NATIVE VEGETATION CLEARING PERMIT
DUNCAN ROAD AND GORDON DOWNS ROAD
STAGE 1 UPGRADES

PREPARED FOR:

SHIRE OF HALLS CREEK

AUGUST 2019

PREPARED BY:

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DUNCAN ROAD AND GORDON DOWNS ROAD UPGRADES - STAGE 1
NATIVE VEGETATION CLEARING PERMIT APPLICATION

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Draft Report	Stephanie Stack	Spencer Shute	5 August 2019
Final Report	Stephanie Stack	Spencer Shute	19 August 2019

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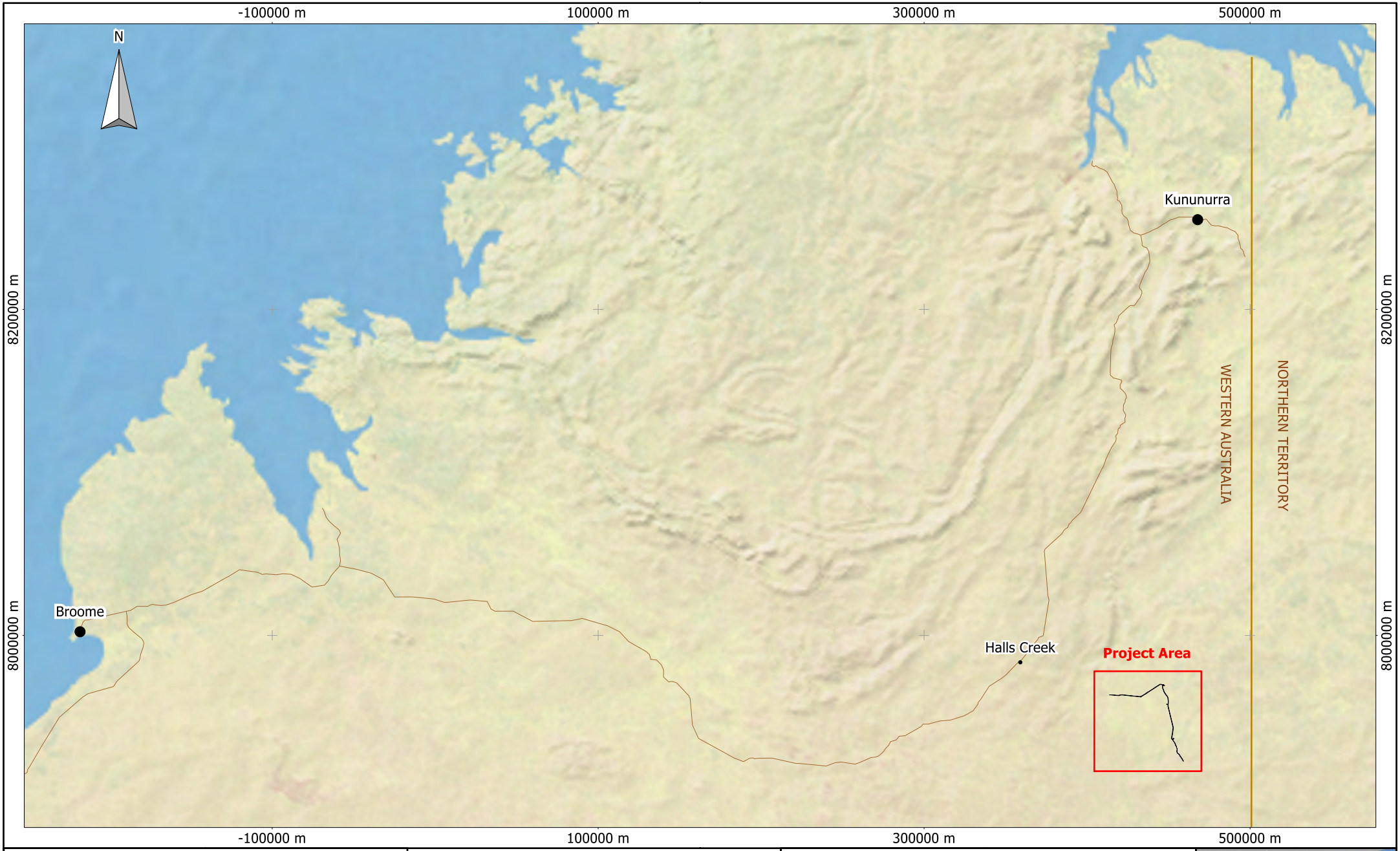
1. SUMMARY

The Shire of Halls Creek is proposing to undertake upgrades to Gordon Downs Rd and a portion of Duncan Rd in the Shire of Halls Creek (the Project) (Figure 1). Under Stage 1, upgrades will be undertaken along a length of 87 km, requiring the clearing of 144 ha of native vegetation for the proposed upgrades, including a number of floodways and creek crossings and the construction of several new gravel pits and groundwater bores.

An assessment against the ten clearing principles was undertaken based on information collected from a desktop review, as well as the flora, vegetation and fauna habitat survey data provided by Northern Minerals.

The assessment of the proposed clearing against the ten clearing principles determined that the clearing of 144 ha of vegetation for the proposed Stage 1 road upgrades may be at variance with one of the ten clearing principles. Appropriate environmental management procedures will be implemented to ensure potential impacts associated with the clearing are minimised.



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0 50 km

Shire of Halls Creek
Stage 1 Duncan Road and
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Figure 1

Location Plan

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2. INTRODUCTION

The Shire of Halls Creek is proposing to upgrade Duncan Rd and Gordon Downs Rd in the Shire of Halls Creek (total length of road approximately 161 km). The total length of road to be upgraded is 87 km (the Project), which commences 75 km east of Halls Creek, following Duncan Road for approximately 35 km and extending south along Gordon Downs Road for approximately 52 km to the Kundat Djaru (Ringer Soak) Community. Funding is being provided by Main Roads Western Australia (MRWA).

Under Stage 1, planned for completion in 2019/2020, the following works are proposed:

- Sturt Creek crossing upgrade (Slk 34.3 – 38.5 Gordon Downs Rd).
- 9 x Duncan Rd blacksoil sealed floodways (Slk 80 – 115).
- 20 x Gordon Downs Rd blacksoil sealed floodways (Slk 0 – 53).
- Ringer Soak Sealed Pavement (approx. 3km of road adjacent Ringer Soak community).
- Upgrade 3 x gates to grids on Gordon Downs Rd.
- Development of three new gravel pits.
- Development of 10 groundwater bores.

