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Onslow Material Pits

Environmental Impact Assessment and Environmental Management Plan

November 2011

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- did not include fauna trapping.
- latest DEC database results.

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Executive Summary

Main Roads Western Australia (MRWA) proposes to widen the seal of Onslow Road to 10.0 metres to accommodate the future increase of traffic associated with the LNG processing facilities. To undertake these works, considerable road building material needs to be sourced. To meet the environmental requirements, MRWA commissioned GHD Pty Ltd (GHD) to complete an environmental impact assessment of the proposed material pit locations.

Table 1 identifies the material pits and estimates the clearing requirement.

Table 1 Pit Name and Estimated Clearing Requirement

Pit Name	Estimated Clearing Requirement (ha)
10/1 SLK RHS	0.5
10/2 SLK RHS	0.5
17/1 SLK LHS	0.5
17/2 SLK LHS	0.5
17/3 SLK LHS	0.5
17/1 SLK RHS	0.5
17/2 SLK RHS	0.5
21/1 SLK LHS	0.5
21/2 SLK LHS	0.5
21/3 SLK LHS	0.5
21/4 SLK LHS	0.5
27.5 SLK LHS	0
29.7 SLK LHS	0
35 SLK LHS	0
47.5/1 SLK LHS	0
47.5/2 SLK RHS	0
47.5/3 SLK RHS	0
65 SLK LHS	0
70/1 SLK LHS	0
70/2 SLK RHS	0
74.5 SLK RHS	2
Total	**7.5**

GHD undertook a vegetation and flora assessment of the Project Area in September 2011.

- A total of 26 vegetation types were delineated, including one comprised of Cleared / Degraded vegetation occurring as a result from existing impacts.
- No Threatened or Priority Ecological Communities were recorded in the Project Area. Vegetation within the Project Area is considered to be of *Least Concern* with greater than 90% of its pre-European extent remaining. The Project Area occurs in a location with relatively unaltered vegetation and associated ecological linkages.
- No Threatened (Declared Rare) Flora taxa were recorded from the Project Area.
- Two Priority 3 Flora taxa were recorded from the Project Area:
  - *Eremophila forrestii* subsp*. viridis;*
  - *Triumfetta echinata.*
- *Eremophila forrestii* subsp. *viridis* predominately occurred at Material Pit 10 SLK/1.
- Environmental approvals will not be required if the priority species are avoided.
- GHD has had confirmation from Main Roads that the recorded locations of these Priority Flora can be avoided.
- Two Priority 4 fauna species were observed during the field assessment:
  - Australian Bustard (*Ardeotis australis*); and
  - Grey Falcon (*Falco hypoleucos*).
- GHD considers that both species are highly mobile and nomadic and are unlikely to be impacted by the proposed works.
- No significant fauna habitats are considered likely to be impacted by the proposed works.
- A listed Aboriginal Heritage site was located at Material Pit 70 SLK, MRWA will require approval for the proposed works. MRWA will be required to obtain a Section 18 approval pursuant to the *Aboriginal Heritage Act* 1972, prior to interfering with the site.

1. Introduction

1.1 Background

Onslow Road (0 to 79.4 SLK) is the main arterial and freight transport route to Onslow from the North West Coastal Highway. The route transverses a number of low level floodways and was built in 1980's to service the Onslow community and the Onslow Salt venture. It was not designed to cater for the resource industry expansion that is currently being planned.

Overall locations are shown in Figure 1 and individual pits in Figure 2 contained within Appendix A.

The road has a total pavement width of 8.6 metres with 6.2 metres seal and 9.0 metres sealed floodways and a pavement designed to last 20 years. Although the seal width meets the current demands, the expected increase in heavy vehicles will require a seal width of 10.0 metres in accordance with Austroads Standards. Onslow Road is a designated RAV Route 9 but will need to be upgraded to RAV route 10.

Industry proponents Chevron and BHBP Petroleum/Exxon Mobil are proposing on-shore LNG processing facilities to surround the Onslow town site. An early indication from the project proponents is that there could be up to 30, 000 road train movements on Onslow Road per year, during the construction phase of the facilities. Many of these road trains will be over width with concessional loading permits.

Main Roads proposes to widen the seal of Onslow Road to 10.0 metres to accommodate the future increase of traffic associated with the LNG processing facilities. To undertake these works, considerable road building material needs to be sourced. In total, MRWA expects 7.5 ha of vegetation will be cleared in order to meet the material requirement for the project.

To meet the environmental requirements, MRWA commissioned GHD Pty Ltd (GHD) to complete an EIA of the proposed material pit locations.

1.2 Scope of Work

Scope of work for this project includes:

- Identify and review any existing relevant environmental reports;
- Conduct an initial assessment that determines the key environmental aspects for the road proposal
- A comparative assessment to the *Environmental Protection Act's* 10 Clearing Principles (Schedule 5);
- Assess environmental aspects likely to require referral of the project and advise whether the project should be referred to the Environmental Protection Authority (EPA);
- Assessment of all Matters of National Environmental Significance likely to require referral of the project to the Commonwealth Department of the Sustainability, Environment, Water, Population and Community (DSEWPaC);
- Consultation with relevant government agencies as required
- Determine (but do not apply for) clearances required under other legislative provisions including (but not limited to) those required under the following Acts;

- Conservation and Land management Act 1984;
- Wildlife Conservation Act 1950;
- Environmental Protection Act 1986;
- Rights in Water and Irrigation Act 1914;
- Heritage of Western Australia Act 1990; and
- Aboriginal Heritage Act 1972.

1.3 Clearing of Native Vegetation

GHD is required to:

- Confirm whether the clearing of native vegetation will occur;
- Advise what permits or exemption apply or are required;
- Confirm whether the project occurs within an ESA;
- Assess the project against the 10 principles of clearing and complete the MRWA Vegetation Clearing Impact Assessment Report.
- Provide information regarding the amount (in hectares) and the boundaries of the clearing required for the project activity; and
- Advise whether weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that is in good or better condition.
- Each principle shall be properly assessed in accordance with the EPA's Guideline to the Assessment – Clearing of Native Vegetation.

2. Desktop Assessment

2.1 Study Area

The Study Area is located in the Pilbara region of Western Australia. The surveyed area was limited to a corridor of 300 m (150 m either side of the centreline) along the Onslow Road between 0.0 and 79.4 SLK.

18 material pit areas were surveyed as part of this project. Overall locations are shown in Figure 1 and individual pits in Figure 2 contained within Appendix A.

2.2 Climate

The Pilbara region experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Cyclonic activity is a significant aspect of the weather in the region generally occurring between November and April.

The closest Bureau of Meteorology (BoM) weather station to the Project Site is located at Onslow Airport (Station number 5017). A summary of the climatic data (BoM, 2011) for this weather station is summarised below:

The mean average rainfall is approximately 320 mm with the most rainfall occurring in the summer months.

- Mean Maximum: 36.4^{o}C in January to 25.3^{o}C in July; and
- Mean Minimum: 24.9^{o}C in February to 12.9^{o}C in July.

2.3 Reserves and Conservation Areas

Cane River Station was purchased by the DEC in 1996 and was designated as a Conservation Park in 2000. This station occurs approximately 100 km south-east of Onslow and abuts the Project Area. Onslow Road passes through the Cane River Conservation Park at the southern end of the Project Area.

The DEC has also purchased Mt Minnie Pastoral Lease, which occurs to the north of the Cane River Station. The Onslow Road passes through the Mt Minnie Pastoral Lease towards the southern end of the Project Area.

2.4 Geology and Soils

The Carnarvon IBRA region consists of Quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata.

Within the Project Area, GeoVIEW.WA (Department of Mines and Petroleum, 2011) indicates the following soil types:

- Coastal deposits; including beaches and coastal dunes;
- Tidal deposits; including intertidal and supratidal flats, and channels associated with the saline lakes and salt works;

- Sandplain areas which are mainly Aeolian and include some residual deposits. These are located to the northern end of the survey area, south of the saline lake systems;
- Slope deposits; which includes colluvium and sheetwash. These are located in the central and southern sections of the Project Area associated with the broad plains;
- Exposed rock, saprolite and saprock. Small areas associated with low hills and outcrops. These occur in two particular locations towards the southern end of the Project Area.

2.5 Acid Sulphate Soils

The DEC (2009) describes Acid Sulphate Soils (ASS) as naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the water table, these soils are benign and not acidic. However if the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid.

Inappropriate disturbance of these soils can generate large amounts of sulphuric acid and leaching of contaminants naturally occurring in soils. Flushing of acidic leachate to ground water and surface waters can cause off site impacts including:

- Ecological damage to aquatic and riparian ecosystems;
- Effects on estuarine fisheries and aquaculture Projects;
- Contamination of groundwater with arsenic, aluminium and other metals;
- Reduction in agricultural productivity through metal contamination of soils; (predominantly aluminium); and
- Damage to infrastructure through the corrosion of concrete and steel pipes, bridges and other sub-surface assets.

The Australian Soil Resource Information System (ASRIS) indicated the majority of the Project Area occurs in an area that has low to extremely low probability of ASS occurring, but with a very low confidence level of the accuracy of this statement due to a lack of surveys in the area.

The northern section surrounding the saline lakes is considered by ASRIS to be of a high probability of ASS occurrence, but as no surveys have been completed, a very low confidence of the veracity of that statement.

The Shared Land Information Portal (SLIP) (Government of Western Australia, 2011) indicates that these areas contain a “low to moderate risk” of the presence of ASS on the low islands in the Project Area, and a “high to moderate risk” of the presence of acid sulphate soils occurring in association with the saline lake system.

2.6 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are subject to definition under Section 51B of the *Environmental Protection Act 1986* and may include areas such as those requiring special management attention to protect important scenic values, fish wildlife resources, historical and cultural values, and other natural systems or processes.

The Department of Environment and Conservation’s Native Vegetation Map Viewer did not indicate the presence of any ESAs within the vicinity of the Project Area.

2.7 Wetlands and Waterways

No defined watercourses occur within the vicinity of the Project Area.

A number of water bodies occur within the vicinity of the Project Area. *WetlandBase* defines these as:

- Lakes
- Settling Ponds (associated with the Dampier Salt Operations); and
- Saline Coastal Flat.

None of these wetland areas are listed on the Register of the National Estate in the Directory of Important Wetlands or as a Ramsar listed internationally recognised wetland of importance.

2.8 Vegetation

The Project Area is situated within the Eremaean Botanical Province (Beard, 1975) and occurs in two Interim Biogeographic Regionalisation of Australia (IBRA) regions: Carnarvon and Pilbara; crossing over portions of the CAR1 Cape Range and PIL4 Roebourne sub-regions.

The Carnarvon CAR1 IBRA sub-region consists of a mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrubs on clay flats and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia startii/bivenosa* shrublands outcrop in the north, where extensive tidal flats in sheltered embayments support mangroves (http://florabase.calm.wa.gov.au/help/ibra/#map).

The Pilbara PIL4 IBRA sub-region includes areas of quaternary alluvial plains with a grass savannah of mixed bunch and hummock grasses; and a dwarf shrub steppe of *Acacia translucens* over *Triodia pungens*. Samphire, *Sporobolus* and mangroves occur on marine alluvial flats. The sub-region is characterised as being arid tropical with summer rain.

2.8.1 Vegetation Associations

The following Beard Vegetation Associations exist within the vicinity of the Project Area.

Table 2 Beard Vegetation Associations within the Vicinity of Onslow Material Pits.

Vegetation Association	Description	Location
98	Hummock grasslands, shrub steppe; kanji over soft spinifex & Triodia basedowii.	According to the NRM Slip portal located in middle of Project Area.
127	Bare Areas; mud flats.	Located close to Onslow Town site.
583	Hummock grasslands, sparse shrub steppe; kanji & Acacia bivenosa over hard spinifex Triodia basedowii & T. wiseana.	Located at beginning of Project Area- South end.
585	Mosaic: Shrublands; snakewood & Acacia victoriae scrub/Hummock grasslands, shrub-steppe; kanji over soft spinifex &Triodia basedowii.	Located at Southern end of Project Area.

Vegetation Association	Description	Location
670	Hummock grasslands, shrub steppe; scattered shrubs over Triodia basedowii.	Located in middle of Project Area.
676	Succulent steppe; samphire	Located Northern end of Project Area.

2.8.2 Vegetation Extent and Status

A vegetation type is considered to be underrepresented if there is less than 30% of its original extent remaining. From a biodiversity perspective, and taking no account of any other land degradation issues, there are several key criteria applied to vegetation where clearing is still occurring (EPA Position Statement No. 2, December 2000):

- The threshold level below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level 30% of the pre- European extent of the vegetation type. Vegetation communities where less than 30% of the original vegetation extent remain are referred to as *Vulnerable*; and
- A level of 10% of the original vegetation extent is regarded as being a level representing an *Endangered* community. Clearing which would put a vegetation type into this category should be avoided.

Such vegetation community status can be delineated into five classes, where:

- Presumed extinct: Probably no longer present in the bioregion
- Endangered*: < 10% of pre-European extent remains
- Vulnerable 10-30% of pre-European extent exists
- Depleted* > 30% and up to 50% of pre-European extent exists
- Least concern > 50% pre-European extent exists and subject to little or no degradation over a majority of this area.

*or a combination of depletion, loss of quality, current threats and rarity gives a comparable status

Table 3 indicates that remaining vegetation within the project area ranges from 98% - 100%..

Table 3 Regional Assessment of Vegetation Extent for the Cape Range Sub-region.

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining	Status
98	Hummock grasslands, shrub steppe; kanji over soft spinifex & Triodia basedowii.	221851.483 (CAR1)	221851.483 (CAR 1)	100.0 (CAR1)	Least Concern
		153.14 (PIL4)	153.14 (PIL4)	100.0 (PIL4)	

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining	Status
127	Bare Areas; mud flats.	100903.221 (CAR1)	100612.131 (CAR1)	99.7 (CAR1)	Least Concern
		179917.135 (PIL4)	177262.423 (PIL4)	98.5 (PIL4)	
583	Hummock grasslands, sparse shrub steppe; kanji & Acacia bivenosa over hard spinifex Triodia basedowii & T. wiseana.	2427.254 (PIL4)	2427.254 (PIL4)	100.0 (PIL4)	Least Concern
585	Mosaic: Shrublands; snakewood & Acacia victoriae scrub/Hummock grasslands, shrub-steppe; kanji over soft spinifex &Triodia basedowii.	797.02 (CAR1)	797.02 (CAR1)	100.0 (CAR1)	Least Concern
		144749.039 (PIL4)	144749.039 (PIL4)	100.0 (PIL4)	
670	Hummock grasslands, shrub steppe; scattered shrubs over Triodia basedowii.	147814.252 (CAR1)	147714.96 (CAR1)	99.9 (CAR1)	Least Concern
		1.182 (PIL4)	1.182 (PIL4)	100.0 (PIL4)	
676	Succulent steppe; samphire	29195.18 (CAR1)	28900.32 (CAR1)	99.0 (CAR1)	Least Concern
		10369.549 (PIL4)	10305.864 (PIL4)	99.4 (PIL4)	

*Vegetation Association 583 only occurs in the Pilbara IBRA region.

2.9 Threatened Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat (English and Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. *Presumed Totally Destroyed, Critically Endangered, Endangered, Endangered* and *Vulnerable*.

Some TECs are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Although TECs are not formally protected under the *State Wildlife Conservation Act 1950* (WC Act), the loss of, or disturbance to, some TECs trigger the EPBC Act. The EPA's position of TECs states that proposals that result in the direct loss of TECs are likely to require formal assessment.

Possible TECs that do not meet survey criteria are added to the DEC's Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. These are ecological communities that are adequately known;

are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed on Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An EPBC Act Protected Matters Search was undertaken for the Project Area. No EPBC Act listed TECs were indicated to occur within the search area.

A DEC TEC databases search indicated that no TECs are likely to occur within the vicinity of the Project Area. There is an occurrence of an ecological community approximately 25 km of the Project Area:

- The 'Priority 1' ecological community – 'Peedamulla (Cane River) Swamp Community'. This community will not be impacted by the proposed Project.

2.10 Flora

2.10.1 Significant Flora

Flora species considered to be under threat are listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the *Wildlife Conservation Act 1950* (WC Act). Any activities that are deemed to have a significant impact on species that are recognised by these can trigger referral to the EPA and/or the DSEWPaC.

A description of conservation categories delineated under the EPBC Act is detailed in Table 13, Appendix B. These are applicable to threatened flora and fauna species.

A search of the EPBC Act Protected Matters Search Tool did not identify any Commonwealth flora species within the vicinity of the Project Area.

In addition to the EPBC Act, significant flora in Western Australia is protected by the Wildlife Conservation Act 1950. This Act is administered by the DEC protects Threatened Flora (Declared Rare) species. The DEC also maintains a list of Priority Listed Flora species. Conservation Codes for flora species are assigned by the DEC to define the level of conservation significance (Appendix B, Table 13). Priority Flora are not currently protected under the WC Act. Priority Flora may be rare or threatened, but cannot be considered for declaration as rare flora until adequate surveys have been undertaken of known sites and the degree of threat to theses populations have been clarified. Special consideration is often given to sites that contain Priority Flora, despite them not having formal legislator protection.

A search was undertaken through the DEC Threatened (Declared Rare) Flora Database, the DEC Declared Rare and Priority List and the Western Australian Herbarium (WAHERB). A total of five Priority Flora species were indicated to occur, or potentially occur within the vicinity of the Project Area.

Table 4 Results of the DEC Database Searches for Conservation Significant Flora Within the Vicinity of the Onslow Road

Species	Conservation Code	Description	Flowering Time	Preferred Habitat	Data Source	Likelihood of Occurrence
Abutilon uncinatum ms	P1	Prostrate perennial, herb, 0.2-1 m high, grey foliage, spined pods	-	Red sand. Flat plain.	DR & PF List WAHERB	Possible – occurrence known from vicinity of Project Area.
Eremophila forrestii subsp. *viridis*	P3	Much-branched shrub, ~1 m high. Flowers are pink, cream	August	Sandplain	WAHERB	Likely – occurrence known from Project Area.
Helichrysum oligochaetum	P1	Erect annual herb, to 0.25 m high. Flowers Yellow.	August - November	Red clay. Alluvial plains. In disturbed locations	WAHERB	Possible – occurrence known from vicinity of Project Area.
Triumfetta echinata	P3	Prostrate shrub, to 0.3 m high.	August	Red to red-brown sandy soils. Sand dunes.	WAHERB	Likely - occurrence known from Project Area.
Vigna sp. Central (M.E. Trudgen 1626)	P2	Prostrate annual with yellow flowers on long upright pedicels, with trifoliate leaves. Grows up to 0.1 m x 0.65 m	June - October	Brown sands on sand plains, with occasional limestone hardpan.	WAHERB	Possible – occurrence known from vicinity of Project Area.

2.10.2 Invasive Flora Species

The EPBC Act Protected Matters Search (DoSEWPaC, 2011) indicates that there are species or species habitat that may occur within the vicinity of the Project Area:

- *Cenchrus ciliaris* (Buffel-Grass);
- *Parkinsonia aculeata* (Parkinsonia);
- *Prosopis* species. (Mesquite);
- *Salvinia molesta* (Salvinia);
- Buffel Grass is indicated by *FloraBase* to occur within the vicinity of the Project Area.
- Mesquite is a Weed of National Significance and is also classified as a Declared Plant under the *Agriculture and Related Resources Protection Act 1976* with control categories: P1, P2 and P4.

2.11 Diseases or Pathogens

Phytophthora cinnamomi ("Dieback) disease is generally restricted to areas in the southwest of the State, south of the 26th parallel of latitude, in areas receiving an average annual rainfall of greater than 400 mm.

As the Project Area is north of this latitude it is not considered to be susceptible to the development of the *Phytophthora cinnamomi* pathogen.

2.12 Fauna

2.12.1 Existing Fauna Records

A search on *NatureMap* Records (sourced from the DEC and records of the Western Australian Museum) was undertaken for the Project Area inclusive of a five kilometre buffer. The *NatureMap* records show that 105 bird, 23 mammal, 7 amphibian and 67 reptile species have been officially recorded as present within the search area (Table 17).

2.12.2 Significant Fauna

The conservation of fauna species and their significance status is currently assessed under both State and Commonwealth Acts. The Acts include the Commonwealth EPBC Act and WC Act.

Commonwealth

The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (ICUN). A description of Conservation Categories delineated under the EPBC Act and the circumstances under which a project will trigger referral to the DESWPaC are described in EPBC Act Fauna Conservation Categories.

The WC Act uses a set of schedules, but also classifies species using some of the ICUN categories. These Schedules are described in Table 14.

The EPBC Act protects migratory species that are listed under the following International Agreements:

- Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state under the Convention;

- The Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- Listed migratory species also include species identified in other international agreements approved by the Commonwealth Environment Minister.

The Act also protects marine species on Commonwealth lands and waters.

The DSEWPaC maintains a database of matters of national environmental significance that are protected under the EPBC Act. An EPBC Act Protected Matters Report was generated for the matters of significance that may occur in, or relate to, the study area (DSEWPaC, 2010).

In Western Australia the DEC also produces a supplementary list of Priority Fauna, these being species that are not considered Threatened under the Western Australian WC Act but for which the Government feels there is a cause for concern. These species have no special legislatory protection, but their presence would normally be considered. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Levels of Priority are described in Appendix B, Table 15.

A search of the DEC's Threatened Fauna database for any rare and priority species that may occur in the general area has previously been undertaken. These records are from the DEC and DSEWPaC databases and the Western Australian Museum (WAM). The protected fauna species were identified as potentially occurring within the survey area are listed in Table 5.

It should be noted that some species that appear in the EPBC Act Protected Matters Search Tool are often not likely to occur within the specified area, as the search provides a general guidance to matters of national significance that require further investigation. The records from the DEC searches of threatened fauna provide more accurate information for the general area, however some records of sightings or trappings can be dated and often misrepresent the current range of threatened species.

