

DRAFT

**Main Roads Western
Australia**

North West Coastal Highway
Bridges/Culvert Upgrade
Preliminary Environmental
Impact Assessment

December 2007

Contents

1.	Introduction and Project Description	1
1.1	Introduction	1
1.2	Project Location	2
1.3	Project Background	2
1.4	Project Description	3
1.5	Purpose of this Report	4
2.	Environmental Aspects	5
2.1	Climate	5
2.2	Surrounding Area Land Use	5
2.3	Reserves and Conservation Areas	6
2.4	Geology and Soils	6
2.5	Surface Waters and Drainage	7
2.6	Groundwater	7
2.7	Acid Sulphate Soils	8
2.8	Vegetation	8
2.9	Fauna	15
2.10	Contaminated Sites	21
2.11	Aboriginal Heritage	21
2.12	European Heritage	21
2.13	Public Safety and Risk	21
3.	Project Impacts and Management	23
3.1	Aspects Considered Most Relevant by Project Site	23
3.2	Other Aspects	28
4.	Recommendations and Approvals	31
5.	References	33

Table Index

Table 1	Environmental and Social Aspects Considered Relevant	1
Table 2	Key features of the Main Roads Project Sites	3
Table 3	Climate Readings at Closest Weather Stations (Bureau of Meteorology, 2007)	5

Table 4	Geology and Soils described at each of the Project Sites	7
Table 5	Vegetation Communities likely to be present in each of the Project Sites (Beard, 1975)	9
Table 6	Regional Assessment of Vegetation Extent (Shepherd <i>et al</i> , 2005)	11
Table 7	Vegetation Association by Project Site	12
Table 8	Threatened and Priority Flora	13
Table 9	Threatened Fauna	17
Table 10	Project Site Issues Summary	23
Table 11	Estimated Clearing Impacts	25
Table 12	Recommendations and Approvals required for the Project	31
Table 13	Government of Western Australia (2000) Vegetation Condition Scale	43

Figure Index

Figure 1	Project Sites Locational Map	36
Figure 2	Proposed location of bridge at Cave Creek	36
Figure 3	Proposed location of strategic Materials Area (Section 19/211)	36
Figure 4	Proposed location of Materials Area (Section 19/210) and culvert upgrade at Goodeman Creek	36
Figure 5	Proposed location of culvert upgrade at Toolunga Creek	36
Figure 6	Proposed location of bridge at Peedamulla Creek	36
Figure 7	Proposed location of culvert upgrade at Peedamulla East Creek	36
Figure 8	PEIA Points of Interest	36

Appendices

A	Consultation
B	DoW Bore Search Results
C	Project Site Photos
D	Government of Western Australia (2000) Vegetation Condition Definitions
E	DEC Rare and Priority Flora Search
F	DEC Threatened Fauna Search
G	Aboriginal Heritage Sites
H	Department of Environment Clearing Principles

1. Introduction and Project Description

1.1 Introduction

GHD Pty Ltd (GHD) were engaged by the Gascoyne Regional Office of Main Roads Western Australia (Main Roads) to prepare a desktop Preliminary Environmental Impact Assessment (PEIA) for a series of bridge constructions or culvert upgrades along the North West Coastal Highway (NWCH) at selected sites between 802.87 SLK and 929.81 SLK.

In addition, two material extraction areas have been identified from which Main Roads propose to source the road-building materials required for the upgrades. Apart from the provision of materials for the current proposals, these areas are also viewed as a strategic resource that will provide long-term (expected 20 years) road building material supplies for Main Roads. These areas also require environmental assessment prior to development and have also been considered in this PEIA.

This report details the requested PEIA, which:

- » Describes the significant aspects of the existing project environment; and
- » Details the primary environmental and social impacts of the proposed works.

This PEIA has been prepared based on:

- » A review of information supplied by Main Roads in the Consultant's Environmental Standard Brief and discussions with, and information supplied by, the Main Roads Environment Officer for the Gascoyne Region;
- » Consultation with the relevant government agencies, including the Department of Environment and Conservation (DEC), the Department of Water (DoW), the Department of Agriculture and Food (DAF), Fire and Emergency Services Authority (FESA) and the Shire of Ashburton (refer to **Appendix A** for details of consultations); and
- » A review of relevant databases.

Environmental and social aspects identified as requiring consideration during the project have been identified in Table 1 and discussed in Section 2.

Table 1 Environmental and Social Aspects Considered Relevant

Aspect	Section
Surrounding Area Land Use	2.2
Reserves and conservation areas	2.3
Geology and Soils	2.4
Surface waters and Drainage	2.5
Groundwater	2.6
Salinity	2.6.3

Acid Sulphate Soils	2.7
Vegetation	2.8
Fauna	2.9
Contaminated sites	2.10
Aboriginal heritage	2.11
European cultural heritage	2.12
Public safety and risk (Gas pipeline, unexploded ordinance)	2.13

1.2 Project Location

The Project, which consists of a series of bridge constructions or culvert upgrades and the strategic materials areas, are located along the North West Coastal Highway (NWCH) at seven sites between 802.87 SLK and 929.81 SLK.

The Project can be separated into two areas, a northern section, with Project Sites located between 910.85 SLK and 929.81 SLK and a southern section with Project Sites located between 802.87 and 823.50 SLK.

Toolunga Creek (910.85 SLK), Peedamulla Creek (925.94 SLK) and Peedamulla East Creek (929.81 SLK) are located in the northern section and are situated approximately 25 to 45 km north of the intersection between Onslow Road and the NWCH. The southern section consists of Cave Creek (802.87 SLK), Materials Area - Section 19/211 (802.87 SLK), Materials Area - Section 19/210 (823.50 SLK) and Goodeman Creek (824.11 SLK), located approximately 20 to 50 km south of the intersection of Nanutarra to Wittenoom Road and the NWCH.

The Project Site locations have been presented in Figure 1.

1.3 Project Background

The North West Coastal Highway (NWCH) is the main link between regional centres of Geraldton, Carnarvon, Karratha and Port Hedland and provides access to various tourist destinations and coastal mining and pastoral communities. The NWCH is also a main freight route with triple road trains operating north of Carnarvon.

The NWCH traverses significant watercourses at Cave Creek (802.87 SLK), Goodeman Creek (824.11 SLK), Toolunga Creek (910.85 SLK), Peedamulla Creek (925.94 SLK) and Peedamulla East Creek (929.81 SLK). The existing crossings for these creeks are via low-level floodways that become impassable with excessive flow. There is evidence that the flow depths for these floodways can exceed 2m, which represents a significant safety hazard for all types of vehicles.

The purpose of Main Roads proposed upgrades is to reduce the flood impact on NWCH due to the road being overtopped by these creeks. The construction of bridges or improved culvert systems will increase the serviceability of this transport link and reduce closure times which has an economic benefit, especially in light of proposed industry expansions and new mining developments in the Western Pilbara.

There will also be an increased level of serviceability for tourist traffic. The need for lengthy detours will also be removed significantly, further improving road safety through the reduced risk of driver fatigue.

1.4 Project Description

Main Roads proposes to construct two bridges and three culverts along the NWCH at selected sites between 802.87 SLK and 929.81 SLK.

The construction of the bridges and culverts requires the sourcing of gravel and other fill materials. Two materials areas have been proposed as suitable areas from which to extract road-building materials for the proposed road upgrades, as well as providing a strategic location for long-term road building material supplies.

Figure 1 identifies the location of the seven proposed Project Sites. The location and study area extent for each of the Project Sites are shown in Figure 2 to Figure 7.

Table 2 below outlines the key features of the Project Sites.

Table 2 Key features of the Main Roads Project Sites

SLK	Project Site	Proposed Works	Study Area	Proposed Clearing (ha)
802.87	Cave Creek Refer to Figure 2	Bridge	124.6 ha in area. Approximately 1 km in length from the centre of the floodway, as well as 200 m, in width, on either side of the road	5.75 ¹
820.3	Materials Area (Section 19/211) Refer to Figure 3	Source Material Area	100 ha in area, with existing tracks to be utilised for access to the materials area. This Project Site will be used as a strategic supply area from which Main Roads can access road building materials for the long-term (up to 20 years).	Up to 100.00
823.5	Materials Area (Section 19/210) Refer to Figure 4	Source Material Area	3.3 ha in area, with existing tracks to be utilised for access to the materials area. This Project Site will be used as a strategic supply area from which Main Roads can access road building materials for the long-term (up to 20 years).	Up to 3.30
824.11	Goodeman Creek Refer to Figure 4	Culverts	77.54 ha in area. Approximately 1 km in length from the centre of the floodway, as well as 200 m, in width, on either side of the road.	3.79 ²
910.85	Toolunga Creek Refer to Figure 5	Culverts	67.72 ha in area. Approximately 1 km in length from the centre of the floodway, as well as 200 m, in width, on either side of the road.	3.79 ²
925.94	Peedamulla Creek Refer to Figure 6	Bridge	72.85 ha in area. Approximately 1 km in length from the centre of the floodway, as well as 200 m, in width, on either side of the road.	5.75 ¹
929.81	Peedamulla East Creek Refer to Figure 7	Culverts	80.04 ha in area. Approximately 1 km in length from the centre of the floodway, as well as 200 m, in width, on either side of the road.	3.79 ²

Notes:

1. Clearing breakdown estimates:

- a) Side track $1\text{km} \times 1.5\text{m} = 1.5\text{ha}$ (0.15ha?);
- b) Hardstand Area $150\text{m} \times 150\text{m} = 2.25\text{ha}$; and
- c) Bridge Construction Area = $40\text{m} \times 50\text{m} = 2\text{ha}$ (0.2ha?) (Oswald, *pers comm.*, 2007).

2. Clearing breakdown estimates:

- a) Side track $1\text{km} \times 1.5\text{m} = 1.5\text{ha}$ (0.15ha?);
- b) Hardstand Area $150\text{m} \times 150\text{m} = 2.25\text{ha}$; and
- c) Bridge Construction Area = $20\text{m} \times 40\text{m} = 0.04\text{ha}$ (0.08ha?)(Oswald, *pers comm.*, 2007).

To check above calculations / areas with Matt Oswald.

1.5 Purpose of this Report

Main Roads requires a Preliminary Environmental Impact Assessment (PEIA) for the proposed NWCH upgrades and strategic road-building materials source areas.

This report details the findings of the PEIA for the seven Project Sites, as identified in Table 2. This report provides an initial desktop assessment of factors of likely environmental significance and provides recommendations for further work and/or approvals, in order to meet Main Roads obligations under their Purpose Clearing Permit (CPS 818/3).

2. Environmental Aspects

The following section provides a summary of the desktop review of the general environment surrounding all of the Project Sites.

In any instances where the review found differences between the Project Sites, this has been specified. In particular, some differences were noted between the southern and northern Project Sites, refer to Section 1.2 for a definition of these areas.

2.1 Climate

The climate of the Site is best described as moderate arid tropical with hot summers and low, highly variable rainfall. The majority of the rainfall occurs as a result of cyclonic activity and consequently, the amount varies widely.

