	398613	6468940	Private Owner		
61620157	398599	6468929	Private Owner		
61620158	398720	6469034	Private Owner		
61622110	398468	6468082	CSBP & Farmers Ltd	Production	Operating
61622111	398477	6468169	CSBP & Farmers Ltd	Production	Operating
61642138	397230	6473381	Private Owner	WRL linked	Unknown
61642139	397230	6473344	Private Owner	WRL linked	Unknown

APPENDIX F

Schematic Conceptual Site Model



Conceptual Site Model
Preliminary Site Investigation

Tonkin Grade Separation Project
Main Roads Western Australia

Attachment 2e: Flora and fauna database searches

DPAW Declared Rare and Priority Flora Search Results

Threatened (Declared Rare) and Priority Flora Database Results				
Taxon	Status	DECRegion	DECDistrict	Distribution
<i>Anthotium</i> sp. <i>Darling Range</i> (<i>F. Hort & B. Hort 2431</i>)	1	SWAN	PERTH HILLS	Bedforddale
<i>Carex tereticaulis</i>	1	SWAN,SWST,WARR	SWAN COASTAL,BLACKWOOD,WELLINGTO N,DONNELLY	Dardanup, Bridgetown, Blackwood River, Guildford, (Harvey), Mungalip
<i>Dampiera triloba</i>	1	SWAN,WHTB	SWAN COASTAL,CENTRAL WHEATBELT	Gnangarra, Bayswater, Cunderdin
<i>Hydrocotyle striata</i>	1	SWAN	PERTH HILLS	Gooseberry Hill, Guildford
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	4	MWST,SWAN	PERTH HILLS,SWAN COASTAL,MOORA	Gillingarra-Forrestdale, Cannington, Guildford, Muchea, Gingin, Murray River, Moore River, Serpentine

DOTE EPBC Act Protected Matters Search Tool Results



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/06/13 16:11:08

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

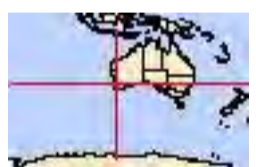
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 2.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	33
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	2
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	40
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans amsterdamensis Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Mammals		

Name	Status	Type of Presence
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum [25911]	Vulnerable	Species or species habitat may occur within area
Other		
Idiosoma nigrum Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Calytrix breviseta subsp. breviseta Swamp Starflower [23879]	Endangered	Species or species habitat may occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
Darwinia foetida Muceha Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leaved Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Epiblema grandiflorum var. cyaneum Baby Blue Orchid, Blue Babe-in-the-cradle Orchid, Blue Babe-in-a-cradle [67182]	Endangered	Species or species habitat known to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Thelymitra manginii K.Dixon & Batty ms. [67443]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area
Villarsia calthifolia Mountain Villarsia [10886]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

Places on the RNE [\[Resource Information \]](#)

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Swan River Foreshore, Maylands	WA	Indicative Place
Historic		
Halliday House	WA	Indicative Place

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Unnamed WA44853	WA

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry		Species or species

Name	Status	Type of Presence
Asparagus Fern, Asparagus Fern, South African Creeper [66908] Asparagus plumosus		habitat likely to occur within area
Climbing Asparagus-fern [48993] Brachiaria mutica		Species or species habitat likely to occur within area
Para Grass [5879] Cenchrus ciliaris		Species or species habitat may occur within area
Buffel-grass, Black Buffel-grass [20213] Chrysanthemoides monilifera		Species or species habitat may occur within area
Bitou Bush, Boneseed [18983] Chrysanthemoides monilifera subsp. monilifera		Species or species habitat likely to occur within area
Boneseed [16905] Genista sp. X Genista monspessulana		Species or species habitat may occur within area
Broom [67538] Lantana camara		Species or species habitat likely to occur within area
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum		Species or species habitat likely to occur within area
African Boxthorn, Boxthorn [19235] Olea europaea		Species or species habitat may occur within area
Olive, Common Olive [9160] Opuntia spp.		Species or species habitat likely to occur within area
Prickly Pears [82753] Pinus radiata		Species or species habitat may occur within area
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] Protasparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern, Ferny Asparagus [11747] Rubus fruticosus aggregate		Species or species habitat likely to occur within area
Blackberry, European Blackberry [68406] Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		Species or species habitat likely to occur within area
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] Salvinia molesta		Species or species habitat likely to occur within area
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] Tamarix aphylla		Species or species habitat likely to occur within area
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018] Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands	<u>[Resource Information]</u>
Name Swan-Canning Estuary	State WA