Table 5 Conservation Significant Fauna Indicated from Database Searches to Occur within the Vicinity of the Project Area

Genus	Species	Common name	EPBC Act Status	WC Act Status	DEC Act Status	Cited
Adrea	*alba*	Great Egret	Mi;Ma;Mi Wetland			EPBC
Adrea	*ibis*	Cattle Egret	Mi;Mi Wetland			EPBC
Apus	*pacificus*	Fork-tailed Swift	Mi;Ma		Mi;S3	EPBC,DEC
Ardeotis	*australis*	Australian Bustard			P4	DEC
Calyptorhynchus	*latirostris*	Carnaby's Cockatoo	E	S1		EPBC,WC
Charadrius	*veredus*	Oriental Plover	Mi Wetland;Ma	S3 Mi		EPBC;WC
Dasycercus	*cristicauda*	Mulgara	Vu	S1	Vu	EPBC;WC;DEC
Dasyurus	*hallucatus*	Northern Quoll	En	S1	En	EPBC;WC;DEC
Falco	*peregrinus*	Peregrine Falcon		S4	Protected	WC;DEC
Falco	*hypoleucos*	Grey Falcon			P4	
Glareola	*maldivarum*	Oriental Pratincole	Mi Wetland;Ma	S3 Mi		EPBC;WC
Haliacetus	*leucogaster*	White-bellied Sea-Eagle	Mi Terrestrial; Ma			EPBC
Hirundo	*rustica*	Barn Swallow	Mi Terrestrial; Ma	S3 Mi		EPBC;WC
Leggadina	*lakedownensis*	Short-tailed Mouse			P4	DEC
Leipoa	*ocellata*	Malleefowl		S1	Vu	WC;DEC

Genus	Species	Common name	EPBC Act Status	WC Act Status	DEC Act Status	Cited
Liasis	*olivaceus* subsp. *barroni*	Olive Python (Pilbara subsp.)	Vu			EPBC
Macronectes	*giganteus*	Southern Giant-Petrel	En;Ma;Mi	S1	S1;En	EPBC,DEC, WC
Merops	*ornatus*	Rainbow Bee-eater	Mi Terrestrial; Ma	S3 Mi		EPBC;WC
Numenius	*madagascariensis*	Eastern Curlew		S3 Mi	P4	DEC; WC
Pseudomys	*chapmani*	Western Pebble-mound Mouse			P4	DEC
Rhinonicteris	*aurantia*	Pilbara Leaf-nosed Bat	Vu			EPBC

2.12.3 Exotic Fauna

Desktop Assessment

A search was undertaken on DEC and EPBC, that indicates the presence of four taxon within the Project Area. These include:

- *Capra hircus* (Feral Goats);
- *Felis catus* (Feral cat);
- *Oryctolagus cuniculus* (Rabbit);
- *Vulpes Vulpes* (Red fox).

2.13 Contaminated Sites

A search was conducted on the DEC database for Contaminated Sites and their records indicate that there are no contaminated sites existing within the vicinity of the Study Area.

2.14 Heritage Listings

2.14.1 Indigenous

The Aboriginal Site Register is held under Section 38 of Western Australia's *Aboriginal Heritage Act* (1972). It protects places and objects customarily used by, or traditional to, the original inhabitants of Australia.

Where an activity disturbs an Aboriginal site or object an application for permission to disturb will need to be submitted under Section 18 of the *Aboriginal Heritage Act 1972.* Where a site of previously unknown Aboriginal heritage is to be disturbed it is advised that a detailed anthropological and archaeological heritage survey is undertaken to find if there are any sites or objects of significance in that area, as it is an offence to disturb all Aboriginal Heritage sites, even those not contained on the Aboriginal Heritage Site Register. In the event that Aboriginal archaeological or ethnographic sites are discovered during construction, there will be a need to meet the requirements of the *Aboriginal Heritage Act (1972).*

A search of the Project Area was undertaken on Department of Indigenous Affairs, Aboriginal Inquiry System. The search indicates that is 3 registered Aboriginal sites in or near the Project Area (Figure 5). The search results indicating the location of each Aboriginal heritage listed site in relation to the Project Area is provided in Table 6 .

Table 6 Listed Aboriginal Heritage Site

Site ID	Restriction	Site Name	Additional Information	Coordinates	Site No.
6572	N	Old Racecourse Camp	Camp	Not available for closed site	P06367
6573	N	Old Racecourse Ceremonial	Meeting Place Camp	Not available for closed site	P06368
6620	N	Jinta 2	Water Source	Not available for closed site	P06365

2.14.2 Non Indigenous

Database searches were undertaken to determine whether or not the Project would impact on World Heritage Sites, National Heritage Sites or Commonwealth Heritage Sites.

No non–indigenous heritage sites will impacted by the proposal.

3. Field Investigation

3.1 Physical Environment

3.1.1 2011 Climate

The Project Area received above average rainfall during June and July 2011, with a combined total of 136 mm. The long-term average for these two months is 65.7 mm. However, in August 2011, Onslow recorded a below average rainfall of 0.8 mm and the long-term average is 9.8 mm.

The above average rainfall during June and July would facilitate taxon identification as a result of a large number of flora flowering.

3.1.2 Soil and Topography

The soils observed in the Project Area corresponded with those indicated by the desktop assessment. Sandy areas with stabilised dunes were observed at the northern end of the survey area. A broad sandplain in the central portion, which was predominantly flat to gently undulating, and a rocky soils associated with low hills towards the southern end of the survey area.

Vegetation-soil relationships were broad within the Project Area, with a samphire dominated community present within the vicinity of the saline wetlands, a low heath on sand dunes, a mixed vegetation suite on the broad sandplains typically dominated by *Acacia* and *Grevillea* species and spinifex dominated vegetation on the rocky hills.

Acid Sulphate Soils

The vegetation and flora survey did not include a field assessment of the presence of acid sulphate soils. Given the high probability of the presence of soils based on the ASRIS and Shared Land Information Portal (SLIP) online mapping programs, GHD considers that such soils may occur within the vicinity of the saline lakes towards the northern end of the Project Area (Figure 4).

Given that MRWA will not be upgrading the road over causeways, no disturbance to ASS is expected.

3.1.3 Wetlands and Drainage

Saline Wetlands

A number of saline wetlands occur near the Project Area; however they will not be affected by the proposed works.

Drainage

The Project Area is free of any form of drainage and watercourses. Two undefined floodways were present towards the southern end of the Project Area, one near the Mt Minnie Station turnoff and the other associated with flow events originating from nearby hills. Neither ephemeral drainage line was considered to contain a riparian vegetation suite.

3.2 Vegetation

Surveys were undertaken in all Material Pit areas and any additional vegetation occurring outside the Material Pit areas were considered as incidentals.

3.2.1 Vegetation Type

The Project Area vegetation is dominated by *Acacia* shrublands, with different species dominant due to soil type and topography. In the southern half of the Project Area, *Acacia xiphophylla, Acacia inaequilatera* and *Acacia ancistrocarpa* are dominant. In the central portion of the Project Area, *Acacia ancistrocarpa, Acacia bivenosa* and *Acacia stellaticeps* are dominant. The dominance of *Acacias* diminishes in the northern portion of the Project Area, where degraded low shrublands and grasslands surrounding the saline lake systems and sand dunes predominate.

The series of maps in Figure 6 show the vegetation types at each of the pit locations.

The Project Area comprised of 26 vegetation types

1 Rocky Hills; Hummock Grassland of *Triodia lanigera* with Scattered Emergent Shrubs of *Acacia atkinsiana, Senna glutinosa* subsp*. pruinosa, Senna glutinosa* subsp*. chatelainiana, Indigofera georgei.*

2 Snakewood Plains; Open Shrubland of *Acacia xiphophylla, Acacia synchronicia, Acacia bivenosa,* over *Indigofera georgei* over Open Hummock Grassland of *Triodia lanigera* on stony soils.

Location: Material Pit 47.5 SLK/1, LHS 17 SLK 1/2/3, RHS 17 SLK 1/2, 17/1 SLK access track, RHS 10 SLK 1/2.

3 Floodway; Shrubland of Acacia *ancistrocarpa, Acacia inaequilatera* with emergent trees/mallees of *Corymbia candida, C. hamersleyana,* over *Acacia bivenosa, A. wanyu,* over Low Shrubland of *Bonamia erecta, Ptilotus astrolasius, Indigofera boviperda,* over Hummock Grassland of *Triodia lanigera* with Open Sedgeland of *Cyperus cunninghamii* over Open Herbland of *Mollugo molluginea, Tribulus hirsute, Boerhavia* spp.

4 Baderi Plains; High Open Shrubland of *Acacia inaequilatera, Grevillea wickhamii,* over Shrubland of *Acacia ancistrocarpa, Acacia bivenosa* with Scattered Mallees/Trees of *Corymbia zygophylla* over Low Open Shrubland of *Bonamia erecta, Indigofera boviperda, , Corchorus parviflorus, Ptilotus fusiformis*, over Hummock Grassland of *Triodia lanigera* with scattered Tussock Grasses of *Eriachne pulchella, Aristida holathera* over Very Open Herbs of *Mollugo molluginea, Tribulus hirsutus.*

Location: Material Pit 29.7 SLK, 27.5 SLK, LHS 17 SLK/3, RHS 17 SLK/1/2, 10 SLK/1/2.

5 Quartz Hills; Typically an Open Shrubland of *Senna artemisoides* subsp. *oligophylla, S. glutinosa* subsp. *pruinosa*, Over Low Open Shrubland of *Cullen lachnostachys, Indigofera monophylla*, over Hummock Grassland of *Triodia lanigera* with Scattered Tussock Grasses of *Paraneurachne muelleri, Paspalidium clementii*, Scattered Sedges of *Cyperus cunninghamii,* over *Portulaca pilosa, Goodenia microptera* on Quartz Ridges and Hills.

6 Broad Sheetwash; Low Woodland of *Corymbia hamersleyana, C. candida* over Open Scrub of *Acacia ancistrocarpa, A. tumida, A. inaequilatera* with *Grevillea wickhamii* over Low Shrubland of *Bonamia erecta, Mollugo molluginea, Indigofera boviperda* over Hummock Grassland of *Triodia*

lanigera with *Aristida holathera*, over Scattered Sedges and Herbs of *Cyperus bulbosus* and *Portulaca oleracea* associated with broad sheetwash.

Location: Material Pit 10 SLK/2.

7 Mosaic Sandplains; High Open Shrubland of *Acacia ancistrocarpa, Hakea lorea* over Shrubland *Acacia bivenosa, A. stellaticeps, Grevillea stenobotrya* with Low Open Mallee/Woodland of *Corymbia hamersleyana*, with Scattered *C. candida, Eucalyptus victrix* over Low Shrubland of *Indigofera boviperda, Bonamia erecta, Dicrastylis cordifolia, Scaevola parvifolia*, over Open Hummock Grassland of *Triodia basedowii, T. schinzii* with Scattered Tussock Grasses of *Eriachne aristidea, Aristida holathera,* over Scattered Herbs of *Goodenia microptera, Cleome uncifera.*

Location: Material Pit 35 SLK.

7a Mosaic Sandplains Dense; Dense Shrublands of *Acacia ancistrocarpa, Hakea lorea* over Shrubland *Acacia bivenosa, A. stellaticeps, Grevillea stenobotrya* with Low Open Mallee/Woodland of *Corymbia hamersleyana*, with Scattered *C. candida, Eucalyptus victrix* over Low Shrubland of *Indigofera boviperda, Bonamia erecta, Dicrastylis cordifolia, Scaevola parvifolia*, over Open Hummock Grassland of *Triodia basedowii, T. schinzii* with Scattered Tussock Grasses of *Eriachne aristidea, Aristida holathera,* over Scattered Herbs of *Goodenia microptera, Cleome uncifera.*

Location: Material Pit 47.5 SLK 1/2/3 and 17/3 SLK.

7b Mosaic Sandplains Open; High Open Shrubland of *Acacia ancistrocarpa, Hakea lorea* over Shrubland *Acacia bivenosa, A. stellaticeps, Grevillea stenobotrya* with Low Open Mallee/Woodland of *Corymbia hamersleyana*, with Scattered *C. candida, Eucalyptus victrix* over Low Shrubland of *Indigofera boviperda, Bonamia erecta, Dicrastylis cordifolia, Scaevola parvifolia*, over Open Hummock Grassland of *Triodia basedowii, T. schinzii* with Scattered Tussock Grasses of *Eriachne aristidea, Aristida holathera,* over Scattered Herbs of *Goodenia microptera, Cleome uncifera.*

47.5 SLK 1/2 and 17 SLK.

8 Dense Shrublands; High Open Shrubland of *Acacia bivenosa,* with scattered *Eucalyptus victrix* over Open Heath of *Senna artemisioides subsp. oligophylla, Acacia sclerosperma, A. tetragonophylla* over Low Open Shrubland of *Indigofera boviperda, Stemodia* sp. Onslow, *Corchorus sidioides* over Hummock Grassland of *Triodia lanigera, T. basedowii, T. schinzii* with Very Open Tussock Grassland of *Chrysopogon fallax, Eriachne aristidea, Iseilema membranaceum.*

9 Verticordia Sandhill; Shrubland of *Grevillea stenobotrya, Acacia stellaticeps, Verticordia forrestii* on Sand Dune.

10 Plains below Sand Dunes; Low Open Heath to Open Heath of *Acacia stellaticeps, A. bivenosa, Scaevola sericophylla* with Scattered emergent Shrubs to Tall Shrubs of *Santalum lanceolatum, Acacia sclerosperma, A. tumida* over Hummock Grassland of *Triodia lanigera, T. basedowii, T. schinzii* on sandplains below sand dunes.

Location: Material Pit 74.5 SLK, 65 SLK and 29 SLK.

11 Consolidated Sand Dunes; High Open Shrubland of *Grevillea eriostachya, G. stenobotrya,* over Mixed Shrubland to Low Open Shrubland of *Acacia stellaticeps, Dicrastylis cordifolia, Alyogyne*

pinoniana, Scaevola parvifolia with *Senna notabilis, Ptilotus gomphrenoides, Scaevola sericophylla* in burnt areas over Very Open Hummock Grassland of *Triodia schinzii*, with Open Tussock Grassland of *Aristida holathera* on consolidated Sand Dunes.

Location: Material Pit 70 SLK and 35 SLK.

12 Non-saline Plains; Low Open Woodland of *Eucalyptus victrix* over High Open to Open Shrubland of *Acacia sclerosperma, A. stellaticeps, A. tetragonophylla* over Low Open Shrubland of *Abutilon oxycarpum, Stemodia* sp. Onslow, *Pluchea dunlopii*, over Very Open Tussock Grassland of **Chloris virgata, Dactyloctenium radulans,* with Scattered *Triodia lanigera* over Scattered Herbs of *Bergia trimera*.

13 Saline Flats; Low Open Shrubland of *Tecticornia pruinosa, Lawrencia viridigrisea, Atriplex semilunaris,* over *Dactyloctenium radulans, *Cenchrus ciliaris, *Chloris virgata, Eragrostis dielsii* with Scattered *Triodia* spp., over Scattered Herbs of *Calotus plumulifera, Nicotiana occidentalis* on saline flats. Often in disturbed condition. May have associated bare salt scalds / salt pans adjacent.

Location: Material Pit 65 SLK.

14 Disturbed Flats/Plains; High Open Shrubland of *Acacia tetragonophylla, *Vachellia farnesiana, Sesbania cannabina,* over Open Shrubland of *Aeschynomene indica, Acacia synchronicia*, Low Open Shrubland of *Scaevola spinescens, Neptunia dimorphantha*, over Tussock Grassland of **Cenchrus ciliaris, *Cynodon dactylon* over Herbs of *Ipomoea coptica, Marsilea* sp.

15 Northern Plains; Mosaic of Vegetation Type 14 and 15. Scattered Shrubs of *Acacia tetragonophylla, A. bivenosa* over Scattered Low Shrubs of *Tecticornia pruinosa, Acacia semilunaris, Lawrencia viridigrisea, Stemodia* sp. Onslow over Hummock Grassland to Open Hummock Grassland of *Triodia lanigera* with Open Tussock Grassland of **Cenchrus ciliaris, Sorghum plumosum.*

Location: Material Pit 70 SLK, 21 SLK.

16 Open Water; Nil – open water associated with salt works, and or saline wetlands.

17 Degraded Sand Dunes; Sand Dunes within vicinity of salt works / open water, dominated by **Cenchrus ciliaris*, *Triodia lanigera*, with scattered *Acacia tetragonophylla* emergent.

18 Cleared Degraded Areas; Areas typically devoid of native vegetation, dominated by **Cenchrus ciliaris.* Landscape generally altered for development purposes. Often greatest disturbance observed along roadsides.

Location: Material Pit 74.5 SLK, 70 SLK.

19 Coastal Dunes; Scattered Shrubs of *Acacia coriacea*, over Low Open Shrubland of *Crotalaria cunninghamii, Acacia stellaticeps, Scaevola sericophylla*, *Stylosanthes hamata*, over Hummock Grassland of *Triodia lanigera*, Tussock Grassland of **Cenchrus ciliaris, Sorghum plumosum, Paspalidium jubiflorum.*

20 Spinifex on Rocky Hills; Hummock grasslands of *Triodia basedowii* with scattered emergent trees/ shrubs of Shrubland of *Codonocarpus cotinifolius, Acacia synchronica, Acacia ancistrocarpa, Acacia bivenosa, Acacia inaequilatera, Hakea chordophylla/lorea over* scattered *Senna glutinosa* subsp. *pruinosa, Ptilotus calostachyus, Ptilotus astrolasius, Mollugo molluginensi, Tussock*

grasses of *Aristida contorta, Erianchne pulchella, Aritida* longawns on lateritic low hills/ iron stone gravel.

Location: Material Pit LHS 17 SLK/1/3, RHS 10 SLK/2.

21 Open *eremophila;* Scattered shrubs of *Eremophila*, over very open to scattered *Triodia basedowii* with *Enneapogon caerulescens, Salsola* species, *Senna notabilis* with isolated emergent shrubs of *Acacia synchronicia, Acacia xiphophylla, Acacia bivenosa* on low basaltic rocky hills.

22 Shrubland on rocky hills; Shrublands of *Acacia Atkinsiana* and *Grevillea wickhamii.*

Location: Material Pit RHS 10 SLK/1/2.

23 Shrublands on rocky hills and flats; Shrublands of *Acacia Atkinsiana* and *Grevillea wickhamii.*

Location: Material Pit RHS 10 SLK.

24 Spinifex on rocky flats; Hummock grasslands of Triodia basedowii with scattered emergent trees/ shrubs of Shrubland of *Codonocarpus cotinifolius, Acacia synchronica, Acacia ancistrocarpa, Acacia bivenosa, Acacia inaequilatera, Hakea chordophylla/lorea over* scattered *Senna glutinosa* subsp. *pruinosa, Ptilotus calostachyus, Ptilotus astrolasius,Mollugo molluginensi,Tussock* grasses of *Aristida contorta, Erianchne pulchella, Aritida* longawns.

Location: Material Pit RHS 10 SLK.

3.3 Vegetation Condition

The vegetation in the Project Area was given a condition rating based on the vegetation conditions ratings scale (after Keighery, 1994). Condition is based on:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping; and
- The potential for natural or assisted regeneration.

Vegetation condition consists of six rating levels as outlined in Table 7.

Table 7 Vegetation Condition Scale (after Keighery, 1994)

Assigned Number	Classification	Description
1	*Pristine*	No obvious signs of disturbance.
2	*Excellent*	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	*Very Good*	Vegetation structure altered obvious signs of disturbance.
4	*Good*	Vegetation structure significantly altered by very obvious signs of multiple disturbance retains basic vegetation structure or ability to regenerate it.
5	*Degraded*	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good

Assigned Number	Classification	Description
		condition without intensive management.
6	*Completely Degraded*	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

The vegetation condition in the northern extent in Material Pit 70 SLK of the Project Area was good to degraded. The remaining Material Pits were observed to have good to very good vegetation condition.

3.4 Flora

The field survey was conducted in September 2011 during Spring. This maximised the chance for recording and identifying annual taxa. During this period of the year the majority of plants in the area are flowering, fruiting and have foliage (EPA, 2004a). The survey was undertaken by an experienced GHD botanist, Joshua Foster.

3.4.1 Flora Records

Results from the field survey revealed a total of 148 taxon from 36 families (Table 18) are contained within Appendix C.

The dominant families that were recorded during the field survey include:

- Fabaceae (peas, wattles): 31 taxa;
- Poaceae (grasses): 21 taxa;
- Malvaceae (hibiscuses): 11 taxa;
- Amaranthaceae (Amaranth Family) 11 taxa;
- Goodeniaceae (Leschenaultia Family) 8 taxa; and
- Chenopodiaceae (chenopods): 7 taxa.

Dominant genera recorded from the survey included:

- *Acacia* (wattles): 14 taxa;
- *Ptilotus* (mulla-mullas): 9 taxa; and
- *Senna* (cassias): 4 taxa.

3.5 Priority Flora

Two Priority 3 flora species were recorded from the Project Area:

- *Triumfetta echinata;*
- *Eremophila forrestii* subsp. *viridis.*

Table 8 Priority Flora

Genus	Species	Status	Easting	Northing
Triumfetta	*echinata*	P3	302094	7591544
Triumfetta	*echinata*	P3	302154	7591541
Eremophila	*forrestii* subsp. *viridis*	P3	345230	7559792
Eremophila	*forrestii* subsp. *viridis*	P3	345251	7559811
Eremophila	*forrestii* subsp. *viridis*	P3	345332	7559656
Eremophila	*forrestii* subsp. *viridis*	P3	345351	7559490

Triumfetta echinata (Priority 3) is a low shrub growing to 0.3 m high, occurring on red sandy soils associated with sand dunes. Previously GHD (2011) has recorded 67 individual plants of this taxon occurring in 16 locations.

In September 2011 GHD recorded this species at 10 SLK within Pit 1. Plants and fruit were identified in at three separate locations (Figure 7).

Plate 1. *Triumfetta echinata*

Eremophila forrestii subsp. *viridis* (Priority 3) is described as a much-branched shrub growing approximately one metre tall, with pink-cream flowers in August. According to *FloraBase*, there are two disjunct known locations – one on the Onslow Road, and one along the Canning Stock Route. Chinnock (2007) indicates that this taxon occurs on sandplain and *Triodia* grasslands.

Within the Project Area this taxon was recorded from one location. The plants were occurring within 10 SLK RHS Pit 1 (Figure 7).

Plate 2. *Eremophila forrestii* subsp *viridis*

3.5.1 Other Significant Flora

Significant flora may include habitat of rare, uncommon or restricted flora species and/or species outside or at the limit of their range.

Within the Project Area a total of six flora taxa were recorded, three of which were recorded beyond their currently known range (Table 9). Range extensions varied from a small 50 km extension, to 200 km. All range extension taxa Priority 3 mentioned in section 3.5 are widespread and not considered to be under threat. One species, *Keraudrenia nephrosperma*, was recorded at the north-western margin of its known range.

Table 9 Native Flora taxa Recorded from the Onslow Material Pit Project Area at the Limit of their Known Range and/or Exhibiting a Range Extension

Genus	Species	Status	Extension	Location	Northing	Easting
Keraudrenia	*nephrosperma*	NW margin of known range		Pit 21		
Acacia	*wiseana*	RE	125 km NE from Giralia Station	Incidental	308281	7582381
Alysicarpus	*muelleri*	RE	130 km W from NWCH crossing of Fitzroy River. First record in Carnarvon IBRA region	Incidental	304675	7603429

3.5.2 Weeds and Introduced Flora

A total of two exotic plant taxon were identified, including **Cenchrus ciliaris* (Buffel Grass) and *Portulaca oleracea* (Purslane). *Cenchrus ciliaris* appeared as the most dominant weed species and this is most likely due to existing pastoral land within the region.