The *Environmental Protection Act 1986* (EP Act) and Environmental Protection (Clearing of Native Vegetation) Regulations 2004 require that all land clearing activities are approved by the Department of Water and Environment Regulation (DWER) in the form of a Clearing Permit (CP). This report supports the application for a CP (Area Permit) for 144 ha of clearing for the proposed road upgrades under Stage 1.

A desktop review was undertaken as part of the preparation of a preliminary environmental impact assessment (PEIA) (Appendix 1), which included information collected from database searches, as well as the flora, vegetation and fauna habitat survey data obtained from Northern Minerals. The results of the desktop review are discussed in Section 4 as part of the assessment of the proposed clearing against the ten clearing principles.

This CP application covers the native vegetation clearing required for the Stage 1 works. A subsequent application will be submitted for Stage 2 upgrades at a later date.

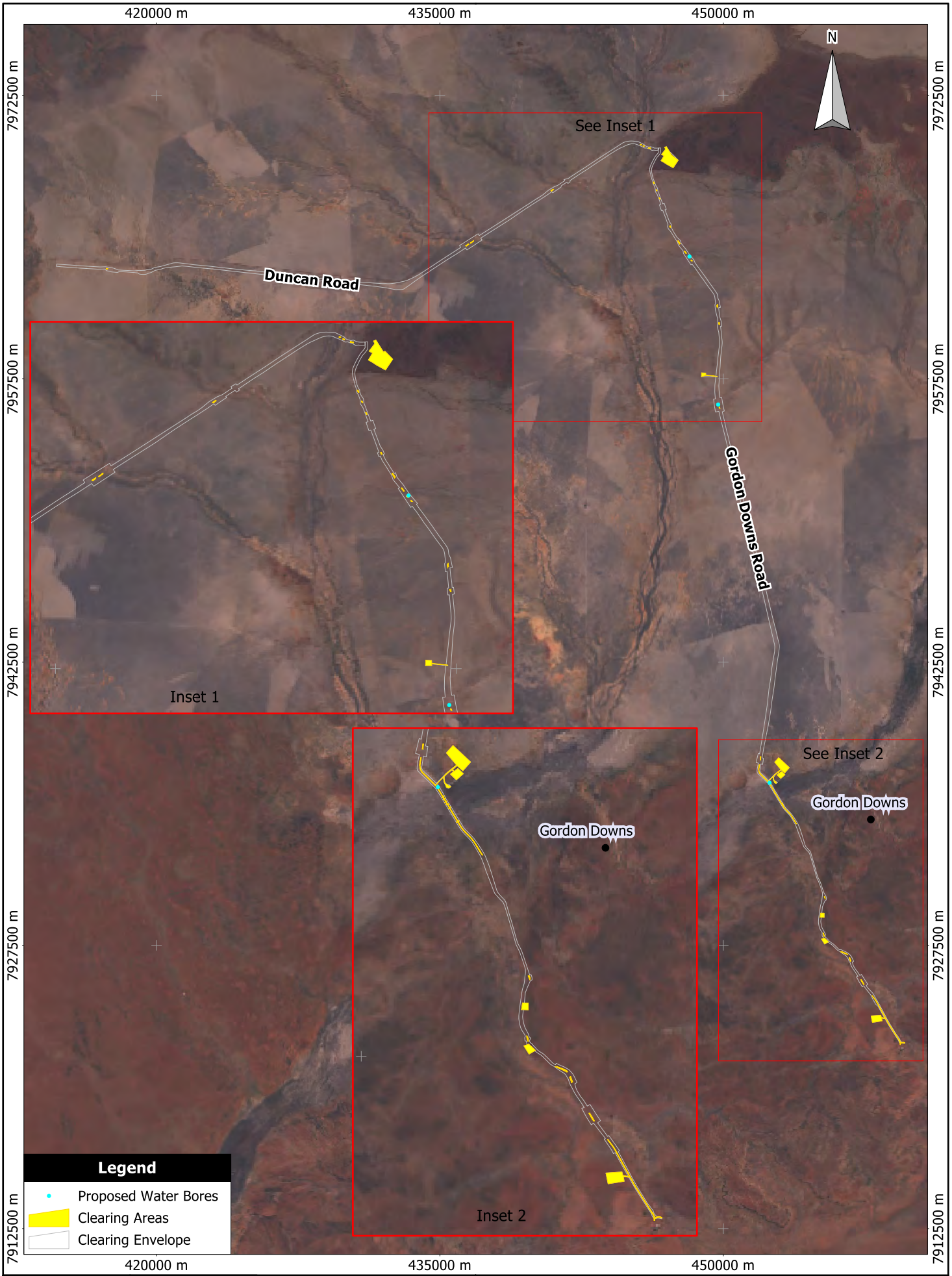
3. BACKGROUND

3.1 LOCATION

The proposed Stage 1 upgrades to Duncan Road and Gordon Downs Road within the Shire of Halls Creek are proposed along the following sections:

- Commences approximately 75 km along the Duncan Rd (from the Great Northern Highway (GNH) intersection in Halls Creek).
- Extends approximately 35 km along the Duncan Rd to the intersection with the Gordon Downs Rd.
- Extends approximately 52 km along the Gordon Downs Rd to the Ringer Soak Community.

The area encompassing all of the potential disturbance, including the proposed creek crossings, floodways, gravel pits and bores, has been termed the Clearing Envelope (Figure 2). The indicative areas of clearing, which could potentially vary slightly following the detailed design of the works, are termed the Clearing Areas. The proposed Stage 1 works require a total of 144 ha of clearing (Figure 2).



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Shire of Halls Creek
Stage 1 Duncan and Gordon Downs Road Upgrades

Figure 2

Clearing Envelope and Proposed Clearing Areas

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3.2 TENURE

The Clearing Envelope crosses two pastoral properties within the Shire of Halls Creek, the Flora Valley Station and Gordon Downs Station (Figure 3).

A number of reserves exist along the proposed Stage 1 Clearing Envelope (Figure 3). A reserve at the southern end of Gordon Downs Road covers the community of Kundat Djaru, which is allocated for the 'use or benefit of aboriginal inhabitants' (Landgate 2018). Further information relating to the reserves within the Clearing Envelope is presented in Section 4.9.

Cadastre data indicates that the current alignment of Duncan Road is not always within the nominated Road Isolation Reserve (Type 3 P). No road reserve exists for Gordon Downs Road (Landgate 2018) (Figure 3). Inconsistencies such as this commonly occur for regional and older roads. It is understood that MRWA has authority under the *Land Administration Act 1997* to construct on Crown Land, which underlies the Clearing Envelope. Subject to the *Main Roads Act 1930* and the *Public Works Act 1902*, the local government within the district in which a road is situated has the care, control and management of the road.