Coordinates

-31.866192 115.91626,-31.866192 115.91626,-31.866192 115.91626,-31.866192 115.91626,
-31.920028 115.925183,-31.920028 115.925183,-31.920028 115.925183,-31.920028
115.925183

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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DPAW Fauna Database Search Results

Threatened Fauna Database Results						
NAME	VERNACULAR	KINGDOM	CONSV CODE	CLASS	SITE NAME	LOC NAME
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Mt Lawley	INGLEWOOD
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MT LAWLEY	INGLEWOOD
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MT LAWLEY	INGLEWOOD
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MT LAWLEY	INGLEWOOD
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MT LAWLEY	INGLEWOOD
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Rosher Park	LOCKRIDGE
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Kerwin Way	LOCKRIDGE
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Kerwin Way	LOCKRIDGE
<i>Cacatua pastinator subsp. pastinator</i>	Muir's Corella	Animalia	S	BIRD	Guildford	GUILDFORD
<i>Tringa glareola</i>	Wood Sandpiper	Animalia	IA	BIRD	Guildford	GUILDFORD
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Ixobrychus flavicollis subsp. australis</i>	Australian Black Bittern	Animalia	3	BIRD	Guildford area, Perth	GUILDFORD
<i>Cacatua pastinator subsp. pastinator</i>	Muir's Corella	Animalia	S	BIRD	Guildford	GUILDFORD
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Swan River, Lilac Hill Park, Caversham	GUILDFORD

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Guildford	GUILDFORD
<i>Geotria australis</i>	Pouched Lamprey	Animalia	1	FISH		GUILDFORD
<i>Cacatua pastinator subsp. pastinator</i>	Muir's Corella	Animalia	S	BIRD	Guildford	GUILDFORD
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL		GUILDFORD
<i>Burhinus grallarius</i>	Bush Stone-curlew	Animalia	4	BIRD	Guildford area, Perth	GUILDFORD
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Ixobrychus minutus subsp. dubius</i>	Australian Little Bittern	Animalia	4	BIRD	Guildford	GUILDFORD
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD	Guildford area, Perth	GUILDFORD
<i>Anous tenuirostris subsp. melanops</i>	Australian Lesser Noddy	Animalia	T	BIRD	Guildford	GUILDFORD
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	GUILDFORD
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Thornburn Reserve, cnr Reid Hwy and Altone Rd, Beechboro	BEECHBORO
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Thornburn Reserve, cnr Reid Hwy and Altone Rd, Beechboro	BEECHBORO
<i>Morelia spilota subsp. imbricata</i>	Carpet Python	Animalia	S	REPTILE	WEST GUILDFORD	BEECHBORO

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Thorburn Park	BEECHBORO
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Beechboro	BEECHBORO
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	West Guildford	BEECHBORO
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	WEST GUILDFORD	BEECHBORO
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BEECHBORO	BEECHBORO
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Victoria Rd, Malaga, Bush Forever Site 480	BENNETT SPRINGS
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Marshall Rd sie, Bennett Brook	BENNETT SPRINGS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Swan River, Asfield Flats, Bassendean	ASHFIELD
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Cyril Jackson Senior College Oval, Bassendean	ASHFIELD
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MAYLANDS	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Maylands - Lake Bungano	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Tringa nebularia</i>	Common Greenshank	Animalia	IA	BIRD	Berringa Park	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Berringa Park	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus banksii subsp. naso</i>	Forest Red-tailed Black-Cockatoo	Animalia	T	BIRD	Near corner of central ave and peninsula road Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Berringa Park	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Maylands / Gibney Reserve	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bardon Park	MAYLANDS
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MAYLANDS	MAYLANDS

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Maylands / Gibney Reserve	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Berringa Park, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MAYLANDS	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bardon Park	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	East Street, Maylands	MAYLANDS
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	East Street, Maylands	MAYLANDS
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Berringa Park	MAYLANDS
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters canal	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Ascot Waters Canal	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL		ASCOT
<i>Tringa nebularia</i>	Common Greenshank	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Garvey Park	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Garvey Park, Swan River, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Island	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL		ASCOT

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL		ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Falco peregrinus subsp. macropus</i>	Australian Peregrine Falcon	Animalia	S	BIRD	Garvey Park	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Garvey Park, Ascot	ASCOT
<i>Tringa nebularia</i>	Common Greenshank	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT

<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Ascot Waters Canal	ASCOT
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL		ASCOT