The Bureau of Meteorology weather-recording stations located closest to the Projects Sites are Onslow and Onslow Airport, between 70 and 110 km to the north and north-west of the Project Sites, and Pannawonica approximately 70 km to the north-east of the northern-most Project Site. The recorded climate data at Onslow, Onslow Airport and Pannawonica are summarised in **Table 3**.

Table 3 Climate Readings at Closest Weather Stations (Bureau of Meteorology, 2007)

Climate Statistic	Onslow	Onslow Airport	Pannawonica
Mean Annual Maximum Daily Temperature Range (°C)	24.8 (July) to 35.7 (January)	25.2 (July) to 36.4 (January/February)	26.7 (July) to 40.9 (January)
Mean Annual Minimum Daily Temperature Range (°C)	11.6 (July) to 24.2 (February)	12.8 (July) to 24.9 (February)	12.7 (July) to 25.3 (January)
Mean Annual Rainfall (mm)	274.5	321.1	394.8
Mean Annual Rain days per year (days)	23.4	28.7	43
Highest Recorded Daily Rainfall (mm)	355.6 (February)	312.2 (March)	228.0 (February)
Highest Monthly Rainfall (mm)	544.6 (February)	374.9 (March)	443.8 (February)

2.2 Surrounding Area Land Use

The dominant land uses for the Ashburton subregion, within the Gascoyne Interim Biogeographic Regionalisation for Australia (IBRA) region, have been described as:

- » Grazing – native pastures;
- » Unallocated Crown Land (UCL) and crown reserves; and
- » Conservation (CALM, 2001).

The Project Sites are surrounded by general farming uses and are zoned as “Rural”, under the Shire of Ashburton Town Planning Scheme No. 7 (2004). The Australian Government (2007a) describes the

surrounding land tenure for the Project Sites located in the northern section as Private leasehold – Aboriginal.

The DAF have advised that the surrounding land use around the proposed Project Sites is extensive grazing of livestock (Watkins, *pers comm.*, 2007).

The road is used to service various activities in the area, including tourism, coastal mining and pastoral activities, as well as to link the regional centres of Geraldton, Carnarvon, Karratha and Port Hedland.

2.3 Reserves and Conservation Areas

Barlee Range Nature Reserve, which is listed on the Register of the National Estate, is located approximately 60 km to the south-east of the southern Project Sites (Australian Government, 2007b).

Cane River Conservation Park is located approximately 35 km to the north of the nearest of the southern Project Sites (Goodman Creek at 824.11 SLK) and 2 km to the south of the nearest of the northern Project Sites (Toolunga Creek at 910.85 SLK), as shown in Figure 8.

In addition, the DEC advised that the Toolunga Creek Project Site occurs adjacent to the Peedamulla Station land, which is proposed for conservation in the 2015 Pastoral Lease reclamation by DEC (Shipway, *pers. comm.*, 2007). The proposed location of the conservation reserve in relation to the Main Roads Project Sites is presented in Figure 8.

The Shire of Ashburton Town Planning Scheme No. 7 (2004) does not recognise any local Parks and Recreation reserves in the vicinity of the roadworks.

2.4 Geology and Soils

2.4.1 Northern Project Sites

The Project Sites located in the northern section consist of alluvial plains and sandplains (with some flood plains and gravelly plains) on Cainozoic deposits over Cretaceous sedimentary rocks of the Carnarvon Basin. Red deep sandy duplexes with red/brown non-cracking clays and red loamy earths and some red deep loamy duplexes, red sandy earths and self-mulching cracking clays are also present (Department of Agriculture and Food, 2006).

2.4.2 Southern Project Sites

The Project Sites located in the southern section consist of hills, ranges, stony plains and sandplains on sedimentary rocks (with some granite) of the northern Ashburton Basin and Gascoyne Complex. Stony soils and red deep sandy duplexes with red loamy earths and red shallow loams and some red sandy earths are also present (Department of Agriculture and Food, 2006).

2.4.3 Project Sites Geology

Table 4 presents the geology for each of the Project Sites as described by the Geological Survey of Western Australia 1:250,000 mapping series (1968, 1986 and 1980).

Table 4 Geology and Soils described at each of the Project Sites

Project Site	SLK	Geology (GSWA, 1968, 1986 and 1980)
Cave Creek	802.87	Alluvium – clay, silt, sand and gravel, partly calcreted; and Colluvium - poorly sorted clay, silt, sand and gravel, formed by sheet flood and deflation.
Goodeman Creek, Materials Area (19/210) and Materials Area (19/211)	824.11, 823.50 and 820.30	Alluvium – clay, silt, sand and gravel, partly calcreted; Colluvium – poorly sorted clay, silt, sand and gravel, formed by sheet flood and deflation; and Granitic rocks.
Toolunga Creek, Peedamulla Creek and Peedamulla East Creek	910.85, 925.94 and 929.81	Lacustrine deposits – clay and silt, claypan (predominately freshwater deposits).

2.5 Surface Waters and Drainage

The Project Sites are located within two surface water catchment areas.

The southern Project sites are located in the Lyndon - Minilya Rivers surface water catchment basin (Mailey, *pers. comm.*, 2007), including the following creek crossings relevant to the Project:

- » Cave Creek (802.87 SLK); and
- » Goodeman Creek (824.11 SLK).

The northern Project Sites are located in the Onslow Coast surface water catchment basin (Mailey, *pers. comm.*, 2007), including the following creek crossings relevant to the Project:

- » Toolunga Creek (910.85 SLK);
- » Peedamulla Creek (925.94 SLK); and
- » Peedamulla East Creek (929.81 SLK).

There is evidence that the flow depths for the existing floodways can exceed 2m (Mains Roads, 2007).

2.6 Groundwater

2.6.1 Protected Areas

The Project is located within the Pilbara Rivers Proclaimed Groundwater Area protected under the *Rights in the Water and Irrigation Act 1914* (Mailey, *pers. comm.*, 2007 and DoW, 2006).

The site works will not impact on any gazetted Public Drinking Water Supply Areas (DoW, 2007a) protected under the *Country Areas Water Supply Act 1947*. The nearest Public Drinking Water Supply Areas identified are Priority 1 areas at Cane River and Exmouth Water Reserves, located approximately 30km and 150km from the Project Sites respectively (DoW, 2007b)

2.6.2 Groundwater Depth

A Department of Water (DoW) registered bore search was conducted for the Project and identified 13 registered bores within a 5km radius of the Project Sites. Once-off groundwater levels recorded for the bores ranged from 16m to 22m below ground level for the southern Project Sites and 14.63m to 35.97m below ground level for the northern Project Sites.

These groundwater depth indicators should be viewed with some caution as the bores are widely spaced and provided from a once-off reading, which would vary seasonally and with climate over time.

The bore search results are presented in **Appendix B**.

2.6.3 Groundwater Quality

The Toolunga Creek Project Sites (within the northern Project Sites) and the southern Project Sites have been identified by the Department of Water (DoW, 2007b) as having, on average, groundwater salinity levels of between 1,000 and 3,000 mg/L total dissolved solids (TDS), compared with that of the remainder of the northern Project Sites of between 500 to 1,000 mg/L TDS.

The DoW bore search, discussed above, also provided limited salinity data, which indicated that samples taken for these bores recorded salinity levels from 887 mg/L to 6,000 mg/L TDS. The limitations of this data should be noted, as discussed in Section 2.6.2.

Very little additional water quality data is available, what has been provided in the bore search is presented in **Appendix B**.

2.7 Acid Sulphate Soils

The Project Sites locality has been mapped for Potential Acid Sulphate Soils (PASS) as part of the Western Australian Planning Commission's (2003) Planning Bulletin No. 64.

The Project Sites are identified in this mapping as having no known risk of Acid Sulphate Soils (ASS) occurring within 3m of natural soil surface (or deeper). Some surrounding areas, where seasonal inundation occurs have been mapped as having a low to moderate risk of ASS, while the coastal tidal flats (at least 30km from the Project Sites), are considered to pose a moderate to high risk of encountering ASS within 3m of the surface.

It is considered that the Project Sites would fall into the former category, with it likely that the area would pose a low risk of ASS occurring within 3m of natural soil surface (or deeper).

2.8 Vegetation

2.8.1 Site Vegetation Composition

The composition of remnant native vegetation at each of the Project Sites was interpreted from mapping conducted by Beard (1975). According to this mapping, each of the Project Sites are likely to contain the vegetation communities as identified in Table 5.

Table 5 Vegetation Communities likely to be present in each of the Project Sites (Beard, 1975)

SLK	Project Site	Beard Vegetation Association Number	Beard Vegetation Description
802.87	Cave Creek	1162	This Project Site is likely to consist of hummock grasslands and grass steppe with hard Spinifex species; <i>Triodia wiseana</i> and <i>T. basedowii</i>
820.30	Materials Area-Section 19/211	98	This Project Site is likely to consist of hummock grasslands, shrub steppe; dominated by <i>Acacia pyrifolia</i> (kanji) over soft spinifex and <i>Triodia basedowii</i>
823.50	Material Area –Section 19/210	98	This Project Site is likely to consist of hummock grasslands, shrub steppe; dominated by <i>Acacia pyrifolia</i> (kanji) over soft spinifex and <i>Triodia basedowii</i>
824.11	Goodeman Creek	98	This Project Site is likely to consist of hummock grasslands, shrub steppe; dominated by <i>Acacia pyrifolia</i> (kanji) over soft spinifex and <i>Triodia basedowii</i>
910.85	Toolunga Creek	583 & 29	Beard (1975) describes the vegetation in this area as poor, stony country with sparse wattles and buck spinifex. The majority of this Project Site is likely to contain hummock grasslands and sparse shrub steppe, dominated by <i>Acacia pyrifolia</i> (kanji) and <i>A. bivenosa</i> over hard buck Spinifex, <i>Triodia basedowii</i> and <i>T.wiseana</i> . The vegetation along the river banks near Toolunga Creek has been identified as likely to comprise sparse low woodland, with <i>Acacia aneura</i> (mulga), discontinuous in scattered groups.
925.94	Peedamulla Creek	583	Beard (1975) describes the vegetation in this area as poor, stony country with sparse wattles and buck spinifex. The majority of this Project Site is likely to contain hummock grasslands and sparse shrub steppe, dominated by <i>Acacia pyrifolia</i> (kanji) and <i>A. bivenosa</i> over hard buck Spinifex, <i>Triodia basedowii</i> and <i>T.wiseana</i> .
929.81	Peedamulla East Creek	583	As above

2.8.2 Site Vegetation Condition

Vegetation condition has been inferred via aerial photography (Landgate, 2007), photos supplied by Main Roads on the 18th September 2007 (refer to **Appendix C**) and GHD's general knowledge of the region. Factors such as the continuity and extent of vegetation, adjacent land use, proximity to existing roads and other disturbance / disease vectors were also considered.

Based upon this assessment, the majority of the vegetation in general is likely to be in "Good" or better condition as defined by the Government of Western Australia (2000). This scale recognises a level of intactness of vegetation, which is defined by the following:

- » Completeness of structural levels;
- » Extent of weed invasion;

- » Historical disturbance from tracks and other clearing or dumping;
- » The potential for natural or assisted regeneration.