Environmental Weed Rating

Environmental weeds are plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade. Many environmental weeds are successfully invading Western Australian ecosystems. Some of these weed species are having a significant impact on biological diversity at genetic, species and community levels.

In developing the Environmental Weed Strategy for Western Australia (EWSWA, 1999), criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity were formulated. Three criteria were selected to rate weeds. These were:

- Invasiveness,
- Distribution, and
- Environmental impacts.

A list of 1350 weeds were rated as either high, moderate, mild or low against these criteria. Thirty four weed species were rated as high.

One of the weed species recorded from the Project Area, *Portulaca oleracea,* did not have an Environmental Weed Rating (EWR). This is due to the fact that taxonomic studies have only recently indicated that this species is exotic to Western Australia.

Table 10 Weed Species Recorded from their Project Area and their Environmental Weed Rating

Genus	Species	Common Name	Rating
Cenchrus	*ciliaris*	Buffel Grass	High
Portulaca	*oleracea*	Purslane	-

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WONS) is based on four major criteria:

- Invasiveness;
- Impacts;
- Potential for spread; and
- Socio-economic and environmental values.

No WONS were recorded from the Project Area.

Declared Plants (DP)

Weeds that are, or may become, a problem to agriculture or the environment can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976* (ARRP Act). The Department of Agriculture and Food (DAFWA) and the Agriculture Protection Board maintains a list of Declared Plants for Western Australia. If a plant is declared for the whole of the State or for particular Local Government areas all landholders are obliged to comply with the specific category of control. Declarations specify a category, or categories, for each plant according to the control strategies or objectives which the Agriculture Protection Board believes are appropriate in a particular place.

Among the factors considered in categorising Declared Plants are:

- The impact of the plant on individuals, agricultural production and the community in general;
- Whether it is already established in the area; and
- The feasibility and cost of possible control measures.

These Declared Plants are divided into five classes, which are detailed in Table 11.

Table 11 Department of Agriculture and Food Declared Plant Control Classes

Priority Class	Description
P1	Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P2	Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3	Control infestation in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants.
P4	Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.
P5	Infestations on public lands must be controlled.

No Declared Plants pursuant to the ARRP Act were recorded from the Project Area.

Weed Spread

Weed species within the Project Area are not considered have an impact on the status of weeds in the local area. This is due to the fact that weed species are considered to be common in the local and regional area as a result of disturbance from the clearing of the existing material test pits located along Onslow road and associated pastoral activities on the adjacent Stations.

3.6 Fauna

3.6.1 Fauna Records

A Level 1 fauna field assessment was conducted in conjunction with the flora survey over five days. The fauna survey was limited to daylight hours and only examined terrestrial animals occurring within the Project Areas. A total of 23 birds, three mammals and one reptile were identified. Of the 25 fauna identified four were introduced.

3.6.2 Threatened and Priority Fauna Assessment

There were no threatened fauna identified within the survey, however the field investigations have identified two declared priority species as occurring within the area:

- Grey Falcon (*Falco hypoleucos* – Priority 4);
- Australian Bustard (*Ardeotis australis* – Priority 4).

The desktop assessment indicated that number of protected fauna may occur within the Study Area (Table 5). The requirements for preferred habitat and the likelihood of these species occurring are as follows:

Australian Bustard (*Ardeotis australis*) Priority 4 [DEC Act]

The Australian Bustard is widespread throughout northern Australia and but less prevalent in some areas of south-eastern of Australia. They occur in grasslands, woodlands and open agricultural country. The Australian Bustards forages on seeds and fruit. It also preys on centipedes, insects, molluscs, lizards, young birds and small rodents (Wikipedia, 2011b).

Assessment: There is a high probability of this occurring within the Study Area, because the habitat is suitable for the Australian Bustard as some of the habitats occurring in the Study Area comprised of grasslands, woodland and open agriculture country. One observation was made of the Australian Bustard during the field survey. However, because this species is highly mobile it is unlikely for it to be impacted by the proposed works.

Barn Swallow (*Hirundo rustica*) Listed Migratory Terrestrial, Marine [EPBC Act]; Schedule 3 Migratory [WC Act]

The Barn Swallow is migratory species that widespread in the Pilbara to the Kimberly bioregion. It occurs in open country comprising of low vegetation mainly pastures, meadows and farmlands. This species nests in culverts, stables and barns.

Assessment: There is a low probability of the Barn Swallow with Study area because it does not comprise of the appropriate habitat. There is a high probability of the species flying over the area. This species is considered unlikely to be impacted by the proposed works.

Black-winged Stilt (*Himantopus Himantopus)*, Marine (EPBC)

The Black-winged Stilt is distributed across the coastal areas of Western Australia. It occurs in flooded paddocks, lagoons, lake, marsh, riparian vegetation and swamps (DEWHA, 2009).

Assessment: It is likely for this species to occur within the northern extent of the Project Area. However, because this species is highly mobile it is unlikely for it to be impacted by the proposed works.

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Schedule 1 [WC Act]

Carnaby's Cockatoo occurs in remnant native eucalyptus woodlands, comprising salmon gum and Wandoo. It also inhabits shrubland or kwongan heathland dominated by Hakea, Banksia and Grevillea species (DEWHA, 2009).

Assessment: It is unlikely for the Carnaby's Cockatoo to occur within the Study Area because no records exist of reported sightings. Furthermore the vegetation type occurring creates an unsuitable habitat for the Carnaby's Cockatoo to occur. The species may fly over over the area, but this probability is low as there are no records of reported sightings. This species is considered unlikely to be impacted by the proposed works.

Cattle Egret (*Adrea ibis*) Listed Migratory, Migratory Wetland [EPBC Act]

The Cattle Egret is a migratory species which is widespread across Western Australia and occurs in tropical, temperate grasslands, woodlands and terrestrial wetlands. It is also associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer.

Assessment: There is a low probability of the Cattle Egret occurring within the Study Area. The most likely place for them to occur is at the Western extent of the Study Area, however there is a high level of disturbances due to the road. There is a high probability of the species flying over the area. This species is considered unlikely to be impacted by the proposed works.

Eastern Curlew (*Numenius madagascariensis*) Schedule 3, Listed Migratory [WC Act]; Priority 4 [DEC Act]

The Eastern Curlew is distributed along the coastal areas of Western Australia, extending from Stokes Inlet to Peel Inlet. Records indicate that they have been sighted on the Houtman Abrolhos and adjacent mainland. It also occurs in and around Shark Bay.

Assessment: It is unlikely for the Eastern Curlew to occur within the Study Area due to the high level of disturbances associated with urban development (township of Onslow), Onslow Road and agriculture. Furthermore, there are no recent and historical records to indicate that they have occurred within the area. This species is considered unlikely to be impacted by the proposed works.

Fork-tailed Swift (*Apus Pacificus*) Listed Migratory, Marine [EPBC Act]; Listed Migratory, Schedule 3 [DEC Act]

The Fork-tailed Swift occurs along the coast from south-west Pilbara to Kimberley region. It also occurs in the eastern area of the Kimberly near Wyndham. There are also sparsely scattered inland records within the Wheatbelt region, between Lake Annean and Wittenoom.

This species occurs over inland plains and sometimes on foothills of coastal areas. These areas comprise of dry or open vegetation, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. This species' diet mainly comprises of insects (DEWHA, 2009).

Assessment: There is a high probability of the Fork-tailed Swift occurring within the Study Area as the appropriate vegetation type exists. Furthermore, the species may flyover over the area as records of reported sightings exist. However, because this species is highly mobile it is unlikely for it to be impacted by the proposed works.

Great Egret (*Adrea alba*) Listed Migratory, Marine, Migratory Wetland [EPBC Act]

The Great Egret is widespread across Western Australia, except in the central south-east. This species occurs in wetland areas such as swamps and marshes, rivers banks and lakes, seasonal flooded grasslands, pastures or agricultural lands, water catchments, sewerage treatment ponds. They have also been sighted in drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, mangroves, coastal lagoons and offshore reefs. This species' diet comprises of fish, insects, crustaceans, molluscs, frogs, lizards, snakes, small bird and mammals (DEWHA, 2009).

Assessment: There is a low probability of the Great Egret occurring within the Study Area. The most likely place for them to occur is at the Western extent of the Study Area, however there is a high level of disturbances due to the road. There is a high probability of the species flying over the area. This species is considered unlikely to be impacted by the proposed works.

Grey Falcon (*Falco hypoleucos)* Priority 4 DEC Act

The Grey Falcon occurs in central and northern Western Australia. It inhabits arid inland areas, open country, comprising of *Triodia* grasslands, *Acacia* shrublands and sparse arid woodlands. This species' diet consists of birds such as parrots, small mammals, reptiles and insects.

Assessment: There is a high probability of this species occurring within the Study Area because it has been sighted flying over the area. However, because this species is highly mobile it is unlikely for it to be impacted by the proposed works.

Malleefowl (*Leipo ocellata*) Schedule 1 [WC Act]; Listed Vulnerable [DEC Act]

The Malleefowl is generally occurs in semi-arid areas of Western Australia, from Carnarvon to south east of the Eyre Bird Observatory (south-east Western Australia). It inhabits areas of eucalypt or native pine, *Callitris* woodlands, acacia shrublands, Broombush *Melaleuca uncinata* vegetation or coastal heathlands. The Malleefowl mainly forages on seed, plants (flowers, fruits and foliage), small invertebrates, fungi, lerps (sugary substances release from a psyllid insect).

Assessment: It is unlikely for Malleefowl to occur within the Study Area due to the high levels of disturbances in the adjacent urban development (Onslow). There are no known records to indicate that the Malleefowl has occurred within the Study Area. This species is considered unlikely to be impacted by the proposed works.

Mulgara (*Dasycercus cristicauda*) Listed Vulnerable [EPBC Act]; Schedule 1 [WC Act]; Listed Vulnerable [DEC Act]

The Mulgara occurs in the arid sandy regions of Australia, mostly living in burrow on the flats between low sand-dunes of central Australia. The Mulgara preys on insects, other arthropods and small vertebrates (Strahan, 2004).

Assessment: It is unlikely for the Mulgara to occur within the Study Area, as the vegetation type and geology of the area is unsuitable for breeding or refuge. Furthermore, it is unlikely to occur due to the high levels of disturbances in the adjacent urban development (Onslow). This species is considered unlikely to be impacted by the proposed works.

Northern Quoll (*Dasyurus hallucatus*) Listed Endangered [EPBC Act]; Schedule 1 [WC Act]; Listed Endangered [DEC Act]

The Northern Quoll occurs north of Shark Bay, mainly within the Pilbara region, with some isolated population existing within the Kimberly Region. Within the Pilbara bioregion they are distributed across the four subregions, the Hamersley, Fortescue Plains, Chichester and Roebourne Plains, although recent records indicate that they occur as far south as Karijini National Park. Within the Pilbara, Northern Quoll generally inhabits rocky areas surrounded by low heath and shrublands. The rocky habitats are generally elevated from the ground. The Northern Quoll preys on insects and anthropods, sometimes they have even been known to scavenge on waste of human origin (i.e. food scraps), along with preying on vertebrates such as bandicoots, sugar gliders, brush-tailed possums, rats and some bird species. They also forage on plants, in particular wild grape *Ampelloccissus acetose* (DEWHA, 2009).

Assessment: There is a low probability for the Northern Quoll to occur within the Study Area. However it may only be isolated to one area of the Study Area which comprises of the most suitable habitat type for refuge and breeding. Vegetation Type 1 contains the appropriate habitat characteristic suitable for the Northern Quoll.

Olive Python [Pilbara subspecies] (*Liasis olivaceus* subsp. *barroni*) Listed Vulnerable [EPBC Act]

The Olive Python (Pilbara) occurs in the in the Hamersley Range and islands of the Dampier Archipelago within the Pilbara region. Recent records indicate that it has been sighted at Pardoo Iron Ore Shipping facility within the Pilbara. This species usually occurs within escarpments, gorges and water holes. The Olive Python (Pilbara) diet consist of rock wallabies, euros, fruit bats, ducks, corellas, spinifex pigeons, coucals, small reptiles and frogs (DEWHA, 2009).

Assessment: It is unlikely for the Olive Python (Pilbara) to occur within the Study Area because it does not comprise of the appropriate habitat suitable for breeding and refuge. This species is considered unlikely to be impacted by the proposed works.

Oriental Plover (*Charadrius veredus*) Listed Migratory Wetland, Marine [EPBC Act]; Schedule 3 Migratory [WC Act]

The Oriental Plover is a migratory species that occurs across northern and south-eastern Western Australia. They inhabit flat, open, semi-arid or arid grasslands where the grass is short and sparse, and interspersed with hard, bare ground. This includes claypans, dry paddocks, playing fields, lawns and cattle camps, along with open areas that have been recently burnt. This species' diet mainly comprises of insects, including termites, beetles, grasshoppers, crickets and bugs.

Assessment: It is unlikely for the Oriental Plover to occur within the Study Area due to the high level of disturbances associated with the Onslow Road. However, there is a high probability for this species to fly over the Study Area.

Oriental Pratincole (*Glareola maldivarum*) Listed Migratory Wetland, Marine [EPBC Act]; Schedule 3 Migratory

The Oriental Pratincole is migratory species that occurs in Northern and in isolated areas along the south west areas of Western Australia. It occurs in open plains, floodplains or short grassland. They are often commonly associated with terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands (reservoirs, saltworks and sewage farms). This species' diet consist of insects, including dragonflies, cicadas, beetles, moths, ants, termites, locusts, grasshoppers, flies, bees and wasps.

Assessment: There is a low probability for the Oriental Pratincole to occur within the Study Area because the habitat type present is suitable for refuge. There is a high probability for this species to fly over the Study Area.

Peregrine Falcon (*Falco peregrinus*) Schedule 4 [WC Act]; Listed Protected [DEC Act]

The Peregrine Falcon is widespread across Western Australia. They inhabit coastal areas and arid environments (Barrett *et. al.* 2003). Its diet consists of small birds, mammals, reptiles and sometimes insects (Wikipedia, 2011a).

Assessment: It is unlikely for the Peregrine Falcon to occur within the Study Area because the only known associated habitat type that exist occurs within an area of high disturbances. There is a low probability to observe the species flying over the Study Area. This species is considered unlikely to be impacted by the proposed works.

Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) Listed Vulnerable [EPBC Act]

The Pilbara Leaf-nosed Bat occurs within the Pilbara bio-region and has been recorded in three distinct areas, including within the mines of the eastern Pilbara and south of the Hamersley Range in small colonies. They generally inhabit caves or old mine shafts throughout the Pilbara (DEWHA, 2009).

Assessment: It is unlikely for the Pilbara Leaf-nosed Bat to occur within the Study Area because the habitat type is not suitable for refuge or breeding. There is a probability of this species flying over the area, as recent records indicate that they have been sighted within the area. This species is considered unlikely to be impacted by the proposed works.

Rainbow Bee-eater (*Merops ornatus*) Listed Migratory Terrestrial, Marine [EPBC Act]; Schedule 3 Migratory [WC Act]

The Rainbow Bee-eater is a migratory species that is widespread across Western Australia. This species occurs in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and developed areas. This species' diet mainly comprises of insects such as beetles, moths, butterflies, damselflies, dragonflies, flies, ants and bugs. Furthermore, it also forages in and around beehives (DEWHA, 2009).

Assessment: There is a low probability for the Rainbow Bee-eater to occur within the Study Area because of a high level of disturbances associated with traffic on the Onslow Rd. There is a high probability for this species to fly over the Study Area because during migration they have been recorded flying over non-preferred habitats such as treeless plains (DEWHA, 2009). An observation was made during the September 2011 survey.

Short-tailed Mouse (*Leggadina lakedownensis*) Priority 4 [DEC Act]

The Short-tailed mouse occurs in inland Western Australia in areas of tussock grasslands and low chenopod shrublands on plains with loam, clay or stony soils. It is occasionally found in mulga woodlands, spinifex grasslands, rocky hills and sand-dune environments. The Short-tailed Mouse diet comprises of seeds, anthropods and green vegetation (Strahan, 2004).

Assessment: It is unlikely for the Short-tailed Mouse to occur within the Study Area due to the high level of disturbances associated with urban development (township of Onslow), Onslow Road and agriculture. This species is considered unlikely to be impacted by the proposed works.

Southern Giant-Petrel (*Macronectes giganteus)* Listed Endangered, Marine, Migratory [EPBC Act]; Schedule 1 [WC Act]

The Southern Giant-Petrel is a migratory species which breeds on sub-Antarctic and Antarctic islands. It disperses widely during the Antarctic winter and can be found off South America, South Africa, Australia and New Zealand. They are a marine species. Their majority of their feeding is done at the ocean surface however they will occasionally dive for food (DEWHA, 2009).

Assessment: It is unlikely for the Southern Giant-Petrel to occur within the Study Area because it does not comprise of the appropriate habitat. There is a low probability to observe this species flying over the Study Area. This species is considered unlikely to be impacted by the proposed works.

Western Pebble-mound Mouse (*Pseudomys chapmani*) Priority 4 [DEC Act]

The Western Pebble-mount Mouse occurs west of the Pilbara and eastwards to the Rudall River. They also occur in coastal ranges in the Pilbara, Gascoyne and Murchison region as there is presence of abandoned mounds. The Western Pebble-mount Mouse inhabits areas comprising Snappy Gums or Bloodwoods over a sparse scatter of shrubs, typically *Cassia*, *Acacia* and *Ptilotus*. They are ground nesting mammal and generally construct their nest on the lower slope of a rocky hill (Strahan, 2004).

Assessment: It is unlikely for the Western Pebble-mound Mouse to occur within the Study Area due to the high level of disturbances associated with urban development (township of Onslow), Onslow Road and agriculture. Furthermore, the Study Area does not comprise of the appropriate habitat type suitable for breeding or refuge. This species is considered unlikely to be impacted by the proposed works.

Whistling Kite (*Haliastur sphenurus)* Marine [EPBC Act]

The Whistling Kite is a marine species distributed along the coast of Western Australia. This species occurs in open or lightly wooded areas. It preys on small mammals, birds, fish, reptiles, amphibians, crustaceans, insects and animal carcasses.

Assessment: There is a high probability for this species to occur within the Project Area. GHD (2011) sighted this species within the Project Area. However, this species is highly mobile and is unlikely to be impacted by the proposed works.

White-bellied Sea-Eagle (*Haliacetus leucogaster*) Listed Migratory Terrestrial, Marine [EPBC Act]

The White-bellied Sea-Eagle is a migratory species are widespread along the coastal areas of Western Australia. They occur on coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even sometimes developed areas. They have been sighted within the vicinity of freshwater swamps, lakes, reservoirs, billabongs, and saltmarsh and sewage ponds. This species' diet comprises of fish, birds, reptiles, mammals and crustaceans, carrion and offal.

Assessment: There is a low probability for the White-bellied Sea-Eagle to occur within the Study Area because of the high level of disturbances as result of Onslow Road. There is a high probability for the species to fly over the area. This species is considered unlikely to be impacted by the proposed works.

3.6.3 Exotic Fauna

Field Investigation Assessment

From the field investigation four exotic fauna were recorded:

- Cattle;
- Feral Goats;
- Horse;
- Domestic Cats.

3.6.4 Habitat Value

The vegetation in the northern extent in Material Pit 70 SLK of the project area was *Good* to *Degraded*. The remaining material pits were observed to have *Good* to *Very Good* vegetation condition. Disturbance appears to be limited to the maintenance zone of the road, side access tracks and parking bays.

The amount of clearing (i.e. ~7.5 ha) is not considered to impact on the habitat value of the project area.

3.6.5 Fauna Habitat Types

The dominant habitat types located at the Project Area is likely to be:

- Saline Wetlands;
- Sand dunes;
- Sand plains closed scrub;
- Sand plains closed acacia scrub.

3.6.6 Habitat Linkage

Habitat linkages are important as it provides fauna as a means of moving between areas. Furthermore such linkage also provides a habitat for all ground and aerial fauna for resting and reproduction. It is important to maintain these habitat linkages in areas where extensive clearing has occurred.

Some of the project area comprises of unaltered vegetation that may be potentially important for maintaining the biodiversity within the region. However, MRWA advises that approximately 7.5 ha of vegetation will be impacted by the proposal.

4. Assessment Against the Department of Environment and Conservation's Ten Clearing Principles

Appendix D assesses the project again the DEC's Ten Clearing Principles.

Assuming no priority species are impacted by the proposal, variance with the clearing principles is not expected.

5. Environmental Aspects

Environmental aspects considered for the project are outlined in Table 12.

Table 12 Environmental Aspects Considered for the Project

Environmental Aspects	Yes	No	Comments
Biophysical			
Vegetation - Clearing	√		Vegetation clearing has been assessed using the 10 Clearing Principles. Note that MRWA advises that approximately 10 ha of vegetation is proposed to be cleared.
Vegetation - threatened species and communities	√		Threatened species and communities have been assessed within section 2.8 and 3.4.
Vegetation-Weeds	√		Weeds occurring within the area have assessed in section 3.5.2.
Vegetation-dieback and other diseases or pathogens		√	Dieback and other disease or pathogens were not considered for this project. Section 2.11, assesses the likelihood of these occurring.
Fauna	√		Fauna occurring within the area were assessed in section 3.6. The fauna identified during the field survey and habitats that they are likely to occur in were assessed against the 10 Clearing Principles.
Surface Waters / Drainage (watercourses, erosion, stormwater, disposal, water quality, salinity)	√		Surface water and drainage were assessed in section 2.7 and 3.1.3.
Wetlands	√		Wetlands were assessed within section 2.7 and it was determine that no wetland occur within the vicinity of the material test pits.
Groundwater		√	No impacts are expected.
Public Drinking Water Supply	√		No Public Drinking water supply occurs within the vicinity of the Material test pits.
Reserve and Conservation Areas		√	No conservation areas will be impacted by the proposal.
Acid Sulphate Soil	√		Acid Sulphates soils were assessed within section 2.5. Although no field investigation was undertaken and as a result it recommended that one is to be undertaken indicates that to the west of the study area SLK 74.5, there is a high potential for ASS.

Environmental Aspects	Yes	No	Comments
Pollution	√		
Air Quality		√	The air quality for the proposed works is not likely to have an impact, because they occur away from the township of Onslow.
Dust	√		Refer to Section 6.
Noise and Vibration		√	Noise and vibration for the proposed works is not likely to have an impact, because they occur away from the township of Onslow.
Contaminated Sites	√		Contaminated sites were assessed in section 2.13.
Use of Hazardous Substances	√		Refer to Section 6.
Social Surroundings			Not applicable
European Heritage	√		Not applicable
Aboriginal Heritage	√		Material Pit 70 occurring towards the western area of the Project Areas occurs within two listed Aboriginal Heritage sites (Figure 4). Consequently this breaches of the *Aboriginal Heritage Act 1972*.
Visual Impacts	√		Refer to Section 6.
EPA Assessment Against the Ten Clearing Principles	√		Refer to Section 4 and Appendix D.