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Garvey Park	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Falco peregrinus subsp. macropus</i>	Australian Peregrine Falcon	Animalia	S	BIRD	Garvey Park, Ascot. In upper dead branches of tree overlooking the river	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Tidewater Way, Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters Canal	ASCOT
<i>Tringa nebularia</i>	Common Greenshank	Animalia	IA	BIRD	Ascot Waters canal	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ascot Waters swamp	ASCOT

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Grove Farm Reserve, Ascot	ASCOT
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ashfield Flats	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	ASCOT
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C23 along Bennett Brook	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	West Swan Road swamp, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C11 along Bennett Brook	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C20 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C2 along Bennett Brook	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C11 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C7 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C1 along Bennett Brook	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C21 along Bennett Brook	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennet Brook	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C36 along Bennett Brook	CAVERSHAM
<i>Hydromys chrysogaster</i>	Water-rat	Animalia	4	MAMMAL	Beside residential area along Bennett Brook.	CAVERSHAM
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C5 along Bennett Brook	CAVERSHAM

<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C7 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road swamp, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Under the footbridge on Bennett Brook	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C2 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road swamp, Caversham	CAVERSHAM

<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lilac Hill Park, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Acacia Swamp, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C30 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Hydromys chrysogaster</i>	Water-rat	Animalia	4	MAMMAL	Bennett Brook near Clarry Small Park	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C6 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C7 along Bennett Brook	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Whiteman Park, Bennett Brook from Highway to Benora Road. Either side of footbridge	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road swamp, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C17 along Bennett Brook	CAVERSHAM
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Trap no. C14 along Bennett Brook	CAVERSHAM
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM

<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Lilac Hill Park, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	CAVERSHAM
<i>Hydromys chrysogaster</i>	Water-rat	Animalia	4	MAMMAL		REDCLIFFE
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	POST OFFICE	REDCLIFFE
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL	ABERNETHY ROAD	REDCLIFFE
<i>Hydromys chrysogaster</i>	Water-rat	Animalia	4	MAMMAL	Belmont Park	REDCLIFFE
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	POST OFFICE	REDCLIFFE
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL		MOUNT LAWLEY
<i>Cacatua pastinator subsp. pastinator</i>	Muir's Corella, Muir's Corella (Western Corella SW WA)	Animalia	S	BIRD	Swan River	MOUNT LAWLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MAYLANDS	MOUNT LAWLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Maylands	MOUNT LAWLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Maylands	MOUNT LAWLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MT LAWLEY	MOUNT LAWLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Mt Lawley	MOUNT LAWLEY
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL		MOUNT LAWLEY

<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Maylands	MOUNT LAWLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bardon Park	MOUNT LAWLEY
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bardon Park, Maylands	MOUNT LAWLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bardon Park	MOUNT LAWLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bardon Park	MOUNT LAWLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bardon Park	MOUNT LAWLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bardon Park, Maylands	MOUNT LAWLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bardon Park	MOUNT LAWLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lightning Swamp Bushland	NORANDA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp	NORANDA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Lightning Swamp	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Noranda Open Space	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Noranda Open Space	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp Bushland	NORANDA

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp	NORANDA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Lightning Swamp	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	Lightning Swamp, Bush Forever site 307	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Lightning Swamp, Noranda	NORANDA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Lightning Swamp	NORANDA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Waltham Reserve, Morley	MORLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Waltham Reserve, Morley	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BEDFORD PARK	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Inglewood	MORLEY

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	INGLEWOOD	MORLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Way Park, Morley	MORLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	EMBLETON	MORLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bedford Park	MORLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Embleton	MORLEY
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Waltham Reserve, Morley	MORLEY
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bassendean	EDEN HILL
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bassandean	EDEN HILL
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bassendean	EDEN HILL

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bassendean	EDEN HILL
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bassendean	EDEN HILL
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Bassendean	EDEN HILL
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	West Swan Road, Caversham	EDEN HILL
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bennett Brook, Caversham	EDEN HILL
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Dianella	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Dianella	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	DIANELLA	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Dianella	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	INGLEWOOD	DIANELLA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	184 Birkett Street, Dianella	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	DIANELLA	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	DIANELLA	DIANELLA
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Inglewood	DIANELLA
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Animalia	T	MAMMAL	Leake St.	BELMONT
<i>Isoodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	KEW STREET	BELMONT