The ratings in this scale are described in **Appendix D**.

The Project Sites are located in the Pastoral or Extensive Land-use Zone (ELZ). This region of the State is dominated by grazing and mining landuses and although the extent of native vegetation remains largely intact, the structure and floristic composition have been substantially altered since European settlement through grazing by introduced animals such as sheep, cattle, goats and rabbits, and by altered fire regimes (Shepherd, *et al*, 2002). The Site photographs indicate evidence of grazing at some of the Project Sites, particularly around the creeklines.

There is some evidence that sections of the Project Sites (particularly the Materials Areas) have been cleared / disturbed in the past. There is also evidence in the Site photographs to suggest that fire may have recently occurred within localised sections of the materials areas.

There has been disturbance from old roadworks at the proposed upgrade Project Sites. The Site photographs indicate some weed invasion particularly of grass species (eg: buffel grass) along the edge of the highway, adjacent to the maintenance zone.

The vegetation adjacent to the highway and where evidence suggests the area has been previously disturbed is likely to be rated between Condition 3 ('Very Good') and Condition 4 ('Good'). Based upon the available information, disturbance would appear to only be restricted to the edge of the maintenance zone (or in localised sections of the two Materials Areas) and after a few metres in from the maintenance zone / disturbed area the vegetation is likely to be rated between Condition 1 ("Pristine or nearly so") to Condition 2 ("Excellent condition").

Main Roads Environment Officer, Matthew Oswald, and Materials Area Manager, Anil Phal, inspected the Project Sites and their estimation of the vegetation condition is consistent with GHD's desktop assessment (Oswald, *pers. comm.*, Nov. 2007).

2.8.3 Site Vegetation in a Regional Context

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

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

Such vegetation community status can be delineated into five (5) classes, where:

- *Presumed extinct*: Probably no longer present in the bioregion
- *Endangered**: <10% of pre-European extent remains

- *Vulnerable**: 10-30% of pre-European extent exists
- *Depleted**: >30% and up to 50% of pre-European extent exists
- *Least concern*: >50% pre-European extent exists and subject to little or no degradation over a majority of this area.

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

Native vegetation types represented in the study, their regional extent and reservation status are generally drawn from Shepherd (2002; *pers. comm.*, 2005) to give an indication of the regional impact of the proposed clearing. Shepherd mapping is based on the broad-scale (1:1,000,000) vegetation mapping produced by Beard (1975).

The results of this assessment are summarised in Table 6 below.

Table 6 Regional Assessment of Vegetation Extent (Shepherd *et al*, 2005)

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (2005)	Status
29	Sparse low woodland; <i>Acacia aneura</i> (mulga), discontinuous in scattered groups	7,904,064	7,904,064	100	Least Concern
98	Hummock grasslands, shrub steppe; <i>Acacia pyrifolia</i> (kanji) over soft spinifex and <i>T. basedowii</i>	309,641	309,641	100	Least Concern
583	Hummock grasslands, sparse shrub steppe, <i>Acacia pyrifolia</i> (kanji) and <i>Acacia bivenosa</i> over hard spinifex <i>Triodia basedowii</i> and <i>T.wiseana</i>	243,119	243,119	100	Least Concern
1162	Hummock grasslands, grass steppe, hard spinifex <i>Triodia wiseana</i> and <i>T. basedowii</i>	71,620	71,620	100	Least Concern

The Vegetation Associations detailed in Table 6 above all still record 100% of the original regional vegetation extent remaining intact as at 2005. Clearing of this vegetation is not considered contradictory to the EPA's recommendations stated in Position Statement No. 2.

Note, that although the extent of native vegetation remains largely intact, the structure and floristic composition may have been substantially altered since European settlement, as discussed in Section 2.8.3.

The Project Sites have been compared to the Shepherd (2002; *pers. comm.*, 2005) in Table 7.

Table 7 Vegetation Association by Project Site

SLK	Project Site	Vegetation Association
802.87	Cave Creek	1162
820.30	Materials Area- Section 19/211	98
823.50	Material Area –Section 19/210	98
824.11	Goodeman Creek	98
910.85	Toolunga Creek	29 and 583
925.94	Peedamulla Creek	583
929.81	Peedamulla East Creek	583

2.8.4 Environmentally Sensitive Areas

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

The Department of Environment and Conservation (DEC, 2007a) does not identify any Environmentally Sensitive Areas (ESAs) within the vicinity of the Project Sites.

The nearest identified ESA (DEC, 2007a) cover the tidals flats area, located along the coastline between Exmouth and Onslow, approximately 100km to the west of the Project Sites.

2.8.5 Significant Flora

Flora species that are considered to be significant are listed under the Western Australian *Wildlife Conservation Act 1950* and the *EPBC Act 1999*. Additionally, the DEC keeps a list of Priority species, that are not listed under legislation but for which the DEC feels there is cause for concern, or for which not enough information is known.

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (*Declared Rare*) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within the vicinity of the Site.

The Project Sites were divided into three search areas by the DEC for the purpose of this search, as identified below:

- » Area 1: Materials Area – Section 19/210, Materials Area – Section 19/211 and Cave Creek;
- » Area 2: Peedamulla Creek, Peedamulla Creek East and Toolunga Creek; and
- » Area 3: Goodeman Creek.

The recorded locations of these species are presented in Figure 8.

The DEC also provided results from a search of their *Declared Rare and Priority Flora* (DR&PF) list. The species in this list are those known to exist in the general surrounds, and not to the Project Sites specifically. No species were recorded in this list for the area.

DECs full search response has been provided in **Appendix C**.

Table 8 provides a description of those species recorded in the general vicinity on the WAHERB database. No Declared Rare Flora were identified as having been recorded in the vicinity of the Project Sites, however, four priority species were recorded.

No results were available for the Project Sites from the TFD.

The recorded locations of these species are presented in Figure 8.

The DEC also provided results from a search of their *Declared Rare and Priority Flora* (DR&PF) list. The species in this list are those known to exist in the general surrounds, and not to this project Site specifically. No species were recorded in this list for the area.

DECs full search response has been provided in **Appendix C**.

Table 8 Threatened and Priority Flora

Species	Conservation category	DEC Search Area	Description (DEC & WA Herbarium, 2007)
<i>Abutilon uncinatum</i>	P1	Area 1 and Area 2	Prostrate perennial, herb, 0.2–1 m high, grey foliage, spined pods. Red sand. Flat plain.
<i>Corchorus congener</i>	P3	Area 1	Spreading shrub, to 0.6 m high. Fl. yellow, Apr–Nov. Sand, red sandy loam with limestone. Sand dunes, plains.
<i>Sida</i> sp. <i>Wittenoom</i> (W.R. Barker 1962)	P3	Area 2	Spreading shrub, to 0.6 m high. Fl. yellow, Mar–Apr. Disturbed roadside.
<i>Rhodanthe frenchii</i>	P2	Area 3	Upright annual, herb, to 0.35 m high. Fl. yellow, Aug–Oct. Stony hills, rocky river banks & outcrops.

In addition to the DEC database search, an *Environment Protection and Biodiversity Conservation Act* 1999 (*EPBC Act*) Protected Matters Search was undertaken for the Shire of Ashburton. The following three plant species listed as “Vulnerable” are all known to occur, or to have historically occurred, in the Shire of Ashburton:

- » *Lepidium catapycnon* (Hamersley Lepidium) – known from a limited number of populations, over a range of about 200km in the Hamersley Range (Brown *et al*, 1998 and DEC and WA Herbarium, 2007);
- » *Pityrodia augustensis* (Mt Augustus Foxglove) – known from Mt Augustus, north-east of Carnarvon, and in the Robinson Range, north-west of Meekatharra (Brown *et al*, 1998 and DEC and WA Herbarium, 2007); and
- » *Thryptomene wittweri* (Mountain Thryptomene) – known from 3 populations in the central north-west between the Hamersley and Carnarvon Range and a fourth location near Laverton (Brown *et al*, 1998 and DEC and WA Herbarium, 2007).

None of the flora species listed from the *EPBC Act* Protected Matters Search Tool (Department of Environment and Water Resources, 2007) are considered likely to occur at any of the Project Sites.

2.8.6 Threatened Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, that is, Presumed Totally Destroyed, Critically Endangered, Endangered, and Vulnerable. Some TECs are protected under the Commonwealth *EPBC Act*. Although TECs are not formally protected under the WA *Wildlife Conservation Act* 1950, the loss of, or disturbance to, some TECs trigger the *EPBC Act*. The Environmental Protection Authority's (EPA) position on TECs states that proposals that result in the direct loss of TECs are likely to require formal assessment.

A search of the DEC TEC database was undertaken and identified no known TEC's to be located within any of the Project Sites or the near vicinity of the Project Sites. The *EPBC Act* Protected Matters Search Tool (Department of Environment and Water Resources, 2007) also does not identify any TEC's within the Shire of Ashburton municipality.

2.8.7 Diseases or Pathogens

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

As the Project Sites are north of this latitude, they are not considered to be susceptible to the development of the *Phytophthora cinnamomi* pathogen.

No other known plant diseases or pathogens are recognised as being present in the Gascoyne Region.

2.8.8 Weeds

The Department of Agriculture and Food (2007) have recorded 81 Declared Plants as occurring within the Shire of Ashburton.

The DAF (Watkins, *pers. comm.*, 2007) have advised that declared plant species present in the Pilbara include Mesquite (*Prosopis* sp), Parkinsonia (*Parkinsonia aculeata*), *Calotropis* sp, Chinese Apple (*Ziziphus mauritiana*) and Prickly Pear (*Opuntia* sp). These plants are gazetted under the *Agriculture and Related Resources Protection Act* (1976).

DEC also advised that Mesquite is known to be present in a number of waterways and surrounding areas near Peedamulla Creek and Peedamulla Creek East.

In addition, it is understood that there would be a range of pasture grass weeds at the Project Sites, for example, buffel grass is noted in Project Site photographs along the existing NWCH verge (refer to **Appendix C**). Main Roads have confirmed the presence of buffel grass and other pasture weeds within the Project Sites (Oswald, *pers comm.*, Nov 2007).

2.9 Fauna

2.9.1 Fauna Habitat

The dominant habitat type located at the Project Sites is mapped as hummocks grasslands and shrub steppe. This vegetation would provide shelter for a range of reptile species and small marsupials, particularly rodent species.

The Project Site located at Toolunga Creek is additionally inferred to support a low woodland, and it would be expected that a variety of bird species may be transient visitors to this Site.

2.9.2 Threatened Fauna

The conservation status of fauna species is assessed under State and Commonwealth Acts; in particular the Western Australian *Wildlife Conservation Act 1950*; *Wildlife Conservation (Specially Protected Fauna) Notice 2006*, and the Commonwealth *EPBC Act*.

The significance levels for fauna used in the *EPBC Act* are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals).

Listed migratory species also include any native species identified in an international agreement approved by the Commonwealth Environment Minister. The Minister may approve an international agreement for this purpose if satisfied that it is an agreement relevant to the conservation of migratory species.