6. Potential Impacts and Management

There are a number of potential impacts associated with construction of the Project. This Section details the environmental impacts and management measures for those aspects considered relevant for the Project, as identified in Section 5.

A summary of the management actions forming the Environmental Management Plan is contained within Appendix E.

6.1 Native Vegetation Clearing

Area of Assessment

Material pit investigation areas.

Method of evaluation

The purpose of the EPA it to ensure levels of abundances, diversity and productivity of flora species is maintained or either adverse impacts are management in an appropriate in accordance of Schedule 5 of the *Environmental Protection Act's 2003* 10 Clearing Principles Appendix D.

Extent of Potential Impact

The potential impact of native vegetation clearing includes all proposed material pit areas.

Proposed Management

Main Roads will manage clearing in the following manner to ensure clearing and disturbance of vegetation for the proposed Project is minimised:

- The areas to be cleared will be minimised by preferentially using areas of existing disturbance, including existing access tracks and former material pit areas;
- Areas to be cleared will be pegged prior to commencing earthworks;
- No vegetation outside the designated areas will be removed during earthworks, construction or operation;
- Earthmoving equipment will be cleaned of soil and vegetation prior to entering and leaving the area to be cleared;
- Avoid impacting areas of variable vegetation, such as vegetation along creek lines, rock outcrops and breakaways as these areas generally tend to have higher biodiversity values and are of value as fauna habitat;
- Vehicle parking and temporary materials storage will be located on existing cleared areas where possible;
- Once the pits are exhausted, the disturbed areas will be rehabilitated as soon as possible;
- Material cleared will be utilised in rehabilitation works where practicable;
- Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared;

- If movement of soil will be avoided in wet conditions imported soils and materials are to be used, they will be weed free;
- Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared;
- Cleared vegetation (including stubble) will be used in site rehabilitation and erosion control where practical;
- Cleared vegetation (or stubble) will not be burnt on-site;
- Stripped topsoil will be salvaged for use in site rehabilitation if required; and
- Materials and topsoil stockpiles will be located so as not to restrict or interfere with existing site drainage.

6.2 Weed Management

Area of Assessment

Material pits.

Extent of Potential Impact

There is a risk of spreading weed species during construction works. This will be managed through clearing vehicles and machinery of soil and vegetative material and also ensuring that any introduced materials are free from environmental or noxious weeds.

Proposed Management

The following management actions will be adhered to:

- Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared;
- Movement of soil will be avoided in wet conditions;
- If imported soils and materials are to be used, they will be weed free;
- Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared; and
- Any declared flora species located in the area will be controlled in accordance with sections 49 and 51 of the *agriculture and related resources protection act* 1976.

6.3 Fauna

Area of Assessment

Material pits.

Extent of Potential Impact

Impacts are likely to occur to individual animals and include:

- Minor loss of habitat and feeding areas. This is not considered to be a substantial impact on the current extent of habitat. There will be a minor loss of refuge vegetation and associated foraging resources.

- The harm/death/displacement of fauna may likely occur during material pit exploration.

Proposed Management

Main Roads will manage the Project in the following manner to protect the local fauna during clearing and operation of the Project works:

- Meet all requirements of the *Wildlife Conservation Act* (1950);
- Clearing will be undertaken as outlined in Section 6.1;
- Noise and vibration will be managed as outlined in Section 6.7;
- Works will cease on sighting an animal which might be at risk of injury in the Project Area. Works will recommence once the animal has moved on;
- The work site will be left in a safe condition at the end of each working day to ensure animals are not subject to harm from the project works;
- During construction works the area will be inspected each morning to ensure no fauna have been trapped during the previous evening. A Regional DEC Officer or designated representative will be contacted to facilitate removal if necessary;
- No native fauna (including venomous snakes) will be deliberately impaired or killed during project works;
- Where possible, clearing will be undertaken at a time of year that is least likely to impact on breeding or nesting species (i.e. Avoid clearing from late in the wet season to the early dry season);
- Barriers to native fauna movement will be minimised;
- Ensure material pits are left hydrologically neutral to prevent water pooling which may enhance the success of feral fauna species;
- Laydown areas will be constructed on previously disturbed areas; and
- The movement of machinery and vehicles will be minimised or restricted at dusk and dawn and during night-time hours.

6.4 Surface Waters / Drainage

Relevant Area

Material pits.

Extent of Potential Impact

Drainage impacts during construction works are issues in respect to maintaining existing surface water flows. The Project works will alter the local hydrological regime through the following impacts:

- There are minor risks of erosion in the pit areas;
- Pit excavation has the potential to create temporary pools following rainfall;
- Alteration to natural surface water drainage may occur;.**proposed management**

In order to mitigate any drainage impacts that may occur, the following management measures will be initiated:

- No construction works will occur within 50 m of any water body;

- No hazardous materials will be used or held on-site within 50 m of any water body;
- Existing natural drainage paths and drainage channels along road reserves will not be unnecessarily blocked or restricted by material stockpiles;
- Any material that is found to block drainage will be removed.

6.5 Groundwater

Relevant Area

Material pits.

Extent of Potential Impact

The following are potential impacts to groundwater:

- Groundwater quality could be degraded by pollutants entering the soil;
- Unsustainable use of groundwater.

Proposed Management

Construction of bores and abstraction of groundwater or surface water will require a 26D Licence under the *Rights in Water and Irrigation Act 1914*.

The Construction Contractor is responsible for the supply and delivery of water required for the Project. The Construction Contractor (subject to the approval of the Superintendent) is also responsible for ensuring that all water abstraction and use is licensed and all approvals have been obtained.

Main Roads will ensure adhere to the following management practices to prevent contamination of the groundwater resources in the Project Area:

- In the event that hazardous materials are to be used or held on-site, materials will be managed in accordance with Main Roads' safety procedures;
- No vehicles will be serviced or refuelled on the site;
- A 'Spill Kit' will be provided on-site at all times;
- The site spill response plan will be implemented to deal with spillages and leaks within the site area. This plan provides details on methods of containment, collection and disposal, and training of personnel;
- Any accidental spillage will be reported to the contracting manager and emergency clean-up procedures will be immediately implemented. These procedures will include the control of any spilt material and removal of contaminated soil to an approved site if required; and
- Liaise and gain relevant abstraction licences from the Department of Water.

6.6 Dust

Relevant Area

Material pits.

Extent of Potential Impact

Dust may be generated from the clearing of vegetation, earthworks, spillage of soil material and vehicle movements along sealed and unsealed roads.

There is likely to be some dust lift generated during the construction works and from passing traffic, which has the potential to settle on and cause impacts to adjacent vegetation and residential premises.

Proposed Management

During vegetation clearing of the access track, regular watering of the road will be undertaken to minimise dust emissions. The Construction Contractor will provide for the management of dust by watering of the works area and other areas immediately adjacent to the works as required.

Where it is found that vehicles leaving the Site have dropped excessive soil material onto adjacent existing sections of Onslow Road, these sections will be swept to reduce the potential for dust generation and maintain traffic safety.

The following methods of dust management will be used:

- Water tankers will be available at all times to wet down exposed surfaces on works areas, laydown sites, spoil dumps and topsoil and materials heaps;
- Minimise as far as possible dust generating activities;
- Dust lift will be monitored through visual and other means and all complaints responded to rapidly; and
- Staged vegetation clearing will be undertaken to reduce dust generation.

6.7 Noise and Vibration

Relevant Area

Material pits.

Extent of Potential Impact

Machinery and vehicles during the construction and operational phases of the Project will emit some noise. However the noise impact is considered minimal.

Proposed Management

In order to control noise emissions in the Project Area, the following site actions will be undertaken:

- All equipment will be regularly maintained and serviced, including exhaust systems; and
- Plant and equipment will only be operated in accordance with shire of ashburton requirements.

6.8 Use of Hazardous Substances

Relevant Area

Material pit investigation areas.

Extent of Potential Impact

There is potential for vehicle fuels leaks / spills during any of the operating procedures associated with material pit construction; and

There is risk of soil contamination resulting from any spills.

Proposed Management

The following management actions will be the responsibility of Main Roads. Overall site management will include the following:

- Any accidental spillage will be reported to the contracting manager as soon as practicable;
- Emergency clean-up procedures will be immediately implemented in the case of any spillage. These will include control of spilled material and removal of contaminated soil to an approved site if required;
- No light vehicles will be serviced or refuelled on the site;
- Larger plant machinery will be serviced off-site; and
- A 'spill kit' will be provided on-site at all times.

6.9 Aboriginal Heritage

Relevant Area

Material pits.

Extent of Potential Impact

Material pit SLK 70 occurs within a listed Aboriginal Heritage Site.

Proposed Management

Main Roads and their contractors will be aware of their obligations under the *Aboriginal Heritage Act 1972* during the Project works.

If, during Project works, the Construction Contractor uncovers any materials that could be considered significant to Aboriginal people, Main Roads will:

- Immediately cease works within 50 m of the material and notify DIA immediately;
- If any human skeletal material is uncovered, work shall cease within 20 m of the material and it shall be reported to the WA Police as soon as possible;

Approval needed

MRWA will be required to obtain a Section 18 Clearance pursuant to the *Aboriginal Act* 1972 prior to work at SLK 70.

6.10 Visual Impacts

Relevant Area

Material pit.

Extent of Potential Impact

Material pits occurring close to the road have the potential to cause a decrease in visual amenity for road users.

Proposed Management

To minimise the longer-term visual impact the following should occur:

- No spoil heaps or other materials will be left in view of the road;
- Rehabilitation will be carried out as soon as possible following completion of works in each area.

6.11 Inductions and Training

Relevant Area

Project area.

Extent of Potential Impact

Project area.

Proposed Management

The following management actions will be adhered to:

- Construction personnel should be made aware of the issues and actions in this Management Plan so that they do not unnecessarily damage the environment during the works phase;
- Emergency training in relation to fires, chemical spills or other risks shall be carried out early in the construction phase.

6.12 Complaints Handling Procedure and Register

Relevant Area

Project area.

Extent of Potential Impact

Project area.

Proposed Management

The following management actions will be adhered to:

- Any complaints received relating to the project will be notified to the site representative and MRWA representatives notified.

6.13 Management of Environmental Incidents

Relevant Area

Project area.

Extent of Potential Impact

Project area.

Proposed Management

The following management actions will be adhered to:

- Structure and content of incident reports;

- Reporting of the incident in an incident log;
- Time limits for incident reporting and response;
- Assessment of the significance of each incident;
- Discontinuation of the work which gave rise to the incident;
- Reporting incidents where necessary to regulatory authorities and stakeholders; and
- Satisfactory and timely remediation/mitigation of impacts.

7. Recommendations and Approvals Required

7.1 Recommendations

Recommendations associated with this project include:

- Avoiding areas of Priority Flora locations identified within this document.
- Erosion from wind is considered to be minimal. However, some vegetation in the northern Project Area occurs on consolidated sand dunes. Clearing in this vegetation type is should be minimised where possible.

7.2 Approvals

Government of Western Australian

The material pit at SLK 70 occurs within a registered Aboriginal heritage site. MRWA will be required to obtain a Section 18 Clearance under the *Aboriginal Heritage Act* 1972 prior to the commencement of the propose works.

8. References

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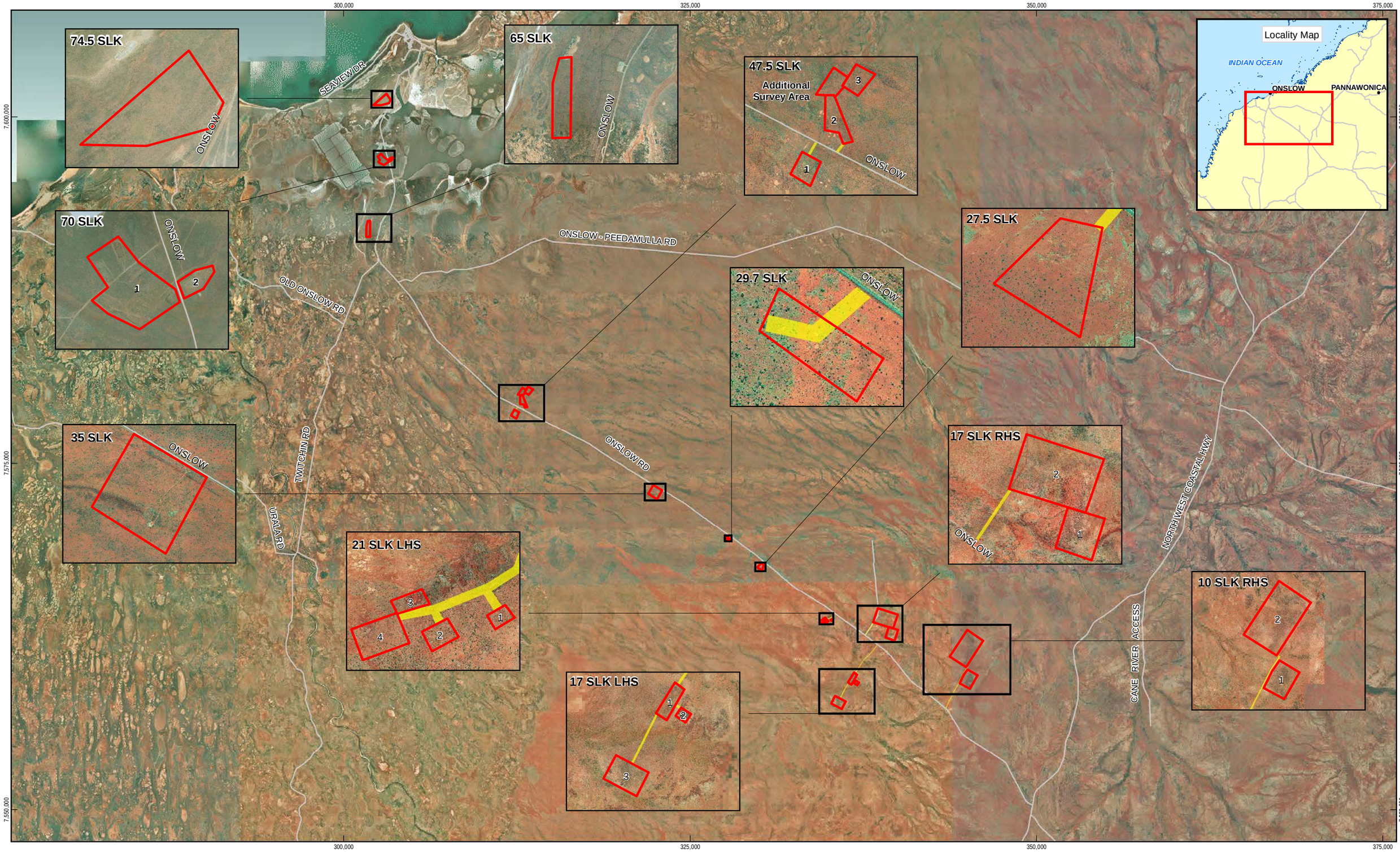
Appendix A

Figures



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0 1.25 2.5 5 7.5 10 12.5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Study Area
- Access Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

Location Map

Figure 1

G:\61\27496\GIS\Maps\MXD\6127496_G001_Fig1_Rev0.mxd

Data source: Landgate: Onslow 2007 Mosaic - 20110413, Cane River 2005 Mosaic - 20110413, Koordarrie 2007 Mosaic -20110413, Yarraloola 2007 Mosaic - 20770413, Talandji 2007 Mosaic - 20110413 and Tubridgi 2007 Mosaic - 20110413; GA: Topo 250k Series III - 2006; Main Roads: Access Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026. Created by: mczekaj

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1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed
Material Pit Areas Onslow Road

Job Number	61-27496
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Location of Pit
at 74.5 SLK

Sheet 1 of 11

Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Location of Pit at 70 SLK

Job Number	61-27496
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Date	09 Nov 2011

Sheet 2 of 11

Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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300,000 301,000 302,000 303,000

7,593,000 7,592,000 7,591,000

65 SLK

ONSLOW

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Job Number	61-27496
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Location of Pit
at 65 SLK

Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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311,000 312,000 313,000 314,000

7,580,000

7,579,000

Additional Survey Area

47.5 SLK / 3

47.5 SLK / 2

47.5 SLK / 1

ONSLOW

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Location of Pit at 47.5 SLK

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Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Main Roads WA - ETS
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Location of Pit at 35 SLK

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Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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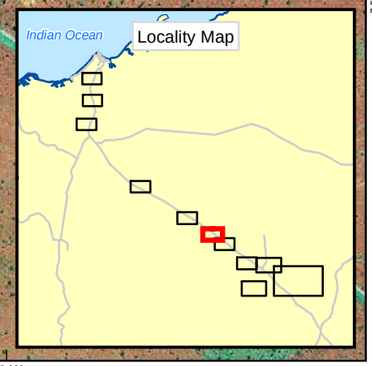
326,000 327,000 328,000 329,000

7,570,000

ONSLOW

29.7 SLK

7,569,000



326,000 327,000 328,000 329,000

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0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Main Roads WA - ETS
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Location of Pit at 29.7 SLK

Sheet 6 of 11

Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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329,000 330,000 331,000 332,000

7,568,000

7,567,000

ONSLOW

27.5 SLK

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed
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Location of Pit
at 27.5 SLK

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Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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333,000 334,000 335,000 336,000

7,564,000

ONSLOW

21 SLK LHS / 3

21 SLK LHS / 1

21 SLK LHS / 4

21 SLK LHS / 2

7,563,000

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Location of Pit
at 21 SLK LHS

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Figure 2

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337,500 338,750 340,000 341,250

7,563,750

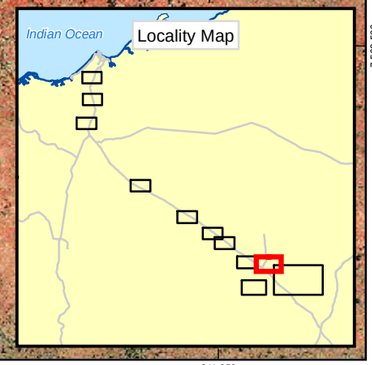
MT MINNIE STATION RD

17 SLK RHS / 2

17 SLK RHS / 1

ONSLOW

7,562,500



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0 62.5 125 250 375 500 625

Metres

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Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Location of Pit at 17 SLK RHS

Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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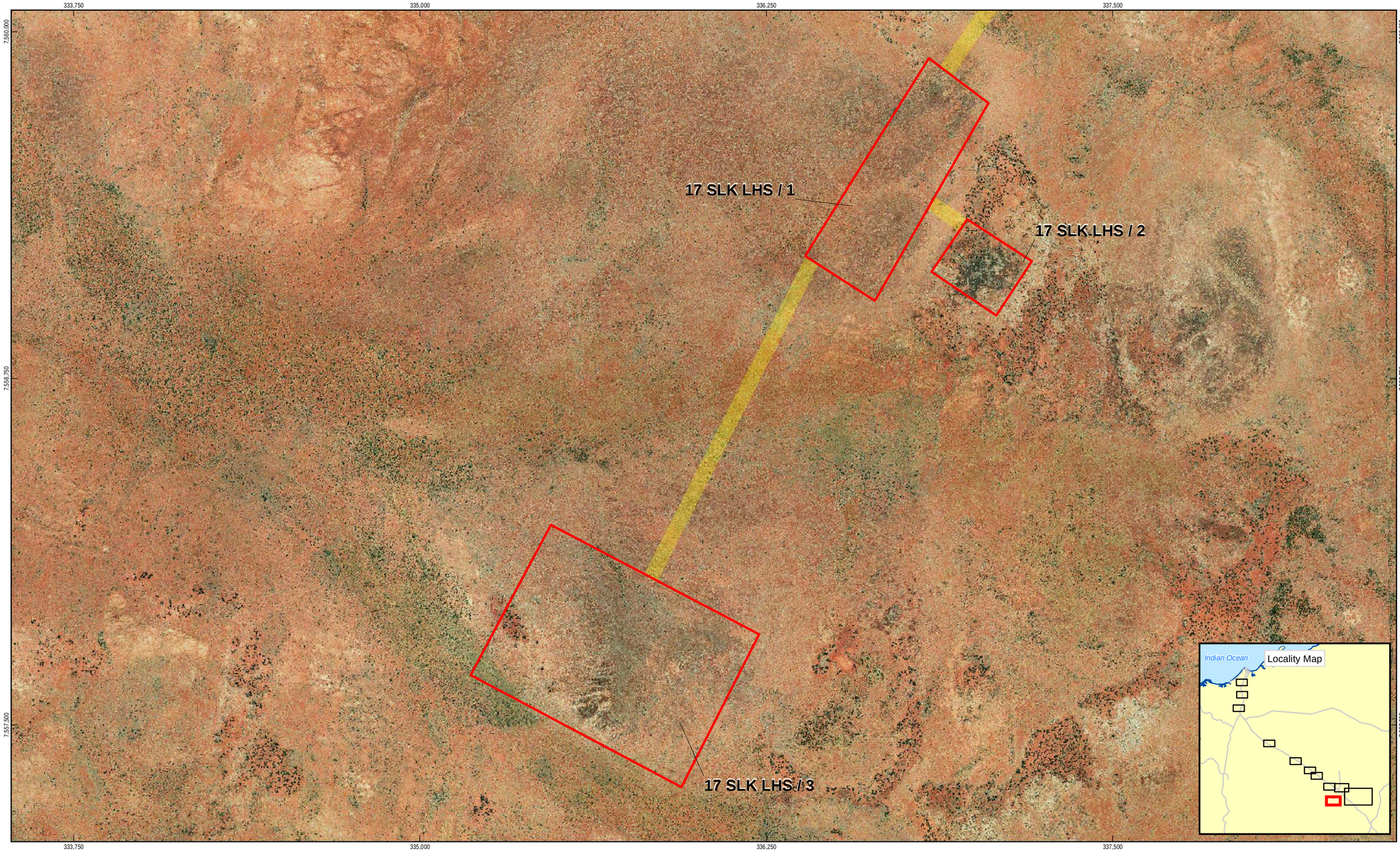

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed
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Location of Pit
at 17 SLK LHS

Job Number	61-27496
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Date	09 Nov 2011