3.3 ABORIGINAL HERITAGE

The townships of Balgo (Wirrimanu), Billiluna (Mindibungu), Mulan, Ringer Soak (Kundat Djaru), Warmun (Turkey Creek), Kundat Djaru and Yiyili are key Aboriginal communities within the Shire of Halls Creek (SoHC 2019).

The proposed road upgrades occur solely within the Jaru Native Title Area (Table 1), which covers an area of about 32,250 km^2.

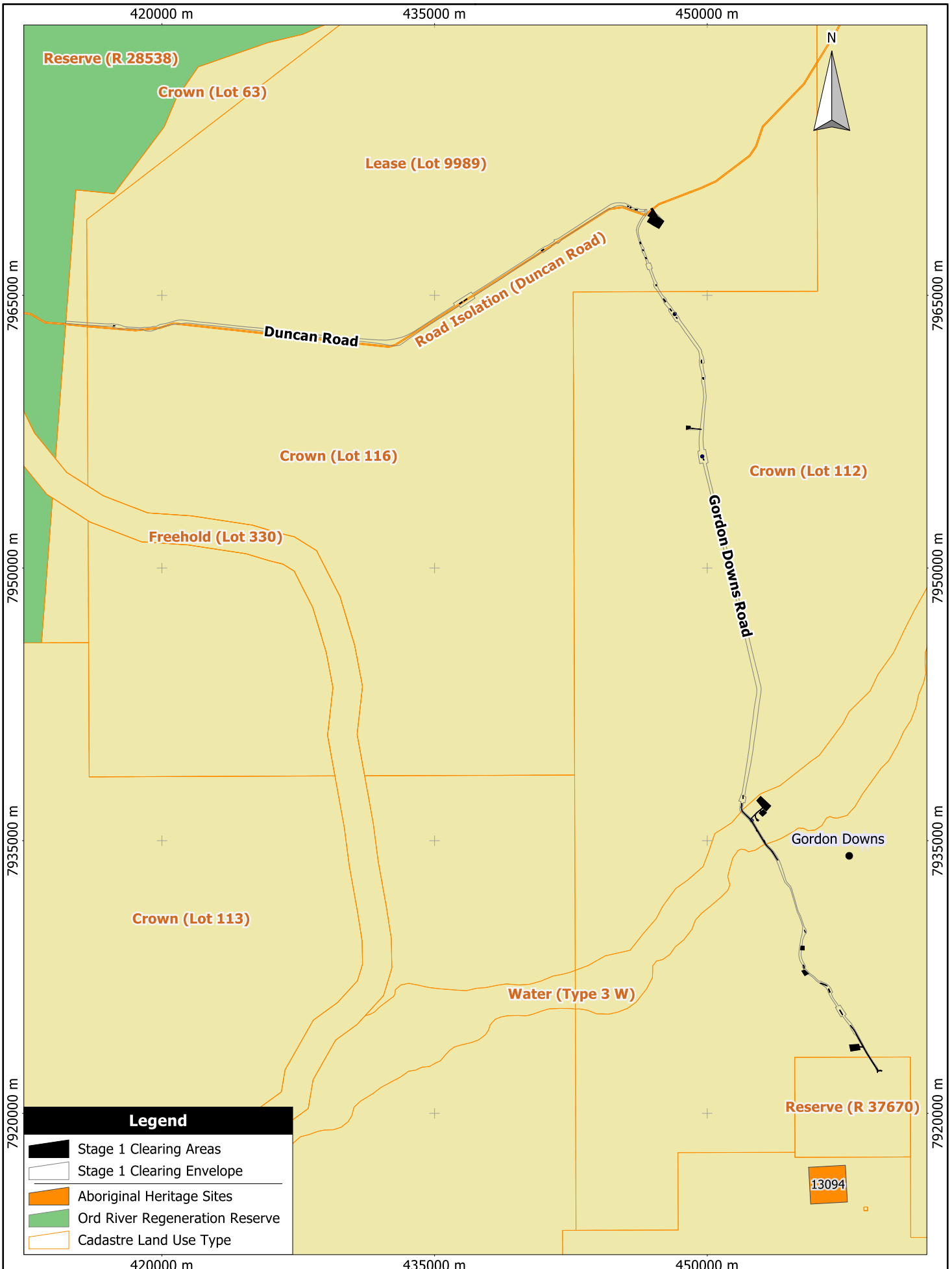
No registered Aboriginal Heritage sites are present within the Clearing Envelope or within 100 m of the proposed clearing areas. One heritage site occurs 5.5 km south west of the southern end of Gordon Downs Road (Table 2).

Table 1: Registered Native Title Claims intersecting the Clearing Envelope

Applicant Name	Tribunal File No.	Federal Court File No.	Representative	Date Registered
Jaru	WC2012/003	WAD42/2019	Kimberley Land Council	16/03/2012

Table 2: Aboriginal Heritage Sites within a 100m Buffer of Clearing Envelope

Site ID	Site Name	Site Type
13094	Liralyan	Mythological



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0 10 km

Shire of Halls Creek
Stage 1 Duncan and Gordon Downs Road Upgrades

Figure 3

Cadastre, Reserves and Heritage

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3.4 ENVIRONMENTAL SETTING

3.4.1 Landscape

The Project predominantly occurs within the South Kimberley Interzone (OVP02) sub-region of the Ord Victoria Plain IBRA bioregion, with the southern extent of Gordon Downs Road occurring in the Tanami Desert (TAN1) sub-region of the Tanami bioregion. The OVP02 sub-region covers an area of 3,540,414 ha and is characterised by gently undulating plains with scattered hills on Cambrian volcanics and Proterozoic sedimentary rocks (Graham 2001a). The vegetation comprises grassland with scattered bloodwoods (*Eucalyptus* spp.) and snappy gum (*Eucalyptus brevifolia*) with spinifex and annual grasses (Graham 2001a).

The TAN1 sub-region is characterised by red Quaternary sandplains that support mixed shrub steppes of *Hakea* spp., desert bloodwoods, *Acacia* spp. and *Grevillea* spp. over soft spinifex (*Triodia pungens*) hummock grasslands (Graham 2001b).

3.4.2 Climate

The climate of the region is dry and hot tropical to semi-arid with summer rainfall (Graham 2001a and 2001b). The average annual rainfall is 575.6 mm, with average temperatures ranging from 33.6 to 20 C (BOM 2019a) (Figure 4). The majority of the annual rainfall is recorded from November to March, with evaporation rates exceeding rainfall during the winter dry season (Figure 4).