In Western Australia, the *Wildlife Conservation (Specially Protected Fauna) Notice 2006* has classified Threatened Fauna in a series of Schedules. The DEC also produces a supplementary list of Priority Fauna, being species that are not considered “threatened” under the Western Australian *Wildlife Conservation Act 1950* but for which the Department feels there is a cause for concern. These species have no special protection, but their presence would normally be considered to determine any potential impacts on these species.

A search was undertaken through DEC Threatened Fauna database, which includes species declared as 'Rare or likely to become extinct (Schedule 1)', 'Birds protected under an international agreement (Schedule 3)', and 'Other specially protected fauna (Schedule 4)'. The Project Sites were divided into two search areas, as shown below:

Area 1 – Cave Creek, Materials Area (Section 19/210), Materials Area (Section 19/211), Goodeman Creek (plus~25km); and

Area 2 – Toolunga Creek, Peedamulla Creek, Peedamulla East Creek (plus~25km)

Refer to Table 9 and **Appendix F** for the DEC search results obtained within the relevant DEC search area.

In addition to the DEC database search, an *EPBC Act* Protected Matters Search was undertaken for the Shire of Ashburton. Significant Fauna from the *EPBC Act* Protected Matters Search Tool (Department of

Environment and Water Resources, 2007) that may potentially occur within the Project Sites have also been included in Table 9.

Some species that appear in the *EPBC Act* Protected Matters Search Tool are often not likely to occur within the specified area, rather the search provides an approximate guidance to matters of national significance that may require further investigation. The records from the DEC searches of Threatened Fauna are considered to provide more accurate information for the general area, however, some of these records can also be out-dated and often misrepresent the current range of threatened species. A desktop assessment has been provided on the likelihood of each species occurring in the Project Sites based on their recorded population extents and preferred habitat.

DRAFT

Table 9 Threatened Fauna

Scientific Name	Common Name	Conservation Code	Record No / Date	Other information	Search Area	Likelihood of Occurring in the Project Sites
<i>Bettongia leseur</i> (unnamed subsp) ^{1B}	Boodie	Vulnerable	EPBC Search	This small thickset, nocturnal rat-like kangaroo occupies arid and semi-arid habitats on the mainland and Barrow and Boodie islands.	Ashburton Shire	Negligible
* <i>Dasyercus cristicauda</i> ^{1B}	Mulgara	Schedule 1	1 in 2006	This small carnivorous marsupial lives in burrows and occurs in arid sandy regions from the eastern Pilbara to central Australia	Area 1	Low
<i>Dasyercus hallucatus</i> ^{1A}	Northern Quoll	Endangered	EPBC Search	The Northern Quoll is a medium-sized carnivorous marsupial that lives in the savannas of northern Australia. Northern Quolls live in a range of habitats, but prefer rocky areas and eucalypt forests	Ashburton Shire	Negligible
<i>Falco hypoleucos</i>	Grey Falcon	Priority 4	1 in 2003	A nomadic species inhabiting lightly timbered riverine plains	Area 1	Low
<i>Falco peregrinus</i>	Peregrine Falcon	Schedule 4	1 in 1975	This species is uncommon and prefers areas with rocky ledges, cliffs, water courses, open woodland or margins with cleared land.	Area 1	Low
<i>Hirundo rustica</i> ^{1C}	Barn Swallow	Marine Migratory	EPBC Search	This species is a small migratory passerine bird and is an uncommon visitor to parts of northern Australia. While migrating, they tend to fly over open areas, often near water or along mountain ridges.	Ashburton Shire	Negligible

<i>Leggadina lakedownensis</i>	Lakeland Downs Mouse (Kerakenga)	Priority 4	16 in 2006	This secretive species is known to occur in the Pilbara and the Kimberly. Its populations rise and fall dramatically, probably in response to climatic fluctuations and availability of seeds.	Area 1	Moderate
* <i>Liasis olivaceus barroni</i> ^{1A}	Pilbara Olive Python	Schedule 1	1	This species is restricted to ranges within the Pilbara Region and some islands off the coast of Western Australia. They live in rock piles where they can hide in crevices to get away from the Pilbara heat. They are often found near water in search of prey.	Area 1	Low
<i>Macrotis lagotis</i> ^{1A}	Greater Bilby	Vulnerable	EPBC Search	This species occurs in fragmented populations in mulga shrublands and spinifex grasslands in the Tanami Desert of the Northern Territory; in the Gibson and Great Sandy Deserts and the Pilbara and Kimberley regions of Western Australia.	Ashburton Shire	Negligible
<i>Merops ornatus</i> ^{1C}	Rainbow Bee-eater	Marine Migratory	EPBC Search	The Rainbow Bee-eater is a medium-sized bird with a widespread distribution, being recorded in a variety of habitats. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. However, they can also occur in grasslands, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages.	Ashburton Shire	Negligible - Low
<i>Neochima ruficaruda subclarescens</i>	Star Finch (western)	Priority 4	1 in 2002	A nomadic species inhabiting grasslands and eucalypt woodlands near water	Area 2	Low- Moderate

<i>Petrogale lateralis lateralis</i> ^{1A}	Black-flanked Rock Wallaby	Vulnerable	EPBC Search	The Black-flanked Rock-wallaby is a dark grey-brown marsupial with a distinctive white cheek-stripe. Existing populations of this subspecies are scattered across much of western WA, with mainland populations occurring east of the Fortescue River Roadhouse, in Cape Range, Ningaloo Station, Calvert Range and Kalbarri National Park. The habitat of this subspecies varies in detail from colony to colony but usually involves the proximity of some form of cliff, rock-pile, talus or escarpment for refuge to a source of food.	Ashburton Shire	Negligible
* <i>Pezoporus occidentalis</i> ^{1AC}	Night Parrot	Schedule 1	1 in 1967	This nocturnal species is known to inhabit treeless or sparsely wooded spinifex (<i>Triodia</i> spp) near water	Area 2	Low
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse (Ngadji)	Priority 4	1 in 1994 1 in 1996	This species is well-known for the characteristic pebble-mounds which it constructs over underground burrow systems. These mounds are most common on spurs and lower slopes of rocky hills	Area 1 Area 2	Low - Moderate
<i>Rhinonictis aurantius (Pilbara form)</i> ^{1A}	Pilbara Leaf-nosed Bat	Vulnerable	EPBC Search	This species is thought to have a disjunct Pilbara population, although relatively few records exist. Foraging occurs in a range of habitats including grassland, open woodland, savannah woodland, and spinifex covered hills, although the habitat use may be more influenced by roost availability, of which they have very restrictive requirements	Ashburton Shire	Negligible

Note:

1. These species are protected under the Commonwealth *Environmental Protection and Biodiversity Act 1999* (as well as the *Wildlife Conservation Act 1950*) and have been categorised as:

A. Endangered

B. Vulnerable

C. Migratory

* Identified in *EPBC Act* Protected Matters Search Tool (Department of Environment and Water Resources, 2007) and DEC rare fauna database search (2007).

DRAFT

2.10 Contaminated Sites

A search for Potentially Contaminated Sites through the DEC online database was conducted (DEC, 2007b). This search concluded that no previously recorded contaminated sites occur within the Project Sites, which is consistent with the pattern of historical land use in the area.

In addition, the Fire and Emergency Services Authority (FESA) were contacted and have advised that the Project Sites lie well outside any known or suspected Unexploded Ordinance (UXO) contaminated sites, with the nearest known or suspected sites lying some 45 to 60 km away at the old Yanrey RAAF Air Base and around the Onslow Townsite. Arnold (*pers. comm.*, 2007) confirmed that it is highly unlikely that any of the Project Sites would pose any risk in relation to UXO.

2.11 Aboriginal Heritage

A search of the Department of Indigenous Affairs (DIA) Register of Aboriginal Sites was conducted to determine the likelihood of the project impacting on a listed Aboriginal heritage site.

One Aboriginal Heritage artefacts / scatter site is known to occur within the vicinity of the proposed works at Toolunga Creek (910.85), being Site No. P06399 (Site ID: 6554).

Site 6554 is on the “permanent register” and protected under the *Aboriginal Heritage Act 1972*.

The approximate location of the registered site has been presented in Figure 8, with further details provided in **Appendix G**.

It was considered possible that there are other unregistered sites located in the vicinity of the Project Sites, particularly given the location along creeklines.

2.12 European Heritage

A search of the Australian Heritage database (Australian Government, 2007b) was conducted to determine the likelihood of the project impacting upon a listed World Heritage Site, National Heritage Site, Commonwealth Heritage Site or site listed on the Register of the National Estate.

Barlee Range Nature reserve, which is listed on the Register of the National Estate, is the closest identified heritage site to the Project Sites. This nature reserve is located approximately 60km to the south-east of the southern section Project Sites.

A search of the Heritage Council of Western Australia’s (2007) Heritage Places database was conducted to determine the likelihood of the project impacting upon a Western Australian listed heritage site.

No sites of European heritage were located in close vicinity to any of the Project Sites.

2.13 Public Safety and Risk

The Department of Planning and Infrastructure have advised that the Dampier to Bunbury Natural Gas Pipeline (DBNGP) corridor, which houses a major high-pressure gas pipeline, operated by Alinta Asset Management Pty Ltd (formerly Epic Energy) lies within the vicinity of the proposed Project Sites. This gas pipeline is located to the west of NWCH, approximately 5 to 25 km from any of the Project Sites. The gas pipeline does not cross the NWCH within the vicinity of any of the proposed Project Sites and given

the distance of the road works from the gas pipeline it is not anticipated that the proposed works will interfere with the gas infrastructure corridor.

The Sites lie well outside any known or suspected Unexploded Ordinance (UXO) contamination sites, and FESA have advised that it is highly unlikely that any of the sites shown pose any risk in relation to UXO (refer to Section 2.10 for details).

DRAFT

3. Project Impacts and Management

3.1 Aspects Considered Most Relevant by Project Site

Table 10 below identifies those environmental factors of most relevance to each Project Site where further works and / or approvals are recommended. The requirements for each of the factors are outlined in the summary below.

Table 10 Project Site Issues Summary

Site	SLK	Reserves & Cons. Areas	Surface Water & Drainage	Ground water	Clearing	Sight Vegn or Flora	Priority Fauna	Aborig Heritage
Cave Creek	802.87		√	√	√	√	√	√
Materials Area- Section 19/210	820.30			√	√	√	√	√
Materials Area- Section 19/211	823.50			√	√	√	√	√
Goodeman Creek	824.11		√	√	√	√	√	√
Toolunga Creek	910.85	√	√	√	√	√	√	√
Peedamulla Creek	925.94		√	√	√	√	√	√
Peedamulla East Creek	929.81		√	√	√	√	√	√

KEY

√ = issue to be addressed;

√ = potential issue to be addressed, more information required.

A summary of those environmental factors of most relevance to each Project Site are discussed throughout this section.

3.1.1 Reserves and Conservation Areas

No current conservation areas are identified adjacent to any of the Project Sites. The nearest reserve is the Cane River Conservation Park, situated approximately 2 km away from the nearest Project Site (Figure 8). Given the distance and Main Roads standard environmental management requirements, the reserve will not be impacted by the roadworks.

