2005/228
Version 2

ALine East
AN ALLIANCE TO UPGRADE GREAT EASTERN HIGHWAY

ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
(SLK 245.2 – 251.6)
GREAT EASTERN HIGHWAY

VERSION 2
MAY 2006
ATA Environmental Report No: 2005/228

ATA Environmental
environmental scientists

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EXECUTIVE SUMMARY

The Great Eastern Highway is the main link connecting Perth to the Eastern States, carrying commuter traffic, regional and interstate road freight. Much of the existing road pavement between Kellerberrin and Carrabin is about 40 years old and is relatively rough. During the past 10 years several sections of the road have been upgraded, resulting in a road with varying standards of geometry, surface roughness, width and overtaking opportunities. Some sections are deficient in width for the amount and type of traffic that use the road. There are also sections with poor alignment, thus increasing travel times and affecting safety.

The Western Australian Government has formed an alliance, Aline East, which is made up of representatives from Main Roads Western Australia (Main Roads), Brierty Contractors, BG&E and WML Consultants to widen and realign the deficient sections of Great Eastern Highway between Kellerberrin and Carrabin.

The project area has been divided into the following Design Packages (DPs), which are proposed for construction over the next two years:

Design Package (DP)	From (SLK)	To (SLK)	Length (km)	Possible Treatment
DP 1	239.2	245.2	6.0	Re-Condition / Widen / Overlay
DP 2	251.6	256.25	4.65	Widen Shoulders to 11m
DP 2a	256.25	258.05	1.8	Kerbing & Pavement Marking
DP 3	245.2	251.6	6.4	Realignment & Widen/Overlay
DP 6	226.9	239.2	12.3	Realignment
DP 10	257.8	264.8	8.8	Widen
DP 11	198.4	203.65	3.4	Townsite & Intersections (Steel Weld Road and Mather Road)

For the project to proceed, environmental approval will be required from the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* for some of the Design Packages. Where necessary, these design packages will be referred for assessment in accordance with the Memorandum of Understanding between the Main Roads and Department of Environmental Protection (now DoE) (2000).

This EIA addresses the environment factors within Design Package 3 (DP 3) as identified in the Preliminary EIA undertaken by Kellogg Brown and Root (KBR, 2005). The principle issues relating to DP 3 are consistent with issues identified as possible constraints during preliminary discussions with the DoE.

Specialist flora, fauna, noise and Aboriginal and European heritage surveys have been undertaken for the area.

The project will have no impact on significant flora or vegetation and no trees rated as having Very High Significance are to be cleared. However approximately 2.0 ha of previously rehabilitated (planted) vegetation and 1.52ha of a mixture of remnant vegetation and rehabilitated (planted) vegetation will be cleared.

The clearing will have no impact on significant fauna and little impact on fauna habitat as the rehabilitated (planted) areas have a poorly developed understorey and appear to support few species.

Acoustical modelling determined that the predicted noise levels resulting from the implementation of the proposal will comply with Main Roads Noise Level Objectives and the WAPC's Draft Planning Policy for Road and Rail Transport Noise.

Environmental factors relating to the design and construction of DP 3 are summarized in Table 1. This document addresses these environmental factors, along with the potential impacts of the proposed road upgrade and preliminary management measures to minimise or prevent these impacts and suggests other recommendations.

Required Approvals

Of the environmental factors identified, none are considered potentially referable to the EPA.

There is no requirement for the proposal to be referred to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act, 1999.*

TABLE 1
SUMMARY OF ENVIRONMENTAL ASPECTS AND IMPACTS ASSOCIATED WITH DP 3

ENVIRONMENTAL ASPECT	ISSUE	IMPACT
Vegetation and Flora		
Clearing of Vegetation	Clearing of 2.0ha of previously rehabilitated (i.e. planted) *Eucalyptus* spp. and 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation	Project area has been extensively cleared. Remaining vegetation is fragmented and degraded and comprised of isolated trees and remnants with little understorey.
Threatened Species	No Declared Rare or Priority species or Threatened Ecological Communities (TECs) present	na
Significant Trees	Depending on species, mature trees with a circumference at breast height of >2.0m, are of significance due to their age, aesthetics and the presence of nesting hollows for parrots	One tree rated as having High Significance to be cleared. Numerous trees rated as of Medium Significance to be cleared (mostly planted *E. salmonophloia*).
Dieback	Dieback has not been recorded east of Northam	na
Weeds	Area contains various weed species including the Declared weed *Echium plantagineum* (P1 for the State and P4 for Shire of Merridin)	Potential risk of importing spreading weeds to remaining vegetation
Topsoil management	Topsoil may contain seeds of weed species	Respreading topsoil may promote spread of weed

ENVIRONMENTAL ASPECT	ISSUE	IMPACT
Fauna		
Fauna - general	A number of fauna may potentially use the area	Loss of habitat will remove and displace fauna. However the vegetation is fragmented and degraded and comprised of isolated trees and remnants with little understorey.
Threatened Fauna	Four species of threatened fauna (Carnaby's Black Cockatoo [Schedule 1], Peregrine Falcon, Rainbow Bee-eater and Fork-tailed Swift) are expected to occur in the study area.	The Peregrine Falcon, Rainbow Bee-eater and Fork-tailed Swift are migratory species. Given the minimal and linear nature of the clearing, the project is unlikely to have a significant impact on any of these species. Carnaby's Black-Cockatoo may utilise the small remnants of vegetation for feeding. However, the remnants are generally degraded. DP 3 did not contain trees with hollows of adequate size to support Carnaby's Black Cockatoos. The project is not expected to have a significant impact on this species.
Conservation Reserves	No conservation reserves or other significant bushland within or adjoining the site	na
Surface Water, Groundwater and Drainage	No wetlands or surface drainage lines. No potable water catchments or resource protection areas	na
Surrounding Land use	Project is adjacent to 6 residences, and the town of Nangeenan	Potential for noise, dust and disruption during and following construction.
Contaminated Sites	No contaminated sites identified or likely	na
Noise and vibration	Six residences, the Merredin Agricultural Research station and the Merredin Radio Station are located adjacent to the Great Eastern Hwy and currently receive high levels of ambient noise.	The project will comply with Main Roads noise level objectives. No noise amelioration required
Aboriginal Heritage	No sites of ethnographic or archeological significance within the project	na
European Heritage	No registered sites within or	na

ENVIRONMENTAL ASPECT	ISSUE	IMPACT
	adjacent to the project area	
Visual amenity	Project will result in clearing of 2ha of rehabilitated (i.e. planted) and 1.52ha of remnant and rehabilitated (planted) vegetation adjoining the road. One significant tree will be cleared but will not reduce visual amenity.	Minor impact as majority of existing vegetation within the project area to be retained.

1. INTRODUCTION

1.1 Background

The Great Eastern Highway is a major transport and tourist route to the Goldfields and eastern states. The section of Highway at Kellerberrin and between Hines Hill and Carrabin is to be upgraded to improve safety standards.

The project area has been divided into six design packages (DPs), which will be constructed over the next two years (Figures 1 and 2a-f). Proposed works for DP 3 are defined as follows:

Package	SLK	Length (km)	Treatment
DP3	245.2 – 251.6	6.4	Widen/Overlay and Realignment (Nangeenan townsite)

Aline East appointed ATA Environmental to undertake a series of environmental assessments for the project, including the EIA for this Design Package.

This report constitutes the EIA for DP 3 (245.2 to 251.6) including the Nangeenan townsite (Figures 2a–f).

A Preliminary EIA was prepared by Kellogg Brown and Root (2005) for proposed works on Great Eastern Highway between Chedaring Road and Northam (SLK 59 and 90) and between Hines Hill and Southern Cross (SLK 225 – 366.4).

1.2 Scope of Report

This EIA identifies the existing environment, potential impacts of the proposed road upgrade within DP 3 including those environmental factors identified in the Preliminary EIA and management measures to minimise or prevent these impacts.

This EIA may be referred to the Environmental Protection Authority (EPA) for assessment under Section 38 of the *Environmental Protection Act 1986* although it is unlikely that it will be necessary to obtain statutory approval from the EPA in order to proceed with DP 3.

The report contains detailed information from desktop and field investigations to determine whether the proposal needs to be referred to and assessed by the relevant authorities.

2. DESCRIPTION OF THE PROPOSAL

2.1 Location

DP 3 comprises 6.4km of the GEH including 2.0km through the Nangeenan townsite, approximately 50m to the south of the current alignment on the east side of Town. (Figures 1 and 2a-f).

2.2 Justification and Objectives

Great Eastern Highway is being upgraded by widening, overlay and realignment between Kellerberrin and Carrabin to improve road geometry, surface roughness, width and overtaking opportunities. This will contribute to reduced travel times and improved safety.

DP 3 is one section of the highway identified for upgrade. It will generally follow the existing horizontal design except for 2km realignment to the south through Nangeenan. The existing alignment follows the original rail alignment and contains two bends that do not meet safety requirements. Several serious accidents have occurred in this section of the highway. Heavy haulage contractors, (Marley's Transport) accesses and egresses the highway between these two bends. The proposed realignment addresses and resolves community concerns about safety.

2.3 Legal Framework

In addition to meeting the requirements of the *Environmental Protection Act 1986* the proposal is required to comply with, amongst others, any or all of a number of Acts of Parliament and Regulations at the State and Commonwealth level as listed below:

- *Aboriginal Heritage Act, 1972;*
- *Agriculture and Related Resources Protection Act 1984,*
- *Conservation and Land Management Act 1984;*
- *Environment Protection and Biodiversity Conservation Act, 1999;*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004;*
- *Heritage of Western Australia Act, 1990;*
- *National Heritage Trust of Australia Act 1997;*
- *Soil and Land Conservation Act 1945;*
- *Soil and Land Conservation Act 1945-1982;*and the
- *Wildlife Conservation Act 1950.*

The approvals process is aligned with the Memorandum of Understanding between Main Roads and the Department of Environmental Protection (2000) and the Main Roads Project Purpose Permit (2006). The environmental impact assessment and approval process related to this project is outlined in Table 2.

TABLE 2

IMPACT ASSESSMENT AND APPROVAL FLOW CHART

ENVIRONMENTAL IMPACT ASSESSMENT (DESKTOP & FIELD)

- Aspect 1: Aboriginal Heritage Sites
- Aspect 2: European and National Heritage Places
- Aspect 3: Threatened Fauna – particularly Carnaby's Cockatoo nesting sites
- Aspect 4: Flora – DRF, Priority Species, Nationally Threatened species, ESAs, significant trees
- Aspect 5: Land tenure – CALM A Class Reserves, World Heritage properties, Commonwealth land
- Aspect 6: Vegetation – Threatened Ecological Communities & Nationally Threatened Communities, remnant vegetation
- Aspect 7: Riparian beds, banks and surface water
- Aspect 8: Wetlands – RAMSAR, ESAs
- Aspect 9: Noise

↓

INCORPORATE ENVIRONMENTAL ASPECTS INTO DESIGN

- Environmental constraints incorporated into design plan.
- Alignment selected to minimise impacts

↓

REFER PROPOSAL AND INTENDED REFERRALS TO MAIN ROADS

Northam Region then Perth to ensure that the assessments and referral strategy have been undertaken in accordance with Main Roads Environmental Guidelines and Project Purpose Permit to Clear Native Vegetation (1st February 2006)

↓

SUBMISSIONS REQUIRED

If the impacts of proposed clearing are at variance with the clearing principles in the Main Roads Project Purpose Permit (1st February 2006) then the following parties must be invited to comment:

- DoE Native Vegetation Protection Branch;
- Clearing Assessment Unit of the Environmental Protection Branch in CALM;
- The Office of the Commissioner of Soil and Land Conservation in the Department of Agriculture;
- The Conservation Council of Western Australia Inc.;
- The local government responsible for the areas that is to be cleared;
- The owner (as defined in section 51A of the EP Act), or occupier (as defined in section 3 of the EP Act), of any land on which the clearing is proposed to be done;
- Any other environment or community groups that considered to have an interest in the proposed clearing;
- Any other party that is considered to have an interest in the clearing proposed to be done.

The submission period must be at least 21 days. Any submissions received must be addressed in an EIA report in accordance with condition 7(k) of the Main Roads Project Purpose Permit.

2.4 Key Project Characteristics

The following table includes the key characteristics associated with the proposed construction and upgrade of Great Eastern Highway through DP 3, including the nature and extent of the works to be undertaken.

TABLE 3
KEY PROJECT CHARACTERISTICS

Element	DESCRIPTION
Construction Duration	Summer of 2005/2006
General Standards of Design and Construction	Design speed 110km/h. Main Roads standards
Length of Section	6.4km
Proposal Description	Design, construction and use of a highway of two lanes at Nangeenan townsite and east towards Merredin within the Shire of Merredin. The proposal includes construction of all road pavements, associated earth works, culverts, fencing, rehabilitation and signs. A truck parking stop west of Nangeenan and one rest stop (at SLK 249.4 to 249.5) are incorporated into the design.
Typical cross-section	A total of 16.6m comprising 2.6m for table drains, 12m for carriageway, 2m for sealed shoulder. Widening works on both sides of road for approximately 6.0 m with the vertical profile lifted between 100 and 300mm (See Figure 3)
Vegetation to be Cleared	Approximately 2.0ha of previously rehabilitated (planted) vegetation, 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation.
Water Requirements	Approximately 300-400KL/day of which 60% would be fresh (2000mg/L) and 40% saline water.

DP 3 extends from SLK 245.2– 251.6 with widening works on both sides of the road for approximately 6m either side of the centerline with a realignment to approximately 60m south of the existing road and associated improvement of access points and intersections through Nangeenan. The vertical profile will be raised between 100 and 300mm.

2.5 Timing and Staging of the Project

The final design for DP 3 is almost completed. Subject to environmental approval being granted for the proposal, construction is scheduled to commence as soon as possible and will continue over the summer of 2006. DP 1 and DP 2 are also being constructed during summer 2006. The remaining sections of the upgrade project are scheduled for construction in the summer of 2006-2007.

3. EXISTING ENVIRONMENT

3.1 Physical Environment

3.1.1 Climate

Merredin, the meteorological station closest to the project area, has a temperate climate with warm and dry summer days with clear skies. A band of high pressure known as the subtropical ridge dominates the weather in the region. The typical position of this ridge changes during the year and the prevailing winds in Merredin change correspondingly from easterly in summer to westerly in winter. Winter temperatures are mild with a most of the average rainfall being received during this period. The mean annual rainfall recorded at Merredin over the past 100 years is 328.4mm over 70 rain-days. Mean daily maximum temperatures range from 33.7 degrees Celsius in summer to 16.2 degrees in winter. Mean minimum temperatures range from 17.9 degrees Celsius in summer to 5.4 degrees in winter.

The average mean temperatures (over a 38 year recording period), rainfall and number of rainy days (recorded over 100 years) at the Merredin Bureau of Meteorology Station 010092 are shown in Table 4.

TABLE 4

SELECTED CLIMATIC PARAMETERS AT MERREDIN

Mean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily Max °C	33.7	32.9	30.0	25.2	20.4	17.2	16.2	17.1	20.4	24.5	28.3	31.9
Daily Min °C	17.7	17.9	16.0	12.9	8.9	6.8	5.6	5.4	6.8	9.4	12.9	15.8
Rainfall (mm)	13.2	15.8	20.8	23.5	41.6	51.1	51.6	39.4	25.4	17.9	14.1	14.0
Rainy days	2.1	2.5	3.2	4.7	8.0	11.1	12.1	10.3	7.2	5.0	3.2	2.5

3.1.2 Geology, Soils and Landforms

The underlying bedrock of the project area is estimated to be 2-3 billion years old Archaean tectonic unit known as the Yilgarn Craton and comprises crystalline granite and gneiss rocks. No outcropping or surface expressions of these rocks are found within DP 3.

Ten major soil associations, or land management units, have been identified in the Merredin area. The most common soil association within DP 3 is the Merredin soil group which is described as red-brown sandy loam to sandy clay loam surfaced soils with red-brown alkaline subsoils. This soil type is often associated with *Eucalyptus salmonophloia* and *Eucalyptus salubris*. Rising salinity and acidic soils are problematic within the Shire of Merredin (Lantzke, 1992), however acid soils are unlikely to pose a problem if, as anticipated; excavations during construction do not exceed 2ms below current surface levels

The topography within DP 3 is relatively flat and valleys are shallow with only 60m from valley floors to divides with gradients between 1:1000 and 1:1500.

3.1.3 Surface Hydrology

The entire project is located within the Yilgarn Catchments of the Avon River Basin (Australian Water Resource Council basin number 615). This basin is located in the Northern Zone of Ancient Drainage which contains extensive chains of salt lakes extending out to Southern Cross that have connected surface flow only in exceptionally wet years (e.g. 1963 and 2000) (Viney and Sivapalan, 2001). When surface water does flow it ultimately drains into the Yilgarn River with a catchments area of 55,900km^2 and then into the Avon and then Swan Rivers. In average rainfall years, surface water drainage is internal and the playa lakes act as sumps in which salts accumulate (i.e. seasonal salt lakes). The lakes are inter-connected by very limited ground water movement. There are no wetlands within DP 3.

There are large areas of secondary salinity on the valley floors and the potential for salinity to spread is high because of the low relief and regional ground water pattern. The Avon Catchments Council (2005) has estimated that up to 30% of agricultural land will be affected by salinity and two-thirds will require some treatment for soil acidity by 2050.

3.1.4 Groundwater Hydrology

Groundwater systems in this region are not fully understood. However, it is known that the water table has risen since broad scale clearing commenced and groundwater has also become more saline. Dryland salinity is common in the Shire of Merredin and occurs when the shallow saline groundwater rises by capillary action through the soil. There has been limited deep drilling for water supply in this area. There is no plan to abstract groundwater for the project within the zone of influence of DP 3.

Demand for water during the construction of DP 3 will be approximately 300-400KL/day of which 60% would be fresh (2000 mg/L) and 40% saline water. This water will be sourced from the following:

- treated effluent from the Merredin Wastewater Treatment Plant and saline water from two Department of Agriculture bores will be stored in three water tanks located at a Wash Down Bay immediately north of Dam 3, which contains runoff from the CBH Building;
- Freshwater will be drawn from Dam 3 after installation of a pump and standpipe; and
- Any shortfall of freshwater would be sourced from the Water Corporation standpipes managed by the Shire of Merredin.

Any abstraction of groundwater will be licensed in accordance with the requirements of the *Rights to Water and Irrigation Act 1914.*

3.2 Vegetation and Flora

3.2.1 Methodology

An assessment of the vegetation and flora occurring within DP 3 was undertaken between October 31 and November 2, 2005. The assessment was undertaken to provide a description of the dominant vegetation communities, vegetation condition and flora species present within the study area. The survey concentrated on the vegetation and flora within the gazetted road reserve, proposed road realignment area and 10 m either side of the reserve, wherever access was possible. The survey was undertaken by traversing the study area on foot and by vehicle to identify significant species and vegetation types that may potentially be impacted.

A desktop search was undertaken to identify significant flora or vegetation communities that could potentially occur in the study area. This investigation encompassed a review

of the following Department of Conservation and Land Management (CALM) databases:

- CALM's 'Threatened Ecological Communities' database;
- CALM's 'Threatened (Declared Rare) Flora' database; and
- CALM's 'Declared Rare and Priority Flora' database, which contain species that are Declared Rare (Conservation Code R or X for those presumed to be extinct) poorly known (Conservation codes 1, 2 or 3) or require monitoring (Conservation Code 4).