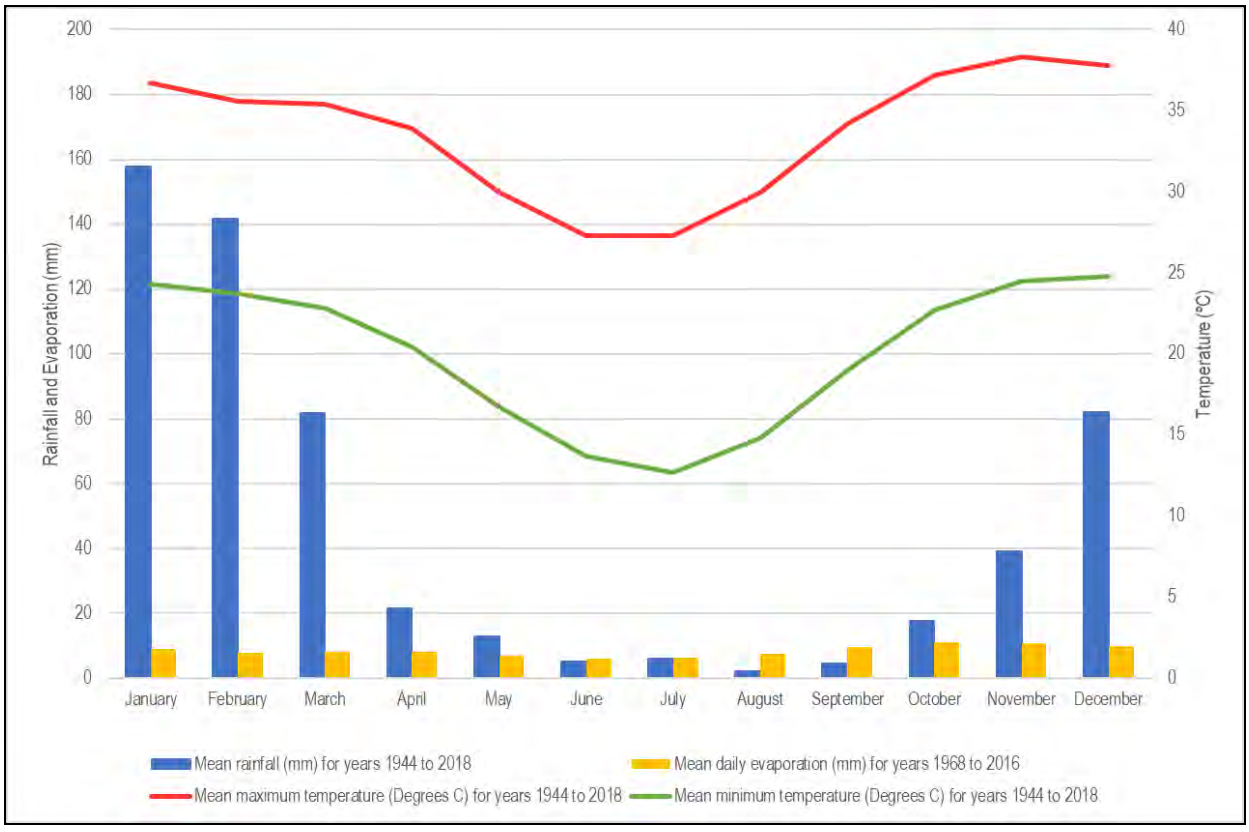


Figure 4: Climate data for Halls Creek Meteorological Office (ID 002012)

3.4.3 Vegetation

Flora surveys within and adjacent to portions of the Clearing Envelope, completed by Northern Minerals Limited (Figure 5), identified a total of 258 flora species from 56 families and 140 genera (MWH 2014). The most common genera were Acacia, Triodia and Eucalyptus, which are characteristic of the dominant vegetation types within the OVP02 sub-region (MWH 2014). No Threatened Flora species were recorded during the survey. One Priority Flora species, *Goodenia crenata* (P3), was recorded during the surveys.

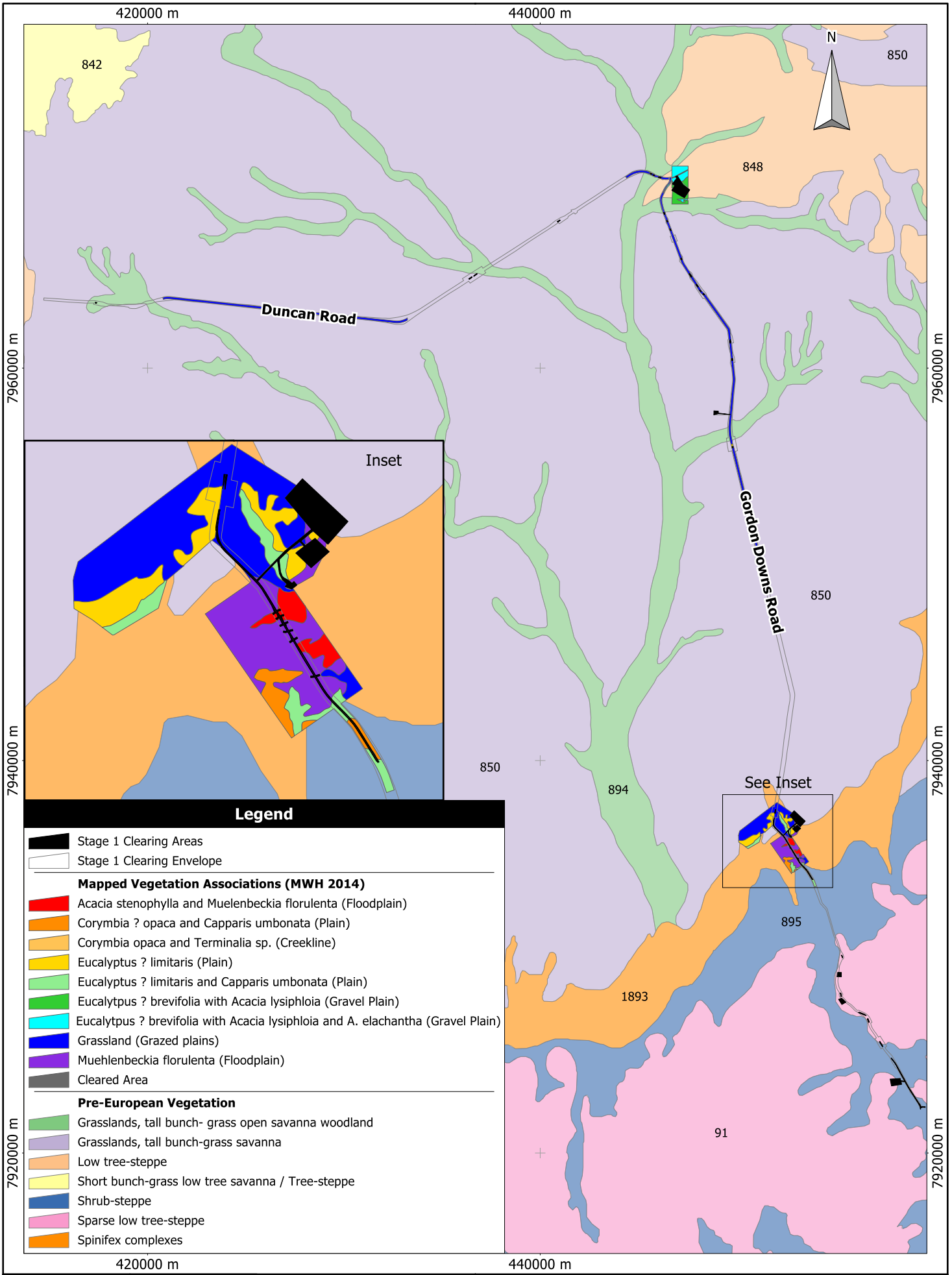
Four Declared Pest species under the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act) were identified as potentially occurring within a 50 km radius of the Clearing Envelope, comprising Mesquite *(Prosopis* spp.), Prickly Acacia *(Vachellia nilotica),* Parkinsonia *(Parkinsonia aculeata)* and Athel Pine *(Tamarix aphylla)* (MWH 2014).