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Garvey Park, Ascot	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Sandy Beach Reserve, Bassendean	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Sandy Beach Reserve, Bassendean	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Success Hill Reserve, Bassendean	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Success Hill Reserve, Bassendean	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BASSENDAN	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Success Hill Reserve, Bassendean	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Swan River - Ashfield	BASSENDAN
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Ashfield Flats	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BASSENDAN	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Bassendean Primary School	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BASSENDAN	BASSENDAN

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Bassendeen	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BASSENDAN	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bassendeen	BASSENDAN
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD	Ashfield Flats	BASSENDAN
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BASSENDAN	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Garvey Park, Ascot	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats	BASSENDAN
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Garvey Park, Ascot	BASSENDAN
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Reid Hwy/ Malaga Drive N corner	MALAGA
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Malaga Regional Open Space	MALAGA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Malaga	MALAGA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Malaga Regional Open Space	MALAGA
<i>Calidris alba</i>	Sanderling	Animalia	IA	BIRD		BAYSWATER
<i>Limosa lapponica</i>	Bar-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calidris alba</i>	Sanderling	Animalia	IA	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Limosa lapponica</i>	Bar-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Baigup Wetlands	BAYSWATER

<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Myrmecobius fasciatus</i>	Numbat, Walpurti	Animalia	T	MAMMAL		BAYSWATER
<i>Tringa brevipes</i>	Grey-tailed Tattler	Animalia	IA	BIRD		BAYSWATER
<i>Limosa lapponica</i>	Bar-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Gobba Lake	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bedford Park	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER

<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Erik Singleton Bird Sanctuary	BAYSWATER

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Erik Singleton Bird Sanctuary	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BEDFORD PARK	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Bagup Wetland Reserve	BAYSWATER
<i>Onychoprion anaethetus</i>	Bridled Tern	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER

<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Calidris canutus</i>	Red Knot	Animalia	IA	BIRD		BAYSWATER
<i>Calidris tenuirostris</i>	Great Knot	Animalia	T	BIRD		BAYSWATER
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Isodon obesulus subsp. fusciventer</i>	Quenda, Southern Brown Bandicoot	Animalia	5	MAMMAL	CITY AIRPORT AREA	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER

<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Tringa nebularia</i>	Common Greenshank	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands, north	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bayswater Bird Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Sterna nereis subsp. nereis</i>	Fairy Tern	Animalia	T	BIRD	Mount Hawthorn	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bayswater Bird Sactuary	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Gobba Lake	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER

<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Bayswater Bird Sanctuary	BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Bayswater Bird Sanctuary	BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER

<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea ibis</i>	Cattle Egret	Animalia	IA	BIRD	Hynes Rd. Dardanup	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Hinds Reserve	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Bayswater Bird Sanctuary	BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Erik Singleton Bird Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Maylands	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	MAYLANDS	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER

<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Limosa lapponica</i>	Bar-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Hinds Reserve, Baywater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Calidris alba</i>	Sanderling	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Wetlands, north	BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Limosa lapponica</i>	Bar-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Erik Singleton Bird Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER

<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bedford Park	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER

<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calidris ruficollis</i>	Red-necked Stint	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Limosa limosa</i>	Black-tailed Godwit	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Erik Singleton Bird Sanctuary	BAYSWATER
<i>Actitis hypoleucos</i>	Common Sandpiper	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER

<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Apus pacificus</i>	Fork-tailed Swift	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singelton Sanctuary	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calidris ferruginea</i>	Curlew Sandpiper	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	Bayswater	BAYSWATER
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BAYSWATER	BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Baigup Reserve	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER

<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Pluvialis squatarola</i>	Grey Plover	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Neelaps calonotos</i>	Black-striped Snake	Animalia	3	REPTILE	BEDFORD PARK	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Gobba Lake, Bayswater	BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD		BAYSWATER
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo (short-billed black-cockatoo)	Animalia	T	BIRD	Eric Singleton Sanctuary	BAYSWATER
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo (long-billed black-cockatoo)	Animalia	T	BIRD		BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Eric Singleton Bird Sanctuary, Bayswater	BAYSWATER
<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Ashfield Flats, Bassendean	
<i>Merops ornatus</i>	Rainbow Bee-eater	Animalia	IA	BIRD	Swan River, Maylands Yacht Club	
<i>Falco peregrinus</i>	Peregrine Falcon	Animalia	S	BIRD	Swan River, Maylands Yacht Club	

<i>Ardea modesta</i>	Eastern Great Egret	Animalia	IA	BIRD	Swan River, Maylands Yacht Club	
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