3.2.2 Significant Flora

The results of the (CALM) Threatened (Declared Rare) Flora database and the CALM's 'Declared Rare and Priority Flora' database search are presented below in Table 5.

TABLE 5

SPECIES OF SIGNIFICANT FLORA RECORDED IN THE VICINITY OF THE ALINE EAST PROJECT AREA

Species/Taxon	Conservation Code	Flowering Period	Preferred Habitat
Acacia ancistrophylla var. *perarcuata*	P3	Aug–Sep	Red sand, clay loam, loam. Undulating plains.
Acacia ataxiphylla subsp. *magna*	DRF	Jun-Jul	Sandy soils. Lateritic ironstone rises, flats.
Acacia crenulata	P3		Rocky rises, granite outcrops, breakaways.
Acacia denticulosa	DRF	Sep-Oct	Granite outcrops, rarely on sandplains.
Acacia dissona var. *indoloria*	P3	Aug-Sep	Sand, sandy loam. Undulating plains
Acacia filifolia	P3	May-Sep	Yellow sand, gravelly lateritic sand. Sandplains.
Acacia lirellata subsp. *compressa*	P2		Yellow sand, clayey loam. Sandplains
Acacia sclerophylla var. *teretiuscula*	P1	Sep-Oct	Clay & loamy soils
Acacia undosa	P3	Jul-Sep	Undulating plains, low-lying areas.
Austrostipa blackii	P3	Sep–Nov	Unknown
Baeckea sp. *Muntadgin*	P1		Unknown
Blennospora phlegmatocarpa	P3	Sep-Oct	Sandy soils. Saline flats
Conospermum eatoniae	P3	Aug-Oct	Deep white sand, sandy clay loam
Conostylis albescens	P2	Aug	Yellow sand.

Species/Taxon	Conservation Code	Flowering Period	Preferred Habitat
			Sandplains.
Dampiera scaevolina	P1	Sep-Nov	Sandy & gravelly soils.
Daviesia oxylobium	P4	Jul-Aug	Sandy lateritic soils. Undulating plains.
Dryandra shanklandiorum	P4	Jun-Aug	White/yellow sand with lateritic gravel.
Eremophila resinosa	DRF	Apr/Oct-Nov	Clay loam, gravelly sandy clay. Road verges.
Eremophila viscida	DRF	Sep-Nov	Granitic soils, sandy loam. Stony gullies, sandplains
Eucalyptus caesia subsp. *magna*	P4	May-Sep	Loam. Granite outcrops.
Eucalyptus caesia subsp. *caesia*	P4	May-Sep	Loam. Granite outcrops.
Eucalyptus cruces subsp. *crucis*	DRF	Oct-Mar	Sand, loam. Granite outcrops
Eucalyptus myriadena subsp. *parviflora*	P1		Loam. Swamps, plains
Eucalyptus subangusta subsp. *virescens*	P1	Apr	Yellow sand, white clay
Euryomyrtus leptospermoides	P3	Aug-Oct	Yellow or white sand, clayey sand, gravel. Undulating plains.
Frankenia brachyphylla	P2	Nov	Salt lake margins
Gastrolobium spectabile	P3	Sep-Nov	Sandy loam or clay loam, granite. Margins of rock outcrops.
Gastrolobium tenue	P1	Sep-Oct	Yellow sand or sandy clay. Undulating dunes, stony outcrops.
Gompholobium asperulum	P3	Aug-Oct	Yellow sand. Undulating plains.
Grevillea asteriscosa	P4	May-Nov	Gravelly or granitic soils. Gravel rises, granite outcrops
Grevillea haplantha subsp. *recedens*	P3	Jun-Aug	Sand, sandy loam
Gunniopsis rubra	P3	Sep	Sandy loam.
Hakea aculeata	DRF	Oct	Sand, loam or clay. Road verge.

Species/Taxon	Conservation Code	Flowering Period	Preferred Habitat
Hibbertia glabriuscula	P2	Sep	Sandplains with some laterite breakaways.
Isoetes brevicula	P3		Submerged in rock pools on granitic outcrops
Myriophyllum petraeum	P4	Aug-Oct	Strictly confined to ephemeral rock pools on granite outcrops.
Neofuscelia subimiatrix	P3		Unknown
Persoonia pungens	P3	Sep-Dec	White or yellow sand, often over laterite.
Phebalium brachycalyx	P3	Aug-Sep	Sand, gravelly soils. Lateritic uplands, hills
Scaevola tortuosa	P1	Oct	Sandy clay. Margins of salt lakes.
Symonanthus bancroftii	DRF	Sep	Unknown
Synaphea divaricata	P3	Jun-Oct	White or grey sand. Slopes, among quartzite rocks.
Thyanotus cymosus	P3	Sep-Oct	Clay, granitic or lateritic sand.
Trachymene croniniana	P3	Nov	Lateritic or loamy sand. Creek beds.
Tricoryne tuberosa (ms)	P1	Oct	Dry red-brown sand, red loam with greenstone gravel. Hilltops & gentle slopes.
Verticordia gracilis	P3	Oct-Nov	Yellow sand, gravelly sand, sandy loam.
Verticordia mitodes	P3	Oct-Jan	Yellow sand. Undulating plains
Verticordia multiflora subsp. *solox*	P2	Oct-Jan	Yellow sand over gravel, sand over granite.
Verticordia stenopetala	P3	Oct-Jan	Yellow sand, sometimes with gravel. Undulating plains.
Vittadinia cervicularis var. *oldfieldii*	P1	Aug-Sep	Alluvium

R **Declared Rare Flora:** Threatened and in need of special protection.

P1 **Priority One:** Poorly Known Taxa, only a few threatened populations remaining.

P2 **Priority Two:** Poorly Known Taxa, few populations remaining, some not under threat.

P3 **Priority Three:** Poorly Known Taxa, several populations known, some not under threat.

P4 **Priority Four:** Poorly Known Taxa, rare flora, not presently threatened.

3.2.3 Vegetation Condition

The vegetation condition was described using Bush Forever's condition scale rating (Government of Western Australia, 2000) which includes six main categories ranging from Completely Degraded to Pristine. The condition categories relevant to the study area are described below:

> **Good** – Vegetation structure significantly altered by very obvious signs of multiple disturbances. Vegetation retains basic structure or ability to regenerate it, for example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
>
> **Degraded** – Basic vegetation structure severely impacted by disturbance. There is scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
>
> **Completely Degraded** – The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with flora composing weed or crop species with isolated native trees or shrubs.

3.2.4 Significant Trees

Tree species were identified within the route and the following attributes recorded on the 11-12th January 2006 to provide data to rank their significance - species, height, circumference at breast height (CBH) and approximate distance from the road edge (north or south). The trees were then prioritised utilising a ranking system tabled in Appendix 1 to determine their significance.

Western Australia provides no legislative protection for significant trees and the National Trust of Western Australia's tree register is now closed. However reference was made to definitions and legislation used by the National Trust of South Australia (*The Development Act 1993*). The National Trust of South Australia considers trees to be Significant if they are outstanding and therefore deserving of special protection because of their rarity, appearance, natural or cultural importance. This may be on the basis of outstanding age, size and aesthetic merit, connection to an important historic event, scientific value, Aboriginal importance or occurrence in a unique location or context. Significant trees generally have a trunk circumference of 2.0m or more at a point 1.0m above the ground (trees with multiple trunks are also covered by the legislation).

Tree and vegetation data was annotated on the design plans to assist in determining an alignment that minimised impacts to the environment.

3.2.5 Vegetation Complexes

The project area lies within the South West Botanical Province, Avon Botanical District and Muntadgin Vegetation System (Pate and Beard, 1984). This area is also defined as the Avon Wheatbelt Biogeographic Region, sub-region AW1 in which less than 20% of the original vegetation remains (DEH, 2001).

The DEH (2001) estimated that the Shire of Merredin supports 11.8% of the original vegetation. Approximately 8.2% of the remnant vegetation in the wheatbelt is protected within CALM conservation estate (DEH, 2001). More than 70% of the *Eucalyptus salmonophloia* and *Eucalyptus salubris* Medium Woodlands have been cleared since

European settlement (Department of Agriculture, Technical Report 249) and it has been estimated that only 9.4% is extant in the Avon River Basin (Avon Catchments Council, 2005). The remnant vegetation in this region is highly fragmented (Dunne and Caccetta 2001).

3.2.6 Vegetation Types and Condition

The vegetation structure throughout DP 3 has been extensively modified due to clearing for agriculture and roads. A total of five principle vegetation types were identified, which are described below.

LOWEsEsEl

Low Open Woodland dominated by *Eucalyptus salmonophloia, Eucalyptus salubris* and *Eucalyptus loxophleba* subsp. *lissophloia* with occasional *Casuarina obesa* over a Tall Shrubland to 2m dominated by *Acacia acuminata, Acacia hemiteles* and *Acacia assimilis* subsp. *assimilis* over a Herbland dominated by *Atriplex bunburyana* over a Grassland dominated by *Avena fatua.*

LWWEoEl

Low Woodland to Woodland dominated by *Eucalyptus orthrostemon* (ms) and *Eucalyptus loxophleba* subsp. *lissophloia* with occasional *Eucalyptus ?campaspe* over Shrubland dominated by *Atriplex bunburyana* and *Acacia merrallii.*

SAaAh

Shrubland to 2m dominated by *Acacia acuminata* and *Acacia hemiteles* over a Grassland to 0.7m dominated by *Avena fatua* and *Eragrostis curvula* with occasional *Casuarina obesa, Eucalyptus loxophleba* subsp. *lissophloia* and *Eucalyptus salmonophloia.*

LOSAb

Low Open Shrubland dominated by *Atriplex bunburyana* over a Low Shrubland of *Halosarcia* sp. and *Halosarcia indica* subsp. *bidens* with occasional *Limonium sinuatum* over Very Open Grassland of *Avena fatua.*

PEs

Planted *Eucalyptus* species dominated by *Eucalyptus loxophleba* subsp. *lissophloia* and *Eucalyptus ?campaspe.*

The vegetation types and condition ratings for vegetation within DP 3 are shown in Table 6.

The majority of the vegetation was in Good to Degraded condition due to past clearing and the presence of more aggressive weeds (Table 6). All of the cleared areas were classified as Completely Degraded in condition.

TABLE 6

VEGETATION TYPES AND CONDITION ALONG DP 3

Section (SLK)	Vegetation Type	Condition Rating	Clearing Required (ha)
245.2 to 245.3	LOWEsEsEl	G-D	0.05
245.3 to 245.5	LWWEoEl	G-D	0.05
245.5 to 245.6	LOWEsEsEl	G-D	0.27
245.6 to 246.3	PEs	CD	2.0
246.3 to 248.1	LOWEsEsEl	G-D	0.6
248.1 to 249.9	SAaAh	G-D	0.55
249.9 to 251.6	LOWEsEsEl	G-D	0
Total clearing proposed			**3.52**

G = vegetation in good condition

D = vegetation in degraded condition

3.2.7 Flora

As a consequence of extensive clearing very few species of native flora remain within DP 3. A total of 22 plant species (14 native and 8 introduced) were recorded from the road reserve and adjacent areas (Appendix 2). The families with the greatest representation within the study area were the Myrtaceae (*Eucalyptus* – 5 taxa) and Poaceae (Grass – 6 taxa) families.

A total of 9 introduced (weed) species were recorded from DP 3 including *Avena fatua, Ehrharta calycina, Briza maxima, Bromus diandrus, Cynodon dactylon, Eragrostis curvula, Limonium sinuatum, Rhaphanus rhaphanistrum*. One Declared Weed *Echium plantagineum* was recorded within vegetation type SAaAh.

3.2.8 Significant Vegetation

A search of the Department of Conservation and Land Management's (CALM) Threatened Ecological Community (TEC) database found no known occurrences of TECs within the study area. No inferred TEC's were recorded within DP 3.

There are two vegetation communities with Salmon gum considered at risk by CALM (2003). The Inering System *Allocasuarina campestris* scrubs and thickets with York and Salmon Gums on lower slopes and foothills is considered Vulnerable and the Tall emergent *Eucalyptus salmonophloia* over *Allocasuarina huegeliana* tall closed forest over *Acacia acuminata* mid high isolated trees over *Alyxia buxifolia* tall sparse shrubland over *Peteridum esculetum* very tall closed fernland over various sparse forland. This community occurs in a drainage line near the base of granite. Neither of these communities are located within the project area.

Detailed mapping of Wheatbelt vegetation is yet to be completed as part of the State Salinity Strategy, however CALM (2003) estimated that less than 2% of the vegetation in the Avon Wheatbelt has been incorporated into a comprehensive, adequate and representative reserve (CAR) system. However, the LOWEsEsEl and SAaAh communities approximately resemble Beard Vegetation Association 145, A Mosaic Medium Woodland of *Eucalyptus loxophleba* subsp. *lissophloia* (York Gum), *Eucalyptus salmonophloia* (Salmon Gum) over Shrublands; thicket, *Acacia-Casuarina-Melaleuca* alliance which was considered of a low priority for reservation in the conservation estate by CALM (2002).

The majority of the vegetation to be cleared (0.97ha) is described as LOWEsEsEl, a Low Open Woodland dominated by *Eucalyptus salmonophloia, Eucalyptus salubris* and *Eucalyptus loxophleba* subsp. *lissophloia* with occasional *Casuarina obesa* over a Tall Shrubland to 2 m dominated by *Acacia acuminata, Acacia hemiteles* and *Acacia assimilis* subsp. *assimilis* over a Herbland dominated by *Atriplex bunburyana*. This vegetation association is the most common vegetation type (approximately 70%) adjacent to Great Eastern Highway between Hines Hill and Walgoolan. This community is also represented in the A Class Reserve 23580, located approximately 3 km east of Merredin. The remainder of the vegetation to be cleared (0.55ha) is described as SAaAh, a Shrubland to 2m dominated by *Acacia acuminata* and *Acacia hemiteles* over Grassland to 0.7m dominated by *Avena fatua* and *Eragrostis curvula* with occasional *Casuarina obesa*, *Eucalyptus loxopheba* subsp *lissophoia* and *Eucalyptus salmonophloia*. This vegetation was recorded adjacent to 4.3 km of the southern side and 2 km of the northern side of Great Eastern Highway.

3.2.9 Significant Flora

A search of the Department of Conservation and Land Management Declared Rare and Priority Flora database was undertaken to identify significant flora which have been recorded in the vicinity of the study area (CALM, 2005).

The CALM (2005) database search identified a total of seven DRF, nine Priority 1 species, five Priority 2 species, twenty three Priority 3 and six Priority 4 species occurring in the vicinity of the Aline East project area.

No Declared Rare or Priority species were recorded during the assessment of DP 3.

3.2.10 Significant Trees

Most of the northern side of the road in DP 3 is cleared and supports only the occasional remnant tree and *Acacia* shrubs. The Nangeenan town site supports numerous trees and some remnant vegetation on both sides of the highway.

Two trees rated as Very High Significance are located near SLK 245.22 on the south side of the existing GEH. Numerous trees rated as High to Very High Significance also occur on the south side of the GEH between SLK 247.06 and 247.8. One tree rated as High and another as Very High Significance are located on the south side at SLK 248.75 and on the north side at SLK 249.84 respectively. A list of the trees evaluated for significance within DP 3 is included in Appendix 3.

One tree rated as having High significance will be cleared for the project. Several, mostly planted *Eucalyptus salmonophloia* trees rated as having Medium Significance will be cleared for the Nangeenan realignment.

3.2.11 Dieback

The dieback species *Phytophthorra cinnamomi* was probably introduced by European settlers in 1828 with plant stock of domestic fruit trees (Podger, et al., 1996 and 1999). It is considered that areas most vulnerable to the pathogen are confined to the parts of the SW Land Division with rainfall isohyets of at least 600mm.

Phytophthorra cinnamomi has not been recorded east of Northam on the Great Eastern Highway (Dieback Working Group and Threatened Species Network, 2005).

3.3 Fauna

3.3.1 Methodology

A Level 1 fauna assessment of the study area was conducted from 31 October to 2 November 2005. The methodology follows that described in the *Environmental Protection Agency* (EPA) *Guidance Statement No. 56: Terrestrial Fauna Surveys for*

Environmental Impact Assessment in Western Australia (EPA, 2004). This Level 1 fauna assessment consists of three components:

a. desktop study which includes a literature review and a search of the relevant databases;

b. reconnaissance survey to verify the desktop survey and to delineate fauna values present in the area; and

c. targeted search for significant feeding and breeding sites for Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*).

3.3.2 Database Searches

A search of the Western Australian Museum on-line database (FaunaBase) was undertaken to develop a list of potential birds, reptiles, mammals and amphibians in the study area. The search area was bounded by latitude 31°30' to 31°45'S, and longitude 117°30' to 118°12'E.

Data from FaunaBase supplemented with information from other surveys conducted in the general region and the consultant's personal experience of the area. Specific surveys reviewed included Muir *et al.* (1978), Smith *et al.* (1997) and Chapman and Dell (1985).

Potential Scheduled and Threatened Fauna species in the study area were identified by searches of the Department of Conservation and Land Management's (CALM) Threatened and Priority Species database and the Commonwealth Department of Environment and Heritage's (DEH) *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* on-line database (Appendix 4).

Taxonomy and nomenclature for fauna species used in this report follow FaunaBase which follows Aplin and Smith (2001) for amphibians and reptiles, How et al. (2001) for mammals and Johnstone and Storr (1998; 2004) for birds.

3.3.3 Site Assessment

A site visit conducted by Dr Jessica Oates to examine the available fauna habitat for amphibians, reptiles, mammals and birds was undertaken from 31 October to 2 November 2005. No fauna trapping was conducted as part of this assessment. This survey was used specifically to identify any suitable tree hollows that may be used for breeding by Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*).

The weather throughout the survey period was fine with occasional cloud, and warm.

3.3.4 Fauna Habitat

The majority of the native vegetation within the road reserve has been cleared, although there is some remnant vegetation extending north and south of the Nangeenan town site. There is also a relatively large area of rehabilitated (planted) vegetation south of the highway extending east-west, although this vegetation generally is sparse and lacks an understorey. Five major fauna habitat types were identified corresponding to the vegetation types described in Section 3.2.6.

3.3.5 Avifauna, Reptiles, Amphibians and Mammals

The assessment predicted that the habitats within DP 3 could potentially support 7 amphibians, 46 reptiles, 110 birds and 27 mammals (including 9 introduced mammals) (Table 7). However, not all of these species will be necessarily present because of the absence of specific micro-habitat requirements and the large database search area.

No reptiles or mammals were noted in the Design Packages during the survey. The weather was fine; however it may still have been too cool for some reptiles.

3.4 Significant Fauna

The fauna species listed in Table 7 have special status in either State or Commonwealth government legislation or are on the CALM Priority Species list. They were highlighted as being potentially present after searching the CALM and EPBC records for the region and matching those with the available faunal records for the area.