Fourteen introduced flora species were recorded during the surveys completed by Northern Minerals Limited, including two listed as Declared Pests under Section 22 of the *Biosecurity and Agriculture Management Act 2007* with one also listed as a Weed of National Significance (WONS):

- **Calotropis procera* (Declared Pest Category 3).
- **Prosopis* ? *glandulosa* var. *glandulosa* (Declared Pest Category 2 and WONS).

A total of 42 Vegetation Associations were recorded during the surveys, including tussock and hummock grassland, woodlands, shrublands and open forest (Figure 5). No TECs or PECs were identified within the Survey Area (MWH 2014).

MWH (2014) identified degradation of vegetation (or 'edge effects') extending 10 to 20 m into the surrounding vegetation adjacent to the existing roads as a result of soil compaction from mechanical disturbance, dust deposition, grazing pressure and the presence of introduced species.



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0 5 km

Shire of Halls Creek
Stage 1 Duncan and Gordon Downs Road Upgrades

Figure 5

Overview of Regional Vegetation

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4. ASSESSMENT OF CLEARING PRINCIPLES

4.1 NATIVE VEGETATION CLEARING PRINCIPLES

Clearing applications are assessed against 10 principles outlined in Schedule 5 of the *EP Act 1986*. These principles aim to ensure that all potential impacts resulting from removal of native vegetation are assessed in an integrated way and apply to all lands throughout Western Australia. The principles address the four environmental areas of biodiversity significance, land degradation, conservation estate and ground and surface water quality.

The following sections discuss the potential impacts associated with clearing for the Project. A summary of the outcomes of the assessment against the 10 Clearing Principles is provided in Table 3.

Table 3: Summary of Clearing Assessment Against Clearing Principles

Principle Number	Clearing Principle	Outcome
a	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Unlikely to be at variance
b	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Unlikely to be at variance
c	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	Not at variance
d	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a Threatened Ecological Community (TEC).	Not at variance
e	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Not at variance
f	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	Likely to be at variance.
g	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Unlikely to be at variance.
h	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation areas.	Not at variance
i	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	Unlikely to be at variance.
j	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	Not at variance

4.2 BIODIVERSITY

Clearing principle a: Native vegetation should not be cleared if it comprises a high level of biological diversity.

Desktop assessments for the Project identified one significant flora species, *Atriplex flabelliformis* within 1 km of the Clearing Envelope. Flora surveys covering sections of the Clearing Envelope (MWH 2014) identified a total of 258 flora species from 56 families and 140 genera. The most common genera were Acacia, Triodia and Eucalyptus, which are characteristic of the dominant vegetation types within the IBRA subregion (MWH 2014).

The desktop assessment and survey data did not record any Threatened flora species or Threatened Ecological Communities within or adjacent to the Clearing Envelope.

Fourteen introduced flora species were recorded during the surveys completed by Northern Minerals Limited, including two listed as Declared Pests under Section 22 of the *Biosecurity and Agriculture Management Act 2007* with one also listed as a Weed of National Significance (WONS).

Approximately 500 ha of the Clearing Envelope (32.9%) has vegetation mapping available from vegetation surveys completed by Northern Minerals Limited (MWH 2014). The majority of the mapped vegetation within the Clearing Envelope is Grassland (Grazed plains). The Grassland (Grazed plains) vegetation is described as '*Vachellia farnesiana* sparse to isolated shrubs over grassland of mixed species and isolated herbs' (MWH 2014).

The vegetation condition for the proposed clearing areas covered by survey was mapped as Very Good to Excellent Condition (Table 4). However, MWH (2014) also identified that 'edge effects' extend 10 to 20 m into the surrounding vegetation adjacent to the existing roads as a result of soil compaction from mechanical disturbance, dust deposition, grazing pressure and the expansion of introduced species. The vegetation adjacent to the existing roads, where the majority of clearing is proposed, is assumed to be Completely Degraded.

Table 4: Condition of Vegetation within Clearing Envelope (within areas surveyed by MWH (2014))

Vegetation Condition	Clearing Area (ha)	% Total
Excellent to Very Good	9.10	10.02
Very Good	56.14	61.82
Very Good to Totally Degraded	20.17	22.21
Degraded	0.19	0.21
Totally Degraded	5.22	5.74
Total	90.80	100

The proposed clearing is unlikely to impact vegetation comprising a high level of biological diversity, and is unlikely to be at variance to Principle a.

4.3 SIGNIFICANT FAUNA HABITAT

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

Flora, fauna and vegetation surveys commissioned by Northern Minerals Limited (MWH 2014) included fauna habitat mapping, which covered 500 ha of the Clearing Envelope. Four fauna habitats were recorded across the Clearing Envelope, with Pasture Grassland comprising the majority of the mapped habitat (Table 5)

Table 5: Mapped Fauna Habitat within the Clearing Envelope

Vegetation Association	Fauna Habitat	Area within Clearing Envelope (ha)	Area within Clearing Envelope (%)
26	Pasture Grassland	432.35	86.44
2	Drainage Line	15.13	3.02
D	Disturbance	5.21	1.04
7	Acacia Shrubland on Gravel	47.5	9.5
	Total	500.2	100

The MWH (2014) survey identified that the low-lying Pasture Grassland habitats are generally of low quality due to grazing pressure and weed introduction. Fauna habitat within the Ord River Regeneration Reserve is considered highly degraded and unlikely to be of value to native fauna (MWH 2014).