The DEC have advised that the Toolunga Creek Project Site is located immediately to the west of the Peedamulla Station land, which is proposed for conservation in the 2015 Pastoral Lease reclamation by DEC (Shipway, *pers. comm.*, 2007). Although clearing and roadworks will occur adjacent to the

Peedamulla Station, direct impacts will remain entirely within the Main Roads road reserve (what about road detour during construction?).

Main Roads should ensure the implementation of appropriate management strategies, as outlined in a project specific Environmental Management Plan, are employed to ensure there is no indirect impact on the Peedamulla Station lands as a result of the proposed design and construction. It is further recommended that Main Roads liaise with DEC in relation to those management measures proposed adjacent to Peedamulla Station (refer to Section 4, Recommendation 2).

3.1.2 Surface Waters and Drainage

Main Roads will need to apply for a Section 17 Permit to Interfere with Bed and Banks under the Rights in Water Irrigation Act 1914 (RIWI Act 1914) for each Site identified below:

- Cave Creek (802.87 SLK);
- Goodeman Creek (824.11 SLK);
- Toolunga Creek (910.85 SLK);
- Peedamulla Creek (925.94 SLK) and;
- Peedamulla East Creek (929.81 SLK)

Refer to Section 4, Recommendation 4.

It is understood that the two material source areas will not require the disturbance of the bed or banks of a watercourse and therefore do not require a Section 17 Permit.

The proposed construction of bridges or culvert upgrades at the above-mentioned creek crossings have the potential to change the hydrology, and therefore, the localised upstream and downstream environments. The increased flow of floodwater can result in erosion and sedimentation downstream of the works, especially during times of intensive flooding. The Main Roads design should consider these upstream and downstream impacts and maintain the hydraulic connectivity of the creeklines (refer to Section 4, Recommendation 5).

3.1.3 Groundwater

All the Project Sites are located within the Pilbara Rivers Proclaimed Groundwater Area. If additional groundwater is required, Main Roads will need to apply for a 26D License under the *Rights in Water and Irrigation Act (1914)* to construct bores in this area and apply for a 5C Licence for abstraction of water (refer to Section 4, Recommendation 6).

In addition, the DAF (Watkins, *pers comm.*, 2007) have recommended that Main Roads consult with surrounding land owners if large quantities of water from local aquifers are required (refer to Section 4, Recommendation 7).

Main Roads have advised that groundwater requirements at this stage are unknown, however, that it is likely water will be sourced from existing Main Roads licensed bores that are located in close vicinity to the Project area. Pastoralists in the area often use Main Roads bores and Main Roads has good channels of communication with the farmers in the region (Oswald, *pers. comm.*, 2007)

3.1.4 Flora and Vegetation

Proposed Clearing

Table 11 below identifies the estimated clearing areas for each of the Projects Sites, as advised by Main Roads (Oswald, *pers. comm.*, Nov. 2007).

Table 11 Estimated Clearing Impacts

SLK	Project Site	Proposed Works	Estimated Total Clearing Area (ha)	Rehabilitation Area (ha)
802.87	Cave creek	Bridge	5.75	5.75
820.3	Materials Area (Section 19/211) ¹	Road Building Materials	Up to 100.00	Up to 100.00
823.5	Materials Area (Section 19/210) ¹	Road Building Materials	Up to 3.30	Up to 3.30
824.11	Goodeman Creek	Culverts	3.79	3.79
910.85	Toolunga Creek	Culverts	3.79	3.79
925.94	Peedamulla Creek	Bridge	5.75	5.75
929.81	Peedamulla East Creek	Culverts	3.79	3.79

Note:

1. Clearing proposed is a maximum area for strategic materials source areas and will be undertaken over a long time frame (up to a 20 year period).

Main Roads have been granted a Purpose Clearing Permit (CPS 818/3) under the provisions of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* to clear a maximum area of up to 150ha in the Gascoyne Region per annum. This permit provides for Main Roads to conduct such clearing associated with roadworks projects where that clearing is:

- » not within an Environmentally Sensitive Area, and
- » the clearing is not at variance with the 'Ten Clearing Principles'

The DEC (2007a) do not identify any Environmentally Sensitive Areas (ESA's) at, or in the near vicinity of, the Project Sites (refer to Section 2.8.4), however, given the findings of the desktop survey, the clearing is considered to be potentially at variance with Clearing Principle 'c' of the 'Ten Clearing Principles', being:

c. The area should not be cleared if it includes, or is necessary for the continued existence of, rare flora?

See **Appendix H** for a more detailed assessment against each of the criteria (including limitations of the desktop review).

As the project is potentially at variance with some of the ten clearing principles, it is recommended that Main Roads undertake an Environmental Impact Assessment (EIA) process, including field surveys.

Should the EIA studies determine that the project is at variance with one or more of the clearing principles, then Main Roads will need to undertake further consultation and provide a vegetation offset, to the approval of the DEC. Where the EIA is significantly at variance with any of the above criteria, MRWA will need to apply to the CEO of the DEC for a clearing permit in respect of that clearing (Clearing Permit Condition 7n).

Significant Flora

The DEC database search recorded no known populations of Declared Rare Flora within or near any of the Project Sites, however, the WA Herbarium database recorded four Priority species occurring near the Project Sites (refer to Figure 8), although none of the Priority Flora have been recorded within the environmental impact zone boundaries identified by Main Roads.

No field work has been conducted at the Project Sites as part of the commission and GHD is aware of no other specific flora surveys covering the Project Sites, so Priority Flora could exist within the proposed Project Sites, particularly given the large area of the proposed clearing for the Materials Area (Section 19/211). Therefore, it is recommended that a targeted priority flora survey be undertaken in late Winter / Spring to identify the presence of the species listed in Table 8, prior to construction of the bridges or culvert upgrades, or the development of the materials areas (refer to Section 4 Recommendation 1).

Threatened Ecological Communities

No TEC's were identified by the DEC as occurring within the vicinity of the proposed works. However, a TEC assessment could be undertaken during the targeted priority flora survey prior to construction of the bridges or culvert upgrades, or the development of the materials areas, to confirm the desktop assessment (refer to Section 4 Recommendation 1).

DEC have advised that occurrences of TEC's encountered during the project works should be reported to DEC to ensure their ongoing management.

Weeds

DEC advised that Mesquite is known to be present in a number of waterways and surrounding areas near Peedamulla Creek and Peedamulla Creek East and as such advised that Main Roads would be required to consult with the DAF and the Pilbara Mesquite Committee with regard to developing specific hygiene procedures to avoid spread of this pest species.

The DAF advised the site was not known to contain any Declared Plants, but has recommended the adoption of a biosecurity protocol to ensure weeds are not spread to other locations from the sites and new weeds are not introduced to the sites through road materials and machinery.

Main Roads should adhere to the following hygiene protocols, incorporating the following steps:

- » Clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- » Ensure that no weed affected road building materials, mulches or fill are brought into an area that is not already affected by such weeds; and
- » Restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

Management measures should be included in a Construction Environmental Management Plan (refer to Section 4, Recommendation 2).

Main Roads Term Network Contractors need to be aware of their operational responsibilities under the *Agriculture and Related Resources Protection Act 1976*, which stipulates that landowners whose properties support Declared Plant species are legally responsible for the management of the species.

3.1.5 Fauna and Habitat

Proposed Habitat Clearing

Clearing will be undertaken as described in Section 3.1.4.

The clearing of vegetation associated with the Project is minimal given the significant amount of intact vegetation surrounding the Project Sites. The relatively small area of clearing required for the Project Sites, taking into account the vegetation extent in the region, is unlikely to have a significant impact on resident individuals. The clearing of 100ha for Materials Area (Section 19 / 211) will be required over an approximate 20-year period and is not expected to adversely impact upon the available fauna species habitat located in the area.

The DEC (Shipway, *pers. comm.*, 2007), however, have particularly requested that Main Roads consider the potential for the bridge construction and culvert upgrade designs to consider ecological linkages along the watercourse (refer to Section 4 Recommendation 2).

Significant Fauna

A number of Threatened Flora Species have been identified from the DEC Threatened Fauna database as being recorded within the vicinity of the Project Sites, some of which are protected under the Commonwealth *EPBC 1999*.

Based upon the clearing area associated with the Project Sites and taking into account the vegetation extent in the region, it is considered unlikely that the project will significantly impact upon the long-term survival of any species of threatened fauna that may occur in the area, as the fauna species are likely to be present in other similarly vegetated areas within the vicinity of the Project Sites.

Although the clearing of vegetation has the potential to have a direct impact on fauna, the project is unlikely to have a significant impact on the biodiversity value at the species and ecosystem levels in the region. However, a threatened fauna and threatened fauna habitat assessment could be undertaken during the targeted priority flora survey prior to construction of the bridges or culvert upgrades, or the development of the materials areas, to confirm the desktop assessment (refer to Section 4 Recommendation 1).

Main Roads should protect threatened fauna and threatened fauna habitat during works in accordance with a Construction Environmental Management Plan (refer to Section 4, Recommendation 2).

3.1.6 Aboriginal Heritage

One Aboriginal heritage artefacts / scatter site is known to occur within the vicinity of the proposed works at Toolunga Creek (910.85), being Site No. P06399 (Site ID 6554).

Given the location of the permanent site within the road reserve, to the southern extent of the proposed culvert upgrades, there may be some impact upon this site and potentially the need to apply for a Section 18, conditional approval to disturb an Aboriginal Heritage Site.

It is also considered possible that there are unregistered sites located in the vicinity of the Project Sites, particularly given the need to disturb creeklines.

It is recommended that Main Roads Project Officer liaise with the Main Roads Heritage Liaison Officer and appropriate representatives of the local Aboriginal community to determine the level of impact on Aboriginal heritage within the Project Sites and apply for Section 18, conditional approval to disturb an Aboriginal Heritage Site, where required (refer to Section 4, Recommendation 3).

Main Roads have advised that Aboriginal heritage surveys are planned in the near future for the northern section Project Sites, with the Native Title claimant group, Kuruma Marthudunera (Oswald, *pers comm.*, Nov 2007). Consultations are proposed with the Native Title claimant group relevant to the southern Project Sites (Thalanji Group), using the services of the Yamitji Land and Sea Council, in 2008 (Oswald, *pers comm.*, Nov 2007).

Should Main Roads discover any Aboriginal heritage artefacts during construction, works should be ceased immediately and an Archaeologist called to identify any artefacts and consult with the DIA. Main Roads WA and their contractors need to be aware of their obligations under the *Aboriginal Heritage Act 1972* during road construction works.

3.2 Other Aspects

Through the results of this PEIA and based upon available information, it is considered unlikely that the following factors will be of concern, either as there is a low risk of impact or the matter can easily be addressed via the implementation of a standard Construction Environmental Management Plan (refer to Section 4, Recommendation 2).

3.2.1 Surrounding Area Landuse

The surrounding land use around the proposed Project Sites is extensive grazing of livestock. The road already exists in the area and the upgrades would not impact the adjacent lands.

Impacts on the station business should be minimal unless large quantities of water from local aquifers are required and in this case, some consultation would be advised (refer to Section 4, Recommendation 4).

3.2.2 Wetlands

No permanent or seasonally inundated wetlands, excluding the creek crossings (discussed in Section 3.1.1), occur within close proximity to any of the Project Sites.