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Figure 2

G:\61\27496\GIS\Maps\MXD\6127496_G002_Fig2_Rev0.mxd

Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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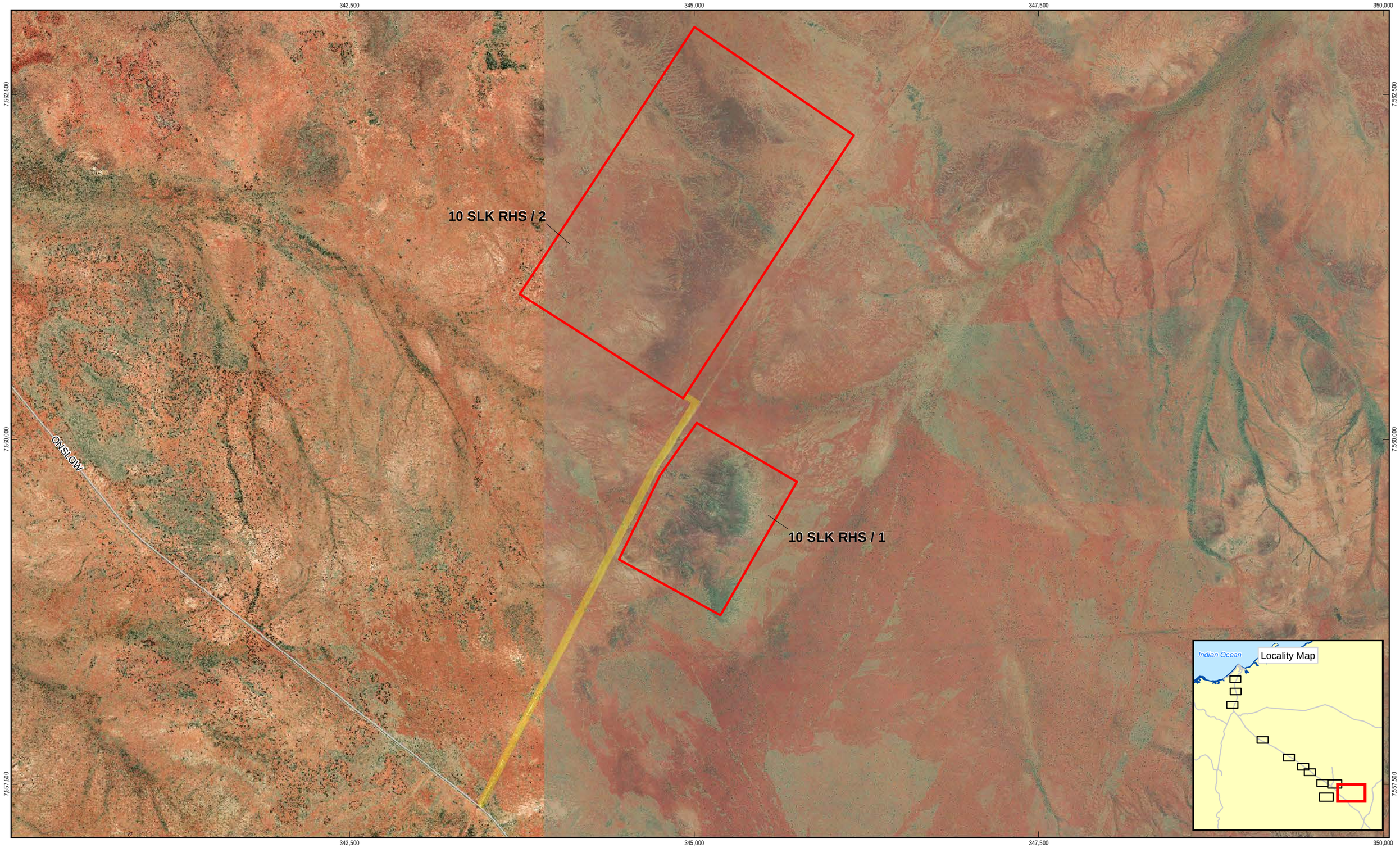

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Metres

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Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Access Area
- Study Area

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Main Roads WA - ETS
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Location of Pit
at 10 SLK RHS

Job Number	61-27496
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Figure 2

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Data source: Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Access Area - 20110923, Roads - 20091023; GA: Topo 250k Series III - 2006; GHD: Study Area - 20111026. Created by: mczekaj, jrutherford

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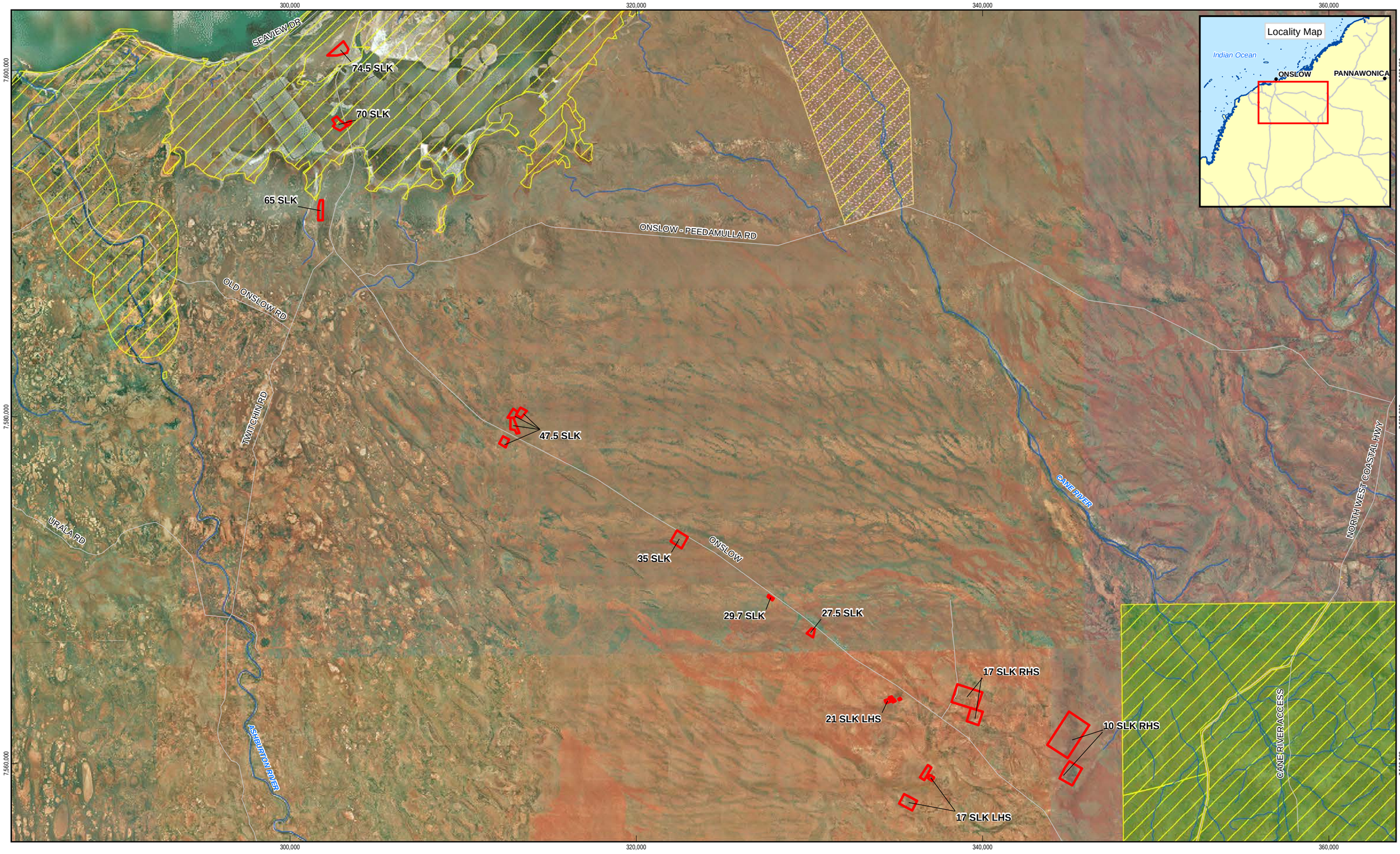

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0 1 2 4 6 8 10

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Watercourse
- Roads
- Cane River Conservation Park
- Schedule 1 Clearing Areas
- Study Area
- **Public Drinking Water Source Areas**
- Protection Area-P1

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Job Number	61-27496
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Administrative Theme

Figure 3

G:\61\27496\GIS\Maps\MXD\6127496_G007_Fig3_Rev0.mxd

Data source: Landgate: Onslow 2007 Mosaic - 20110413, Cane River 2005 Mosaic - 20110413, Koordarrie 2007 Mosaic -20110413, Yarraloola 2007 Mosaic - 20770413, Talandji 2007 Mosaic - 20110413, Tubridgi 2007 Mosaic - 20110413; MRWA: Roads - 20110923; DoW: Public Drinking Water Source Areas - 20111026; DEC: Schedule 1 Clearing Areas - 20111027, Cane River Conservation Area - 20111026; GA: Topo 250k Series III - 2006, Watercourse - 2006; GHD: Study Area - 20111026.
Created by: mczekaj

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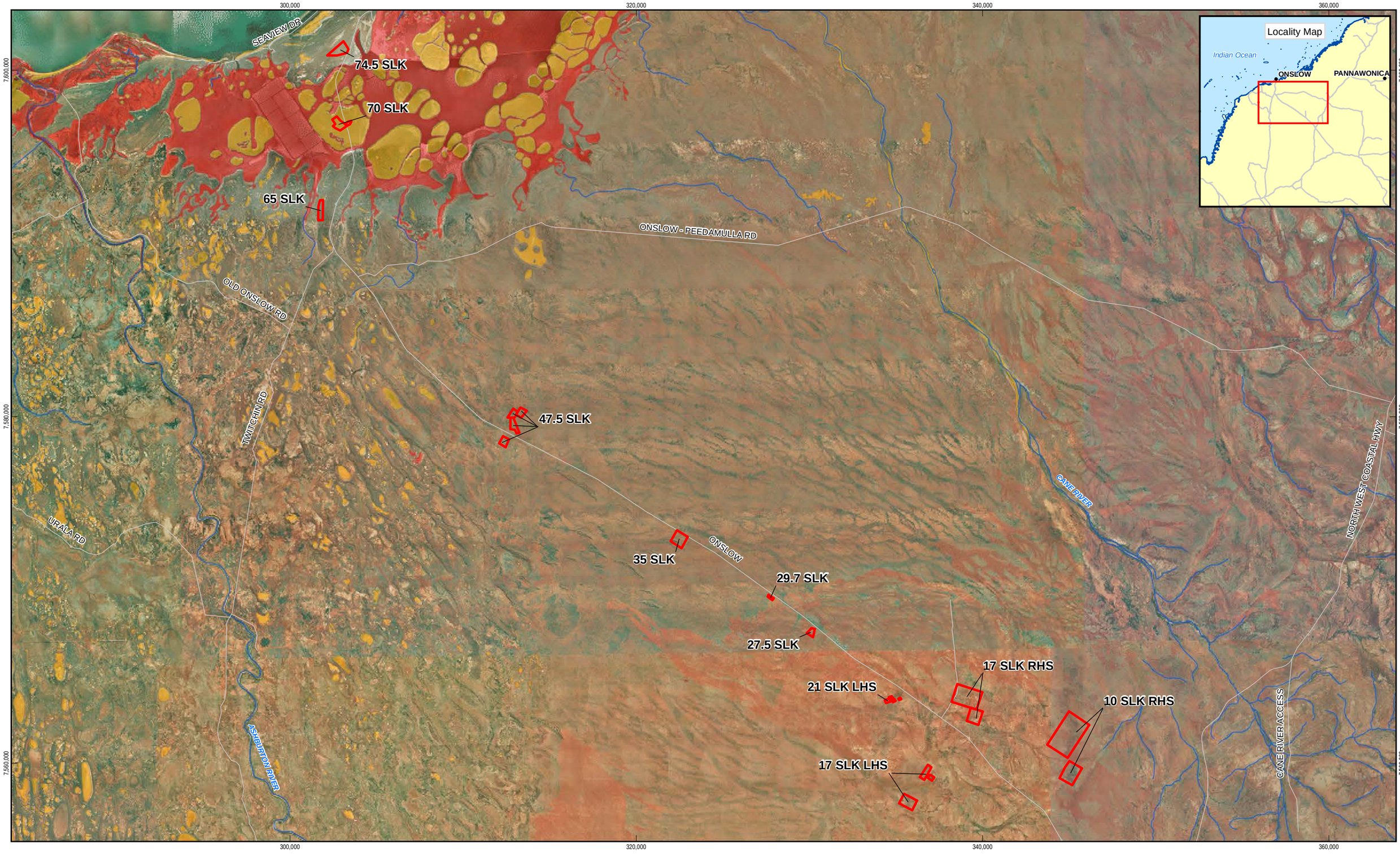

1:200,000 (at A3)

0 1 2 4 6 8 10

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Watercourse
- Roads

Acid Sulfate Soil Risk

- High to moderate risk
- Moderate to low risk
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
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Date	09 Nov 2011

Acid Sulfate Soil Risk

Figure 4

G:\61\27496\GIS\Maps\MXD\6127496_G008_Fig4_Rev0.mxd

Data source: Landgate: Onslow 2007 Mosaic - 20110413, Cane River 2005 Mosaic - 20110413, Koordarrie 2007 Mosaic -20110413, Yarraloola 2007 Mosaic - 20770413, Talandji 2007 Mosaic - 20110413, Tubridgi 2007 Mosaic - 20110413; MRWA: Roads - 20110923; DEC: Acid Sulfate Soil Risk - 20111027; GA: Topo 250k Series III - 2006, Watercourse - 2006; GHD: Study Area - 20111026. Created by: mczekaj

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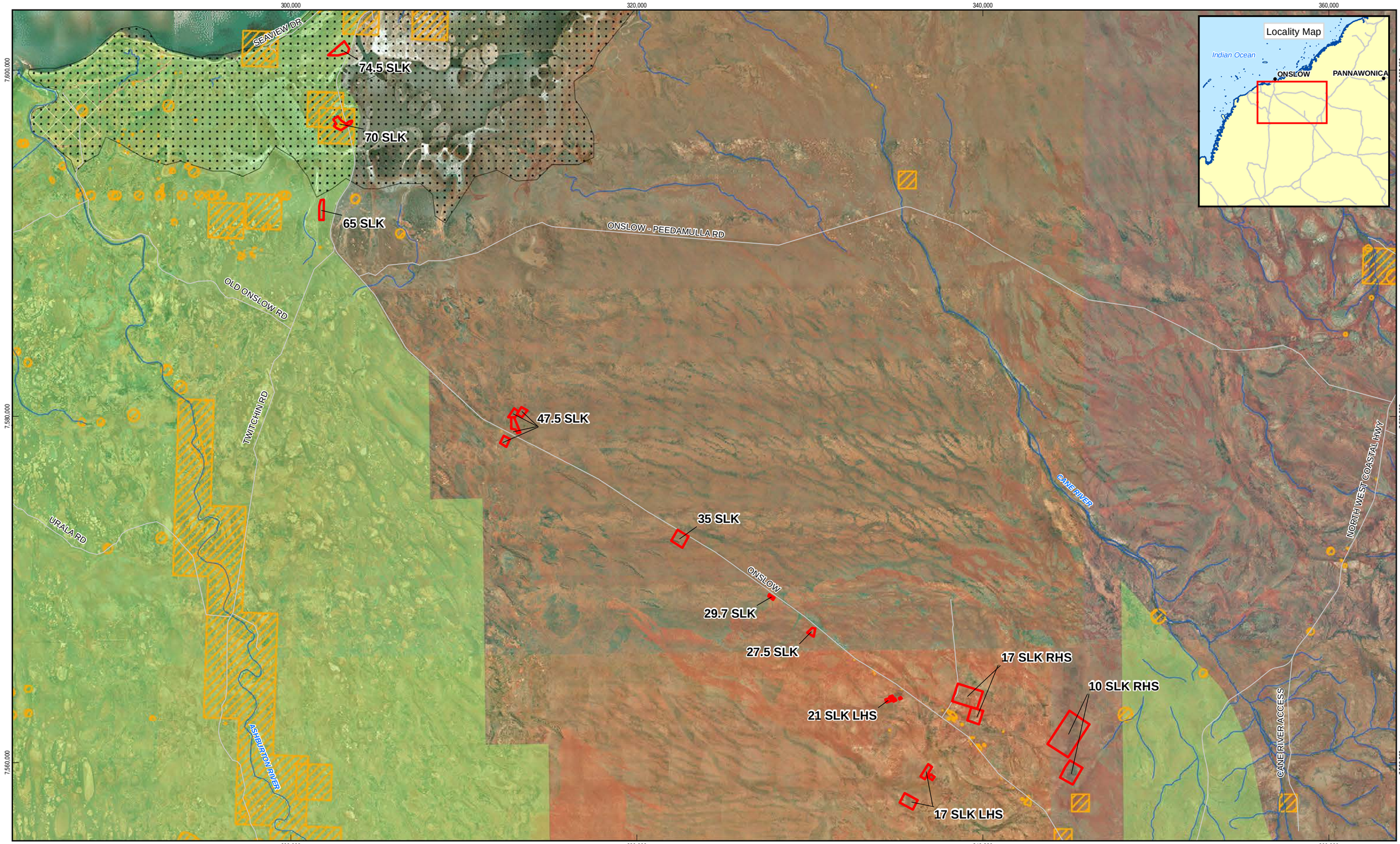

1:200,000 (at A3)

0 1 2 4 6 8 10

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Roads
- Watercourse

Register of the National Estate

- Indicative Place
- Registered
- Interim List
- Rejected Place

- Aboriginal Heritage Site
- Native Title (Determination)
- Heritage Council Sites
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

Cultural Theme

Figure 5

G:\61\27496\GIS\Maps\MXD\6127496_G005_Fig5_Rev0.mxd

Data source: Landgate: Native Title (Determination) - 20111031, Onslow 2007 Mosaic - 20110413, Cane River 2005 Mosaic - 20110413, Koordarrie 2007 Mosaic -20110413, Yarraloola 2007 Mosaic - 20770413, Talandji 2007 Mosaic - 20110413, Tubridgi 2007 Mosaic - 20110413; MRWA: Roads - 20110923; DEWHA: Register of National Estate - 20100118; DIA: Aboriginal Heritage Site - 20111026; DoP: Heritage Council Sites - 20111026; GA: Topo 250k Series III - 2006, Watercourse - 2006; GHD: Study Area - 20111026. Created by: mczekaj

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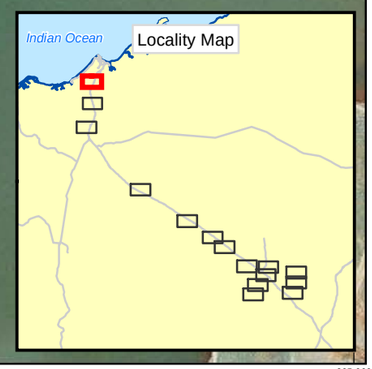
302,000 303,000 304,000 305,000

7,602,000

7,601,000

ONSLOW

74.5 SLK



1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
- Dense Shrublands
- Disturbed Flats/Plains
- Floodway
- Mosaic Sandplains
- Mosaic Sandplains - Open
- Mosaic Sandplains- Dense
- Non-saline Plains
- Northern Plains
- Open Water
- Open eremophila, Spinifex
- Plains below Sand Dunes
- Quartz Hills
- Rocky Hill
- Saline Flats
- Shrubland on stoney flat
- Shrublands on stone hills, *Acacia atkinsiana*, *Grevellia wickhamii*
- Snakewood Plains
- Spinifex on rocky hills
- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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302,000 303,000 304,000 305,000

7,598,000 7,597,000 7,596,000

ONSLOW

Locality Map

Indian Ocean

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
- Dense Shrublands
- Disturbed Flats/Plains
- Floodway
- Mosaic Sandplains
- Mosaic Sandplains - Open
- Mosaic Sandplains- Dense
- Non-saline Plains
- Northern Plains
- Open Water
- Open eremophila, Spinifex
- Plains below Sand Dunes
- Quartz Hills
- Rocky Hill
- Saline Flats
- Shrubland on stoney flat
- Shrublands on stone hills, *Acacia atkinsiana*, *Grevellia wickhamii*
- Snakewood Plains
- Spinifex on rocky hills
- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed
Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

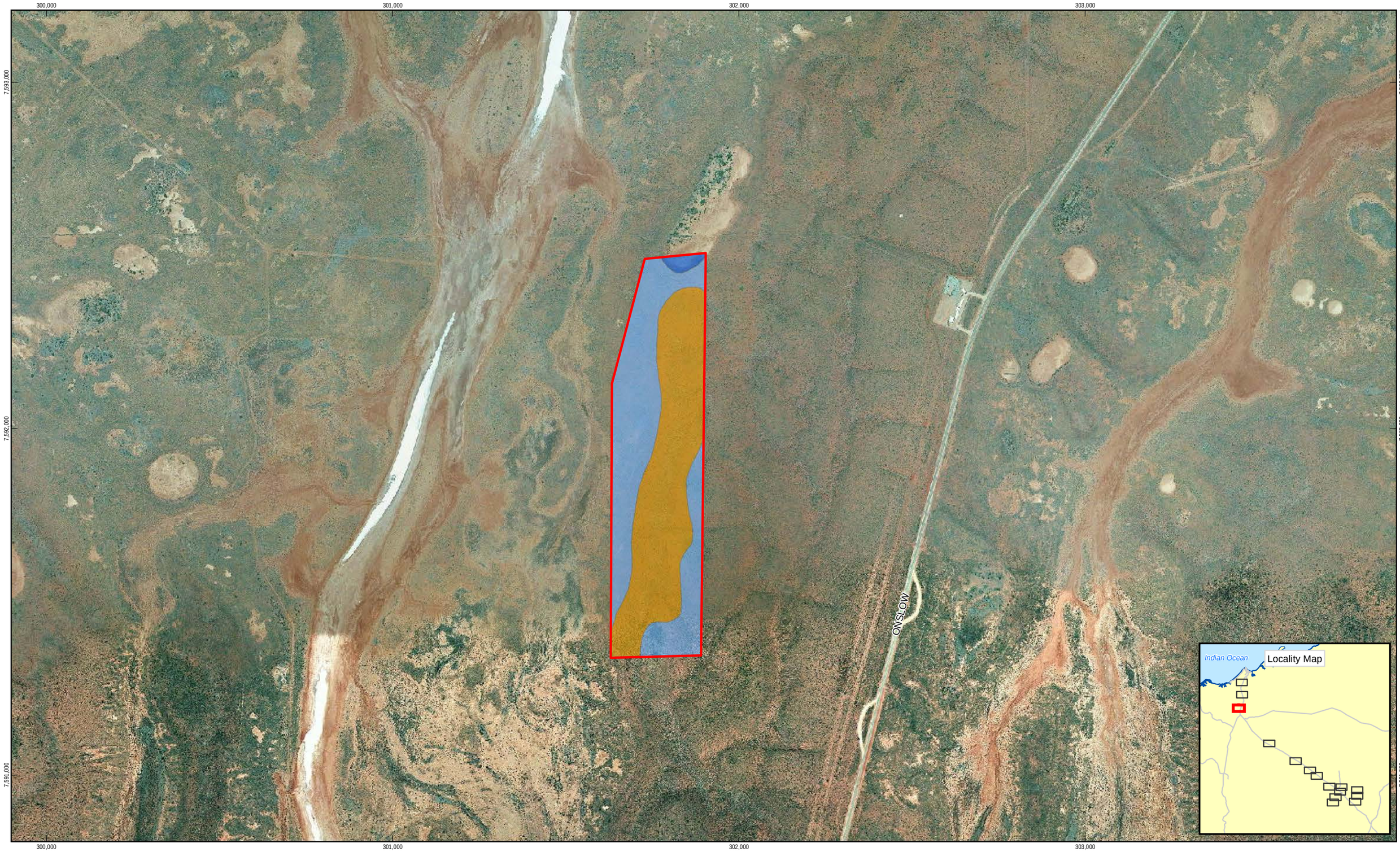
Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au