The proposed floodways occur within Pasture Grassland and Drainage Line habitats (MWH 2014). MWH (2014) identified Drainage Line habitat as consisting of minor, upper order watercourses that do not contain water for much of the year (MWH 2014). Vegetation within Drainage Line habitat comprises open woodland of *Eucalyptus limitaris* and *Corymbia opaca* over scattered shrubs of *Vachellia farnesiana* and sparse grassland of *Cenchrus ciliaris, Chrysopogon fallax* and *Eulalia aurea* (MWH 2014). This habitat type is considered significant, likely due to its limited extent within the region and inherent value for fauna (MWH 2014). Clearing of Drainage Line habitat will be minimal.

The Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) and DBCA NatureMap Database Search (Appendix 1) identified 32 Threatened and Priority Fauna species as potentially occurring within a 50 km radius of the Clearing Envelope.

Based on the NatureMap records and surveys conducted by MWH (2014), 25 fauna species have been recorded in the region, with two species, the Grey Falcon *(Falco hypoleucos)* and Sharp-tailed Sandpiper *(Calidris acuminata),* recorded within 5 km of the Clearing Envelope. The locations of the Threatened fauna species records in relation to the Clearing Envelope are shown in Figure 6.

The Grey Falcon *(Falco hypoleucos)* (VU) and Sharp-tailed Sandpiper *(Calidris acuminata)* (MI, M) are listed under the *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) respectively, and have been recorded within 5 km of the Clearing Envelope. The Grey Falcon inhabits timbered lowland plains, particularly Acacia shrublands with tree-lined water courses (DoEE 2019a). It predominantly occurs in arid and semi-arid zones where there is usually less than 500 mm of annual rainfall (DoEE 2019a). Nests are typically constructed in the tallest trees along watercourses, particularly River Red Gum *(Eucalyptus camaldulensis)* and Coolibah *(E. coolabah),* with breeding occurring from June to November (DoEE 2019a).

The Sharp-tailed Sandpiper is a small to medium wader that predominantly occurs on the muddy edges of shallow fresh or brackish wetlands, including lagoons, swamps and lakes (DoEE 2019b). It has been observed in flooded

fields and paddocks, sedgelands and other ephemeral wetlands, but will leave these areas once they are dry (DoEE 2019b). The species also uses mudflats, mangroves, rocky shores and beaches (DoEE 2019b). Sharp-tailed Sandpipers breed in northern Siberia, returning to Australia during the non-breeding season from mid-August to April (DoEE 2019b).

There is potential for both species to occur within habitat adjacent to watercourses within the Clearing Envelope. Clearing adjacent to watercourses will be limited to the proposed floodways. Both the Grey Falcon and Sharp-tailed Sandpiper are highly mobile and are unlikely to rely on the habitat immediately adjacent to the current Duncan Rd and Gordon Downs Rd where the clearing is proposed.

The vegetation proposed to be cleared is unlikely to comprise significant habitat for these species or other fauna indigenous to Western Australia, and it is unlikely that the proposed clearing will be at variance to Principle b.

Mitigation and management measures to prevent impacts to fauna will include retaining cleared vegetation for use in rehabilitation, inspection of excavations for trapped fauna and the relocation of any captured fauna.

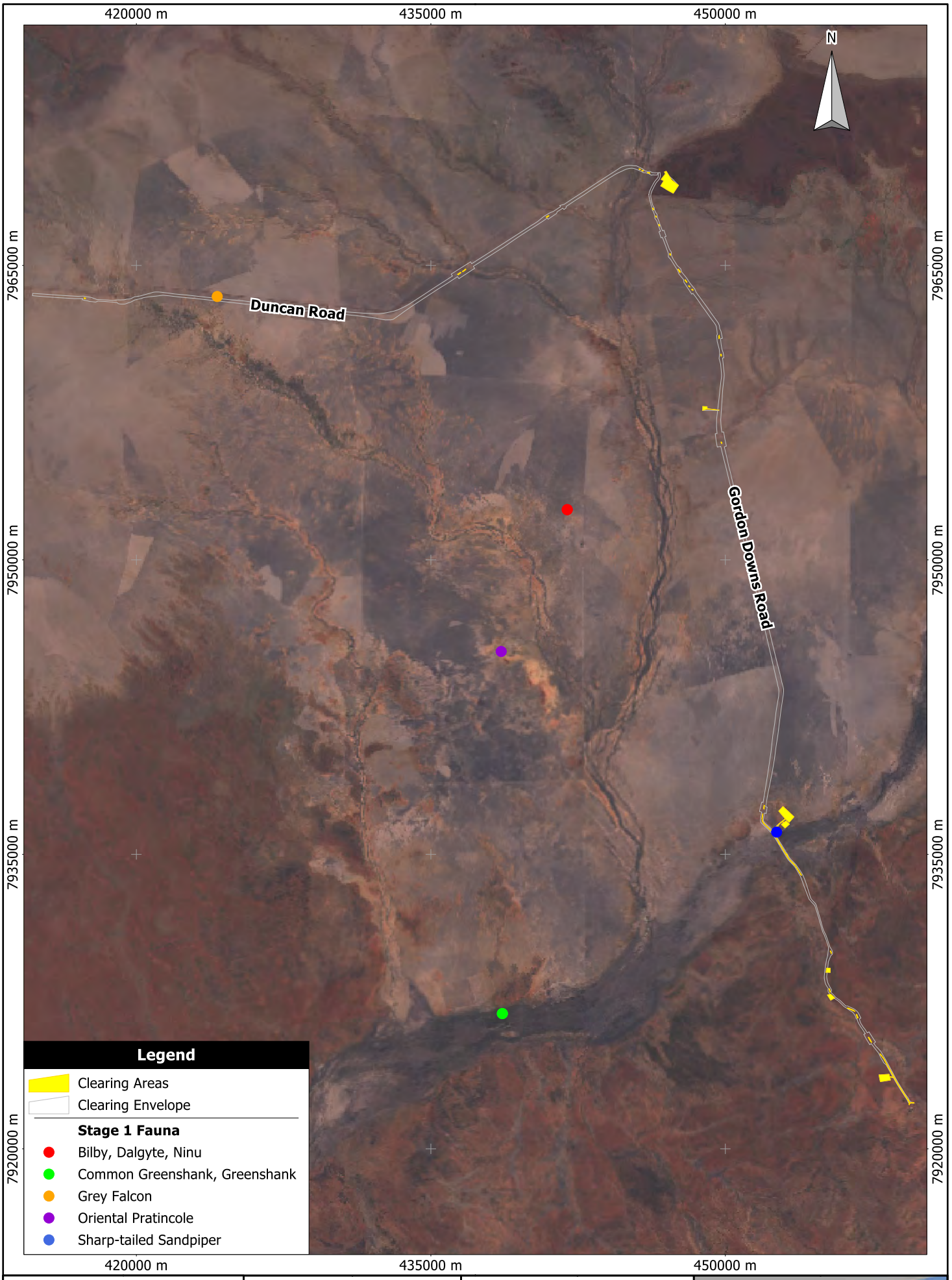

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Figure 6

Threatened Fauna Species in Relation to the Clearing Envelope

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4.4 SIGNIFICANT FLORA

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

The EPBC Protected Matters Search Tool and the DBCA NatureMap database were interrogated to identify any Threatened flora species potentially occurring in the Clearing Envelope. Results from flora and vegetation surveys (MWH 2014) were also reviewed.