3.2.3 Salinity

The vegetation clearing required to be undertaken as part of the proposed roadworks is unlikely to be of sufficient scale to result in, or exacerbate, salinity at any of the Project Sites.

3.2.4 Acid Sulphate Soils

The Project Sites are mapped as having no known risk of ASS occurring within 3 m of natural soil surface or deeper (WAPC, 2003).

As the roadworks associated with the Project are not expected to require deep excavation, it is considered unlikely that Acid Sulphate Soils will be encountered during the Project.

3.2.5 Diseases or Pathogens

Phytophthora cinnamomi ("Dieback") disease is generally restricted to areas in the south west of the State, south of the 26th parallel of latitude, in areas receiving an average annual rainfall of greater than 400mm. As the Project Sites are north of this latitude, the sites are not considered to be susceptible to the development of the *Phytophthora cinnamomi* pathogen.

No other known plant diseases or pathogens are recognised as being present in the Pilbara / Gascoyne region.

It is also considered that hygiene measures outlined in Section 3.1.4 for weeds would minimise any risk of pathogen spread. In addition to those measures outlined, Main Roads would not undertake the road works during wet periods.

3.2.6 Contaminated Sites

No previously recorded contaminated sites occur within the Project Sites and given the historical land use none would be expected.

Should any contamination be discovered during field works, Main Roads would be required to report this to the DEC.

3.2.7 European Heritage Sites

No sites of European heritage were identified in close vicinity to the Project Sites.

3.2.8 Air Quality and Dust

The proposed upgrades and material area development are not expected to significantly impact on regional air quality.

Dust may be generated during construction and should be managed for the protection of road users and adjoining landholders. The nearest sensitive receptors are Peedamulla and Uaroo homesteads, located approximately 10 km from the Project Sites. Dust impacts upon these homesteads are not considered to be an issue given the distance and temporary nature of the works.

Any dust generated during the proposed works has the potential to impact on the surrounding vegetation by smothering the surface layer of the leaves. Main Roads would control dust during construction via the implementation of a standard Construction Environmental Management Plan, any areas no longer required following construction will be rehabilitated (refer to Section 4, Recommendation 2).

3.2.9 Noise and Vibration

Noise and vibration during the construction phase are not expected to be an issue, due to the lack of sensitive receptors in the area.

Main Roads would control noise and vibration via the implementation of a standard Construction Environmental Management Plan (refer to Section 4, Recommendation 2).

3.2.10 Visual Amenity

Visual amenity for road users will be impacted, due to the clearing of remnant vegetation within the road reserve.

It is suggested the relatively minor nature of the works, the fact that a road already exists in the locality and low numbers of surrounding residents will result in minimal impacts on visual amenity.

3.2.11 Public Safety and Risk

The site lies well outside any known or suspected Unexploded Ordinance (UXO) contamination sites.

The DBNGP corridor does not cross the NWCH within the vicinity of any of the proposed Project Sites and given the distance of the road works from the gas pipeline it is not anticipated that the proposed works will interfere with the gas infrastructure corridor.

Should any proposed works impact on the DBNGP corridor, Main Roads is to obtain access approval from the DBNGP Land Access Minister.

Public safety and traffic safety during construction will be managed in accordance with Standard Contract Specifications.

4. Recommendations and Approvals

This Section is intended to fulfil the requirements of Appendix B, PEIA Recommendations, outlined in the Main Roads Western Australia (2007) Environmental Standard Brief.

Table 12 Recommendations and Approvals required for the Project

Recommendation	Agency Required Referral	Relevant Agency
<p>1. Development of EIA documentation to further determine the significance of any potential variances identified in this PEIA.</p> <p>This will include undertaking a targeted survey for rare and priority flora species (particularly those identified from the area listed in Table 8), to be undertaken in late winter / spring.</p> <p>A threatened fauna, threatened fauna habitat assessment and Threatened Ecological Community assessment could be undertaken at the same time as the targeted priority flora survey.</p> <p>The EIA work should cover any areas requiring the clearing of native vegetation, including temporary road diversions.</p>	Yes (where found to be at significant variance)	Department of Environment and Conservation (DEC)
<p>2. Development of a Construction Environmental Management Plan by Main Roads and its contractor. Issues to be considered in this management plan include:</p> <ul style="list-style-type: none"> » Conservation Reserves; » Vegetation clearing; » Rehabilitation; » Fauna protection (including consideration of ecological linkages via the bridge / culvert underpasses) » Protection of threatened flora and threatened fauna habitat (if relevant); » Dust control; » Groundwater consumption; » Traffic safety and access; » Fire management; » Vehicle servicing; » Weed and pathogen hygiene (it has been recommended that Main Roads liaise with the DAF and the Pilbara Mesquite Committee in relation to proposed hygiene measures); » Drainage management – including maintenance of hydraulic connectivity, control of erosion and sedimentation; » Fuel and chemical storage and management; » Rubbish disposal; » Reporting procedures; and » Environmental training. <p>It is suggested that Main Roads liaise with the Pilbara Regional</p>	No	N/A

Recommendation	Agency Required Referral	Relevant Agency
Office of the DEC in relation to relevant matters, particularly environmental management measures to be employed adjacent to the proposed Peedamulla Station conservation area.		
<p>3. It is recommended that Main Roads Project Officer liaise with the Main Roads Heritage Liaison Officer and appropriate representatives of the local Aboriginal community to determine the level of impact on Aboriginal heritage within the Project Sites.</p> <p>A Section 18, conditional approval to disturb an Aboriginal Heritage Site may be required for Toolunga Creek (910.85 SLK).</p> <p>Refer to Note 1.</p>	Yes	Department of Indigenous Affairs (DIA)
<p>4. Main Roads will need to apply for a Section 17 Permit to Interfere with Bed and Banks under the <i>Rights in Water Irrigation Act 1914</i> for each Site identified below:</p> <ul style="list-style-type: none"> » Cave Creek (802.87 SLK); » Goodeman Creek (824.11 SLK); » Toolunga Creek (910.85 SLK); » Peedamulla Creek (925.94 SLK) and; » Peedamulla East Creek (929.81 SLK). 	Yes	Department of Water (DoW)
<p>5. The Main Roads design should consider upstream and downstream impacts and maintain the hydraulic connectivity of the creeklines. This may require modelling of the system to prove maintenance of environmental flows and that no negative erosion / sedimentation impacts are likely.</p>	No	N/A (this information may form part of the Section 17 Permit, discussed above).
<p>6. If additional groundwater is required, Main Roads will need to apply for a 26D License under the <i>Rights in Water and Irrigation Act (1914)</i> to construct bores in this area and apply for a 5C Licence for abstraction of water (Note 2).</p>	Yes	DoW
<p>7. It is recommended that Main Roads consult with surrounding land owners if large quantities of water from local aquifers are required (Note 2).</p>	No	Surrounding pastoral lessees

Note:

1. Main Roads (Oswald, *pers. comm.*, 2007) advised that consultations are already planned – refer to Section 3.1.6.
2. Main Roads (Oswald, *pers. comm.*, 2007) advised that it is most likely that their own pre-existing licenced bores will be used, with quantity requirements to be determined closer to, and during, construction.

5. References

Arnold, A (2007) Personal Communication. UXO Liaison Officer, Fire and Emergency Services Authority. Refer to **Appendix A** for details.

Australian Government (2007a) *Australian Natural Resources Atlas*. Accessed online at: <http://audit.ea.gov.au/mapping/index.cfm> on the 08/10/2007.

Australian Government (2007b) Australian Heritage Database search. Accessed online at : www.deh.gov.au/cgi-bin/ahdb/search.pl on 10/10/07

Beard, J.S. (1975) *Vegetation Survey of Western Australia: Map Sheet 5- Pilbara 1:1,000,000 Vegetation Series*. University of Western Australia Press, Perth

Bureau of Meteorology Australia. (2007). *Climatic Averages for Australian Sites: Onslow, Onslow Airport and Panaowonica Weather Stations*. Bureau of Meteorology on-line database. Accessed at http://www.bom.gov.au/climate/averages/tables/ca_wa_names.shtml on 27/11/07

Department of Agriculture and Food (2006), Government of Western Australia. *Soil - landscapes of Western Australia's Rangelands and Arid Interior*. Resource Management Technical Report 313 ISSN 1039-7205. By Peter Tille, December 2006. Accessed online at http://www.asris.csiro.au/downloads/state_agencies/tr2007_slwarai_ptille_nomaps.pdf on 18/10/2007.

Department of Agriculture and Food (2007). *Declared Plants Search Shire of Ashburton*. Accessed online at: http://www.agric.wa.gov.au/content/pw/weed/decp/declaredplants_index.htm on 4/10/2007. Updated August 2005 and amended January 2007

Department of Conservation and Land Management (CALM) (2001) *Gascoyne 1 (GAS1- Ashburton Subregion*. Report by Peter Kendrick. Accessed online at <http://www.naturebase.net/content/view/960/1397/> on 08/10/2007

Department of Environment and Conservation (2007a) *Native Vegetation Map Viewer*. Accessed online at: http://portal.environment.wa.gov.au/portal/page?_pageid=119,50334&_dad=portal&_schema=PORTAL on 4/10/07.

Department of Environment and Conservation (2007b) *Contaminated Sites Database*. Accessed online at http://portal.environment.wa.gov.au/portal/page?_pageid=53,34343&_dad=portal&_schema=PORTAL on 09/10/07

Department of Environment and Conservation and the Western Australian Herbarium (2007) *FloraBase*. Accessed online at: <http://florabase.calm.wa.gov.au>

Department of Environment and Water Resources (2007) *Environment Protection and Biodiversity Conservation Act Protected Matters Search Tool: Shire of Ashburton*. Accessed online at <http://www.environment.gov.au/erin/ert/epbc> on 10/10/07.

Department of Indigenous Affairs Website (2007). Accessed online at <http://www.dia.wa.gov.au/Heritage/Inquiry/> on 08/10/07.

Department of Water (2006) *Surface Water Management Areas 2006*. Accessed online at <http://portal.water.wa.gov.au/portal/page/portal/LicensingWaterIndustryServices/Licensing/Proclamation/Content/RiWI%20SWA%202.pdf> on 03/12/07

Department of Water (2007a) Geographic Data Atlas of Western Australia. Accessed online at <http://portal.water.wa.gov.au/portal/page/portal/MapsDataAtlases/GeographicDataAtlas> on 09/10/2007

Department of Water (2007b) *Hydrogeological Atlas of Western Australia* at: <http://portal.water.wa.gov.au/portal/page/portal/MapsDataAtlases/HydrogeologicalAtlas>. Assessed 04/10/2007

English, V. and Blythe, J. (1997) *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*. Final Report (Project No. N702) to Environment Australia. Department of Conservation and Land Management, Perth, Western Australia.

Environmental Protection Authority (2000) *Environmental Protection of Native Vegetation in Western Australia*. Clearing of native vegetation, with particular reference to the agricultural area. Position Statement No. 2. Environmental Protection Authority, Perth, Western Australia.