TABLE 7

SIGNIFICANT VERTEBRATE SPECIES RECORDED OR LISTED AS POTENTIALLY OCCURRING WITHIN THE VICINITY OF DP 3

Species	Status under Wildlife Conservation Act Schedule/ Priority	Status under Commonwealth Environment Protection and Biodiversity Act	Comment
Western Spiny-tailed Skink *Egernia stokesii badia*	Schedule 1	Endangered	Unlikely to occur within the area
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	Schedule 1	Endangered	Likely to occur within the area, but unlikely to utilise the area for breeding purposes
Chuditch *Dasyurus geoffroii*	Schedule 1	Vulnerable	Unlikely to occur within the area
Malleefowl *Leipoa ocellata*	Schedule 1	Vulnerable	Unlikely to occur within the area
Tree-stem Trapdoor Spider *Aganippe castellum*	Schedule 1		May occur within the area
Carpet Python *Morelia spilota imbricata*	Schedule 4		May occur within the area
Peregrine Falcon *Falco peregrinus*	Schedule 4	Migratory	Unlikely to rely on the area for survival although regionally present
Cricket *Ixalodectes flectocercus*	Priority 1		May occur within the area
Western Brush Wallaby *Macropus irma*	Priority 4		Highly unlikely to occur within the area due to unsuitable habitat
Crested Bellbird *Oreoica guttaralis guttaralis*	Priority 4		Unlikely to occur within the area
Bush Stone-curlew *Burhinus grallarius*	Priority 4		May occur within the area
White-browed Babbler *Pomatostomus superciliosus ashbyi*	Priority 4		May occur within the area
Rainbow Bee-eater *Merops ornatus*		Migratory	Unlikely to rely on the area for survival although regionally present
Fork-tailed Swift *Apus pacificus pacificus*		Migratory	Unlikely to rely on the area for survival although regionally present

Western Spiny-tailed Skink (*Egernia stokesii badia*) – The Western Spiny-tailed Skink occurs in semi-arid scrubs and woodlands of Shark Bay and the northern Wheatbelt, sheltering in hollow logs, behind the bark of fallen trees and old abandoned buildings. Specimens of the Western Spiny-tailed Skink have been collected previously from localities in the central Wheatbelt. However, a survey of sites within the central Wheatbelt including Kellerberrin did not reveal any current presence of this species (How et al., 2003). The Western Spiny-tailed Skink is unlikely to be found in habitat within DP 3 as the area is at the southern limit of its range. No evidence of this species was found during the site assessment.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - This species inhabits the south-west of Western Australia. Its preferred habitat is the woodland where it preferentially feeds on plants of the Proteaceae family. Preferred nesting trees include, the smooth-barked Salmon Gum (*Eucalyptus salmonophloia*), which contain deep hollows (Johnstone and Storr, 1998). Nesting also occurs in Marri (*Corymbia calophylla*) and Tuart (*E. gomphocephala*). Carnaby's Black-Cockatoos may utilise some of the Eucalypt trees for feeding within DP 3. However, no Black-Cockatoos were sighted during the site assessment. The Eucalypt trees within DP 3 did not contain any suitable hollows to support breeding Black-Cockatoos and therefore, Carnaby's Black-Cockatoo is unlikely to rely on the area for breeding purposes.

Chuditch (*Dasyurus geoffroii*) – The Chuditch is formally known from over 70% of Australia, however, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west Western Australia. Chuditch are solitary animals for most of their life. Habitat alteration and removal of suitable den logs and den sites following land clearing, grazing and frequent wildfire have contributed to a decline in Chuditch numbers. Competition for food and predation by foxes and cats, hunting and poisoning have also contributed to its decline. The Chuditch is unlikely to occur within DP 3 due to the small size of remnant vegetation areas remaining and their lack of connectivity.

Malleefowl (*Leipoa ocellata*) – Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Recently the range has contracted due to fox predation and land clearance. However, Malleefowl are still found throughout these regions in fragmented patches. Malleefowl are threatened Australia wide. Clearing of habitat for agriculture, increased fire frequency, competition with exotic herbivores (sheep, rabbits, cattle, goats) and kangaroos, predation by foxes and cats, inbreeding as a result of fragmentation and possibly hunting for food in marginal populations are all threatening processes. Although there have been several records of Malleefowl in the region, it is unlikely to occur within DP 3 as the habitat is open woodland. Malleefowl tend to prefer the denser thicket vegetation.

Tree-stem Trapdoor Spider (*Aganippe castellum*) – This species lives in summer dry bogs prone to irregular flooding and builds a characteristic burrow entrance against a tree stem. Evidence of this species was recorded from Merredin in 2004 and it may occur within DP 3.

Carpet Python (*Morelia spilota imbricata*) – The Carpet Python is a large snake found across the south-west of Western Australia, north to Geraldton and Yalgoo, and east to Kalgoorlie, Fraser Range and Eyre. It inhabits forest, heath or wetland areas and shelters in hollow logs or in branches of large trees. Carpet Pythons are often found in colonies, particularly during the breeding season in spring. This species is widespread within the south-west of WA, but is not in high density across its distribution. This species may occur within the DP 3 areas.

Peregrine Falcon (*Falco peregrinus*) – The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It shows habitat preferences for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the study area. This species may be a transient visitor to the DP 3 areas.

Ixalodectes flectocercus – This species of cricket was thought to be extinct until it was rediscovered at two sites in 1999. The holotype was collected from Beverley and the other site was Nokaning just north of the search area. It could possibly occur in the DP 3 areas.

Western Brush Wallaby (*Macropus irma*) - This species was very common in the early days of settlement, however, its range has been seriously reduced and fragmented due to clearing for agriculture and there is a significant decline in abundance within most remaining habitat. It is now distributed across the south west of Western Australia from north of Kalbarri to Cape Arid. The optimum habitat is open forest or woodland, particularly favouring open seasonally wet flats with low grasses and open scrubby thickets. This species is highly unlikely to occur due to unsuitable habitat within DP 3.

Crested Bellbird (*Oreoica gutturalis*) – The Crested Bellbird has disappeared from well in excess of 50% of its historical range, particularly along the periphery. The Southern Crested Bellbird is now found towards the inland in south-western Australia, South Australia, Victoria, New South Wales, and Queensland. Crested Bellbirds live in the shrub-layer of eucalypt woodland, mallee, acacia shrubland, *Triodia* hummock grassland, saltbush and heath, where they feed on a variety of insects and seeds. The Crested Bellbird has been eliminated from much of its former range by clearing. It seems particularly sensitive to subsequent fragmentation, with areas of apparently suitable habitat as large as 5000ha now unoccupied. This species was recorded from Carrabin Nature Reserve in 1982.The Crested Bellbird is unlikely to be found within DP 3 due to the highly fragmented nature and small size of the remnant vegetation along the road reserves.

Bush Stone-curlew (*Burhinus grallarius*) – The Bush Stone-curlew is a large, slim, mainly nocturnal, ground-dwelling bird. It is regarded as uncommon or rare having declined as a result of feral cats and foxes. It can be found in open wooded country or scrubs, and in many other habitats. The Bush Stone-curlew is an uncommon resident of the Wheatbelt woodlands. The Bush Stone-curlew potentially occurs within DP 3.

White-browed Babbler (*Pomatostomus superciliosus ashbyi*) – This subspecies lives in Eucalyptus forest and woodland, foraging on or near the ground for insects and seeds. Clearance for agriculture has removed most of this species' habitat in the wheatbelt of Western Australia. Continuing declines are inevitable, even though the subspecies is still widespread and is more persistent in fragments than other wheatbelt taxa. The White-browed Babbler may occur within DP 3.

Rainbow Bee-eater (*Merops ornatus*) – This species is found across the better-watered parts of Western Australia including islands. It prefers lightly wooded, preferably sandy, country near water. It is a resident, breeding visitor, postnuptial nomad, passage migrant and winter visitor, wintering from the Gascoyne north to Indonesia. It moves south mainly in late September and early October and north from February to April. It is scarce to very common across its range. Although this species may be present within the region during the migratory period it is unlikely to rely on the site.

Fork-tailed Swift (*Apus pacificus pacificus*) – This species breeds in the north-east and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara and Eucla in November and in the south-west land division in mid-December, and leaving by late April. It is common in the Kimberley, uncommon to moderately common near north-west, west and south-east coasts and rare to scarce elsewhere. Although this species may be present within the region it is unlikely to rely on the site.

3.4.1 Species of National Environmental Significance

Species Potentially Occurring within DP 3 Identified as Being of National Environmental Significance under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*)

Four threatened species of fauna and three migratory species of birds listed as potentially occurring within the vicinity of DP 3 were identified under the *Environment Protection and Biodiversity Conservation Act 1999* as having national environmental significance (Table 7). Of these only Carnaby's Black-Cockatoo, listed as Endangered and the three migratory species Peregrine Falcon, Rainbow Bee-eater and Fork-tailed Swift are expected to be in the study area.

3.4.2 Threatened or Priority Species

Threatened or Priority Species under the WA Wildlife Conservation Act 1950-1979 That Were Listed as Being Potentially Found within DP 3

In Western Australia, all native fauna species are protected under the WA Wildlife Conservation Act 1950-1979. Fauna that are considered rare, threatened with extinction, or have a high conservation value are specially protected under the WA Wildlife Conservation Act 1950. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan and Australian Migratory Bird Agreement (JAMBA) and the China and Australian Migratory Bird Agreement (CAMBA).

Threatened and Priority species listed under the WA Wildlife Conservation Act 1950 and present on lists generated for the area by searching FaunaBase are shown in Table 7. Included are five Schedule 1 species, two Schedule 4 species, one Priority 1 species and four Priority 4 species.

3.4.3 Biodiversity Value at Genetic, Species and Ecosystem Levels

It is likely that species of mammals, reptiles, birds and amphibians likely to be present within DP 3 would also be present in similarly vegetated areas of higher quality. Much of the area in DP 3 is cleared for agricultural purposes or consists of small remnants of native and planted Eucalyptus species.

The Carnaby's Black-Cockatoo may utilise the small remnants of vegetation for feeding. However, these remnants are generally degraded and there are other areas of higher quality remnant vegetation in the general area of DP 3 that the Black-Cockatoos may utilise for feeding. The trees rated as having High and Very High significance within DP 3 did not support hollows of adequate size to support Carnaby's Black Cockatoos. This proposal therefore is not expected to impact significantly on this species.

The other species of conservation significant fauna likely to be present within DP 3 are the Peregrine Falcon, White-browed Babbler, Carpet Python, Fork-tailed Swift and Rainbow Bee-eater. Given the minimal and linear nature of the clearing, it is unlikely to substantially modify, destroy or isolate an area of important habitat for these species, or seriously disrupt the lifecycle of an ecologically significant proportion of the population of any of these species.

The clearing of vegetation has the potential to have a direct impact on fauna and faunal assemblages in the short term, although it is unlikely to have a significant impact on the biodiversity value at the genetic, species and ecosystem levels in this region.

3.4.4 Ecological Functional Value at the Ecosystem Level

There were no special features or specific habitats within DP 3 that would indicate it possesses ecological functions that are significantly different to many other areas in the region. The rehabilitated areas have very little understorey and thus cover for fauna and so are also unlikely to support significant numbers of fauna, particularly any conservation significant species. Some remnant vegetation is retained in the road reserves within DP 3, but it is generally in poor condition. The remnant vegetation is highly fragmented, allowing limited movement of smaller bird species and almost no movement of smaller terrestrial species. However, these road reserves do provide an important refuge for fauna species in an otherwise cleared habitat. Any further loss of this vegetation would result in a reduction in the already limited amount of habitat connectivity along the road reserves.

3.5 Aboriginal Heritage

A survey of the archaeological and ethnological significance of the site was undertaken in 1994 (McIntyre *et al* 1994). A desktop review was undertaken to determine the need for further consultation in DP 3 and it was considered not necessary due to the degraded nature of the land within these design packages (Quartermaine, 2006).

3.5.1 Archaeological

No known Aboriginal sites of archaeological significance appear on the Department of Indigenous Affairs (DIA) Aboriginal Site Register as occurring within 500m of the existing pavement within DP 3. Field and desktop investigations of Great Eastern Highway between Cunderdin (153.8 SLK) and Walgoolan (288.2 SLK) failed to locate any archaeological sites of significance to living Aboriginal people (MacIntyre et al 1994). Aboriginal sites registered on the Department of Indigenous Affairs database on the 22nd December 2005 are included in Appendix 5.

No Aboriginal cultural material was discovered from the current road reserve in previous surveys and it is considered unlikely in light of the level of degradation of the project area. Aline East is committed to reporting any suspected material uncovered during construction to the Department of Indigenous Affairs.

3.5.2 Ethnographic

Considering the nature of the vegetation and level of disturbance within DP 3, the ethnographic surveys conducted in 1994 (MacIntyre et al 1994) and the desktop review (Quartermaine, 2006) were deemed adequate to ensure that no Aboriginal ethnographic values were affected by the proposed works.

3.6 European Heritage

The Nangeenan Hall is listed on the Merredin Municipal Inventory (78/30) (February 1999) and the Heritage Council of Western Australia's Register of Heritage Places database (http://register.heritage.wa.gov.au/). The hall was built in 1912 and is located on the corner of Cahill Road, 30m north of the existing Great Eastern Highway.

There are no places of natural, indigenous or historic heritage value listed on the Commonwealth Heritage list (www.deh.gov.au/heritage/commonwealth/wa.html) or the Heritage Council of WA's Register of Heritage Places within or adjacent to DP 3.

3.7 Contaminated Sites

The Shire of Merredin currently does not have a list of "potentially contaminated sites" (Warren Bow pers. comm. 2005). There are no apparent contaminated sites within DP 3.

3.8 Noise

Herring Storer Acoustics (2006) undertook an acoustic assessment of DP 3 to determine the impact of future road traffic noise levels received at residences located adjacent to these packages (Appendix 6).

An assessment of acceptable road traffic noise has been made in accordance with Main Roads *Noise Level Objectives.* Main Roads objectives cite an $L_{10,18hour}$ value of 63 dB(A) as being acceptable.

The Western Australian Planning Commission (WAPC) in May 2005 released a Draft Planning Policy for Road and Rail Transport Noise. The appropriate criteria in this case would be Noise Exposure 2, which cites the following noise limits:

Day	L_{Aeq} 60
Night	L_{Aeq} 55

The predicted $L_{A10,(18HR)}$ noise levels for current traffic flows and those predicted for 2025 for residences located adjacent to the road are shown in Table 8.

TABLE 8
CALCULATED $L_{A10,(18HR)}$ NOISE LEVEL

Locations	Calculated $L_{A10,(18hr)}$ dB(A)	
	Current (distance from road)	Year 2025 (distance from road)
L1 – Robartson's Property	56 (75m)	57 (75m)
L2 – Robartson's Rental	62 (25m)	63 (25m)
L3 – 6MD Radio Station	58 (50m)	59 (50m)
L4 – House at SLK 249.88	55 (100m)	56 (100m)
L5 – House at SLK 250.64	53 (150m)	53 (150m)
L6 – Agriculture Research Station	55 (100m)	56 (100m)
L8 – House 1	61 (10m)	62 (130m)
L9 – House 2	53 (200m)	53 (150m)

From extensive monitoring carried out on similar roads, the difference between the $L_{10,18hour}$ and $L_{eq,16hour}$ (day period) and between the $L_{10,18hour}$ and $L_{eq,8hour}$ (night period) are approximately 3 and 9 dB(A) respectively. To calculate the current and future $L_{eq,16hour}$ and $L_{eq,8hour}$ it has been assumed that this same difference will exist in the current traffic flows and the year 2025. The resultant $L_{eq,16hour}$ (day period) and $L_{eq,8hour}$ (night period) are listed in Table 9.

TABLE 9

CALCULATED $L_{eq,(16hr)}$ AND $L_{eq,(8hr)}$

Location	Calculated Noise Level, dB(A)			
	(Day Period)		(Night Period)	
	Current	Year 2025	Current	Year 2025
L1 – Robartson's Property	53	54	47	48
L2 – Robartson's Rental	59	60	53	54
L3 – 6MD Radio Station	55	56	49	50
L4 – House at SLK 249.88	52	53	46	47
L5 – House at SLK 250.64	50	50	44	45
L6 – Agriculture Research Station	52	53	46	47
L8 – House 1 (10m from road)	58	59	52	53
L9 – House 2 (200m from road)	50	50	44	45

Note: Calculation includes +2.5 dB(A) façade correction.

Based on the acoustical assessment, it is predicted that noise received at noise sensitive premises located adjacent to the road modifications in DP 3 will comply with the Main Roads noise level objectives and the WAPC Draft Planning Policy for Road and Rail Transport Noise up to and including the year 2025. No noise amelioration is therefore required.

3.9 Visual Amenity

The majority of land on the north side of DP 3 has been cleared for pasture and agriculture and supports only the occasional isolated tree and *Acacia* shrubs. The south side of the highway supports small areas of remnant vegetation and extensive rehabilitated (planted) vegetation extending laterally east-west. In several locations trees rated as of High and Very High Significance provide the dominant vista, particularly on the south side between SLK 247.06 and 247.8. Remnant vegetation extends to the north and south of the town of Nangeenan outside of the existing road reserve.

Most of the area required to be cleared for the realignment south of Nangeenan is covered in rehabilitated (planted) vegetation and limited remnant vegetation, however the visual amenity will not be significantly impacted because vegetation will be maintained on each side of the realignment.

4. ENVIRONMENTAL ASPECTS AND IMPACTS

Construction of DP 3 has the potential to have direct and indirect impacts on the biophysical and social environment associated with the upgrading of Great Eastern Highway.

Table 10 provides a summary of all of the biophysical, pollution management and social surrounding related environmental aspects associated with the project, including the likely EPA objectives, potential impacts and management and predicted outcomes, while the principal environmental constraints associated with the Section are diagrammatically presented in Figures 2a-f. The "Potential Impact" is the maximum impact associated with the project without any cognisance of impacts during the design or management during construction, while "Predicted Outcome" refers to the most likely actual maximum impact.

The construction of DP 3 in relation to the ten principles for the clearing of native vegetation in the Environmental Protection Act 1986 Schedule 5 and in the Main Roads Project Purpose Permit (1st February 2006) is also described in Table 10.

TABLE 10

GREAT EASTERN HIGHWAY UPGRADE – SUMMARY OF ENVIRONMENTAL FACTORS FOR DP 3

FACTOR	LIKELY EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Biophysical:					
Vegetation communities and Flora	To maintain the abundance, species diversity, geographic distribution and productivity of vegetation of flora at species, ecosystem and community level through the avoidance or management of adverse impacts and improvement in knowledge.	DP 3 has been extensively cleared of the majority of the original native vegetation. The remaining vegetation is extremely fragmented and degraded and is comprised of isolated trees and remnants with very poor understorey. CALM's Threatened (Declared Rare) or Priority Flora database (Table 5) identified 50 species of conservation significance (DRF and Priority species) in the vicinity of DP 3. None were located during the flora and vegetation assessment.	Clearing of 2.0ha of previously rehabilitated (planted) *Eucalyptus* spp. and 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation for road construction and for one parking rest stop.	Significant trees and remnant vegetation was identified and incorporated into the design. Disturbed areas will be revegetated. Remnant vegetation and modified vegetation will be enhanced through supplementary planting where possible to facilitate ecosystem function. Only weed-free vegetation and topsoil is to be re-used for rehabilitation. A Landscaping and Rehabilitation Plan will be prepared.	Loss of 2.0ha of previously rehabilitated (planted) vegetation and 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation. Loss of one tree rated as of High Significance and numerous, mostly planted *Eucalyptus salmonophloia* trees rated as of Medium Significance.
Wetlands	To maintain the integrity, ecological functions and environmental values of wetlands.	No wetlands occur within DP 3.	None on wetlands.	The Environmental Management Plan will limit direct and indirect impacts through surface water drainage movement and erosion.	No impacts on wetlands.