No Threatened flora species have been recorded within the Clearing Envelope and no database records were identified within a 50 km search radius (Appendix 1).

The proposed clearing is unlikely to impact vegetation that includes, or is necessary for the continued existence of, rare flora. The proposed clearing is not at variance to Principle c.

4.5 THREATENED ECOLOGICAL COMMUNITIES

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

No Threatened Ecological Communities (TEC) listed under the EPBC Act were identified within a 50 km search radius (Appendix 1). No TECs listed under the BC Act were identified within a 50 km search radius (Appendix 1). Therefore, the proposed clearing will have no impacts on a TEC and is not at variance to Principle d.

4.6 REMNANT VEGETATION

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

The Clearing Envelope intersects a number of pre-European vegetation associations, as detailed in Table 6.

The EPA uses a standard level of native vegetation retention of at least 30% of the pre-clearing extent of a ecological community as a benchmark. The levels of native vegetation retention have most recently been recognised in the National Objectives and Targets for Biodiversity Conservation 2001-2005, which recognised that the retention of 30%, or more, of the pre-clearing extent of an ecological community is necessary if Australia's biological diversity is to be protected (Department of the Environment and Heritage 2001). The pre-European vegetation types occupying the Clearing Envelope will all have at least 99% remaining at a State-wide scale after the proposed clearing (Table 6) (DBCA 2018).

The vegetation to be cleared is not significant as a remnant of native vegetation in an area that has been extensively cleared and the proposed clearing will not be at variance with Clearing Principle e.

Table 6: Pre-European Vegetation Associations in the Clearing Envelope

System Association	SA Code	Description	Structure Description	Current Extent (ha) in State	Extent (ha) in Clearing area	% Remaining (after Proposed Clearing)
Sturt Plateau_848	848.1	Hummock grassland with scattered bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia*, *Eucalyptus leucophloia*	Low tree-steppe	223,137.30	50.26	99.99
Sturt Plateau_850	850.2	Mainly Mitchell grass *Astrebla* spp.	Grasslands, tall bunch-grass savanna	310,505.48	36.37	99.99
Sturt Plateau_894	894	Coolibah over ribbon/blue grass (rivers) *Eucalyptus microtheca, Chrysopogon* spp., *Dichanthium* spp.	Grasslands, tall bunch- grass open savanna woodland	43,277.67	0.96	99.99
Sturt Plateau_1893	1,893	Hummock grassland with scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species, *Triodia* spp.	Spinifex complexes	16,349.73	19.50	99.99
Tanami_91	91.2	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophloia*	Sparse low tree-steppe	268,971.14	24.96	99.99
Tanami_895	895.1	Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp.	Shrub-steppe	1,151,279.56	11.98	99.99

4.7 WATERCOURSE OR WETLAND ENVIRONMENTS

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

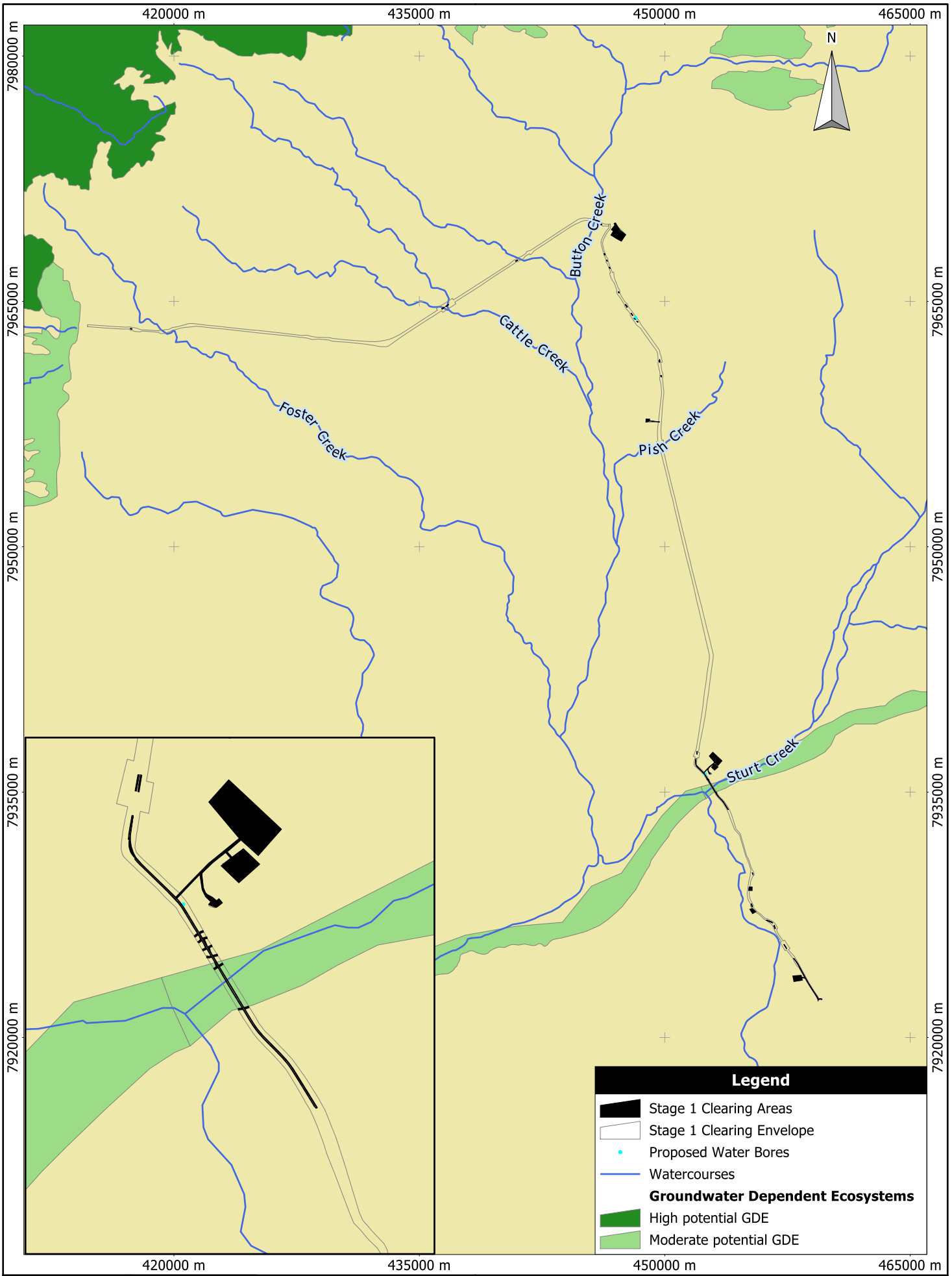
The Project is located within the Mackay Basin in the Western Plateau Division and within the Sturt Creek catchment. There is little to no surface water present within the Clearing Envelope and minimal runoff occurs as rainfall percolates freely into the soil. Two Ramsar wetlands, Lake Gregory and Lake Argyle, occur upstream of the Clearing Envelope, however they are both located over 180 km away and will not be impacted by the proposed road upgrades.