1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
- Dense Shrublands
- Disturbed Flats/Plains
- Floodway
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- Mosaic Sandplains - Open
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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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311,000 312,000 313,000 314,000

7,580,000

7,579,000

Additional Survey

47.5 SLK/3

47.5 SLK/2

47.5 SLK/1

ONSLOW

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
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- Consolidated Sand Dunes
- Degraded Sand Dunes
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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Revision	0
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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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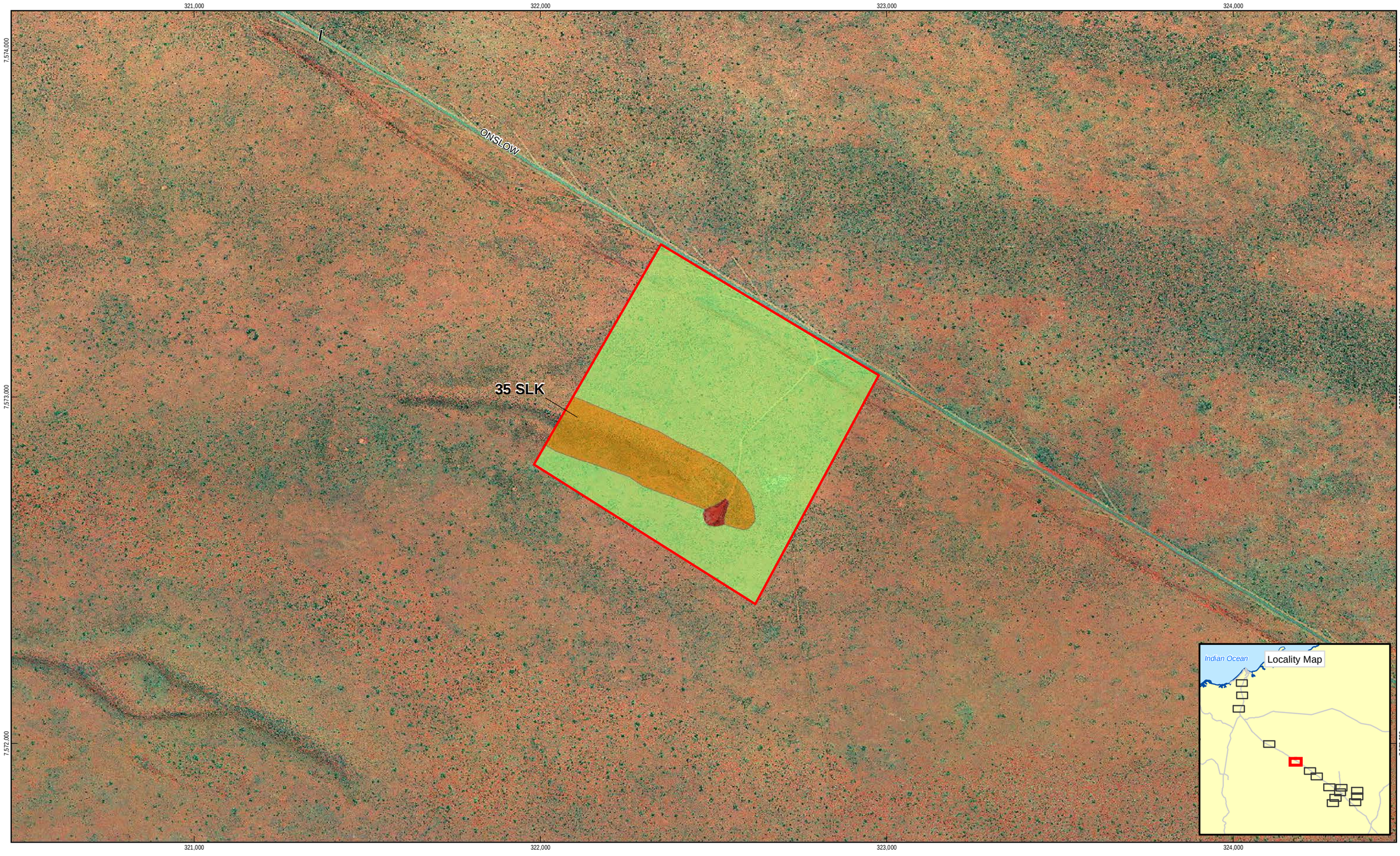

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
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- *Verticordia* Sandhill
- Accesses Area
- Study Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Revision	0
Date	09 Nov 2011

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Vegetation Type

Figure 6

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Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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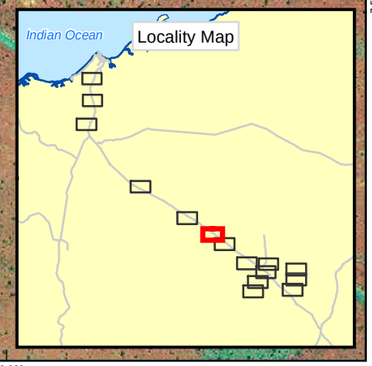
326,000 327,000 328,000 329,000

7,570,000

ONSLOW

29.7 SLK

7,569,000



1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
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- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Revision	0
Date	09 Nov 2011

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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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329,000 330,000 331,000 332,000

7,568,000

ONSLOW

27.5 SLK

7,567,000

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
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- Spinifex on stoney flat
- *Verticordia* Sandhill
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- Study Area

GHD

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MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Date	09 Nov 2011

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Vegetation Type

Figure 6

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Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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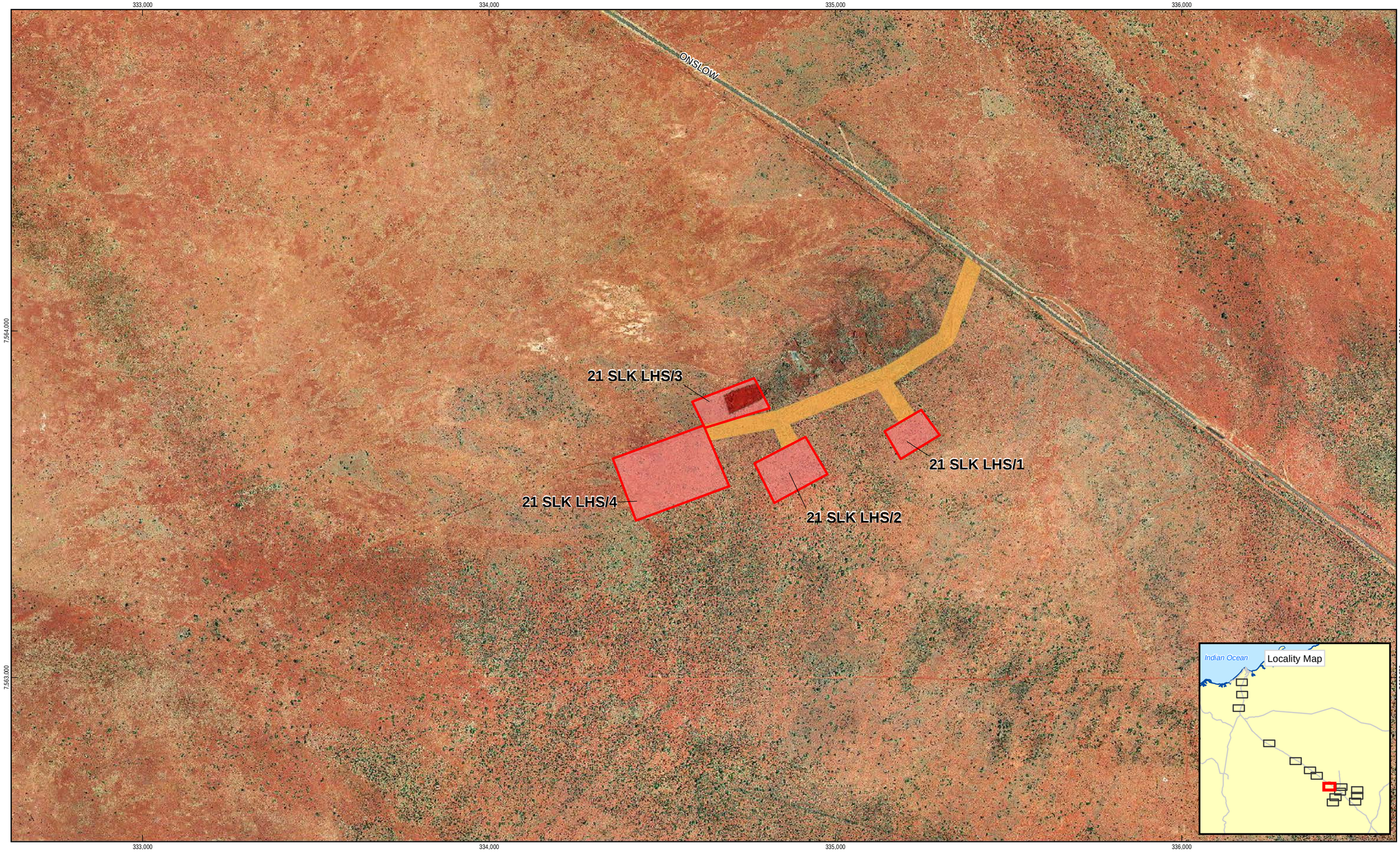

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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337,000 338,000 339,000 340,000

7,564,000

7,563,000

17 SLK RHS/2

MT.MINNIE STATION RD

17 SLK RHS/1

ONSLOW

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
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- Spinifex on rocky hills
- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

Figure 6

Vegetation Type

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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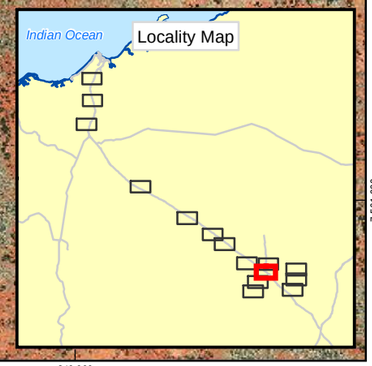
337,000 338,000 339,000 340,000

7,563,000 7,562,000 7,561,000

MT.MINNIE STATION RD

ONSLOW

17 SLK RHS/1



1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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335,000 336,000 337,000 338,000

7,561,000 7,560,000 7,559,000

17 SLK LHS/1

17 SLK LHS/2

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
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- Study Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Vegetation Type

Figure 6

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Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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334,000 335,000 336,000 337,000

7,559,000 7,558,000 7,557,000

17 SLK LHS/2

17 SLK LHS/3

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

GHD

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MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

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Revision	0
Date	09 Nov 2011

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Vegetation Type

Figure 6

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343,000 344,000 345,000 346,000

7,563,000

7,562,000

10 SLK RHS/2

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
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- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
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Date	09 Nov 2011

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Vegetation Type

Figure 6

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Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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343,000 344,000 345,000 346,000

7,561,000

7,560,000

10 SLK RHS/2

10 SLK RHS/1

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
- Coastal Dunes
- Consolidated Sand Dunes
- Degraded Sand Dunes
- Dense Shrublands
- Disturbed Flats/Plains
- Floodway
- Mosaic Sandplains
- Mosaic Sandplains - Open
- Mosaic Sandplains- Dense
- Non-saline Plains
- Northern Plains
- Open Water
- Open eremophila, Spinifex
- Plains below Sand Dunes
- Quartz Hills
- Rocky Hill
- Saline Flats
- Shrubland on stoney flat
- Shrublands on stone hills, *Acacia atkinsiana*, *Grevellia wickhamii*
- Snakewood Plains
- Spinifex on rocky hills
- Spinifex on stoney flat
- *Verticordia* Sandhill
- Accesses Area
- Study Area

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA - ETS
MRWA ETS EIA for the Proposed Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

Sheet 14 of 15

Figure 6

Vegetation Type

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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342,000 343,000 344,000 345,000

7,559,000

7,558,000

10 SLK RHS/1

ONSLOW

Indian Ocean

Locality Map

1:10,000 (at A3)

0 50 100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Vegetation Type

- Baderi Plains
- Broad Sheetwash
- Cleared Degraded Areas
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Main Roads WA - ETS
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Sheet 15 of 15

Vegetation Type

Figure 6

G:\61\27496\GIS\Maps\MXD\6127496_G004_Fig6_Rev0.mxd

Data source: GA: Topo 250k Series III - 2006; Landgate: Koordarrie2009Mosaic - 20110923, Onslow2007Mosaic - 20110923; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Vegetation Type - 20111024. Created by: mczekaj

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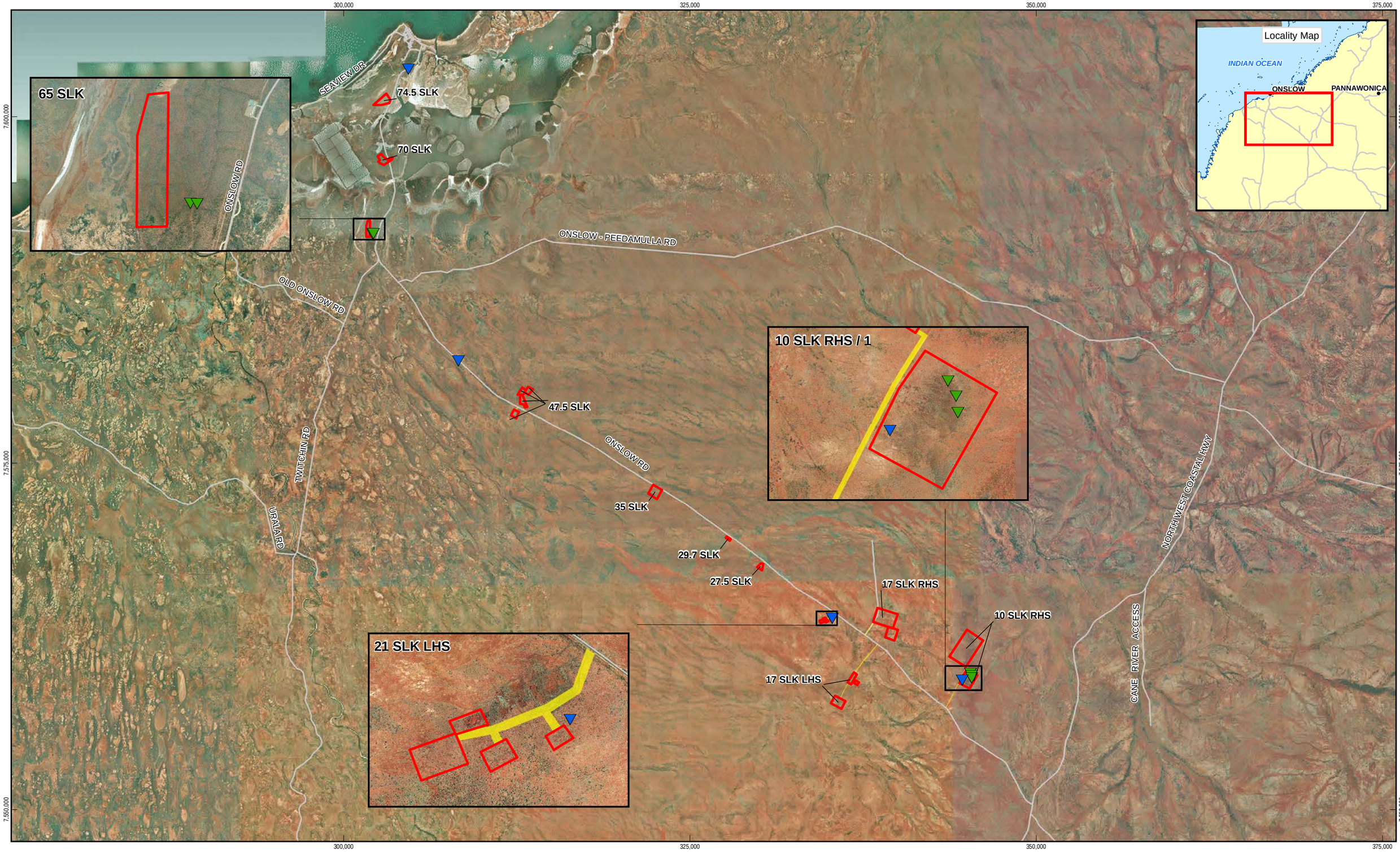

1:250,000 (at A3)

0 1.25 2.5 5 7.5 10 12.5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Conservation Significant Flora

- (T) Threatened Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- RE - Range Extension
- CS - Conservation Significant

- Roads
- Study Area
- Access Area

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Main Roads WA - ETS
MRWA ETS EIA for the Proposed
Material Pit Areas Onslow Road

Job Number	61-27496
Revision	0
Date	09 Nov 2011

Significant Flora

Figure 7

G:\61\27496\GIS\Maps\MXD\6127496_G009_Fig7_Rev0.mxd

Data source: Landgate: Onslow 2007 Mosaic - 20110413, Cane River 2005 Mosaic - 20110413, Koordarrie 2007 Mosaic -20110413, Yarraloola 2007 Mosaic - 20770413, Talandji 2007 Mosaic - 20110413 and Tubridgi 2007 Mosaic - 20110413; GA: Topo 250k Series III - 2006; Main Roads: Accesses Area - 20110923, Roads - 20091023; GHD: Study Area - 20111026, Conservation Significant Flora - 20111103. Created by: mczekaj

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Appendix B

Fauna

EPBC Act Fauna Conservation Categories

Listed threatened species and ecological communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- Extinct in the wild,
- Critically Endangered,
- Endangered, or
- Vulnerable.

See Table 13.

Critically endangered and endangered species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- Lead to a long-term decrease in the size of a population, or
- Reduce the area of occupancy of the species, or
- Fragment an existing population into two or more populations, or
- Adversely affect habitat critical to the survival of a species, or
- Disrupt the breeding cycle of a population, or
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- Interfere with the recovery of the species.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.*

Vulnerable species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- Lead to a long-term decrease in the size of an important population of a species, or
- Reduce the area of occupancy of an important population, or
- Fragment an existing important population into two or more populations, or
- Adversely affect habitat critical to the survival of a species, or
- Disrupt the breeding cycle of an important population, or
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or

- Result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- Interferes substantially with the recovery of the species.
- An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:
- Key source populations either for breeding or dispersal,
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Listed Migratory species

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species. The criteria below are relevant to migratory species that are not threatened.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- Result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

1. Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
2. Habitat utilised by a migratory species which is at the limit of the species range, or
3. Habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated).

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.*

Table 13 Conservation Categories and Definitions for *EPBC Act* Listed Flora and Fauna Species

Conservation Category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild	Taxa known to survive only in captivity.
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened.

Table 14 *Western Australia Wildlife Conservation Act* (1950) Conservation Codes

Conservation Code	Description
Schedule 1	"…fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection."
Schedule 2	"…fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection."
Schedule 3	"…birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection."
Schedule 4	"…fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3]"

(Species not listed under the *Wildlife Conservation Act (*1950), but for which there is some concern).

Table 15 DEC Priority Fauna Codes

Conservation Code	Description
Priority 1	Taxa with few, poorly known populations on threatened lands.
Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
Priority 3	Taxa which are known from few specimens or sight records, some of which are on lands not under immediate threat of habitat destruction or degradation.
Priority 4	Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
Priority 5	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

EPBC Act Flora and Fauna Conservation Categories

Listed Threatened Species and Ecological Communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- Extinct in the wild,
- Critically Endangered,
- Endangered, or
- Vulnerable.

Critically Endangered and Endangered Species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.*

Vulnerable Species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or

- interferes substantially with the recovery of the species.
- **An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:**
- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Table 16 Conservation Categories and Definitions for EPBC Act Listed Flora and Fauna Species.