FACTOR	LIKELY EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Fauna	Significant Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*	DP 3 contains habitats that have being modified to some extent and are unlikely to support Significant Fauna. A review of 'Faunabase' and CALM's Threatened and Priority Fauna list indicates several significant species are likely to occur in the project area between Kellerberrin and Carrabin: • *Calytorhynchus latirostris* (Carnaby's Black Cockatoo (Schedule 1) – recorded in Kellerberrin in the 1960's • Several other significant species may occur within the area: • *Aganippe castellum* (Tree-stem Trapdoor Spider) (Schedule 1); • *Morelia spilota imbricata* • (Carpet Python) (Schedule 4); • *Ixalodectes flectocercus* (Cricket) (Priority 1); • *Burhinus grallarius* (Bush Stone-curlew) (Priority 4); and	Carnaby's Black Cockatoo has been recorded breeding at Kellerberrin in the 1960's. No cockatoos or suitable hollows were located during surveys of DP 3 and therefore the project is unlikely to impact on this species. The realignment and widening will require the clearing of trees that may have eventually supported Carnaby's Black Cockatoo however this has been minimised in the design packages by taking into account significant trees, particularly *Eucalyptus salmonophloia* and native vegetation. There was no evidence of other significant fauna species that may occur in DP 3. The land to be disturbed for road construction comprises 2.0ha of previously rehabilitated vegetation and 1.52ha of remnant	Significant potential habitat trees and remnant vegetation incorporated into design planning constraints. Clearing of vegetation and significant trees that may contain nesting habitats, provide food resource and corridors for fauna minimised. Remnant vegetation and modified vegetation enhanced through supplementary planting where possible to increase total size of vegetated areas.	Clearing of approximately 3.52ha of potential fauna habitat. Clearing of remnant and rehabilitated (planted) vegetation will result in the loss of some habitat and possibly reduced habitat connectivity. A small number of trees rated as of Medium Significance will be cleared that may, over time, have developed hollows large enough for species such as Carnaby's Black Cockatoo.

FACTOR	LIKELY EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
		• *Pomatostomus superciliosus* (White-browed Babbler) (Priority 4). None of these species were recorded during the fauna assessment of DP 3.	vegetation mixed with rehabilitated (planted) vegetation and thus is even less likely to support any of these species.		
Pollution Management					
Surface Water Quality	Maintain or improve the quality of surface water to ensure that existing and potential users, including ecosystem maintenance, are protected and consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA 1993) and the NHMRC/ARMCANZ Australian Drinking Water Guidelines – National water Quality Management Strategy.	Relatively flat land with minimal drainage.	There is low potential for impact on the surface water quality due to the nature of the road making process and products being utilised for construction.	The Environmental Management Plan will address the issue of drainage, erosion and contaminant management.	Drainage, contaminated water control and rehabilitation will ensure no direct impact on the catchments.
Noise	Protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by	The existing noise levels due to traffic within DP 3 are considered to be in "high ambient" areas.	The proposed upgrade of Great Eastern Highway through DP 3 is predicted to comply with the Main Roads WA "Noise Level	- Ensure noise level emissions are in accordance with criteria set by Main Roads WA and DEP. - No vibrating rollers will	Predicted Noise levels associated with upgrading the road in DP 3 comply with Main Roads WA criteria.

FACTOR	LIKELY EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
	ensuring that noise levels meet Aline East's Noise Level Objectives and the *Environmental Protection (Noise) Regulations 1997.*		Objectives".	be used within 100m of private properties or outside of hours prescribed in the Noise Management Plan. -The Environmental Management Plan will address the issue of construction noise and vibration.	
Social Surroundings					
Aboriginal Heritage	(i) Ensure that the proposal complies with the requirements of the Aboriginal Heritage Act, 1972. (ii) Ensure that changes to the biological and physical environment resulting from the project do not significantly adversely affect cultural associations with the area, or historical significance.	No ethnographic or archaeological sites were identified by any of the Aboriginal consultants within the road reserve or areas to be incorporated into the road reserve along this section of the Great Eastern Highway.	No sites of ethnographic or archaeological significance in the Shire of Merredin will be directly impacted by the proposal. Work will cease on any sections of road where suspected Aboriginal heritage values or sites are encountered until a qualified Heritage specialist has inspected the site.	Where suspected Aboriginal heritage values or sites are encountered work will cease until a qualified Heritage specialist has inspected the site. Desktop and previous field surveys have confirmed that no Aboriginal sites will be impacted by DP 3.	No direct impact on sites of Aboriginal cultural significance.
European Heritage	Ensure that changes to the biological and physical environment resulting from the proposal do not adversely affect cultural values in the	There are no registered heritage sites occurring in areas adjacent to DP 3 of the proposed upgrade.	No historical sites have been recorded within or adjacent to DP 3. These areas have been subjected to significant disturbance and therefore it is unlikely	If any evidence of European heritage is discovered during construction, works will cease in that area until a suitably qualified archaeologist is	No impacts to European heritage are predicted.

FACTOR	LIKELY EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
	area.		that there will be any further significant impacts to historical values.	commissioned to make an evaluation of its significance.	
European Heritage	Ensure that the proposal complies with the *Heritage of Western Australia Act 1990.*				
Visual Amenity	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal.	The visual amenity of the DP 3 of the project area varies according the particular land use. The majority of land through this section has been cleared for pasture and agriculture. There is limited vegetation primarily rehabilitated (planted) vegetation and some degraded remnant vegetation within the Nangeenan townsite.	The visual impact of road upgrade and associated works through DP 3 will vary depending on the nature of the works. However given the relatively flat landscape through the area and the comparatively small area of vegetation to be cleared, the visual amenity will essentially remain unchanged.	The Environmental Management Plan will include control measures to ensure that clearing is restricted to the designated surveyed areas and that revegetation of the road reserve enhances ecosystem function and the aesthetic values.	Impacts will be managed through clearing controls and strategic revegetation of the road reserve.

5. ENVIRONMENTAL MANAGEMENT

5.1 Introduction

The upgrade of Great Eastern Highway through DP 3 will result in some impacts on the biophysical and social environment. In most cases the scale of these impacts can be minimised through specific management measures outlined in the Environmental Management Plan that has been prepared for the project. The following preliminary management measures are proposed.

Aline East expects that all impacts associated with the proposal can be avoided, minimised or managed through suitable design, discussion and appropriate management measurers as such as those outlined in the report.

5.2 Biophysical

5.2.1 Vegetation

One of the most critical environmental management issues will be in relation to limiting the clearing of native vegetation to the footprint of the proposed works. It is intended to clear 2.0ha of rehabilitated (planted) vegetation and 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation.

One *Eucalyptus salmonophloia* tree rated as having High Significance and several rated as having Medium Significance will be cleared for the road upgrade to the south of Nangeenan townsite. The majority of these are planted with *Eucalyptus salubris*. Wherever possible, clearing will be minimised to that necessary for construction of the highway.

5.2.2 Environmental Weeds

The most effective measure for the sustainable management of weeds is to use, wherever possible, clean (i.e. weed-seed-free) topsoil, mulch and fill for revegetation and rehabilitation of areas affected by the upgrade. Mixing of topsoil and mulch from areas with heavy weed infestations with soil from uninfected areas should be avoided to control the spread of weeds. Wherever high levels of weed infestation are detected, it is recommended that weed-infected soil be handled separately and disposed of off-site following spraying.

5.2.3 Fauna Corridors

Management controls will be implemented to ensure that corridors of vegetation are maintained and developed to facilitate the movement of fauna between vegetation remnants. Remnant vegetation and trees with High/Very High significance will be protected where possible through sensitive road design. Clearing will be minimised and restricted to that necessary to construct the road to the prescribed standard for safety. Clearing of Salmon Gum (*Eucalyptus salmonophloia*), a species recognised for its value as habitat for parrots, particularly the Carnaby's Black Cockatoo, will be strictly limited.

5.2.4 Wetlands

No wetlands occur within DP 3.

5.2.5 Landscaping and Rehabilitation

A Landscaping and Rehabilitation will be developed. The Plan will focus on the following issues:

- Reuse of topsoil from the project area. This will be subject to careful selection and management due to presence of weeds within DP3;
- Reuse of brush and chipped/mulched vegetation from the project area;

- Replacement of native vegetation. Local native species will be used in revegetation;
- Species of value to Carnaby's Black Cockatoo for either forage (species with woody nuts in the Proteaceae family) and/or habitat (such as Salmon Gums) will be used where appropriate in revegetation.

5.3 Pollution Management

5.3.1 Noise

The proposed construction of DP 3 will comply with the Main Roads WA Noise Level Objectives and the WAPC Draft Planning Policy for Road and Rail Transport Noise.

A Construction Noise and Vibration Management plan will detail measures to limit impacts during the construction period such as restricting the use of vibrating rollers and construction working hours. A Complaints Procedure will address what actions will be taken should complaints be lodged about noise.

5.3.2 Surface Water Runoff

An Environmental Management Plan that includes controls to prevent pollution of surface and groundwater is in place. It will include inspections on the road works to locate any areas of erosion caused by surface water runoff and management of chemicals and hazardous materials.

5.3.3 Dust

An Environmental Management Plan that includes controls to prevent dust generation is in place. It includes inspections of active work areas for visible dust and planning of works to minimise dust generated from earthworks, particularly during stripping and handling topsoil. Water sprays will be used as appropriate on exposed surfaces. A Complaints Procedure addresses actions to be taken should complaints be lodged about dust.

5.4 Social Surroundings

5.4.1 Aboriginal Heritage

No archaeological material or ethnographic sites were discovered within DP 3 (O'Connor, 2006). Heritage Management is included in the Environmental Management Plan and outlines protocols to follow in the event sub-surface cultural remains are encountered during construction. If suspected archaeological artefacts are encountered during construction, work will cease in that area until a suitably qualified and registered specialist can assess the significance of the site in accordance with the *Aboriginal Heritage Act 1972.*

Aline East construction and management employees will be briefed on Aboriginal heritage issues during mandatory inductions and in toolbox meetings.

If an Aboriginal heritage site is located during works and disturbance is unavoidable, written approval to disturb the site will be obtained from the Minister for Indigenous Affairs under Section 18 of the *Aboriginal Heritage Act 1972* (application for 'consent to certain uses'). The site will not be disturbed unless the Minister grants approval.

5.4.2 European Heritage

No European Heritage sites have been identified within DP 3, however if any materials are uncovered during construction, works will cease in that area until a suitably qualified archaeologist has assessed the significance of the materials.

5.4.3 Visual Amenity

The widening and realignment of Great Eastern Highway in DP 3 will not result in significant changes to the landscape and visual amenity as remnant vegetation will be maintained within the realignment through Nangeenan and the northern side of the road is currently almost devoid of vegetation. Therefore, rehabilitation of the northern road reserve will potentially improve the visual amenity of the GEH.

6. ENVIRONMENTAL MANAGEMENT RECOMMENDATIONS

The following table (Table 11) provides a list of environmental management recommendations associated with the proposal to upgrade and widen Great Eastern Highway through DP 3. The environmental management recommendations relate to the pre-construction, and construction phases of the project. The "Advice" column relates to the authority, agency or organisation that should be consulted during the formulation of a particular proposed management strategy.

No matters of National Environmental Significance were identified during desktop and field assessments however if any should be identified during construction, the proposal will then be referred to the DEH and DoE.

No groundwater abstraction or dewatering is likely to be necessary for construction of DP 3. However if design changes that may impact surface or groundwater are necessary, the proposal will be referred to the appropriate regulatory authorities for assessment.

TABLE 11

GREAT EASTERN HIGHWAY UPGRADE – SUMMARY OF ENVIRONMENTAL MANAGEMENT RECOMMENDATIONS FOR DP 3

Commitment	Responsibility	Timing	Objective	Action	Advice - Principles
Develop and implement an Environmental Management Plan that contains the following:	Environment and Community Relations Manager	Pre-construction and throughout construction	To ensure that environmental aspects and impacts on flora, fauna, vegetation, surface water, groundwater and Environmentally Sensitive Areas are minimised.	Develop an Environmental Management Plan for the Aline East project.	EPA, Main Roads, CALM, DoE
Aboriginal Heritage Management	Environment and Community Relations Manager	Pre-construction and throughout construction	To ensure that no Aboriginal sites are disturbed and that any sites located are protected in accordance with the *Aboriginal Heritage Act 1971.*	- Notify DIA of any suspected sites located during construction. - Site Inductions and Toolbox presentations to make personnel aware of heritage issues. - Engage suitably qualified consultant to assess suspected sites. - Submit 'Consent to Certain Uses' Application under Section 18 of the *Aboriginal Heritage Act 1972* if disturbance is unavoidable.	DoE on advice from the DIA
Borrow and Spoil Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	Prior to clearing for construction	To ensure that: • optimal use is made of resources; • approvals are given prior to any disturbance; and • that borrow pits are adequately rehabilitated.	Identify environmental values of resource pits and ensure works do not impact significant values and that rehabilitation meets completion criteria.	Main Roads, DoIR
Dust and Air Quality Management	- Environmental and Community Relations Manager - Alliance Manager	Prior to clearing for construction	To ensure that dust or emissions do not impact adjacent land owners or the environment.	Implement dust management procedures in EMP and ITPs. Record and respond to public complaints and non-compliances.	Shire of Merredin

Commitment	Responsibility	Timing	Objective	Action	Advice - Principles
	- Construction Manager				
Erosion Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	Prior to clearing for construction	To ensure that landforms and water are managed to minimise erosion.	Design culverts, floodways and raised areas to minimise erosion. Audit to ensure no major loss of sediments.	
European Heritage Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	During design phase Prior to and during construction	To ensure that all historical values are recognized and protected.	- Heritage Places avoided during design.	Shire of Merredin
Fauna Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	During design phase	- To protect all species of native fauna. - To ensure that feral animal populations do not increase as a consequence of works in these areas.	- Identify fauna and their habitat in design packages (particularly Threatened Fauna). Protocols included in EMP. - No pets or firearms allowed on site. - If any Nationally Threatened Species or communities are likely to be impacted, the proposal will be concurrently referred to the DoE and DEH.	CALM
Fire Management	Aline East Safety Manager	During construction and rehabilitation	To minimise the risk of fire.	Identify potential sources of fire and controls.	CALM FESA
Flora and Vegetation Management	- Environmental and Community Relations Manager	During design phase	Minimise impact of project on vegetation. Ensure that no DRF, TEC or ESA's are impacted by the project.	Identify all flora and vegetation of significance, including significant trees and incorporate this information into the design plans.	CALM, DoE, Department of Agriculture

Commitment	Responsibility	Timing	Objective	Action	Advice - Principles
Flora and Vegetation Management	- Alliance Manager - Construction Manager	Prior to and during clearing		Conduct clearing according to Process Controls.	Rehabilitation consultants and environmental consultants.
		During rehabilitation	To ensure that weed populations do not increase as a consequence of works in these areas and that weed species are not introduced into the area.	- Rehabilitate to enhance ecosystem function and improve visual amenity. - Vehicles and machinery must be clean (of soils) and weed free. - Rehabilitation to be carried out as soon as possible following completion of works.	CALM, DoE
Hydrocarbon and Hazardous Goods Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	Throughout project	To ensure that hydrocarbons and hazardous goods are transported, stored and cleaned up according to best practice and standards.	- Identify all HC's and Hazardous goods used in project. - Transport, handle and store in accordance with Australian Standards. - Audit to ensure they are transported, stored & cleaned up appropriately.	DoIR
Land Access Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	During design planning and construction	- To ensure that design packages are constructed within road reserves. - To ensure that access is regulated according to land owners' requirements.	- Secure land tenure for road reserves. - Regulate access to properties. - Access to the Department of Agriculture research station land at the eastern extent of DP 3 will be regulated.	- Main Roads Land Tenure - DPI – LAMS Department of Agriculture
Landscaping and Rehabilitation	- Environmental and Community Relations Manager	During design planning and construction	To ensure that Rehabilitation enhances ecosystem function and improves visual amenity.	- prepare a Landscape and Rehabilitation Plan and undertake rehabilitation in accordance with the plan - Identify areas to rehabilitate that	CALM Shire of Merredin

Commitment	Responsibility	Timing	Objective	Action	Advice - Principles
				enhance existing vegetation remnants. - re-use topsoil from the project area in revegetation, with careful management of topsoil to minimise spread of weeds. - Use of brush and chipped/mulched vegetation in rehabilitation. - Use of local native species in revegetation. - Where possible, use of species of habitat or forage value to Carnaby's Black Cockatoo in revegetation.	
Noise and Vibration Management	- Environmental and Community Relations Manager - Alliance Manager - Construction Manager	During construction	- To ensure that construction does not cause damage to property or disturbance. - Ensure that the community is aware of Complaints Procedure.	- Regulate use of vibrating rollers (time and proximity to residences). - Manage Complaints in accordance with Procedure. - Prepare a Construction Noise and Vibration Management Plan.	Shire of Merredin
Pest Management	- Environment and Community Relations Manager - Safety Manager	Throughout project	To ensure that feral animal and weed populations do not increase as a consequence of works in these areas.	-No pets allowed on site. -Access to Department of Agriculture research station land at the eastern extent of DP 3 will be regulated. - Waste managed to prevent foraging by feral animals.	CALM, DoE Department of Agriculture
Public Consultation Management	Environment and Community Relations Manager	Throughout project	To ensure that all affected parties are consulted regarding the alignment and works.	Stakeholder consultation plan is implemented.	
Surface and	- Environment and	Throughout the	To ensure that impacts on	Implement Surface and	Department of

Commitment	Responsibility	Timing	Objective	Action	Advice - Principles
Groundwater Management	Community Relations Manager - Alliance Manager Construction Manager	project	ground and surface water are minimised.	Groundwater Management Plans. - If dewatering or abstraction is required for road construction an application for a 5C licence to take surface and/or groundwater will be submitted to the DoE.	Agriculture DoE
Waste Management	- Environment and Community Relations Manager - Alliance Manager Construction Manager	Throughout the project	To prevent pollution and minimise the use of non-renewable resources.	- Implement a Waste Management Plan that includes waste minimization, reuse, recycling and disposal.	

CALM = Department of Conservation and Land Management

DoE = Department of Environment

DPI - - LAMS = Department of Planning and Infrastructure, Land Asset Management Services

FESA = Fire and Emergency Services Authority of Western Australia

7. CONSULTATION

7.1 Public Consultation

A Community and Stakeholder Relations Plan (CSRP) has been developed for Aline East that sets out the strategic framework for managing communications for the project including all community and stakeholder liaison and media management.

This plan has been developed to control the development and distribution of messages to ensure that a clear and consistent image, reflecting the overall philosophy and direction of Aline East is presented to all project stakeholders and audiences.

This strategy will direct the project team in the way it communicates with its audiences to provide a constant communication flow that delivers accurate information in a timely and transparent manner.

The plan also:

- States the communication objectives in relation to the Project;
- Outlines the evaluation procedures by which these objectives will be measured;
- Has been developed to fit within the Project's Integrated Management System (IMS);
- Provides a communications program that addresses the key areas of responsibility listed above and outlines strategies to address them.