Geological Survey of Western Australia (GSWA, 1968) 1:250,000 Yarraloola Map Sheet – Parts of Sheets SF50-6

Geological Survey of Western Australia (GSWA, 1986) 1:250,000 Wyloo Map Sheet – Parts of Sheets SF50-10

Geological Survey of Western Australia (GSWA, 1980) 1:250,000 Yanrey - Ningaloo Map Sheet – Parts of Sheets SF50-9.

Government of Western Australia (2000) Bush Forever Volume 2- Directory of Bush Forever Sites. Western Australia Planning Commission, Western Australia.

Heritage Council of Western Australia Website. (2007). Accessed online at www.heritage.wa.gov.au on 09/10/06.

Landgate (2007) *Landgate Map Viewer*. Accessed online at <https://www.landgate.com.au/> on 09/10/07.

Mailey, L (2007) Personal Communication. Environmental Officer. Pilbara Regional Office of the Department of Water. Refer to **Appendix A** for details.

Main Roads Western Australia (2007) Environmental Standard Brief Preliminary Environmental Impact Assessment (Desktop Study) Bridges/Culvert Upgrade NWCH, Document No. 6707/012. Issued 13/04/2007

Oswald, M (2007) Personal Communication. Environmental Officer, Main Roads Western Australia – Gascoyne Regional Office.

Shepherd, D.P, Beeston, G.R and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status*. Natural Resource Management Technical Report No. 249: Department of Agriculture. Accessed online at: http://www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/LWE/VEGT/tr249_part1.pdf on 22/10/07

Shipway, M. (2007) Personal Communication. Projects Coordinator – Native Vegetation Conservation. Pilbara Regional Office of the Department of Environment and Conservation. Refer to **Appendix A** for details.

Shire of Ashburton (2004) Town Planning Scheme No. 7: incorporating the entire district of the Shire of Ashburton. Version 1. Prepared by the Department for Planning and Infrastructure, May 2005. Accessed online at <http://www.wapc.wa.gov.au/Region+schemes/Local+planning+schemes/395.aspx> on 03/10/07.

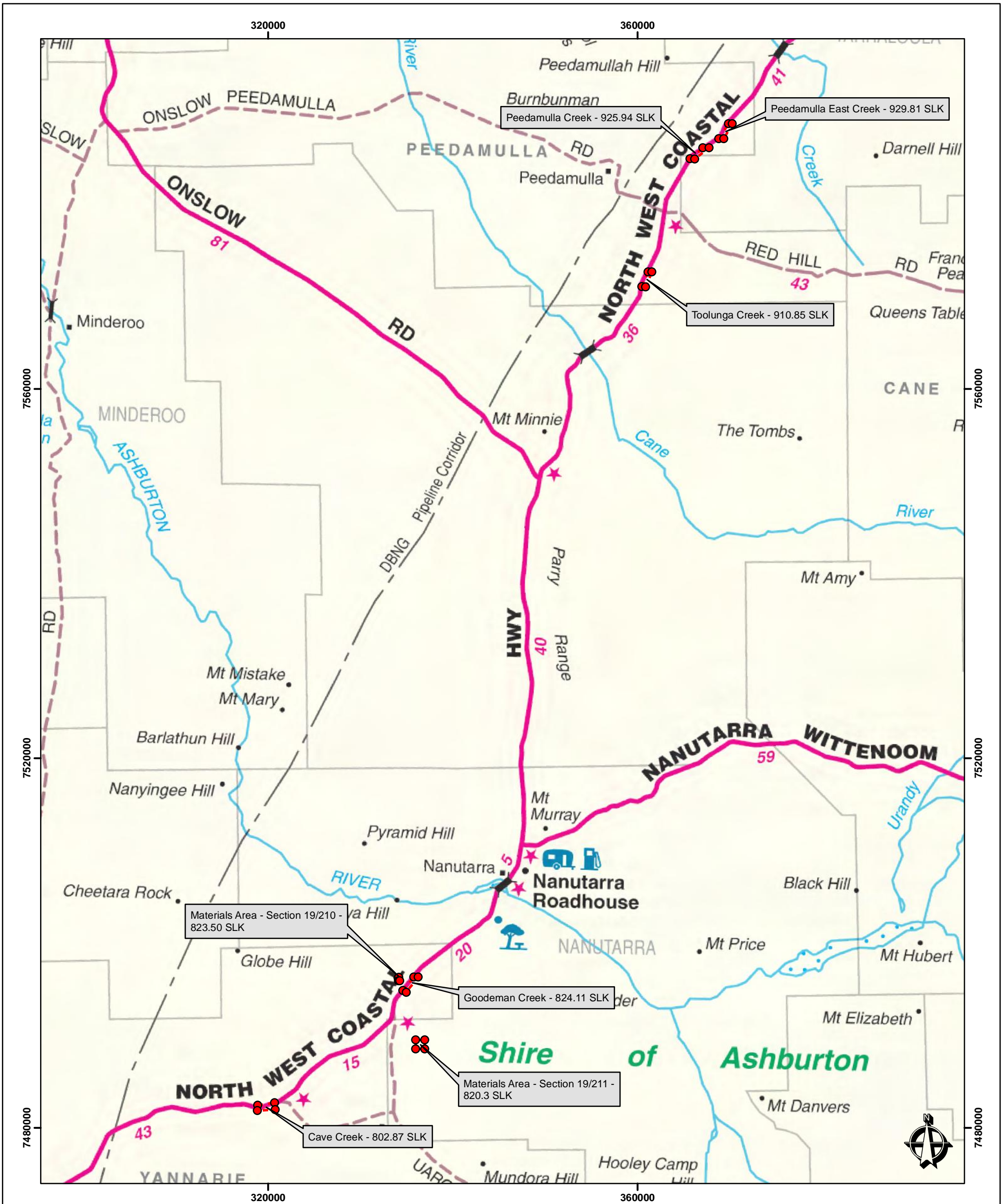
Watkins, R. (2007) Personal Communication. District Manager, Pilbara Office of the Department of Agriculture and Food. Refer to **Appendix A** for details.

Western Australian Planning Commission (2003) *Planning Bulletin No. 64: Acid Sulphate Soils*.

DRAFT

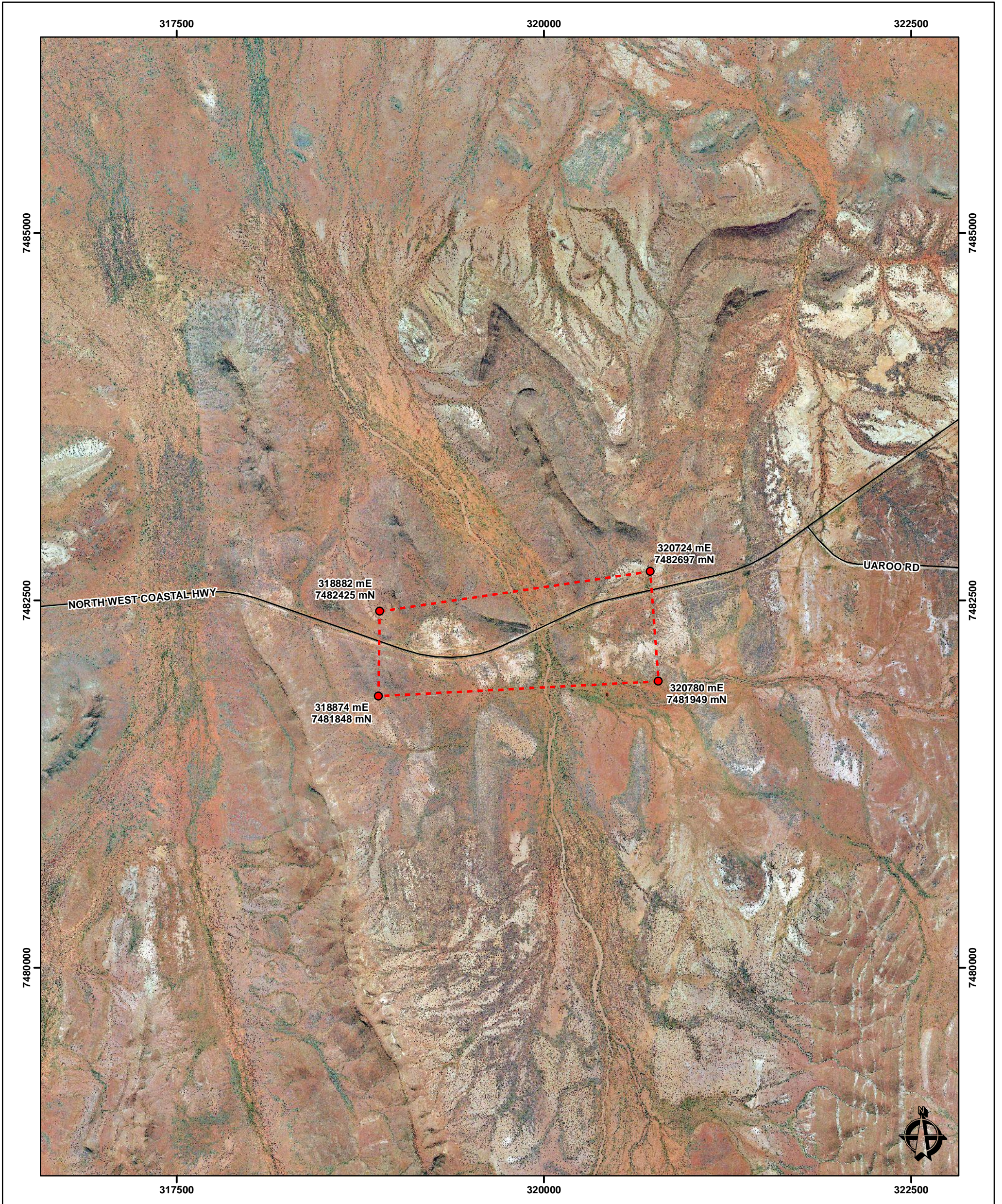
Figures

- Figure 1 Project Sites Locational Map
- Figure 2 Proposed location of bridge at Cave Creek
- Figure 3 Proposed location of strategic Materials Area (Section 19/211)
- Figure 4 Proposed location of Materials Area (Section 19/210) and culvert upgrade at Goodeman Creek
- Figure 5 Proposed location of culvert upgrade at Toolunga Creek
- Figure 6 Proposed location of bridge at Peedamulla Creek
- Figure 7 Proposed location of culvert upgrade at Peedamulla East Creek
- Figure 8 PEIA Points of Interest



LEGEND Project Area Coordinates - MRWA - 20071003	SCALE 1:400,000 at A3	CREATED BY: NT CHECKED: MD APPROVED:
	LOCALITY MAP Pilbara Region	HORIZONTAL DATUM: GDA 94 HEIGHT DATUM: NA PROJECTION: MGA ZONE 50 METADATA RECORDED: 100%
	COPYRIGHT <small>THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF GHD THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION</small>	DATE: 11.10.2007 FILE LOCATION: G:\6121494\gis\mxd\6121494-G1.mxd REVISION: 0 DRAWING NO: 6121494-G1
	 NORTHWEST COASTAL HIGHWAY PEIA Figure 1 Project Sites Locational Map	