Conservation Category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Table 17 Fauna List for Onslow Material Pits

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Amphibian	Hylidae	*Litoria*	*caerulea*	Common Green Tree Frog			RE		x	
Amphibian	Hylidae	*Litoria*	*rubella*	Desert Tree Frog				N	x	
Amphibian	Hylidae	*Cyclorana*	*maini*	Sheep Frog				N		
Amphibian	Limnodynastidae	*Neobatrachus*	*aquilonius*	Northern Burrowing Frog				N		
Amphibian	Limnodynastidae	*Notaden*	*nichollsi*	Desert Spadefoot				N		
Amphibian	Limnodynastidae	*Heleioporus*	*albopunctatus*	Western Spotted Frog				N		
Amphibian	Myobatrachidae	*Crinia*	*pseudinsignifera*	Bleating Froglets				N		
Birds	Accipitridae	*Accipitier*	*cirrocephalus*	Collared Sparrowhawk				N		
Birds	Accipitridae	*Accipitier*	*fasciatus*	Brown Goshawk				N		
Birds	Accipitridae	*Circus*	*approximans*	Swamp Harrier				N		
Birds	Accipitridae	*Circus*	*assimilis*	Spotted Harrier				N		
Birds	Accipitridae	*Elanus*	*caeruleus*	Black-shouldered Kite				N	x	x
Birds	Accipitridae	*Haliaeetus*	*leucougaster*	White-bellied Sea Eagle	Migratory; Terrestrial			N, EPBC	x	
Birds	Accipitridae	*Haliastur*	*sphenurus*	Whistling Kite	Ma				x	
Birds	Accipitridae	*Haliasur*	*indus*	Brahminy Kite				N		
Birds	Accipitridae	*Hamirostra*	*isura*	Square-tailed Kite					x	
Birds	Accipitridae	*hamirostra*	*melanosternon*	Black-breasted Buzzard				N		
Birds	Accipitridae	*Milus*	*migrans*	Black Kite	Mi			N	x	
Birds	Aegothelidae	*Aegotheles*	*cirstatus*	Australian Owlet-nightjar				N		
Birds	Aegothelidae	*Artamus*	*cinereus*	Black-faced Woodswallow				N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Birds	Alaudidae	*Mirafra*	*javanica*	Horsfield's Bushlark					x	
Birds	Anatidae	*Anas*	*gracilis*	Grey Teal				N	x	
Birds	Anatidae	*Anas*	*superciliosa*	Pacific Black Duck				N		
Birds	Apodidae	*Apus*	*Pacificus*	Fork-tailed Swift	Mi,Ma	Mi;S3		EPBC, DEC		
Birds	Ardeidae	*Ardea*	*novaehollandiae*	White-faced Heron					x	
Birds	Ardeidae	*Ardrea*	*alba*	Great Egret	Mi;Ma;Mi Wetland			EPBC		
Birds	Ardeidae	*Ardrea*	*ibis*	Cattle Egret	Mi;Mi Wetland			EPBC		
Birds	Ardeidae	*Ardea*	*novaehollandiae*	White-faced Heron				N		
Birds	Artamidae	*Artamus*	*cinereus*	Black-faced Woodswallow				N		x
Birds	Artamidae	*Artamus*	*cyanopterus*	Dusky Woodswallow				N		
Birds	Artamidae	*Artamus*	*leucorynchus*	White-breasted Woodswalllow				N	x	
Birds	Artamidae	*Artamus*	*personatus*	Masked Woodswallow					x	
Birds	Campephagidae	*Coracina*	*novaehollandiae*	Black-faced Cuckoo-shrike	Ma				x	x
Birds	Casuariidae	*Dromaius*	*novaehollandiae*	Emu				N	x	
Birds	Charadriidae	*Charadrius*	*leschenaultii*	Greater Sand Plover				N		
Birds	Charadriidae	*Charadrius*	*melanops*	Black-fronted Dotterel					x	
Birds	Charadriidae	*Charadrius*	*ruficapillus*	Red-capped Plover				N		
Birds	Charadriidae	*Charadrius*	*veredus*	Oriental Plover	Mi Wetland;Ma		S3 Mi	EPBC;WC	x	
Birds	Cinclosomatidae	*Psophodes*	*occidentalis*	Western Wedgebill				N		
Birds	Columbidae	*Geopelia*	*cuneata*	Diamond Dove				N		
Birds	Columbidae	*Geopelia*	*plumifera*	Spinifex Pigeon				N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Birds	Columbidae	*Geophaps*	*striata*	Peaceful Dove				N	x	x
Birds	Columbidae	*Ocyphaps*	*lophotes*	Crested Pigeon				E,N	x	x
Birds	Corvidae	*Corvus*	*bennetti*	Little Crow				N		
Birds	Corvidae	*Corvus*	*orru*	Torresian Crow				N	x	x
Birds	Cracticidae	*Cracitcus*	*nigrogularis*	Pied Butcherbird				N	x	
Birds	Cracticidae	*Cracticus*	*tibicen*	Australian Magpie				N		
Birds	Cuculidae	*Chrysococcyx*	*basalis*	Horsfield's Bronze-cuckoo	Ma				x	
Birds	Discruridae	*Grallina*	*cyanoleuca*	Magpie Lark				N		
Birds	Discruridae	*Rhipidura*	*leucophrys*	Willie Wagtail				N	x	
Birds	Estrillidae	*Emblema*	*pictum*	Painted Finch				N		
Birds	Estrillidae	*Neochima*	*ruficauda*	Star Finch	Ma			N		
Birds	Estrillidae	*Taeniopygia*	*guttata*	Zebra Finch				N	x	x
Birds	Falconidae	Aquila	audax	Wedge-tailed eagle						x
Birds	Falconidae	*Falco*	*berigora*	Brown Falcon	Ma			N		
Birds	Falconidae	*Falco*	*cenchroides*	Australian Kestrel	Ma			N,EPBC	x	x
Birds	Falconidae	*Falco*	*hypoleucos*	Grey Falcon			P4	DEC	x	x
Birds	Falconidae	*Falco*	*longipennis*	Australian Hobby	V, Ma			N		
Birds	Falconidae	*Falco*	*peregrinus*	Peregrine Falcon		S4		WC, N		
Birds	Glareolidae	*Glareola*	*maldivarum*	Oriental Pratincole	Mi, Ma	S3		EPBC, WC		
Birds	Glareolidae	*Stiltia*	*isabella*	Australian Pratincole	Ma			EPBC	x	
Birds	Haematopodidae	*Haematopus*	*longirostris*	Pied Oystercatcher				N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Birds	Halcyonidae	*Dacelo*	*leachii*	Blue-winged Kookaburra				N		
Birds	Halcyonidae	*Todiramphus*	*sanctus*	Sacred Kingfisher	Ma			EPBC	x	
Birds	Hesperiidae	*Macronectus*	*giganteus*	Southern Giant-Petrel	E			EPBC		
Birds	Hirundinidae	*Hirundo*	*ariel*	Fairy Martin					x	
Birds	Hirundinidae	*Hirundo*	*neoxena*	Welcome Swallow				N		
Birds	Hirundinidae	*Hirundo*	*nigricans*	Tree Martin				N		
Birds	Hirundinidae	*Hirundo*	*rustica*	Barn Swallow	Mi, Ma	S3		EPBC, WC		
Birds	Lariidae	*Larus*	*novaehollandiae*	Silver Gull	Ma				x	x
Birds	Maluridae	*Malurus*	*lamberti*	Variegated Fairy-wren				N	x	
Birds	Maluridae	*Malurus*	*leucopterus*	White-winged Fairy-wren				N		
Birds	Megapodiidae	*Leipoa*	*ocellata*	Malleefowl		S1		WC, N		
Birds	Meliphagidae	*Acanthagenys*	*rufogularis*	Spiny-cheeked Honeyeater				N		
Birds	Meliphagidae	*Certhionyx*	*niger*	Black Honeyeater				N		
Birds	Meliphagidae	*Epthianura*	*aurifrons*	Orange Chat				N		
Birds	Meliphagidae	*Epthianura*	*tricolor*	Crimson Chat				N	x	
Birds	Meliphagidae	*Lichenostomus*	*kertlandi*	Grey-headed Honeyeater				N		x
Birds	Meliphagidae	*Lichenostomus*	*penicillatus*	White-plumed Honeyeater				N	x	x
Birds	Meliphagidae	*Lichenostomus*	*virescens*	Singing Honeyeater				N	x	
Birds	Meliphagidae	*Lichmera*	*indistincta*	Brown Honeyeater				N	x	
Birds	Meliphagidae	*Manoria*	*flavigula*	Yellow-throated Miner				N	x	x
Birds	Molluginaceae	*Merops*	*ornatus*	Rainbow Bee-eater	Mi, Ma			EPBC, N	x	x

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Birds	Motacillidae	*Anthus*	*richardii*	Richard's Pipit					X	
Birds	Otididae	*Ardeotis*	*australis*	Australian Bustard			P4	DEC, N	x	x
Birds	Pachycephalidae	*Colluricincla*	*harmonica*	Grey Shrike-thrush				N		
Birds	Pachycephallidae	*Oreoica*	*gutturalis*	Crested Bellbird				N	x	x
Birds	Pachycephallidae	*Pachycephala*	*rufiventris*	Rufous Whistler					x	x
Birds	Pelecanidae	*Pelecanus*	*conspicillatus*	Australian Pelican	Ma			EPBC, N	x	
Birds	Phasianidae	*Coturnix*	*pectoralis*	Stubble Quail				N		
Birds	Podicipedidae	*Tachybaptus*	*novaehollandiae*	Australasian Grebe blacked-throated Grebe				N		
Birds	Pomatostomidae	*Pomatostomus*	*temporalis*	Grey-crowned Babbler				N		
Birds	Procellariidae	*Macronectus*	*giganteus*	Southern Giant-Petrel				N		
Birds	Psittacidae	*Cacatua*	*roseicapilla*	Galah				N	x	x
Birds	Psittacidae	*Calyptorhychus*	*latirostris*	Carnby's Cookatoo	E	S1		N,EPBC		
Birds	Psittacidae	*Melospittacus*	*undulatus*	Budgerigar				N	x	x
Birds	Psittacidae	*Nymphicus*	*hollandicus*	Weeiro					x	
Birds	Psittacidae	*Nymphicus*	*hollandicus*	Cockateil				N		
Birds	Recurvirostridae	*Himantopus*	*himantopus*	Black-winged Stilt	Ma			EPBC, N		x
Birds	Scolopacidae	*Calidris*	*acumunata*	Sharp-tailed sandpiper				N		
Birds	Scolopacidae	*Calidris*	*ruficollis*	Red-necked Stint				N		
Birds	Scolopacidae	*Limosa*	*lapponica*	Bar-tailed Godwit				N		
Birds	Scolopacidae	*Numenius*	*madagascariensis*	Eastern Curlew		S3	P4	N, DEC, WC		
Birds	Scolopacidae	*Numenius*	*minutus*	Little Curlew				N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed April 2011	Observed September 2011
Birds	Slyviidae	*Cincloramphus*	*cruralis*	Brown Songlark					N	x	x
Birds	Sylviidae	*Cincloramphus*	*matthewsi*	Rufous Songlark					N	x	
Birds	Sylviidae	*Cisticola*	*exilis*	Golden-headed Cisticola						x	
Birds	Sylviidae	*Eremiornis*	*carteri*	Spinifex-bird					N	x	
Birds	Threskiornithidae	*Threskiornis*	*spinicollis*	Straw-necked ibis	Ma				EPBC, N	x	
Birds	Turnicidae	*Turnix*	sp.	Button-quail species						x	
Birds	Turnicidae	*Turnix*	*velox*	Little button-quail					N		
Mammal	Bovidae	*Boe*	*taurus*	European Cattle					N	x	x
Mammal	Bovidae	*Capra*	*hircus*	Feral Goat				*		x	x
Mammal	Canidae	*Vulpes*	*vulpes*	Red fox	Invasive			*	EPBC		
Mammal	Dasyuridae	*Dasycercus*	*cristicauda*	Mulgara	Vu	S1			EPBC, WC		
Mammal	Dasyuridae	*Dasykaluta*	*rosamondae*	Little Red Kaluta					N		
Mammals	Dasyuridae	*Dasyurus*	*hallucatus*	Northern Quoll	En	S1			EPBC, WC		
Mammals	Dasyuridae	*Dasyurus*	*hallucatus*	Northern Quoll	E				EPBC		
Mammals	Dasyuridae	*Ningaui*	*timealeyi*	Pilbara Ningaui					N		
Mammals	Dasyuridae	*Sminthopsis*	*longicaudata*	Long-tailed Dunnart					N		
Mammals	Dasyuridae	*Sminthopsis*	*macroura*	Striped-faced Dunnart					N		
Mammals	Dasyuridae	*Sminthopsis*	*youngsoni*	Lesser Hairy-footed Dunnart					N		
Mammals	Equidae	*Equus*	*caballus*	Horse				*		x	
Mammals	Felidae	*Felis*	*catus*	Domestic cat	Invasive			*	EPBC	x	x
Mammals	Hipposideridae	*Rhinonicteris*	*aurantia*	*Pilbara Leaf-nosed Bat*	Vu				EPBC, N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed April 2011	Observed September 2011
Mammals	Macropodidae	Macropus	robustus	Euro						x	
Mammals	Muridae	*Leggadina*	*lakedownensis*	Short-tailed Mouse				P4	N		
Mammals	Muridae	*Mus*	*musculus*	House Mouse					N		
Mammals	Muridae	*Notomys*	*alexis*	Spinifex Hopping-mouse					N		
Mammals	Muridae	*Pseudomys*	*chapmani*	Western Pebble-mound Mouse				P4	N		
Mammals	Muridae	*Pseudomys*	*desertor*	Desert Mouse					N		
Mammals	Muridae	*Pseudomys*	*hermannsburgensis*	Sandy Inland Mouse					N		
Mammals	Muridae	*Pseudomys*	*desertor*	Desert Mouse					N		
Reptile	Agamidae	*Ctenophorus*	*caudicinctis*	Ring-tailed Dragon					N	x	
Reptile	Agamidae	*Ctenophorus*	*caudicinctis* subsp. *caudicinctis*						N		
Reptile	Agamidae	*Ctenophorus*	*fermoralis*	Dune Drageon					N		
Reptile	Agamidae	*Ctenophorus*	*isolepis subsp. isolepis*	Central Military Dragon					N	x	
Reptiles	Agamidae	*Ctenophorus*	*maculatus* subsp. *maculatus*	Spotted Sand-dragon					N		
Reptiles	Agamidae	*Ctenophorus*	*nuchalis*	Central Netted Dragon					N		
Reptiles	Agamidae	*Ctenophorus*	*reticulatus*	Western Netted Dragon					N		
Reptiles	Agamidae	*Ctenophorus*	*ruben*	Red Dragon					N		
Reptiles	Agamidae	*Pogona*	*minor*						N		
Reptiles	Agamidae	*Pogona*	*minor* subsp. *minor*						N		
Reptiles	Boidae	*Antaresia*	*perthensis*	Pygmy Python					N		
Reptiles	Boidae	*Antaresia*	*stimsona*	Stomson's Python					N		
Reptiles	Boidae	*Antaresia*	*stimsoni* subsp. *stimsoni*						N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed April 2011	Observed September 2011
Reptiles	Boidae	*Aspidites*	*melanocephalus*	Black-headed Python					N		
Reptiles	Boidae	*Liasis*	*olivaceus* subsp. *barroni*	Pilbara Olive Python	V				EPBC		
Reptiles	Diplodactylidae	*Diplodactylus*	*conspicillatus*	Fat-tailed Gecko					N		
Reptiles	Diplodactylidae	*Lacasium*	*stenodactylum*						N		
Reptiles	Diplodactylidae	*Lucasium*	*wombeyi*						N		
Reptiles	Diplodactylidae	*Rynchoedua*	*ornata*	Beaked Gecko					N		
Reptiles	Diplodactylidae	*Strophurus*	*jaenae*						N		
Reptiles	Diplodactylidae	*Strophurus*	*strophurus*						N		
Reptiles	Elapidae	*Acanthopis*	*wellsi*	Pilbara Death Adder					N		
Reptiles	Elapidae	*Demansia*	*psammophis*	Yellow-faced Whipsnake					N		
Reptiles	Elapidae	*Demansia*	*rufescens*	Rufous Whipsnake					N		
Reptiles	Elapidae	*Furina*	*ornata*	Moon Snake					N		
Reptiles	Elapidae	*Pseudechis*	*australis*	King Brown Snake					N	x	
Reptiles	Elapidae	*Pseudonaja*	*nuchalis*	Gwardar					N		
Reptiles	Elapidae	*Simoselaps*	*anomalus*	Desert Banded Dragon					N		
Reptiles	Elapidae	*Suta*	*punctata*	Spotted Snake					N		
Reptiles	Gekkonidae	*Gehyra*	*pilbara*	Pilbara dtella					N		
Reptiles	Gekkonidae	*Gehyra*	*punctata*	Spotted dtella					N		
Reptiles	Gekkonidae	*Gehyra*	*variegata*	Tree dtella					N		
Reptiles	Gekkonidae	*Hemidactylus*	*frenatus*	Asian House Gecko				*			x
Reptiles	Gekkonidae	*Heteronotia*	*binoei*	Bynoe's Gecko					N	x	

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Reptiles	Pygopodidae	*Delma*	*nasuta*	Sharp-snouted delma				N		
Reptiles	Pygopodidae	*Delma*	*pax*	Legless Lizard species					x	
Reptiles	Pygopodidae	*Delma*	*pax*	Peace delma				N		
Reptiles	Pygopodidae	*Delma*	*tincta*	Excitable delma				N		
Reptiles	Pygopodidae	*Lialis*	*burtonis*	Burton's legless lizard				N		
Reptiles	Pygopodidae	*Pygopus*	*nigriceps*	Western Hooded Scaly-foot				N		
Reptiles	Scincidae	Ctenotus	*duricola*					N		
Reptiles	Scincidae	Ctenotus	*grandis*	Grand Ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	*grandis* subsp. *titan*					N		
Reptiles	Scincidae	*Ctenotus*	hanloni						x	
Reptiles	Scincidae	*Ctenotus*	*hanloni*	Nimble ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	*iapetus*	North West Cape Ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	*maryani*	Maryan's ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	*pantherinus*	Leopard Ctenotus				N	x	
Reptiles	Scincidae	*Ctenotus*	*pantherinus* subsp. *ocellifer*					N		
Reptiles	Scincidae	*Ctenotus*	*rufescens*	Rufous finesnout Ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	saxatilis	Rock Ctenotus					x	
Reptiles	Scincidae	*Ctenotus*	*saxatilis*	Rock Ctenotus				N		
Reptiles	Scincidae	*Ctenotus*	*schomburgkii*					N		
Reptiles	Scincidae	*Egermia*	*depressa*	Pygmy Spiny-tailed Skink				N		
Reptiles	Scincidae	*Eremiascincus*	*fasciolatus*	Narrow-banded Sand Swimmer				N		

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic Record	Observed April 2011	Observed September 2011
Reptiles	Scincidae	*Lerista*	*bipes*	Two-toed Skink				N		
Reptiles	Scincidae	*Lerista*	*clara*					N		
Reptiles	Scincidae	*Lerista*	*onsloviana*	Onslow broad-blazed slider				N		
Reptiles	Scincidae	*Menetia*	*greyii*	Common dwarf skink				N	x	
Reptiles	Scincidae	*Morethia*	*ruficauda* subsp. *exquisita*					N		
Reptiles	Scincidae	*Tiliqua*	*multifasciata*	Central Blue-tongue				N		
Reptiles	Typholidae	*Ramphotyphlops*	*ammodytes*					N		
Reptiles	Typholidae	*Ramphotyphlops*	*grypus*					N		
Reptiles	Varanidae	*Varanus*	*brevicauda*	Short-tailed Pygmy Monitor				N		
Reptiles	Varanidae	*Varanus*	*eremius*	Pygmy Desert Monitor				N		
Reptiles	Varanidae	*Varanus*	*gouldii*	Gould's Goanna				N	x	
Reptiles	Varanidae	*Varanus*	*tristis* subsp. *tristis*	Racehorse Monitor				N		

Appendix C

Flora

Code	Conservation Category	Definition
X	Presumed Extinct Flora (Declared Rare Flora – Extinct)	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 Wildlife Conservation Act 1950).
T	Threatened Flora (Declared Rare Flora – Extant)	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 Wildlife Conservation Act 1950). Threatened Flora are further ranked by the Department according the their level of threat using IUCN Red List criteria: ◗ CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild; ◗ EN: Endangered – considered to be face a very high risk of extinction in the wild; and ◗ VU: Vulnerable – considered to be facing a high risk of extinction in the wild.
P1	Priority 1 – Poorly Known Taxa	Taxa that 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
P2	Priority 2 – Poorly Known Taxa	Taxa that 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 threatening processes.
P3	Priority 3 – Poorly Known Taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from 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.

Code	Conservation Category	Definition
P4	Priority 4 – Rare, Near Threatened and other taxa in need of monitoring	◗ Rare. Taxa 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 taxa are usually represented on conservation lands. ◗ 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. ◗ Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Priority 5 – Conservation Dependent Taxa	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.

Table 18 Flora List for Onslow Material Pits

Family	Genus	Species	Common name	Status
Aizoaceae	*Alysicarpus*	*muelleri*		
Alysicarpus	*Calocephalus*	sp.		
Amaranthaceae	*Gomphrena*	*cunninghamii*		
Amaranthaceae	*Ptilotus*	*axillaris*	Matt Mulla Mulla	
Amaranthaceae	*Ptilotus*	*astrolasius*		
Amaranthaceae	*Ptilotus*	*calostachyus*	Weeping Mulla Mulla	
Amaranthaceae	*Ptilotus*	*exaltatus*		
Amaranthaceae	*Ptilotus*	*fusiformis*		
Amaranthaceae	*Ptilotus*	*macrocephalus*		
Amaranthaceae	*Ptilotus*	*polakii*		
Amaranthaceae	*Ptilotus*	*polystachyus*		
Amaranthaceae	*Ptilotus*	*prostrate*		
Amaranthaceae	*Trianthema*	*turgidifolia*		
Apocynaceae	*Sarcostemma*	*viminale* subsp. *australe*		
Asteraceae	*Cenchrus*	*ciliaris*	Buffel Grass	
Asteraceae	*Olearia*	*dampieri*		
Asteraceae	*Angianthus*	*tomentosus*	Camel-grass	
Asteraceae	*Diplopeltis*	*eriocarpa*	Hairy Pepperflower	
Asteraceae	*Pluchea*	*rubelliflora*		
Asteraceae	*Pterocaulon*	*sphacelatum*	Apple bush	
Asteraceae	*Streptoglossa*	*macrocephala*		
Boraginaceae	*Heliotropium*	*heteranthum*		
Boraginaceae	*Trichodesma*	*zeylanicum*	Camel Bush	
Brassicaceae	*Lepidium*	*pholidogynum*		
Capparaceae	*Capparis*	*spinosa* var. *nummularia*		
Caryophyllaceae	*Polycarpaea*	*corymbosa*		
Caryophyllaceae	*Polycarpaea*	*holtzei*		

Family	Genus	Species	Common name	Status
Chenopodiaceae	*Atriplex*	*semilunaris*	Annual Salt bush	
Chenopodiaceae	*Dysphania*	*rhadinostachya*		
Chenopodiaceae	*Maireana*	*planifola*	Low bush	
Chenopodiaceae	*Neobassia*	*astrocarpa*		
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *obovata*		
Chenopodiaceae	*Salsola*	sp.		
Chenopodiaceae	*Tecticornia*	*pruinosa*		
Clomaceae	*Cleome*	*uncifera* subsp. *uncifera*		
Convolvulaceae	*Bonamia*	*alatisemina*		
Convolvulaceae	*Bonamia*	*erecta*		
Convolvulaceae	*Evolvulus*	*alsinoides*	Tropical Speedwell	
Cucurbitaceae	*Cucumis*	*maderaspatanus*		
Cucurbitaceae	*Mukia*	*maderaspatana*		
Cyperaceae	*Bulbostylis*	*barbata*		
Cyperaceae	*Fimbristylis*			
Cyperaceae	*Cyperus*	*cunninghamii*		
Euphorbiaceae	*Euphorbia*	*alsiniflora*	Namana	
Euphorbiaceae	*Euphorbia*	*australis*		
Euphorbiaceae	*Euphorbia*	*boophthona*		
Euphorbiaceae	*Gossypium*	*australe*		
Fabaceae	*Acacia*	*ancistrocarpa*	Fitzroy Wattle	
Fabaceae	*Acacia*	*bivenosa*		
Fabaceae	*Acacia*	*coriacea*	Wirewood	
Fabaceae	*Acacia*	*cunninghamii*	Green Bird Flower	
Fabaceae	*Acacia*	*gregorii*		
Fabaceae	*Acacia*	*inaequilatera*	Baderi	
Fabaceae	*Acacia*	*sclerosperma*		
Fabaceae	*Acacia*	sp.		
Fabaceae	*Acacia*	*stellaticeps*		
Fabaceae	*Acacia*	*sychronicia*		