Communication is undertaken in a continuously changing environment, therefore, it is imperative that this strategy be evaluated, refined and where necessary revised on an ongoing basis to ensure that it continues to reflect the project's needs and Main Roads' and the State and Federal Government's strategic requirements.

Aline East aims to maintain a high level of consultation with the local community to maximise opportunities for community input into the project.

Aline East has visited three Shires – Merredin, Kellerberrin and Westonia. The aim was to establish contact, provide an overview of the project and establish contacts for further liaison. Merredin and Kellerberrin Shire councils have established working groups with a nominated chairperson. The purpose of these working groups is to provide ALine East with a point of contact and forum for discussion. Meetings with these groups have ensured issues have been identified and evaluated during the early stages of the project.

Aline East attended the Merredin Agricultural Show on the 8th October 2005 and set up a manned display to provide an overview of the project and to field community questions. Records of issues raised were recorded and entered on the Community Issues Register established as a repository for feedback from the community. This register ensures that issues are captured and considered during all phases of the project. Comments are considered during the design phase and incorporated into preliminary designs were appropriate.

7.2 Government Agency Consultation

Comments on the key environmental and heritage issues were sought from the following State Government Authorities:

- Department of Agriculture WA;
- Department of Conservation & Land Management (CALM);
- Department of Environment (Northam);
- Department of Indigenous Affairs;
- Environmental Protection Authority;

- Main Roads; and the
- Shire of Merredin.

A meeting was held with the Department of Environmental (DoE) was held to discuss whether the project should be referred the EPA for assessment. The DoE Northam stated that further liaison for approvals would only be required should Aline East wish to disturb any Environmentally Sensitive areas. DoE Northam also requested to be notified prior to commencement of clearing.

The EPA Services Unit provided advice that only proposals likely to have significant environmental impacts would need to be referred to the EPA under Section 38 of the *Environmental Protection Act.*

CALM provided information on Threatened Ecological Communities in the area.

The Department of Indigenous Affairs did not provide any comment on the proposal.

ALine East has undertaken extensive liaison with the Shire of Merredin, the Department of Agriculture and MRWA regarding the use of ground water (and town run off dams) in road construction. This initiative is seen as an opportunity by all parties to utilize a currently unrealized resource (saline ground water and town surface water run off) whilst at the same time addressing rising groundwater and salinity within the town of Merredin and minimizing the use of potable water from the Kalgoorlie pipeline.

8. APPROVALS

8.1 Commonwealth Government

No Threatened Ecological Communities or flora listed under the Commonwealth's *Environmental Protection Biodiversity Conservation Act (EPBC) 1999* has been identified within the project area.

Four species of bird that are listed under the Act, are expected to occur in the study area (Carnaby's Black Cockatoo, Peregrine Falcon, Rainbow Bee-eater and Fork-tailed Swift), but would only trigger referral if the impacts on the species were considered to be significant. The guidelines on significance which relate to the EPBC Act mention that significance means loss of a large area of breeding or feeding grounds or a direct loss of a considerable percentage of the population. The Peregrine Falcon, Rainbow Bee-eater and Fork-tailed Swift are migratory species. Given the minimal and linear nature of the clearing, the project is unlikely to have a significant impact on any of these species.

The Carnaby's Black-Cockatoo may utilise the small remnants of vegetation for feeding. However, these remnants are generally degraded and there are other areas of higher quality remnant vegetation in the general area of DP 3 that the Black-Cockatoos may utilise for feeding. The trees rated as having High and Very High significance within DP 3 did not support hollows of adequate size to support Carnaby's Black Cockatoos. The project is not expected to have a significant impact on this species.

No other issues which would trigger referral under the EPBC Act are present in or adjoining the project area.

8.2 Western Australian Government

This project will result in the clearing of 2.0ha of previously rehabilitated (i.e. planted) vegetation and 1.52ha of remnant vegetation mixed with rehabilitated (planted) vegetation. The project will have no impact on significant flora or vegetation. No trees rated as having high or very high significance will be cleared.

The project adheres to the ten Clearing Principles detailed in Main Roads Clearing Permit (Purpose Permit) issued to Main Roads by the Department of Environment on the 1st February 2006 under the *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004 and therefore does not require referral to the Environmental Protection Authority for assessment. A completed checklist detailing compliance with the Ten Clearing Principles in Main Roads Purpose Permit CPS 818/2 is provided as Appendix 7.

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FIGURES

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DATUM:

BRC-2005-002/MGMT/25_228F02a.dgn

LEGEND

- Cadastral Boundary
- Proposed Road Edge
- Proposed Earthworks
- 240400 Chainage

See Figure 1 for Location

Vegetation Legend

- (L) Tree - Low Significance
- (M) Tree - Medium Significance
- (H) Tree - High significance
- (VH) Tree - Very High Significance
- Remnant or Planted Vegetation
- (L) Tree/Vegetation to be Removed
- EoEI Vegetation Type *(See Figure 2f)*
- G-D Vegetation Condition *(See Figure 2f)*

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BASE & AERIAL PHOTO SOURCE: ALine East, November 2005.

ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

ENVIRONMENTAL CONSTRAINTS DESIGN PACKAGE 3

FIGURE 2a

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TRAYNING
NUNGARIN
WYALKATCHEM
Road
Kellerberrin
Westonia
Walgoolan
HIGHWAY
280
290
300
Carrabin
WESTONIA
270
Merredin
260
Nangeenan
EASTERN
250
DP2
DP10
MERREDIN
YILGARN
Hines Hill
240
DP1
DP3
DP6
Road
Merredin
KELLERBERRIN
Bencubbin
230
220
TAMMIN
Doodlakine
Bungulla
190
210
Kellerberrin
200
GREAT
180
170
Bruce Rock
Tammin
Goldfields
Road
Yoting
Road
Kellerberrin
Doodlakine
Bruce Rock
Road
Merredin
Narembeen
Road
BRUCE ROCK
QUAIRADING
NAREMBEEN

kilometres
0 5 10 15 20
SCALE 1 : 350 000

LEGEND

- Highway
- Major Road
- Minor Road
- Shire Boundary
- Watercourse
- 180 Chainage
- DP6 Design Package

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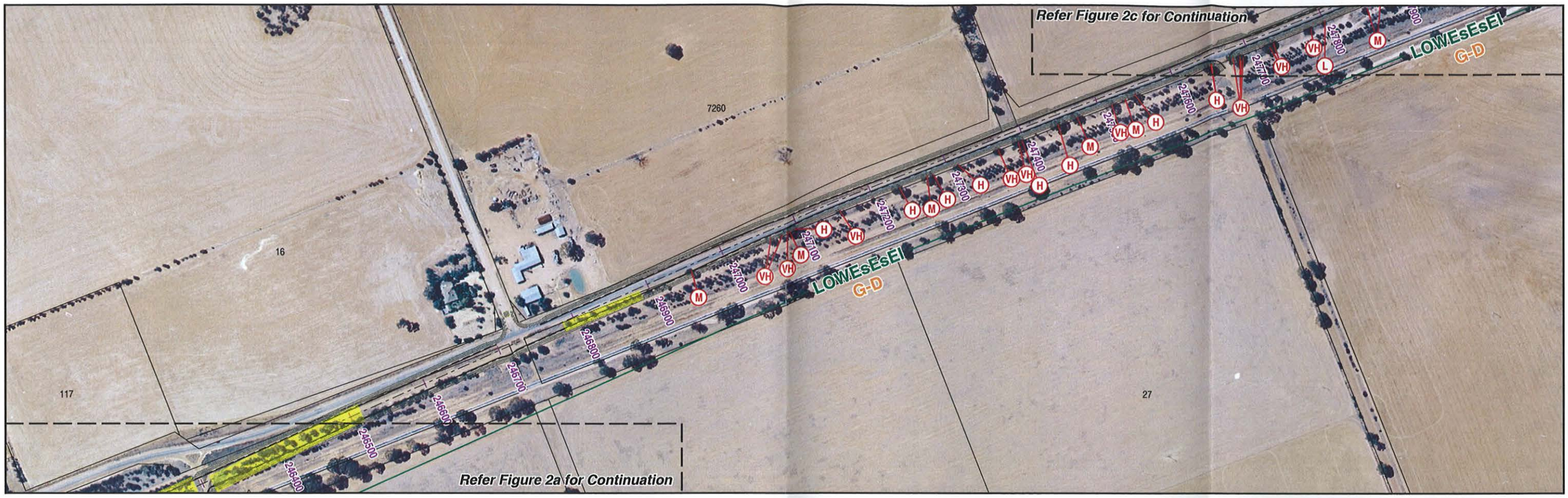
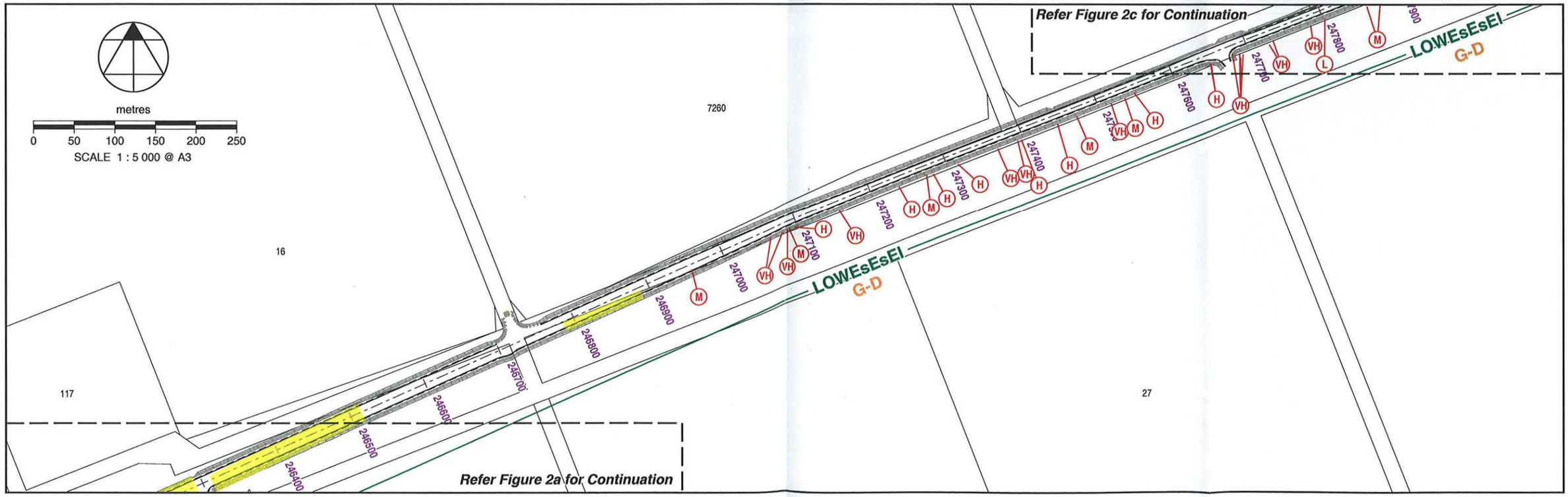
ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

REGIONAL LOCATION

FIGURE 1





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BASE & AERIAL PHOTO SOURCE: ALine East, November 2005.

LEGEND

- Cadastral Boundary
- Proposed Road Edge
- Proposed Earthworks
- 240400 Chainage

See Figure 1 for Location

Vegetation Legend

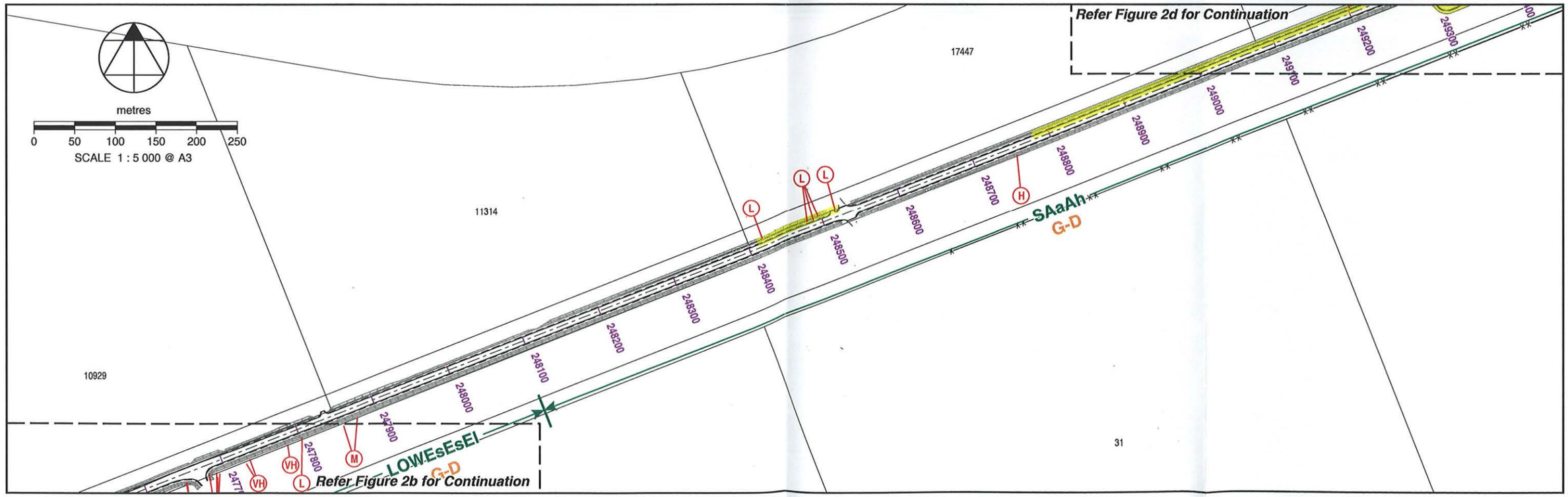
- (L) Tree - Low Significance
- (M) Tree - Medium Significance
- (H) Tree - High Significance
- (VH) Tree - Very High Significance
- Remnant or Planted Vegetation

- (L) Tree/Vegetation to be Removed
- EoEl Vegetation Type *(See Figure 2f)*
- G-D Vegetation Condition *(See Figure 2f)*

ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

ENVIRONMENTAL CONSTRAINTS DESIGN PACKAGE 3

FIGURE 2b



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BASE & AERIAL PHOTO SOURCE: ALine East, November 2005.

LEGEND

- Cadastral Boundary
- Proposed Road Edge
- Proposed Earthworks
- 240400 Chainage

See Figure 1 for Location

Vegetation Legend

- (L) Tree - Low Significance
- (M) Tree - Medium Significance
- (H) Tree - High Significance
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- (L) Tree/Vegetation to be Removed
- EoEl Vegetation Type *(See Figure 2f)*
- G-D Vegetation Condition *(See Figure 2f)*

ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

ENVIRONMENTAL CONSTRAINTS DESIGN PACKAGE 3

FIGURE 2c

LEGEND

- Cadastral Boundary
- Proposed Road Edge
- Proposed Earthworks
- 240400 Chainage

See Figure 1 for Location

Vegetation Legend

- (L) Tree - Low Significance
- (M) Tree - Medium Significance
- (H) Tree - High Significance
- (VH) Tree - Very High Significance
- Remnant or Planted Vegetation
- (L) Tree/Vegetation to be Removed
- EoEl Vegetation Type *(See Figure 2f)*
- G-D Vegetation Condition *(See Figure 2f)*

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ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

ENVIRONMENTAL CONSTRAINTS DESIGN PACKAGE 3

FIGURE 2d

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LEGEND

- Cadastral Boundary
- Proposed Road Edge
- Proposed Earthworks
- 240400 Chainage

See Figure 1 for Location

Vegetation Legend

- (L) Tree - Low Significance
- (M) Tree - Medium Significance
- (H) Tree - High Significance
- (VH) Tree - Very High Significance
- Remnant or Planted Vegetation

- (L) Tree/Vegetation to be Removed
- EoEI Vegetation Type *(See Figure 2f)*
- G-D Vegetation Condition *(See Figure 2f)*

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ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY

ENVIRONMENTAL CONSTRAINTS DESIGN PACKAGE 3

FIGURE 2e

VEGETATION TYPE LEGEND

LOWEsEsEl Low Open Woodland dominated by *Eucalyptus salmonophloia, Eucalyptus salubris* and *Eucalyptus loxophleba* subsp. *lissophloia* with occasional *Casuarina obesa* over a Tall Shrubland to 2m dominated by *Acacia acuminata, Acacia hemiteles* and *Acacia assimilis* subsp. *assimilis* over a Herbland dominated by *Atriplex bunburyana* over a Grassland dominated by *Avena fatua*.

LWWEoEl Low Woodland to Woodland dominated by *Eucalpytus orthrostemon* (ms) and *Eucalyptus loxophleba* subsp. *lissophloia* with occasional *Eucalyptus ?campaspe* over Shrubland dominated by *Atriplex bunburyana* and *Acacia merrallii.*

SAaAh Shrubland to 2m dominated by *Acacia acuminata* and *Acacia hemiteles* over a Grassland to 0.7m dominated by *Avena fatua* and *Eragrostis curvula* with occasional *Casuarina obesa, Eucalyptus loxophleba* subsp. *lissophloia* and *Eucalyptus salmonophloia.*

LOSAb Low Open Shrubland dominated by *Atriplex bunburyana* over a Low Shrubland of *Halosarcia* sp. and *Halosarcia indica* subsp. *bidens* with occasional *Limonium sinuatum* over Very Open Grassland of *Avena fatua.*

PEs Planted *Eucalyptus* species dominated by *Eucalyptus loxophleba* subsp. *lissophloia* and *Eucalyptus ?campaspe.*

VEGETATION CONDITION LEGEND

The vegetation condition was described using Bush Forever's condition scale rating (Government of Western Australia, 2000) which includes six main categories ranging from Completely Degraded to Pristine. The condition categories relevant to the study area are described below:

G **Good** - Vegetation structure significantly altered by very obvious signs of multiple disturbances. Vegetation retains basic structure or ability to regenerate it, for example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

D **Degraded** - Basic vegetation structure severely impacted by disturbance. There is scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD **Completely Degraded** - The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with flora composing weed or crop species with isolated native trees or shrubs.