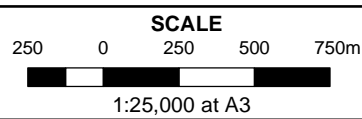
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
 DATASET NAMES INCLUDE PUBLISHED DATE WHERE AVAILABLE
 BACKGROUND TAKEN FROM TRAVELLERS ATLAS 2004 EDITION, PRODUCED 2003



LEGEND

- Project Area Coordinates - MRWA - 20071003
- Project Area - GHD - 20071011
- Roads - MRWA - 200711

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
 DATASET NAMES INCLUDE PUBLISHED DATE WHERE AVAILABLE
 LANDGATE AERIAL PHOTOGRAPHY SOURCED FROM MAINROADS - OCT 2007



LOCALITY MAP



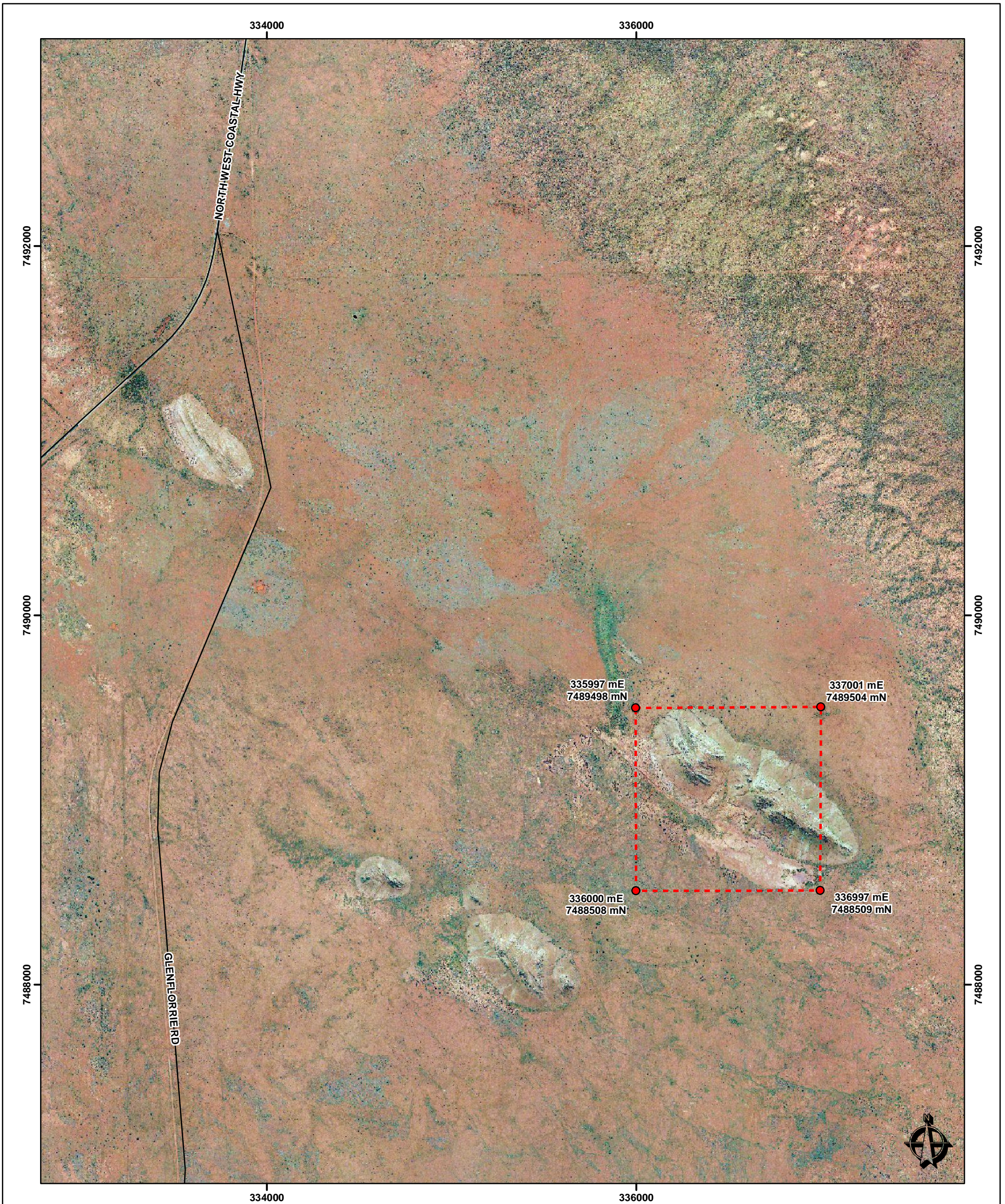
COPYRIGHT

THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF GHD
 THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE
 FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE
 WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION

CREATED BY NT	CHECKED MD	APPROVED
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
HEIGHT DATUM: NA		METADATA RECORDED: 100%
DATE 11.10.2007	FILE LOCATION G:\61\21494\gis\mxds\6121494-G2.mxd	
REVISION 0	DRAWING NO 6121494-G2	



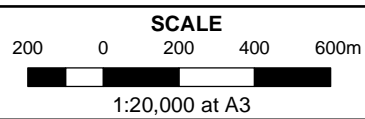
NORTHWEST COASTAL HIGHWAY PEIA
Figure 2
Proposed Location of Bridge at Cave Creek



LEGEND

- Project Area Coordinates - MRWA - 20071003
- Project Area - GHD - 20071011
- Roads - MRWA - 200711

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
 DATASET NAMES INCLUDE PUBLISHED DATE WHERE AVAILABLE
 LANDGATE AERIAL PHOTOGRAPHY SOURCED FROM MAINROADS - OCT 2007



LOCALITY MAP



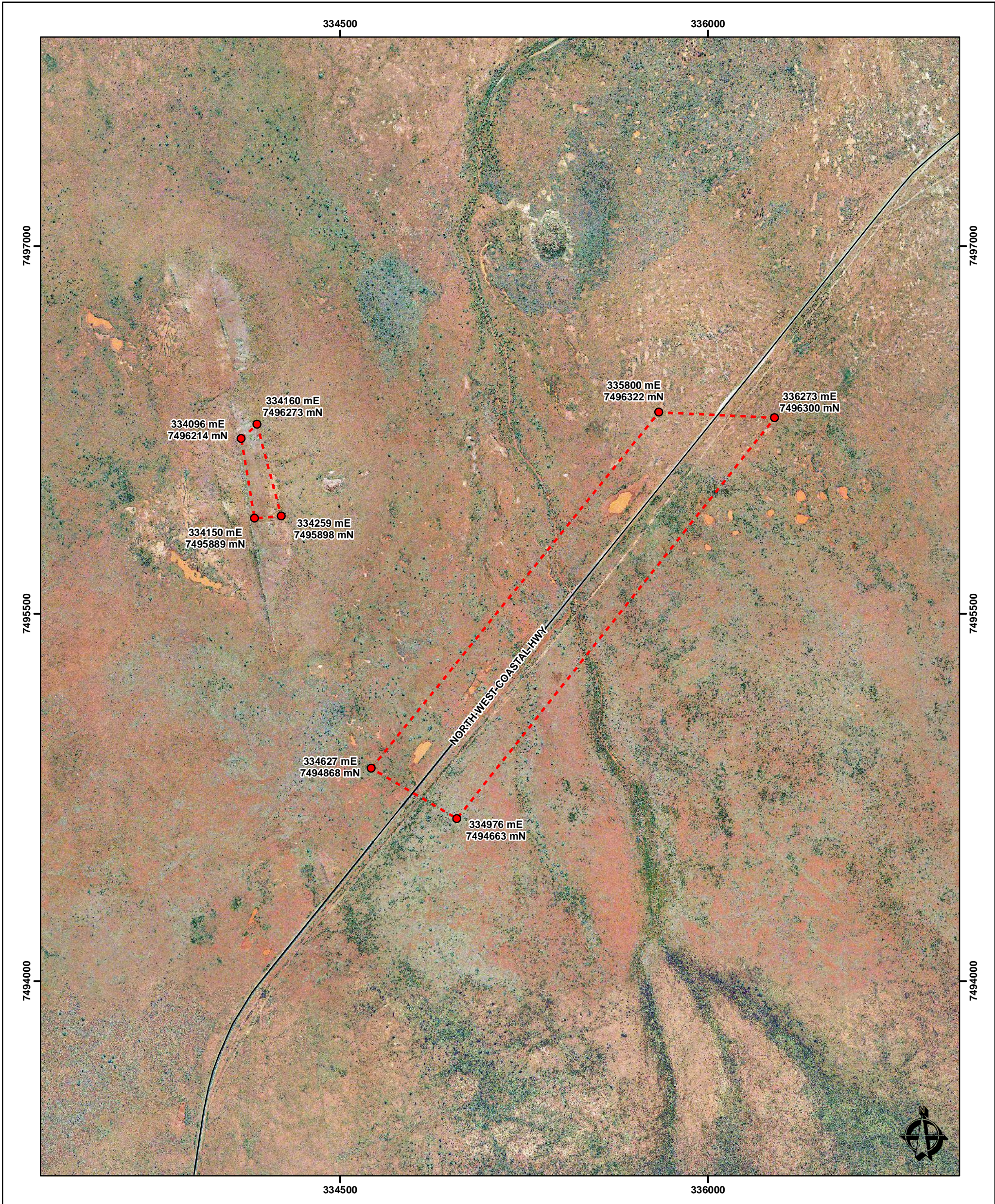
COPYRIGHT

THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF GHD
 THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE
 FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE
 WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION

CREATED BY NT	CHECKED MD	APPROVED
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
HEIGHT DATUM: NA		METADATA RECORDED: 100%
DATE 11.10.2007	FILE LOCATION G:\61\21494\gis\mxds\6121494-G3.mxd	
REVISION 0	DRAWING NO 6121494-G3	



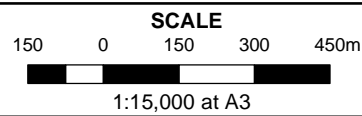
NORTHWEST COASTAL HIGHWAY PEIA
Figure 3
Proposed Location of Strategic Materials Area (Section 19/211)



LEGEND

- Project Area Coordinates - MRWA - 20071003
- - - Project Area - GHD - 20071011
- Roads - MRWA - 200711

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
 DATASET NAMES INCLUDE PUBLISHED DATE WHERE AVAILABLE
 LANDGATE AERIAL PHOTOGRAPHY SOURCED FROM MAINROADS - OCT 2007



LOCALITY MAP



Pilbara Region

COPYRIGHT

THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF GHD
 THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE
 FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE
 WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION

CREATED BY NT	CHECKED MD	APPROVED
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
HEIGHT DATUM: NA		METADATA RECORDED: 100%
DATE 05.11.2007	FILE LOCATION G:\61\21494\gis\mxds\6121494-G4.mxd	
REVISION 0	DRAWING NO 6121494-G4	



NORTHWEST COASTAL HIGHWAY PEIA

Figure 4
Proposed Location of Strategic Materials Area (Section 19/210)
& Culvert Upgrade at Goodman Creek