Family	Genus	Species	Common name	Status
Fabaceae	*Acacia*	*tetragonophylla*		
Fabaceae	*Acacia*	*trachycarpa*	Mini Richi	
Fabaceae	*Acacia*	*tumida*	Pindan Wattle	
Fabaceae	*Acacia*	*wiseana*		RE
Fabaceae	*Crotalaria*	*xiphophylla*		
Fabaceae	*Cullen*	*lachnostachys*		
Fabaceae	*Crotalaria*	*medicaginea*		
Fabaceae	*Indigofera*	*colutea*		
Fabaceae	*Indigofera*	*monophylla*		
Fabaceae	*Petalostylis*			
Fabaceae	*Rhynchosia*	*minima*	Rhynchosia	
Fabaceae	*Senna*	*artemisiodes subsp. helmsii x oligophylla*		
Fabaceae	*Senna*	*notabilis*		
Fabaceae	*Senna*	*glutinosa*		
Fabaceae	*Senna*	*glutinosa* subsp. *pruinosa*		
Fabaceae	*Swainsona*	forrestii		
Fabaceae	*Tephrosia*	sp. B Kimberley		
Fabaceae	*Tephrosia*	*densa*		
Fabaceae	*Tephrosia*	*rosea*		
Fabaceae	*Tephrosia*	*uniovulata*		
Fabaceae	*Vachellia*	*farnesiana*	Mimosa Bush	
Goodeniaceae	*Dampiera*	*candicans*		
Goodeniaceae	*Goodenia*	*lamprosperma*		
Goodeniaceae	*Goodenia*	*broadleaf*		
Goodeniaceae	*Goodenia*	*forrestii*		
Goodeniaceae	*Goodenia*	*stobbsiana*		
Goodeniaceae	*Scaevola*	*acacioides*	Telopea	
Goodeniaceae	*Scaevola*	*sericophylla*		
Goodeniaceae	*Scaevola*	*spinescens*	Currant Bush	
Gyrostemonaceae	*Gyrostemon*	*ramulosus*		

Family	Genus	Species	Common name	Status
Gyrostemonaceae	*Codonocarpus*	*cotinifolius*	Native Popular	
Lamiaceae	*Dicrastylis*	*cordifolia*		
Lamiaceae	*Pityrodia*	sp.		
Lauraceae	*Cassytha*	*aurea*		
Malvaceae	*Abutilon*	*lepidum*		
Malvaceae	*Corchorus*	*sidioides*	Flannel Weed	
Malvaceae	*Corchorus*	*parviflorus*		
Malvaceae	*Hibiscus*	*sturtii* var. *campylochlamys*		P3
Malvaceae	*Hibiscus*	*stuartii*		
Malvaceae	*Keraudrenia*	*nephrosperma*		RE
Malvaceae	*Melhania*	*oblongifolia*	Berrigan	RE
Malvaceae	*Sida*	*fibulifera*		
Malvaceae	*Triumfetta*	*echinata*		
Malvaceae	*Triumfetta*	*chaetocarpa*		
Malvaceae	*Triumfetta*	*macronochieana*		
Molluginaceae	*Mollugo*	*molluginea*		
Myrtaceae	*Corchorus*	*parviflorus*		
Myrtaceae	*Corymbia*	*zygophylla*	Telopea	
Myrtaceae	*Corymbia*	*candida*		
Myrtaceae	*Corymbia*	*hamersleyana*		
Myrtaceae	*Corymbia*	*candida*		
Myrtaceae	*Eucalyptus*	*victrix*	Telopea	
Myrtaceae	*Verticordia*	*forrestii*	Forrest's Featherflower	
Myrtaceae	*Verticordia*	*forrestii*		
Nyctaginaceae	*Boerhavia*	sp.		
Plantaginaceae	*Stemodia*	sp. Onslow		
Poaceae	*Aristida*	*holathera*		
Poaceae	*Aristida*	*contorta*		
Poaceae	*Chrysopogon*	*fallax*	Golden Beard Grass	
Poaceae	*Dactyloctenium*	*radulans*	Button Grass	

Family	Genus	Species	Common name	Status
Poaceae	*Enneapogon*	*caerulescens*	Limestone Grass	
Poaceae	*Eragrostis*	*cunninghamii*		
Poaceae	*Eragrostis*	*eriopoda*		
Poaceae	*Eragrostis*	*xerophila*	Knottybutt-Neverfail	
Poaceae	*Eragrostis*	*dielsii*		
Poaceae	*Eriachne*	*aristidea*		
Poaceae	*Eriachne*	*benthamii*	Swamp Wanderrie	
Poaceae	*Eriachne*	*pulchella*	Pretty Wanderrie	
Poaceae	*Iseilema*	*membranaceum*	Small flinders grass	
Poaceae	*Iseilema*	*mini*		
Poaceae	*Panicum*	*basicladum*		
Poaceae	*Paraneurachne*	*muelleri*	orthern Mulga Grass	
Poaceae	*Paspalidium*	*decompositum*	Native Millet	
Poaceae	*Paspalidium*	*jubiflorum*	Warrego Grass	
Poaceae	*Sporobolus*	*australasicus*	Fairy Grass	
Poaceae	*Triodia*	*basedowii*	Lobbed Spinifex	
Poaceae	*Triodia*	*lanigera*		
Portulacaceae	*Portulaca*	*oleracea*	Purslane	*
Proteaceae	*Hakea*	*lorea*		
Proteaceae	*Grevillea*	*wickhamii*		
Proteaceae	*Hakea*	*chordophylla*		
Proteaceae	*Grevillea*	*eriostachya*		
Rubiaceae	*Synaptantha*	*tillaeacea*		
Santalaceae	*Santalum*	*lanceolatum*		
Sapindaceae	*Dodonaea*	*coriacea*		
Scrophulariaceae	*Eremophila*	*forrestii*	Wilcox Bush	
Scrophulariaceae	*Eremophila*	*forrestii* subsp *viridis*		P3
Scrophulariaceae	*Eremophila*	fraseri		
Scrophulariaceae	*Eremophila*	longifolia	Berrigan	
Solanaceae	*Solanum*	lasiophyllum	Flannel Bush	

Family	Genus	Species	Common name	Status
Solanaceae	*Solanum*	sturtianum	Thargomindah Nightshade	
Thymelaeaceae	*Pimelea*	ammocharis		
Violaceae	*Hybanthus*	aurantiacus		

Appendix D

Assessment Against the Ten Clearing Principles

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Plant Species** ◗ Total Vascular Plant Taxa – A total of 131 flora taxa from 36 families were recorded from the Project Area, representing a moderate level of diversity, with two weed species. This total is considered to be similar to that found in the local and regional area. ◗ Vascular Plant Taxa Diversity – Diversity in the Project Area is considered to be comparable to that found in the local area; in similar habitat that has areas of disturbance (e.g. roads, tracks, pastoral stations). ◗ Priority Flora, Significant Flora – Two Priority Flora taxa were recorded from the Project Area: o *Triumfetta echinata* (Priority 3); and o *Eremophila forrestii* subsp. *viridis* (Priority 3). – These species were recorded in the Project Area and are considered unlikely to be under threat from the proposed Project activities. **Fauna Species** ◗ Total Fauna Taxa – The reconnaissance fauna survey recorded 23 bird species, three mammal species, one reptile species from the Project Area. The survey result was considered to be a relatively good reflection of fauna species present. **Ecosystem Diversity** ◗ Number of Ecological Communities (Plant, Fauna) – A total of 26 vegetation types and six fauna habitats were recorded from the Project Area. This includes a cleared/degraded vegetation type/habitat. These communities are also present in the local area in similar or better condition. ◗ Habitat Diversity – Habitats (macro- and microhabitats) found in the Project Area are also present in the local area in similar or better condition. ◗ Variety of Soil Types/Geological Formations – Soil types or geological formations in the Project Area are also present in the local and regional area.
Assessment	Project is considered unlikely to be at variance with clearing principle. The locations of the known Priority Flora species can be avoided as part of this project.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Significant Fauna** ◗ Threatened Fauna – The desktop assessment indicated that threatened fauna may potentially utilise the Project Area. Significant habitat for threatened fauna was not recorded within the Project Area, with habitat is considered to be common in the local and regional area. No Threatened Fauna taxa were recorded from the Project Area. ◗ Priority Fauna – The desktop assessment indicated that priority fauna may potentially utilise the Project Area for foraging. Two Priority 4 fauna species were recorded within the Project Area: o *Ardeotis australis* (Australian Bustard); and o *Falco hypoleucos* (Grey Falcon). – Both Priority Fauna species are considered to utilise a wide range and are considered unlikely to be impacted by the proposed project. These species are highly mobile and expected to move away during Project activities. ◗ Other Significant Fauna – The desktop assessment indicated that significant fauna may occur in the Project Area. Three EPBC Act Marine and/or Migratory Listed species were recorded from the Project Area. These species are considered common in Western Australia and are not under threat. **Habitat** ◗ Significant Habitat / Habitats of Significance – No habitat deemed to be significant occurs in the Project Area. Habitat in the Project Area also occurs in the local area in similar or better condition. The habitat in the Project Area is disturbed by road maintenance, urban development and pastoral activities. ◗ Habitat Extent and Retention – Habitats recorded in the Project Area are also found in the local area in similar or better condition. The proposed Project will not significantly diminish the extent of these habitats. ◗ Ecological Corridors – The habitat in the Project Area occurs in a region with relatively undisturbed ecological corridors. Existing corridors are not considered to be significantly modified by the proposed project.
Assessment	The Project Area contains potential habitat for Threatened and Priority fauna species. Two Priority Fauna species were recorded from the Project Area, however, due to their mobile nature, the Project is considered unlikely to be impact on these species and is there for considered unlikely to be at variance with this clearing principle.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Rare Flora** ◗ Presence – No Threatened (Declared Rare) Flora taxa were indicated to occur within the vicinity of the Project Area as a result of database searches. No Threatened (Declared Rare) Flora taxa were recorded in the Project Area during the field survey. ◗ Habitat – No habitat considered to be required for the continued existence of Threatened Flora is considered to be present in the Project Area.
Assessment	Not considered to be at variance with clearing principle as no Rare Flora were identified during the field assessment. Priority species occurring within Material Pit 10 SLK RHS/1 will be avoided.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Vegetation** ◗ Extent and Status – Vegetation Associations within the vicinity of the Project Area are considered to be of Least Concern with >90% remaining. – Vegetation types recorded in the Project Area are considered to be equivalent to the Vegetation Associations indicated by Beard. ◗ Communities – No Threatened or Priority Ecological Communities were recorded from the Project Area. ◗ Areas – No Environmentally Sensitive Areas occur within or immediately adjacent to the Project Area.
Assessment	Not considered to be at variance with this clearing principle.

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Vegetation** ◗ Extent and Status – Vegetation Associations within the vicinity of the Project Area are considered to be of Least Concern with >90% remaining. – Vegetation types recorded in the Project Area are considered to be equivalent to the Vegetation Associations indicated by Beard. ◗ Regionally Significant Areas – Vegetation within the Project Area is not considered to contain communities required to maintain ecosystem services (e.g. hydrological processes).
Assessment	Not considered to be at variance with clearing principle.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Watercourses and Wetlands** ◗ Vegetation – A number of saline wetlands occur within the Project Area adjacent to Pit 70 and 74.5. The majority of these have been highly modified for the production of salt and are no longer considered to be natural. – There are a few un-modified wetlands within the vicinity of the Project Area. These will not be impacted by the proposed Project as they occur away from the material test pits. – Two ill-defined floodways with occur towards the southern end of the Project Area associated with runoff from adjacent hills. Neither floodway contains riparian vegetation. ◗ Groundwater Dependent Ecosystems – No groundwater dependent ecosystems occur within or adjacent to the Project Area.
Assessment	Not considered to be at variance with clearing principle.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Land Degradation** ◗ Soil Erosion – The Project proposes to clear vegetation to allow for the material pit investigation. Erosion from wind is considered to be minimal; however, some vegetation in the northern Project Area occurs on consolidated sand dunes. This area is proposed to be cleared. – The clearing of native vegetation is not expected to alter the quality or quantity of water run-off in or adjacent to the Project Area. Waterlogging and changes to nutrient levels are not expected to be altered by the clearing of vegetation in the Project Area. ◗ Soil Acidity – The clearing of vegetation is not considered to alter soil acidity in or adjacent to the Project Area. The vegetation within the vicinity of the existing salt works is already highly modified and is not considered likely to alter soil acidity. ◗ Salinity – The clearing of vegetation is not considered to significantly alter the hydrological balance and cause a change in the salinity either on- or off-site.
Assessment	Not at variance with this clearing principle. In all cases, the clearing of vegetation for material pits will be staged in order to reduce the area of disturbance. A staged operation will ensure that the activity will not cause appreciable land degradation but rather allow for the placement of topsoil and rehabilitation of material areas to occur as soon as possible.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Conservation Areas** ◗ Protected Areas – It not expected that the material test pits will impact conservation areas. ◗ Fragmentation – The Project Area occurs in an area where the vegetation is relatively un-fragmented. ◗ Ecological Linkages – The Project Area occurs in a region where the vegetation where ecological linkages remain mostly intact. Existing ecological linkages are not considered to be impacted by the proposed works.
Assessment	Not considered to be at variance with clearing principle.

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Water Quality** ◗ Catchment Areas – The Project Area does not occur within a proclaimed Public Drinking Water Supply Catchment. ◗ Groundwater – The clearing of vegetation is not considered to cause an alteration to the quality of groundwater in or adjacent to the Project Area. – No groundwater dependent ecosystems occur in or adjacent to the Project Area. ◗ Surface Water – The clearing of vegetation is not considered to cause an alteration to the quality of surface waters in or adjacent to the Project Area.
Assessment	Not considered to be at variance with clearing principle.

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Methodology	Desktop assessment of available information and field survey results
Survey Results	**Water Quantity** ◗ Flooding – The clearing of vegetation in the Project Area is not considered to alter the frequency or intensity of flood events. Runoff coefficients in the Project Area are not likely to be significantly altered by the clearing of native vegetation.
Assessment	Not considered to be at variance with clearing principle.

Appendix E

Environmental Management Plan

Table 19 Environmental Management Commitments

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
1.0	**Vegetation**	"To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge" (EPA, 2004).	Material Pits	Areas to be cleared will be minimised by preferentially using areas of existing disturbance, including existing access tracks and former material pit areas.	Construction	Construction Contractor
				Areas to be cleared will be pegged prior to commencing earthworks.	Construction	Construction Contractor
				No vegetation outside the designated areas will be removed during earthworks, construction or operation.	Construction	Construction Contractor
				Earthmoving equipment will be cleaned of soil and vegetation prior to entering and leaving the area to be cleared.	Construction	Construction Contractor
				Avoid impacting areas of variable vegetation, such as vegetation along rock outcrops and breakaways as these areas generally tend to have higher biodiversity values and are of value as fauna habitat.	Construction	Construction Contractor
				Vehicle parking and temporary materials storage will be located on existing cleared areas where possible.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Once the pits are exhausted, the disturbed areas will be rehabilitated as soon as possible.	Post - Construction	Construction Contractor
				Material cleared will be utilised in rehabilitation works where practicable.	Post - Construction	Construction Contractor
				Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared.	Construction	Construction Contractor
				Movement of soil will be avoided in wet conditions.	Construction	Construction Contractor
				If imported soils and materials are to be used, they will be weed free.	Construction	Construction Contractor
				Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared.	Construction	Construction Contractor
				Cleared vegetation (including stubble) will be used in site rehabilitation and erosion control where practical.	Construction	Construction Contractor
				Cleared vegetation (or stubble) will not be burnt on-site.	Construction	Construction Contractor
				Stripped topsoil will be salvaged for use in site rehabilitation if required.	Construction	Construction Contractor
				Materials and topsoil stockpiles will be located so as not to restrict or interfere with existing site drainage.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
2.0	**Weed management**	Minimise risk of weed entering/impacting the project area		Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared.	Construction	Construction Contractor
				Movement of soil will be avoided in wet conditions.	Construction	Construction Contractor
				If imported soils and materials are to be used, they will be weed free;	Construction	Construction Contractor
				Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared.	Construction	Construction Contractor
				Any declared flora species located in the area will be controlled in accordance with Sections 49 and 51 of the Agriculture and Related Resources Protection Act 1976.	Construction	Construction Contractor
3.0	**Fauna**	"To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge" (EPA, 2004).	Material Pits	Meet all requirements of the Wildlife Conservation Act (1950).	Construction	Construction Contractor
				Clearing will be undertaken as outlined in Section 6.1.	Construction	Construction Contractor
				Noise and vibration will be managed as outlined in Section 6.7.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Works will cease on sighting an animal which might be at risk of injury in the Project Area. Works will recommence once the animal has moved on.	Construction	Construction Contractor
				The work site will be left in a safe condition at the end of each working day to ensure animals are not subject to harm from the Project works.	Construction	Construction Contractor
				During construction works, the area will be inspected each morning to ensure no fauna have been trapped during the previous evening. A Regional DEC Officer or designated representative will be contacted to facilitate removal if necessary.	Construction	Construction Contractor
				No native fauna (including venomous snakes) will be deliberately impaired or killed during project works.	Construction	Construction Contractor
				Where possible, clearing will be undertaken at a time of year that is least likely to impact on breeding or nesting species (i.e. avoid clearing from late in the wet season to the early dry season).	Construction	Construction Contractor
				Barriers to native fauna movement will be minimised.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Ensure material pits are left hydrologically neutral to prevent water pooling which may enhance the success of feral fauna species.	Construction	Construction Contractor
				Laydown areas will be constructed on previously disturbed areas where practical.	Construction	Construction Contractor
				The movement of machinery and vehicles will be minimised or restricted at dusk and dawn and during night-time hours.	Construction	Construction Contractor
4.0	**Groundwater**	"To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected" (EPA, 2004).	Material Pits	In the event that hazardous materials are to be used or held on-site, materials will be managed in accordance with Main Roads' safety procedures.	Construction	Construction Contractor
				No vehicles will be serviced or refuelled on the site.	Construction	Construction Contractor
				A 'Spill Kit' will be provided on-site at all times.	Construction	Construction Contractor
				The site spill response plan will be implemented to deal with spillages and leaks within the site area. This plan provides details on methods of containment, collection and disposal, and training of personnel.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Any accidental spillage will be reported to the contracting manager and emergency clean-up procedures will be immediately implemented. These procedures will include the control of any spilt material and removal of contaminated soil to an approved site if required.	Construction	Construction Contractor
				Liaise and gain relevant abstraction licences from the Department of Water.	Construction	Construction Contractor
5.0	**Surface Waters and Drainage**	To ensure that surface waters and drainage are not unduly impacted by the project.	Material Pits. .	No construction works will occur within 50 m of any water body.	Construction	Construction Contractor
				No hazardous materials will be used or held on-site within 50 m of any water body.	Construction	Construction Contractor
				Existing natural drainage paths and drainage channels along road reserves will not be unnecessarily blocked or restricted by material stockpiles	Construction	Construction Contractor
				Any material that is found to block drainage will be removed	Construction	Construction Contractor
6.0	**Dust**	"To ensure that dust emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards" (EPA, 2004).	Material Pits	Water tankers will be available at all times to wet down exposed surfaces on works areas, laydown sites, spoil dumps and topsoil and materials heaps.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Minimise as far as possible dust generating activities.	Construction	Construction Contractor
				Dust lift will be monitored through visual and other means and all complaints responded to rapidly.	Construction	Construction Contractor
				Staged vegetation clearing will be undertaken to reduce dust generation	Construction	Construction Contractor
7.0	**Noise and Vibration**	"To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring noise levels meet statutory requirements and acceptable standards" (EPA, 2004).	Material Pits	All equipment will be regularly maintained and serviced, including exhaust systems.	Construction	Construction Contractor
				Plant and machinery will operate in accordance with Shire of Ashburton requirements.	Construction	Construction Contractor
8.0	**Use of Hazardous Substances**	"To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards" (EPA, 2004).	Material Pits	Any accidental spillage will be reported to the management of the facility as soon as practicable.	Construction	Construction Contractor
				No light vehicles will be serviced or refuelled on the site.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Larger plant machinery will be serviced off-site.	Construction	Construction Contractor
				A 'Spill Kit' will be provided on-site at all times.	Construction	Construction Contractor
				Emergency clean-up procedures will be immediately implemented in the case of any spillage. These will include control of spilled material and removal of contaminated soil to an approved site if required.	Construction	Construction Contractor
9.0	**Aboriginal Heritage**	"To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation" (EPA, 2004).	Aboriginal Heritage Site Areas	Main Roads and their contractors will be aware of their obligations under the *Aboriginal Heritage Act 1972* during the Project works.	Construction	Construction Contractor
				If during Project works, the Construction Contractor uncovers any materials that could be considered significant to Aboriginal people, Main Roads will immediately cease works within 50 m of the material and notify DIA immediately.		
				If any human skeletal material is uncovered, work shall cease within 20 m of the material and it shall be reported to the WA Police as soon as possible.	Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
10.0	**Visual Impacts**	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable.	Material Pits	No spoil heaps or other materials will be left in view of the road.	Construction	Construction Contractor
				rehabilitation will be carried out as soon as possible following completion of works in each area.	Post-Construction	Construction Contractor
11.0	**Rehabilitation**	Rehabilitation of the Project Area is important to ensure that any visual and environmental impacts of the works are short term.	Material Pits	Pits will be shaped and contoured to ensure that the likelihood of water ponding is reduced.	Post-Construction	Construction Contractor
				Any compacted ground will be ripped or scarified where revegetation is required.	Post-Construction	Construction Contractor
				Cleared topsoil and vegetation will be respread over disturbed areas.	Post-Construction	Construction Contractor
				If imported soils and materials are required, they will be certified weed free.	Post-Construction	Construction Contractor
				All rubbish, materials heaps or other debris will be removed.	Post-Construction	Construction Contractor
				Access tracks will be deep ripped and blocked off where possible.	Post-Construction	Construction Contractor
12.0	**Inductions and Training**	Ensure all construction personnel are inducted	Project Area	Construction personnel should be made aware of the issues and actions in this Management Plan so that they do not unnecessarily damage the environment during the works phase;	Pre-Construction	Construction Contractor

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Emergency training in relation to fires, chemical spills or other risks shall be carried out early in the construction phase.	Construction	Construction Contractor
13.0	**Complaints Handling Procedure and Register**	Ensure any complaints received are dealt with in a timely manner.	Project Area	Any complaints received relating to the project will be notified to the site representative and MRWA representatives notified.	Construction	Construction Contractor
14.0	**Management of Environmental Incidents**	Ensure all incidents are reported and mitigated in a timely manner	Project Area	Structure and content of incident reports.	Pre-Construction	Construction Contractor
				Reporting of the incident in an incident log.	Construction	Construction Contractor
				Time limits for incident reporting and response.	Construction	Construction Contractor
				Assessment of the significance of each incident.	Construction	Construction Contractor
				Discontinuation of the work which gave rise to the incident.	Construction	Construction Contractor
				Reporting incidents where necessary to regulatory .authorities and stakeholders.	Construction	Construction Contractor
				Satisfactory and timely remediation/mitigation of impacts.	Construction	Construction Contractor

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