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FILL BATTER TABLE

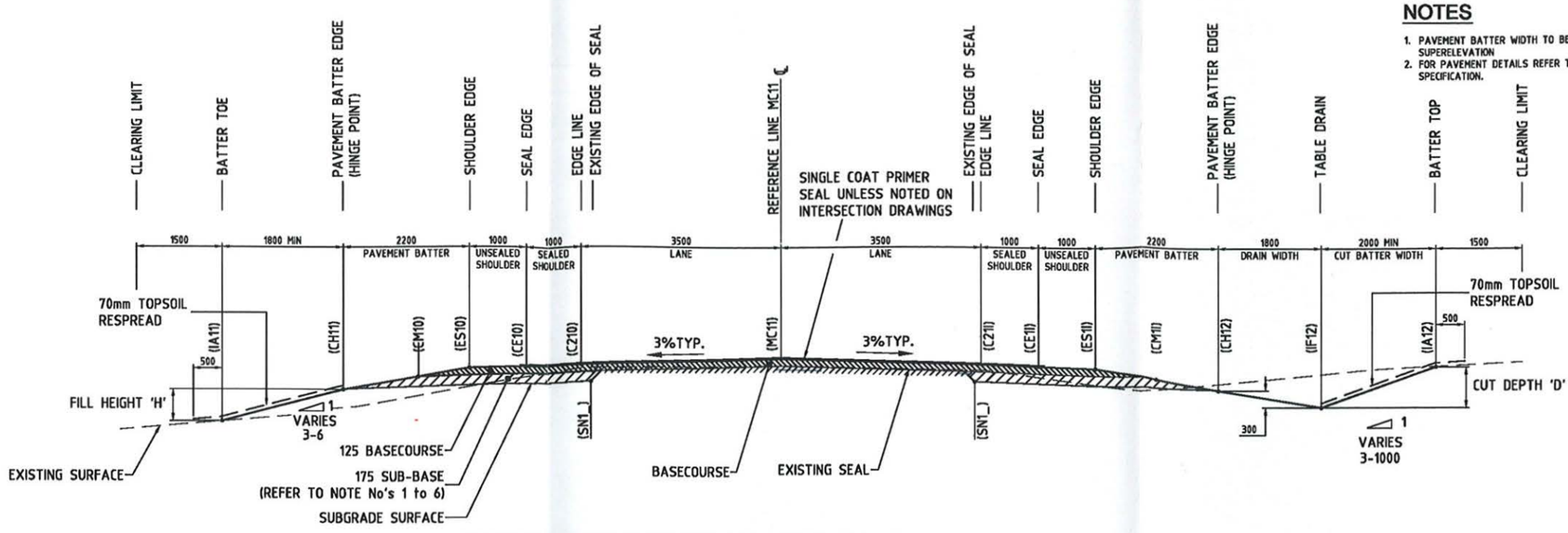
FILL HEIGHT 'H'	FILL BATTER SLOPE 1 IN 'n'	FILL BATTER WIDTH
0 - 300	1IN 6	TABLEDRAIN REQUIRED
300 - 600	1 IN 6 TO 1 IN 3	CONSTANT 1800
600+	1IN 3	VARIES 1800+

CUT BATTER TABLE

CUT DEPTH 'D'	CUT BATTER SLOPE 1 IN 'n'	CUT BATTER WIDTH
0 - 667	LEVEL TO 1 IN 3	CONSTANT 2000
667+	1 IN 3	VARIES 2000+

NOTES

1. PAVEMENT BATTER WIDTH TO BE MAINTAINED ON SUPERELEVATION
2. FOR PAVEMENT DETAILS REFER TO TECHNICAL SPECIFICATION.



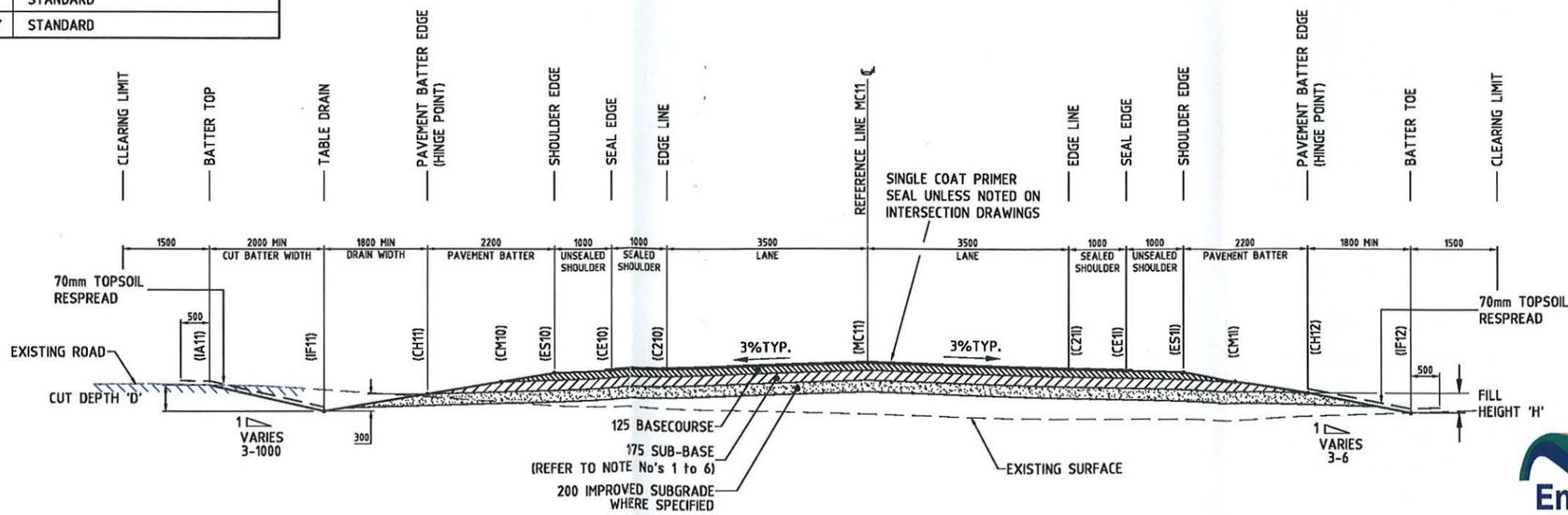
TYPICAL CROSS SECTION - WIDENING BOTH SIDES AND OVERLAY
1:50

PAVEMENT TABLE

CHAINAGE	BASECOURSE DEPTH	SUBBASE DEPTH	TREATMENT	PAVEMENT
239160 - 239330	125mm	175mm	WIDEN AND OVERLAY	STANDARD
239330 - 239430	200mm	300mm	WIDEN AND OVERLAY	CEMENT STABILISED BASECOURSE
239430 - 240590	125mm	175mm	WIDEN AND OVERLAY	STANDARD
240590 - 240700	200mm	300mm	WIDEN AND OVERLAY	CEMENT STABILISED BASECOURSE
240700 - 241600	125mm	175mm	WIDEN AND OVERLAY	STANDARD
241600 - 242390	125mm	175mm	REALIGNMENT	STANDARD
242390 - 242540	200mm	400mm	REALIGNMENT	CEMENT STABILISED BASECOURSE
242540 - 243450	125mm	175mm	REALIGNMENT	STANDARD WITH IMPROVED SUBGRADE
243450 - 243640	125mm	175mm	REALIGNMENT	STANDARD
243640 - 245200	125mm	175mm	WIDEN AND OVERLAY	STANDARD

OVERLAY TREATMENT FOR SUB BASE NOTE

1. IMPORTED GRAVEL SUB BASE MATERIAL SHALL BE ADDED TO THE EXISTING PAVEMENT AS REQUIRED UP TO THE SUB BASE LEVEL (IE DESIGN LEVEL MINUS 125MM).
2. WHERE THE EXISTING PAVEMENT IS ABOVE THE SUB BASE LEVEL IT SHALL MILLED OUT TO THIS LEVEL (WITH MINIMUM DISTURBANCE TO THE UNDERLYING PAVEMENT) AND REMOVED.
3. WHERE THE NEW SUB BASE LAYER OVER THE EXISTING PAVEMENT IS LESS THAN 100MM IT SHALL BE MIXED WITH THE UNDERLYING LAYER TO A MINIMUM DEPTH OF 100MM AND COMPACTED.
4. THE SUB BASE LAYER SHALL BE A MIXTURE OF THE OLD PAVEMENT MATERIAL, THE EXISTING SEAL AND IMPORTED SUB BASE MATERIAL COMPACTED AND TRIMMED TO THE SPECIFIED SUB BASE LEVELS AND DENSITY BEFORE THE PLACEMENT OF THE BASECOURSE LAYER.
5. WHEREVER POSSIBLE DISTURBANCE TO THE EXISTING PAVEMENT IS TO BE KEPT TO A MINIMUM.
6. NO DENSITY TESTING IS REQUIRED ON THE PORTIONS OF THE SECTION WHERE THE EXISTING PAVEMENT HAS NOT BEEN DISTURBED.



TYPICAL CROSS SECTION - REALIGNMENT
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ENVIRONMENTAL IMPACT ASSESSMENT
DESIGN PACKAGE 3
GREAT EASTERN HIGHWAY
TYPICAL CROSS SECTION
FIGURE 3

SOURCE: ALine East, Dwg. No. GEH-DP01-CIV-400, Rev. C1, 16-02-06.

PLATES

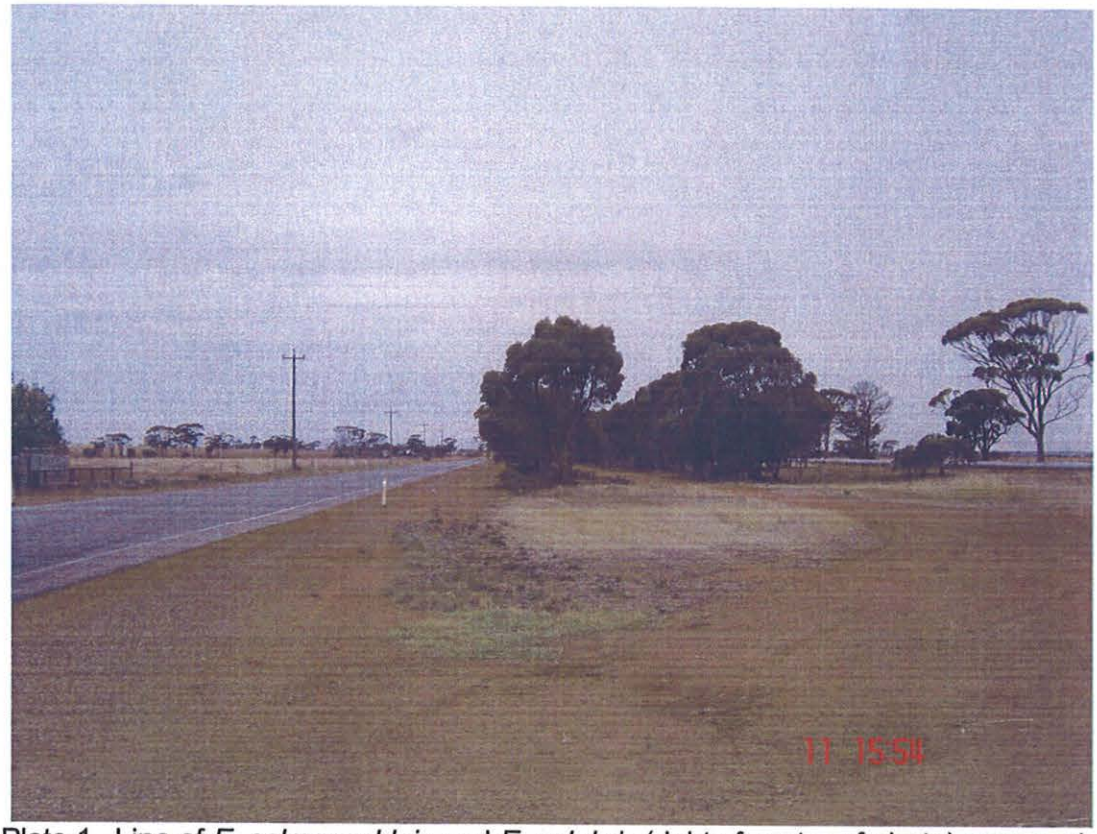

Plate 1 Line of *E. salmonophloia* and *E. salubris* (right of centre of photo) proposed to be cleared ca 50 m west of intersection of Nangeenan North Road and GEH (between SLK 246.7 and 246.3)

Plate 2 Line of *E. salmonophloia* and *E. salubris* (left of centre of photo) proposed to be cleared. View towards Nangeenan townsite from near intersection of Nangeenan North Road.

Plate 3 Photo taken from west end of proposed Nangeenan realignment showing curve in GEH towards north into Nangeenan town site.

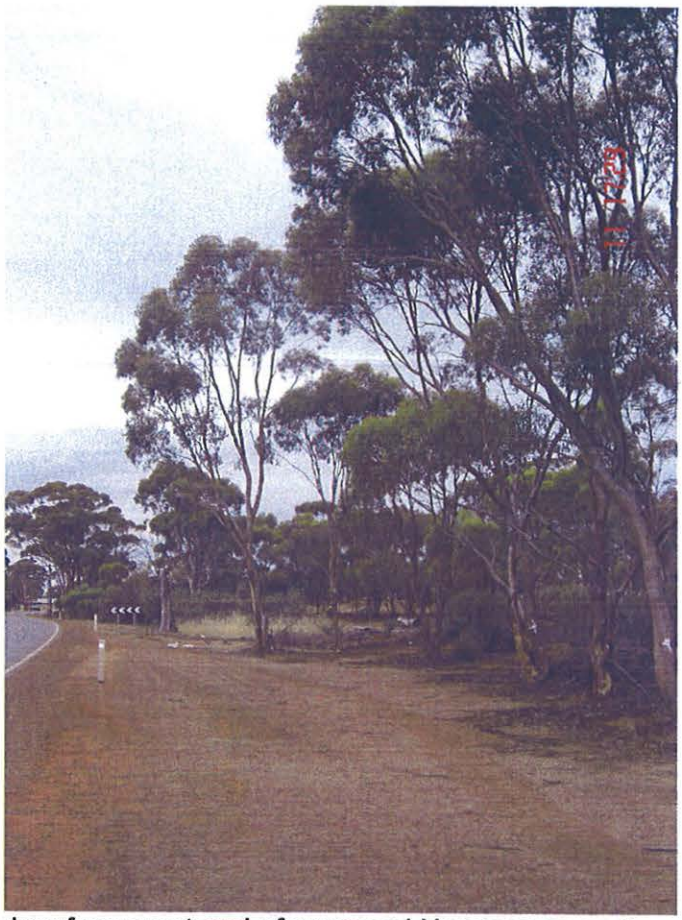

Plate 4 Photo taken from west end of proposed Nangeenan realignment showing trees rated as of Medium Significance likely to be required to be cleared (white markings)

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APPENDICES

APPENDIX 1

CLASSIFICATION SYSTEM FOR SIGNIFICANT TREES ON ALINE EAST PROJECT

APPENDIX 1 CLASSIFICATION SYSTEM FOR SIGNIFICANT TREES ON ALINE EAST PROJECT

TREE SPECIES	MEASURED CIRCUMFERENCE AT BREAST HEIGHT	CLASSIFICATION	JUSTIFICATION
Eucalyptus salmonophloia	0-150 cm	Medium	
	150-200 cm	Medium	
	200-250 cm	High (H)	Aesthetics and age
	> 250 cm	Very High (VH)	Aesthetics, age & development of hollows
Eucalyptus salubris	150 – 200	Very High	Aesthetics & age, hollows for smaller parrots
	100-150	High	Aesthetics & age
Species not endemic to region	200+	Very High	Amenity & social values
	150-200	High	
	<150	Low	Replacement time relatively low
Rehabilitated areas	CBH <100 mm	Medium	Age of rehabilitation and understorey is generally poor
	CBH <50 cm	Low	Replacement time relatively low

Note: National Trust of South Australia's notion of "significant tree" = CBH (circumference at breast height) > or =200 cm

GUIDING PRINCIPLES

If a choice has to be made between clearing several Very High or High Significance Trees or rehabilitated land then the significant trees should be retained, particularly if these trees are local natives.

Remnant vegetation, particularly with intact understorey is ranked higher than:

- rehabilitated land; and
- isolated High Significance trees, particularly if they are already very close to the GEH with no understorey.

APPENDIX 2
FLORA SPECIES LIST FOR DP 3

APPENDIX 2 - FLORA SPECIES LIST FOR DP 3

*-denotes introduced (weed) species

Family	Genus/Species
MONOCOTYLEDONS	
POACEAE	**Avena fatua*
	**Bromus diandrus*
	**Briza minor*
	**Cynodon dactylon*
	**Ehrharta calycina*
	**Eragrostis curvula*
DICOTYLEDONS	
BORAGINACEAE	**Echium plantagineum*
BRASSICACEAE	**Rhaphanus rhaphanistrum*
CASUARINACEAE	*Casuarina obesa*
CHENOPODIACEAE	*Atriplex bunburyana*
	Halosarcia indica subsp. *bidens*
	Halosarcia sp.
MIMOSACEAE	*Acacia acuminata*
	Acacia assimilis subsp. *assimilis*
	Acacia hemiteles
	Acacia merrallii
MYRTACEAE	*Eucalyptus ?campaspe*
	Eucalyptus loxophleba subsp. *lissophloia*
	Eucalyptus orthrostemon (ms)
	Eucalyptus salmonophloia
	Eucalyptus salubris
PLUMBAGINACEAE	**Limonium sinuatum*
MONOCOTYLEDONS	
POACEAE	**Avena fatua*
	**Bromus diandrus*

APPENDIX 3
TREES RATED AS SIGNIFICANT RECORDED IN DP 3

APPENDIX 3 TREES RATED AS SIGNIFICANT RECORDED IN DP 3

Species	Sign.	Easting (mE) (WGS84)	Northing (mN) (WGS84)	Height (m)	Side of road	Distance from road (m)	CBH (cm)
E. salubris	M	614533	6513935	6	N	6	77
E. capillosa	VH	614518	6513931	18	N	8	187,162
E. salubris	M	614522	6513922	6		5	
E. salubris	M	613506	6513526	10	S	12	
E. ?capillosa	M	612684	6513214	5	S	7	58,69,51
E. ?capillosa	M	642665	6513201	5			43,59,41
**Schinus molle*	M	612625	6513185	5	S	7	57
E. salubris	VH	612609	6513185		S	7	207
E. salubris	VH	612556	6513169	18	S	7	259
E. salubris	VH	612552	6513164	20	S	11	183,132
E. salubris	H	612510	6513146	20	S	4 to 12	188
E. salubris	M	612510	6513146	20	S	4 to 12	147
E. salubris	VH	612510	6513146	20	S	4 to 12	86,156
E. salubris	H	612510	6513146	20	S	4 to 12	153
E. salubris	H	612510	6513146	20	S	4 to 12	142
E. salmonophloia	VH	612468	6513134	25	S		205
E. salubris	M	612468	6513134	15	S		119
E. salmonophloia	H	612384	6513102	20	S		207
E. salmonophloia	M	612367	6513094	18	S	5	137
E. salmonophloia	H			20	S	5	202
E. salmonophloia	M			12	S	4	115
E. salmonophloia	H			25	S	4	205
E. salmonophloia	M	612237	6513045		S	6	127
E. salmonophloia	VH	612236	6513045				337
E. salubris	M	612202	6513038		S	6	167
E. salubris	VH	612155	6513018	14	S	8	222
E. salmonophloia	H	612125	6513003	25	S	8	201
E. salmonophloia	M	612117	6513000	25	S	8	180
E. salmonophloia	H	612068	6512985	25	S	4	215
E. salubris	VH	612005	6512964		S	3.5	224
E. salmonophloia	H	611954	6512945	20	S	4	190
E. salmonophloia	M			20	S	5	129
E. salubris	M	611945	6512945	18	S	4	117
E. salubris	VH	611939	6512943	18	S	5	129,71
E. salubris	VH	611918	6512931	20	S	4	205,83
E. salmonophloia	H	611821	6512888	25	S	3.5	180
E. salmonophloia	M	611518	6512754	16	S		100
E. salmonophloia	VH	611450	6512724	18	S		160, 90, 80

Species	Sign.	Easting (mE) (WGS84)	Northing (mN) (WGS84)	Height (m)	Side of road	Distance from road (m)	CBH (cm)
E. salmonophloia	H	611429	6512715	15	S		115, 101
E. salmonophloia & *E. salubris* (one every 10 m)	M	Between 611377 and 611311	Between 6512705 and 6512672	16	S	6-8	
E. salmonophloia (three trees)	M	651262	6512644		S		150-180
E. salmonophloia	M	611138	6512576	10	S		73
E. salmonophloia	M	611000	6512520		S		114
Planted *Eucalyptus* sp.	H	610948	6512511	16	S		200
E. salmonophloia (mid-point of six trees)	M	610458	6512369		S		<100
E. salmonophloia	VH	610440	6512385		N		200, 113
E. salmonophloia	VH	610613	6512450	18	S	10	300
E. salmonophloia	VH	610613	6512450	18	S	10	190, 67
E. salmonophloia	H	610613	6512450	18	S	10	200
Eucalyptus sp. (dead)	L	610601	6512432		S		
E. salmonophloia	H	610605	6512447		S		205
E. salmonophloia	VH	610585	6512443		S	5	138, 108, 123, 45
E. salmonphloia	M	610585	6512443		S	5	76
E. salmonophloia	VH	610583	6512443		S	5	124, 145, 240, 55
E. salmonophloia	H	610598	6512400		S		200
E. salmonophloia	M	610618	6512406		S	30	180
E. salmonophloia	VH	610589	6512415		S		153, 117
E. salmonophloia	M	610472	6512351		S		146
E. salmonophloia (six trees)	M	Between 610472 and 610446	Between 6512351 and 6512354		S		
E. salmonophloia	VH				S	6	138, 200
E.salmonophloia	H				S	4	200
E. salmonophloia	M	610342	6512322		S		185

* = introduced species

Sig = Significance

- M = Medium (any *E. salmonophloia*)
- H = High (*E. salmonophloia* CBH >200 cm; *E. salubris* CBH >100)
- VH = Very High (any tree CBH >200 cm)

CBH = Circumference at breast height

APPENDIX 4
FAUNA SPECIES PREDICTED TO OCCUR IN DP 3

APPENDIX 4 FAUNA SPECIES PREDICTED TO OCCUR IN DP 3

E represents species listed under the Environment Protection and Biodiversity Conservation Act 1999

M represents migratory bird species listed under the Environment Protection and Biodiversity Conservation Act 1999

S represents species listed on the Department of Conservation and Land Management's Scheduled Fauna list

P represents species listed on the Department of Conservation and Land Management's Priority Fauna list

* introduced species

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
AMPHIBIANS	
***Hylidae* (Tree Frogs)**	
Western Banjo Frog *Limnodynastes dorsalis*	
***Myobatrachidae* (Ground Frogs)**	
Bleating Froglet *Crinia pseudinsignifera*	
Western Spotted Frog *Heleioporus albopunctatus*	
Turtle Frog *Myobatrachus gouldii*	
Kunapalari Frog *Neobatrachus kunapalari*	
Humming Frog *Neobatrachus pelobatoides*	
Guenther's Toadlet *Pseudophryne guentheri*	
REPTILES	
***Agamidae* (Dragons)**	
Ctenophorus cristatus	
Ctenophorus maculatus griseus	
Ctenophorus ornatus	
Ctenophorus reticulatus	
Moloch horridus	
Pogona minor minor	
Boidae (Pythons)	
Stimson's Python *Antaresia stimsoni stimsoni*	
Carpet Python *Morelia spilota imbricata*	S
***Elapidae* (Front-fanged Snales)**	
Brachyurophis semifasciata	
Demansia psammophis reticulata	
Parasuta gouldii	
Pseudechis australis	
Pseudonaja affinis affinis	
Pseudonaja nuchalis	
Simoselaps bertholdi	

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
***Gekkonidae* (Geckoes)**	
Christinus marmoratus	
Crenadactylus ocellatus ocellatus	
Diplodactylus granariensis	
Diplodactylus maini	
Diplodactylus pulcher	
Gehyra variegata	
Oedura reticulata	
Strophurus spinigerus	
Underwoodisaurus milii	
***Pygopodidae* (Legless Lizards)**	
Delma australis	
Delma fraseri	
Lialis burtonis	
Pygopus lepidopodus	
***Scincidae* (Skinks)**	
Cryptoblepharus plagiocephalus	
Ctenotus impar	
Ctenotus pantherinus	
Ctenotus schomburgkii	
Lerista distinguenda	
Lerista macropisthopus	
Lerista muelleri	
Menetia greyii	
Morethia butleri	
Morethia lineoocellata	
Morethia obscura	
Tiliqua occipitalis	
Tiliqua rugosa	
***Typhlopidae* (Blind Snakes)**	
Ramphotyphlops australis	
Ramphotyphlops hamatus	
Ramphotyphlops waitii	
***Varanidae* (Monitors)**	
Varanus gouldii	
Varanus tristis tristis	
MAMMALS	
***Bovidae* (Goats, Cattle, Sheep)**	
Goat *Capra hircus*	*
Cow *Bos taurus*	*
Sheep *Oves aries*	*
***Burramyidae* (Pygmy Possums)**	

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
Western Pygmy Possum *Cercartetus concinnus*	
***Canidae* (Dogs, Foxes)**	
Fox *Vulpes vulpes* *	
***Dasyuridae* (Dunnarts, Quolls, etc)**	
Chuditch *Dasyurus geoffroii*	ES
Kultarr *Antechinomys laniger*	
Fat-tailed Dunnart *Sminthopsis crassicaudata*	
Little Long-tailed Dunnart *Sminthopsis dolichura*	
***Equidae* (Horses, Donkeys)**	
Horse *Equus caballus*	*
***Felidae* (Cats)**	
Feral Cat *Felis catus*	*
***Leporidae* (Rabbits)**	
European Rabbit *Oryctolagus cuniculus*	*
***Macropodidae* (Kangaroos and Wallabies)**	
Western Grey Kangaroo *Macropus fuliginosus*	
Euro *Macropus robustus erubescens*	
Western Brush Wallaby *Macropus irma*	P
***Molossidae* (Freetail Bats)**	
White-striped Freetail Bat *Tadarida australis*	
Western Freetail Bat *Mormopterus planiceps*	
***Muridae* (Rodents)**	
House Mouse *Mus musculus*	*
Mitchell's Hopping Mouse *Notomys mitchelli*	
Ash-grey Mouse *Pseudomys albocinereus*	
Black Rat *Rattus rattus*	*
***Phalangeridae* (Possums)**	
Brushtail Possum *Trichosurus vulpecula*	
***Tachyglossidae* (Echidnas)**	
Short-beaked Echidna *Tachyglossus aculeatus*	
***Vespertilionidae* (Evening Bats)**	
Gould's Wattled Bat *Chalinolobus gouldii*	
Lesser Long-eared Bat *Nyctophilus geoffroyi*	
Greater Long-eared Bat *Nyctophilus timorensis*	
Southern Forest Bat *Vespadelus regulus*	
BIRDS	
***Acanthizidae* (Thornbills, Gerygones, Whitefaces, Wrens)**	

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
Inland Thornbill *Acanthiza apicalis*	
Yellow-rumped Thornbill *Acanthiza chrysorrhoa*	
Chestnut-tailed Thornbill *Acanthiza uropygialis*	
Slaty-backed Thornbill *Acanthiza robustirostris*	
Western Gerygone *Gerygone fusca*	
Redthroat *Pyrrholaemus brunneus*	
Weebill *Smicrornis brevirostris*	
***Accipitridae* (Eagles, Kites, Hawks, Bustards)**	
Brown Goshawk *Accipiter fasciatus*	
Collared Sparrowhawk *Accipiter cirrhocephalus cirrhocephalus*	
Wedge-tailed Eagle *Aquila audax audax*	
Little Eagle *Aquila morphnoides*	
Spotted Harrier *Circus assimilis*	
Black-shouldered Kite *Elanus axillaris*	
White-breasted Sea Eagle *Haliastur leucogaster*	
Whistling Kite *Haliastur sphenurus*	
Square-tailed Kite *Lophoictinia isura*	
***Aegothelidae* (Owlet-nightjars)**	
Australian Owlet-nightjar *Aegotheles cristatus cristatus*	
***Anatidae* (Ducks, geese, swans)**	
Grey Teal *Anas gracilis gracilis*	
Pacific Black Duck *Anas superciliosa*	
Australian Wood Duck *Chenonetta jubata*	
Australian Shelduck *Tadorna tadornoides*	
***Apodidae* (Swifts)**	
Fork-tailed Swift *Apus pacifcus*	EM
***Ardeidae* (Herons, Egrets, Bitterns)**	
White-faced Heron *Ardea novaehollandiae novaehollandiae*	
White-necked Heron *Ardea pacifica*	
Rufous Night Heron *Nycticorax caledonicus hilli*	
Artamidae (Woodswallows)	
Black-faced Woodswallow *Artamus cinereus*	
Dusky Woodswallow *Artamus cyanopterus*	
Masked Woodswallow *Artamus personatus*	
***Burhinidae* (Stone-curlews)**	
Bush Stone-curlew *Burhinus grallarius*	P
***Campephagidae* (Cuckoo-shrikes, Cicadabirds, Trillers)**	
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	
White-winged Triller *Lalage tricolor*	
Ground Cuckoo-shrike *Coracina maxima*	

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
***Caprimulgidae* (Nightjars)**	
Spotted Nightjar *Eurostopodus argus*	
***Climacteridae* (Treecreepers)**	
Rufous Treecreeper *Climacteris rufa*	
***Columbidae* (Doves, Pigeons)**	
Crested Pigeon *Ocyphaps lophotes*	
Rock Dove *Columbia livia*	*
Common Bronzewing *Phaps chalcoptera chalcoptera*	
Laughing Turtle-Dove *Streptopelia senegalensis*	*
Spotted Turtle-Dove *Streptopelia chineensis*	*
***Corvidae* (Crows, Ravens)**	
Little Crow *Corvus bennetti*	
Australian Raven *Corvus coronoides*	
***Cracticidae* (Magpies, Currawongs, Butcherbirds)**	
Pied Butcherbird *Cracticus nigrogularis*	
Australian Magpie *Cracticus tibicen*	
Grey Butcherbird *Cracticus torquatus torquatus*	
***Cuculidae* (Cuckoos)**	
Horsfield's Bronze Cuckoo*Chrysococcyx basalis*	
Shining Bronze-Cuckoo *Chrysococcyx lucidus*	
Fan-tailed Cuckoo *Cacomantis flabelliformis*	
Pallid Cuckoo *Cuculus pallidus*	
***Dicaeidae* (Mistletoes)**	
Mistletoebird *Dicaeum hirundinaceum hirundinaceum*	
Dicruridae (Drongos, Fantails, Willie Wagtails, Flycatchers)	
Magpie Lark *Grallina cyanoleuca*	
Grey Fantail *Rhipidura fuliginosa*	
Willie Wagtail *Rhipidura leucophrys leucophrys*	
***Falconidae* (Falcons, Hobbys, Kestrels)**	
Brown Falcon *Falco berigora berigora*	
Australian Hobby *Falco longipennis*	
Peregrine Falcon *Falco peregrinus*	S EM
Nankeen Kestrel *Falco cenchroides cenchroides*	
***Halcyonidae* (Wood Kingfishers, Kookaburras)**	
Laughing Kookaburra *Dacelo novaeguineae*	
Sacred Kingfisher *Todiramphus sanctus sanctus*	
***Hirundinidae* (Swallows, Martins)**	
Fairy Martin *Hirundo ariel*	

FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
Tree Martin *Petrochelidon nigricans nigricans*	
Welcome Swallow *Hirundo neoxena*	
White-backed Swallow *Cheramoeca leucosternus*	
***Maluridae* (Emu-wrens, Fairy-wrens, Grass-wrens)**	
Blue-breasted Fairy Wren *Malurus pulcherrimus*	
Splendid Fairy-wren *Malurus splendens splendens*	
***Megapodiidae* (Malleefowl, Scrubfowl)**	
Malleefowl *Leipoa ocellata*	E S
***Meliphagidae* (Honeyeaters, Chats, Friarbirds)**	
Spiny-cheeked Honeyeater *Acanthagenys rufogularis*	
Red Wattlebird *Anthochaera carunculata*	
Crimson Chat *Epthianura tricolor*	
White-fronted Chat *Epthianura albifrons*	
White-eared Honeyeater *Lichenostomus leucotis leucotis*	
Singing Honeyeater *Lichenostomus virescens*	
Brown Honeyeater *Lichmera indistincta indistincta*	
Yellow-throated Miner *Manorina flavigula*	
Brown-headed Honeyeater *Melithreptus brevirostris*	
White-fronted Honeyeater *Phylidonyris albifrons*	
Tawny-crowned Honeyeater *Phylidonyris melanops*	
***Meriopidae* (Bee-eaters)**	
Rainbow Bee-eater *Merops ornatus*	EM
Motacillidae (Pipits, True Wagtails)	
Richard's Pipit *Anthus novaeseelandiae*	
***Neosittidae* (Sitellas)**	
Varied Sittella *Daphoenositta chrysoptera*	
***Pachycephalidae* (Bellbirds, Shrike-thrushes, Whistlers)**	
Grey Shrike-thrush *Colluricincla harmonica*	
Rufous Whistler *Pachycephala rufiventris rufiventris*	
Golden Whistler *Pachycephala pectoralis fuliginosa*	
***Pardalotidae* (Pardalotes)**	
Striated Pardalote *Pardalotus striatus*	
***Passeridae* (Finches, Sparrows)**	
Zebra Finch *Taeniopygia guttata*	
***Petroicidae* (Flycatchers, Robins)**	
Western Yellow Robin *Eopsaltria australis griseogularis*	
Hooded Robin *Melanodryas cucullata cucullata*	
Jacky Winter *Microeca fascinans assimilis*	

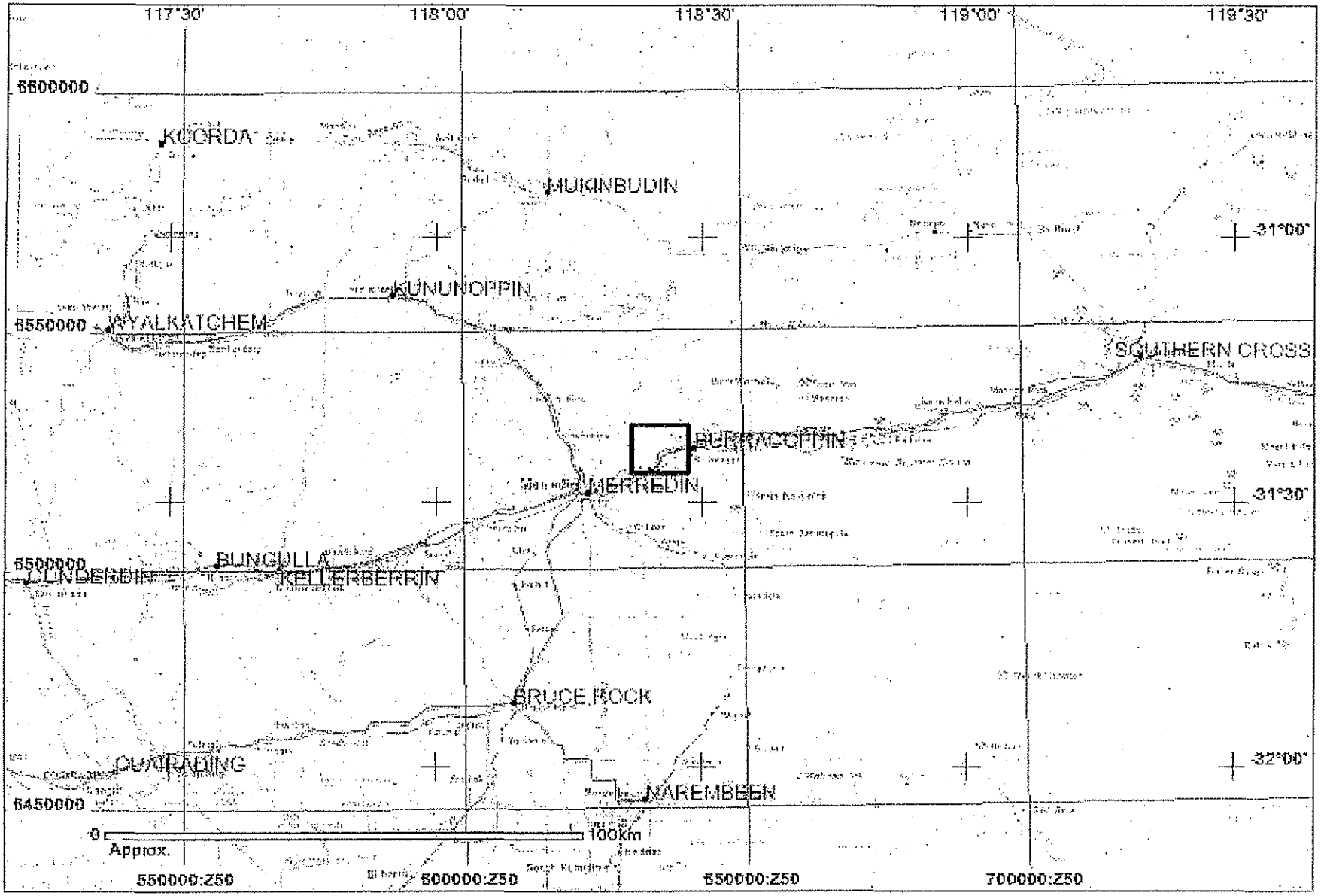
FAUNA SPECIES PREDICTED TO OCCUR IN DP 3	STATUS
Red-capped Robin *Petroica goodenovii*	
***Podargidae* (Frogmouths)**	
Tawny Frogmouth *Podargus strigoides*	
***Pomotostomidae* (Babblers)**	
White-browed Babbler (western Wheatbelt subspecies) *Pomatostomus superciliosus ashbyi*	P
***Psittacidae* (Cockatoos, Parrots, Lorikeets)**	
Galah *Cacatua roseicapilla*	
Western Corella *Cacatua pastinator*	
Carnaby's Cockatoo *Calyptorhynchus latirostris*	E S
Purple-crowned Lorikeet *Glossopsitta porphyrocephala*	
Budgerigar *Melopsittacus undulatus*	
Mulga Parrot *Psephotus varius*	
Elegant Parrot *Neophema elegans*	
Cockatiel *Nymphicus hollandicus*	
Australian Ringneck *Platycercus zonarius*	
Western Rosella *Platycercus icterotis*	
Regent Parrot *Polytelis anthopeplus anthopeplus*	
***Rallidae* (Coots, Crakes, Moorhens, Rails)**	
Eurasian Coot *Fulica atra*	
Black-tailed Native-hen *Gallinula ventralis*	
***Strigidae* (Owls, Hawk-owls)**	
Boobook Owl *Ninox novaeseelandiae ocellata*	
***Sylviidae* (Cisticolas, Grassbirds, Songlarks)**	
Brown Songlark *Cincloramphus cruralis*	
Rufous Songlark *Cincloramphus mathewsi*	
***Turnicidae* (Button-quails)**	
Painted Button-quail *Turnix varia varia*	
Little Button-quail *Turnix velox*	
***Tytonidae* (Owls)**	
Barn Owl *Tyto alba delicatula*	
***Zosteropidae* (White-eyes)**	
Silvereye *Zosterops lateralis gouldi*	

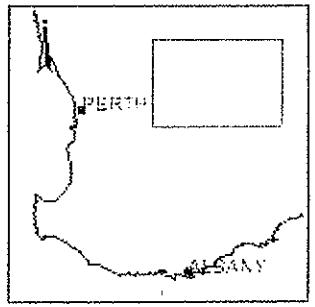
APPENDIX 5

ABORIGINAL SITES REGISTERED ON THE DEPARTMENT OF INDIGENOUS AFFAIRS DATABASE ON 22ND DECEMBER 2005

Aboriginal Heritage Inquiry System

Register of Aboriginal Sites





Legend

- Highlighted Area
- Town
- Map Area
- Search Area

Search Criteria

Site 5605

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

Legend

Restriction		Access		Status	
N	No restriction	C	Closed	I	Interim register
M	Male access only	O	Open	P	Permanent register
F	Female access	V	Vulnerable	S	Stored data

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No
5605	I	O	N	Talgermine Rock.		[Other: STONE FOOTPRINT]		635141mE 6525149mN Zone 50 [Unreliable]	S00549

Search Criteria

0 sites in a search polygon. The polygon is formed by these points (in order).

MGA Zone 50	
Northing	Easting
6532000	642000
6521000	642000
6521000	665000
6532000	665000

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Copyright

Legend

Restriction		Access		Status		Coordinate Accuracy	
N	No restriction	C	Closed	I	Interim register	Accuracy is shown as a code in brackets following the site coordinates.	
M	Male access only	O	Open	P	Permanent register	[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
F	Female access	V	Vulnerable	S	Stored data	[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Spatial Accuracy

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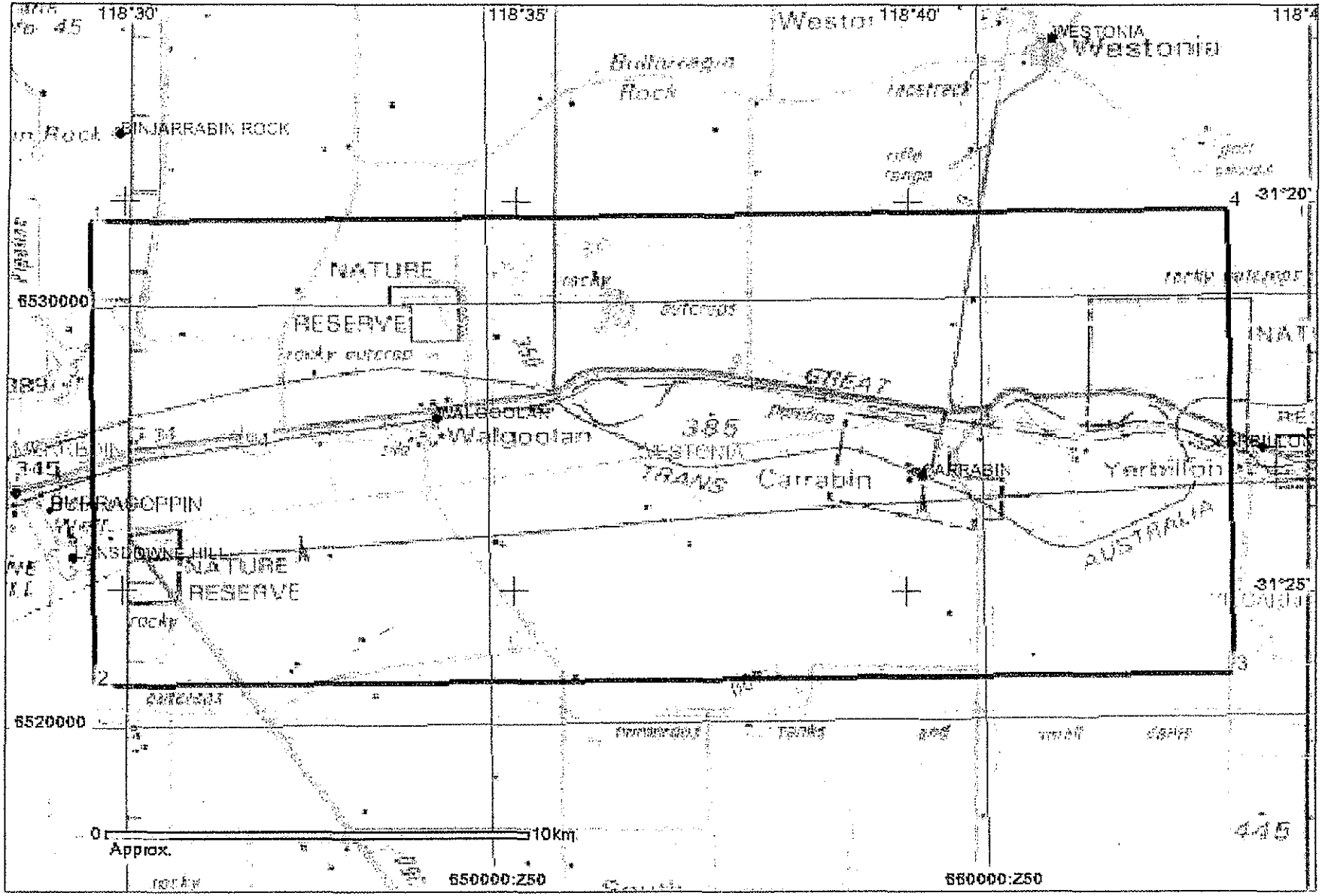
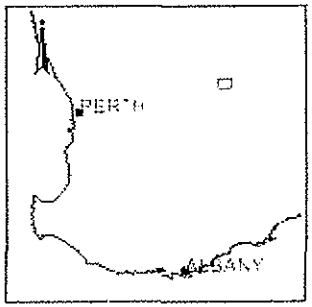
Aboriginal Heritage Inquiry System

Register of Aboriginal Sites





Legend

- Highlighted Area
- Town
- Map Area
- Search Area

Search Criteria

1 sites in local government area 'Merredin'.

Disclaimer

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Copyright

Legend

Restriction		Access		Status		Coordinate Accuracy	
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Spatial Accuracy

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APPENDIX 6
ACOUSTIC ASSESSMENT REPORT FOR DP 3, 6, 7 AND 10

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Suite 34, 11 Preston Street, Como, W.A. 6152
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LYNTON STORER M.A.I.E.A., M.A.A.S.
TIM REYNOLDS M.I.E. AUST. M.A.A.S.

ACOUSTIC ASSESSMENT

GREAT EASTERN HIGHWAY DESIGN PACKAGES 3, 6, 7 AND 10

FOR

ATA ENVIRONMENTAL

BY

HERRING STORER ACOUSTICS

JANUARY 2006

REFERENCE: 5613-1-05198-02

CONTENTS

1.0 INTRODUCTION

Herring Storer Acoustics (HSA) has been commissioned by ATA Environmental to assess the impact of future road traffic noise levels received at residence located adjacent to Packages 3, 6, 7 and 10 of the Great Eastern Highway modifications. It is understood that Packages 3, 6, 7 and 10 are as follows:

- Package 3 is from SLK 247.8 to 251.6.
- Package 6 is from SLK 251.6 to 256.25.
- Package 7 is realignment south of Nangeenan townsite.
- Package 10 is from SLK 260.6 to 261.5.

The acoustic assessment has been carried out for current flows and for 20 years hence (2025). Analysis was based on vehicle traffic data supplied by ATA Environmental.

2.0 SUMMARY

The assessment of acceptable road traffic noise has been made in accordance with Main Roads Western Australia (MRWA) *Noise Level Objectives*. MRWA objectives cite an $L_{10,18hour}$ value of 63 dB(A) as being acceptable.

The Western Australian Planning Commission (WAPC) in May 2005 released a Draft Planning Policy for Road and Rail Transport Noise. The appropriate criteria in this case would be Noise Exposure 2, which cites the following noise limits:

Day	L_{Aeq} 60
Night	L_{Aeq} 55

Predictions were made for noise received at residence located adjacent to the road modifications will comply with the MRWA noise level objectives and the WAPC Draft Planning Policy for Road and Rail Transport Noise up to and including the year 2025, subsequently no noise amelioration is required.

Note: Given the minor nature of the modifications for Package 3 and 6, we do not believe that the WAPC Draft Planning Policy for Road and Rail Transport Noise would be applicable for these packages. However, it could be applied for Packages 7 and 10.

3.0 CRITERIA

3.1 Main Roads Western Australia – Noise Level Objectives

Main Roads Western Australia have criteria known as *Noise Level Objectives*, which include both a day and night time permissible noise level. These are stated as:

"Noise level criteria to be used in the assessment are the Noise Level Objectives specified in Table [3.1] below. Objectives are specified upper limits of traffic noise which it is intended, should not be exceeded. Objectives apply outside residential buildings, and outside public buildings such as hospitals, schools and libraries. In the case of public buildings there is a scope to relax the objectives if affected rooms are air-conditioned, and therefore normally used with windows closed.

TABLE 3.1 - NOISE LEVEL OBJECTIVES

Base Objective	*Objective for High Ambient Areas*
63 dB(A) $L_{10(18hour)}$	*Ambient + 3 dB(A)*
55 dB(A) $L_{eq(8hour)}$	*Ambient + 3 dB(A)*

Notes:

(1) Noise levels are $L_{10\ (18hour)}$ values, from 6am to midnight, and $L_{eq(8hour)}$ values from 10 p.m. to 6 a.m.

(2) Ambient noise is the level of noise before the road project commences

(3) A high ambient area is where ambient noise is more than 60 dB(A) $L_{10(18hour)}$, or 52 dB(A) $L_{eq(8hour)}$.

(4) Due to the impracticality of controlling noise at the upper floors of multi-storey buildings, noise assessment is restricted to the ground floor level.

(5) Noise is assessed 1 metre from a building, and 1.2 to 1.5 metres above the ground floor level.

(6) The objectives apply to the expected 15 to 20 years after opening of the road project, using available traffic forecasts.

(7) Noise level objectives relate to the total traffic noise expected at a building facade, i.e. noise from the new road and any other roads@

3.2 WAPC – Draft Planning Policy for Road and Rail Transport

The Western Australian Planning Commission (WAPC) in May 2005 released a Draft Planning Policy for Road and Rail Transport Noise. The criteria stated in the draft policy is as follows:

5. Policy measures

5.1 Exposure criteria for outdoor noise levels

Table 1 below sets out the outdoor noise exposure criteria for noise-sensitive premises as defined in this policy. These standards are generally consistent with noise criteria adopted in other Australian states where performance criteria or guidelines have been adopted in recent years.

TABLE 1 – EXTERNAL NOISE EXPOSURE CRITERIA FOR NOISE-SENSITIVE LAND USES

Time Period	*External Noise Exposure Level[1] Criteria (dB)*		
	Exposure Level 1 (Target)	*Exposure Level 2*	*Exposure Level 3*
Day *6.00a – 10.00pm*	*Less than L_{Aeq} 55*	*L_{Aeq} 55-60*	*Above L_{Aeq} 60*
Night *10.00pm – 6.00am*	*Less than L_{Aeq} 50*	*L_{Aeq} 50-55*	*Above L_{Aeq} 55*
Additional criteria for railways	*Less than L_{Amax} 75*	*L_{Amax} 75-80*	*Above L_{Amax} 80*

Note [1] Noise levels is to be determined at a point 1 metre from the edge of the site or building façade that is the most exposed to traffic noise, and at a height of 1.5 metre from the ground level at that point. Noise assessments should generally reflect the impact of any future growth in road and rail traffic, based on a 20 year forecast period.

5.2 Exposure Level 1 (Target)

Exposure level 1 refers to a level of outdoor noise that is considered a desirable target for residential and other noise-sensitive development. It will apply primarily to integrated greenfields planning of road or rail infrastructure and adjoining development. In situations where either infrastructure or residential development is already in existence, achievement of this target may not be practicable.

Where residential or other noise-sensitive development is proposed on a site, which is subject to Exposure Level 1, no action is required under this policy in relation to the management or amelioration of transport noise. However, it needs to be recognised that, because some people are more sensitive to noise than others, a proportion of the population may still be affected by noise which falls within Exposure Level 1.

5.3 Exposure Level 2

Exposure Level 2 refers to a level of outdoor noise exposure that would be acceptable for residential and other noise-sensitive development, subject to appropriate measures to ameliorate noise impact.

For road or rail infrastructure with a noise exposure level in this range, new noise sensitive development should be designed and constructed so as to comply with:

- *The 'target' Exposure Level 1 for required outdoor living areas; and*
- *The 'satisfactory' criteria under Australian Standard AS2107:2000 "Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors" , for indoor areas.*

Exposure Level 2 generally represents the maximum noise exposure for proposed new road and rail infrastructure and noise-sensitive development on land adjoining such infrastructure, but may not be practicable for many of the existing major road and rail corridors.

5.4 Exposure Level 3

Exposure Level 3 refers to a level of outdoor noise exposure that is not generally regarded as acceptable for conventional residential or other noise-sensitive development.

*For **new or upgraded roads and railways** where the predicted noise levels are in this range at nearby noise-sensitive site, noise management measures in conjunction with the new or upgraded infrastructure are mandatory, with the objective of achieving Exposure Level 2 or better.*

*For **existing road or rail infrastructure** with a noise exposure level in this range, new noise sensitive development should where practicable, be designed and constructed so as to comply with:*

- *The 'target' Exposure Level 1 for required outdoor living areas; and*
- *the 'satisfactory' criteria under Australian Standard AS2107:2000 "Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors", for indoor areas.*

In determining the practicability of compliance with the criteria, it needs to be recognised that a significantly higher level of noise attenuation would generally be required for sites affected by Exposure Level 3 compared to Exposure Level 2. Accordingly, it may not always be practicable to achieve compliance with the criteria, although special attention should be given to meeting the indoor noise standards. Refer to section 5.10 for guidance on the determination of practicability.

In this case Exposure Level 2 would be the appropriate criteria, therefore, the day and night periods criteria would be:

Day	L_{Aeq} 60
Night	L_{Aeq} 55

Note: Under Section 3 of the Draft Planning Policy, the policy should be applied to major upgrading of existing roads.

Under Appendix 1; Glossary of Terms, an Upgraded transport corridor is defined as "works which involve or are designed to facilitate a substantial increase in traffic carrying capacity and/or heavy vehicle traffic, or a substantial change in the alignment through design or engineering changes (excluding minor road/rail works or minor changes to road/rail alignments or a change in alignment that is required for safety reasons).

Based on the above, we do not believe that Packages 1 and 2 would be considered as major upgrade, but would be a minor change and in this case the policy should not apply.

4.0 CALCULATIONS

Based on the data provided by ATA Environmental (predicted traffic volumes for 2025), the computer program 'TNoise' was used to predict the noise levels received at various premises. Information relevant to the calculations is shown below in Table 4.1.

TABLE 4.1 - NOISE MODELLING INPUT DATA

Parameter	Value
Traffic Volumes	
Year 2005	1400
Year 2025	1710
% Heavy Vehicles	34
Speed (km/hr) 'Open' Highway Townsites	 110 70
Road Surface	Chip Seal

* Based on 1% growth pr year over 20 years

Calculations were carried out for noise received at the following locations:

Package 3

L1 Robartson's property at SLK 247.8
L2 Robartson's rental property at SLK 248.48
L3 6MD Radio Station at SLK 249.88
L4 House at SLK 249.88
L5 House at SLK 250.64
L6 Agriculture Research Station buildings (SLK 251.5 o 251.6) within Hines Hills Townsite

Package 6

L7 Generic premises for between SLK 236.85 and 236.97

Package 7

L8 House 1 (10m from road)*
L9 House 2 (200m from road)*

* Represent worst case scenario.

Package 10

L10 House at 90m south of road
L11 House at 110m south of road

The predicted $L_{A10,(18hr)}$ noise levels for current flows (2005) and for the year 2025 are shown in Table 4.2.

TABLE 4.2 – CALCULATED $L_{A10,(18HR)}$ NOISE LEVEL

Locations	Calculated $L_{A10,(18hr)}$ dB(A)	
	Current	Year 2025
L1 – Robartson's Property	56 (75m)	57 (75m)
L2 – Robartson's Rental	62 (25m)	63 (25m)
L3 – 6MD Radio Station	58 (50m)	59 (50m)
L4 – House at SLK 249.88	55 (100m)	56 (100m)
L5 – House at SLK 250.64	53 (150m)	53 (150m)
L6 – Agriculture Research Station	55 (100m)	56 (100m)
L7 – Hines Hills Townsite	60 (20m)	61 (20m)
L8 – House 1 (10m from road)	61 (10m)	62 (130m)
L9 – House 2 (200m from road)	53 (200m)	53 (150m)
L10 – House 3 (90m from road)	54 (90m)	55 (110m)
L11 – House 4 (110m from road)	53 (110m)	54 (130m)

( ) Distance between

From extensive monitoring carried out on similar roads, the difference between the $L_{10,18hour}$ and $L_{eq,16hour}$ (day period) and between the $L_{10,18hour}$ and $L_{eq,8hour}$ (night period) are approximately 3 and 9 dB(A) respectively. To calculate the current and future $L_{eq,16hour}$ and $L_{eq,8hour}$ it has been assumed that this same difference will exist in the current traffic flows and the year 2025. The resultant $L_{eq,16hour}$ (day period) and $L_{eq,8hour}$ (night period) are listed in Table 4.3.

TABLE 4.3 – CALCUALTED $L_{eq,(16hr)}$ AND $L_{eq,(8hr)}$

Location	Calculated Noise Level, dB(A)			
	(Day Period)		(Night Period)	
	Current	Year 2025	Current	Year 2025
L1 – Robartson's Property	53	54	47	48
L2 – Robartson's Rental	59	60	53	54
L3 – 6MD Radio Station	55	56	49	50
L4 – House at SLK 249.88	52	53	46	47
L5 – House at SLK 250.64	50	50	44	45
L6 – Agriculture Research Station	52	53	46	47
L7 – Hines Hills Townsite	57	58	51	52
L8 – House 1 (10m from road)	58	59	52	53
L9 – House 2 (200m from road)	50	50	44	45
L10 – House 3 (90m from road)	51	52	45	46
L11 – House 4 (110m from road)	50	51	44	45

Note: Calculation includes +2.5 dB(A) façade correction.

5.0 DISCUSSION

Predictions were made for noise received at noise sensitive premises located adjacent to the road modifications will comply with the MRWA noise level objectives and the WAPC Draft Planning Policy for Road and Rail Transport Noise up to and including the year 2025, subsequently no noise amelioration is required.

For: **HERRING STORER ACOUSTICS**

Tim Reynolds

13 January 2006

APPENDIX 7
ADHERENCE TO THE TEN CLEARING PRINCIPLES IN MRWA PURPOSE PERMIT CPS 818/2

Application of Ten Clearing Principles to Design Package 3 (SLK 245.2-251.6), Great Eastern Highway

ITEM NO.	Ten Clearing Principles Variance Checklist	Y	N
1	Does the area to be cleared comprise a high level of biological diversity?		N
2	Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia?		N
3	Does the area to be cleared include, or is necessary for the continued existence of, rare flora?		N
4	Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of a threatened ecological community?		N
5	Is the area to be cleared significant as a remnant of native vegetation in an area that has been extensively cleared?		N
6	Is the area to be cleared growing in, or in association with, an environment associated with a watercourse or wetland?		N
7	Is the clearing of the vegetation likely to cause appreciable land degradation?		N
8	Is the clearing of the vegetation likely to have an impact on the environmental values of any adjacent or nearby conservation area?		N
9	Is the clearing of the vegetation likely to cause deterioration in the quality of surface or underground water?		N
10	Is the clearing of the vegetation likely to cause, or exacerbate, the incidence of flooding?		N