The proposed floodways occur within Pasture Grassland and Drainage Line habitats (MWH 2014). The proposed upgrades to the Sturt Creek floodway require clearing of approximately 6.6 ha of vegetation. Sturt Creek, which is considered a wetland of subregional significance (CALM 2002), flows from the Northern Territory border and feeds into Lake Gregory.

MWH (2014) identified Drainage Line habitat as consisting of minor, upper order watercourses that do not contain water for much of the year (MWH 2014). Vegetation within Drainage Line habitat comprises open woodland of *Eucalyptus limitaris* and *Corymbia opaca* over scattered shrubs of *Vachellia farnesiana* and sparse grassland of *Cenchrus ciliaris, Chrysopogon fallax* and *Eulalia aurea* (MWH 2014). This habitat type is considered significant, likely due to its limited extent within the region and inherent value for fauna (MWH 2014).

Along Sturt Creek there is a moderate potential for a groundwater-dependent ecosystem (GDE) to be present (Figure 7), as identified by the BOM National GDE Atlas (BOM 2019b). The proposed Sturt Creek floodway upgrades clearing area overlaps the potential GDE mapping over an area of 0.9 ha.

Based on the presence of Sturt Creek, the potential for a GDE and the proposed clearing within Drainage Line habitat, the clearing is likely to be at variance with Principle f. However, given the seasonality of water within the Drainage Line habitat and the minimal clearing to be undertaken for the purposes of constructing the floodways (21 ha over about 83 km), any impacts to wetland and watercourse vegetation will be minimal. Clearing within the potential GDE mapping area covers only 0.06% of the total area of the potential GDE mapping and is unlikely to result in significant impacts. Further, the proposed Sturt Creek floodway will help to alleviate future impacts to the creek and associated vegetation during the wet season.



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Original Size: A4
Grid: MGA94(52)

0 10 km

Shire of Halls Creek
Stage 1 Duncan and Gordon Downs Road Upgrades

Figure 7

Potential Groundwater-Dependent Ecosystems

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W:\Shire of Halls Creek\Stage 1 NVCP\Drawings\SOHC PEIA Stage 1.map 16/08/2019 F7 Potential GDE Layout

4.8 LAND DEGRADATION

Clearing principle g: Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

A review of the Atlas of Australian Acid Sulphate Soils (ASS) database identified that the entire Clearing Envelope occurs in an area of Extremely Low Probability of Occurrence of ASS, with the exception of 0.5 ha (which is within an area of High Probability of Occurrence of ASS) (CSIRO 2011).

Given the high seasonal rainfall experienced in the region during the summer months, many roads and drainage lines can be impacted by erosion. The proposed construction and upgrades of several floodways within the Clearing Envelope are for the purposes of preventing erosion of the roadways and adjacent land, thus preventing further land degradation from occurring.

The proposed clearing within the area of potential ASS will target gravel material for the construction of the road upgrades, which is typically not ASS. Potential ASS material is likely to be avoided as this is not suitable material for road construction.

As there is low potential for the exposure of ASS during the proposed clearing, the Project is unlikely to be at variance with Clearing Principle g.

4.9 CONSERVATION ESTATE

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

A reserve exists along the proposed Clearing Envelope at the southern extent of Gordon Downs Road, which covers the community of Kundat Djaru (Figure 3). It is allocated for the 'use or benefit of aboriginal inhabitants' (Landgate 2018).

No Environmentally Sensitive Areas (ESA) as declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* occur along or adjacent to the Clearing Envelope (DWER 2018a).

Considering no clearing will be undertaken within any reserve or ESA, the clearing will not be at variance to Clearing Principle h.

4.10 SURFACE AND GROUNDWATER QUALITY

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

4.10.1 Surface Water

Australia is divided up into drainage divisions that are sub-divided into regions, basins and then catchments (BOM 2012). All the proposed clearing is limited to the Lake Gregory Sub-Catchment of the Sturt Creek Catchment, located in the Mackay Basin (DWER 2018b).

The Ord River, O'Donnell River and Margaret River are present in the region but occur outside of the Clearing Envelope (Geoscience Australia 2017). Lake Gregory occurs 200 km to the south of the Clearing Envelope. Within the Clearing Envelope, a number of smaller watercourses cross the proposed road corridor, including Sturt Creek, Foster Creek, Button Creek and Pish Creek, all of which are ephemeral, intermittently flowing systems.

Two Ramsar wetlands, Lake Gregory and Lake Argyle, were identified during the EPBC Protected Matters Search (Appendix 1) but are located over 180 km from the Clearing Envelope and will not be impacted by the proposed road upgrades.

The 'Ord Irrigation District' and 'Ord River and Tributaries' Surface Water Irrigation Areas, as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act), occur within 2 km of the Duncan Road (DWER 2018c) but will not be impacted.

As the proposed clearing is for the purposes of upgrading and constructing floodways along the existing roads, there is likely to be a positive outcome in relation to surface water quality as a result of the works. The clearing is unlikely to significant impact surface water quality and is unlikely to be at variance with Clearing Principle I.

4.10.2 Groundwater

The Clearing Envelope occurs within the Canning-Kimberley Groundwater Area, as proclaimed under Section 26B (1) of the RIWI Act (DWER 2018d). The main groundwater source for the Halls Creek region occurs within King Leopold Sandstone, which overlies the Moola Bulla Formation (WRC 2012). Groundwater is considered to likely have salinity values of below 1,000 mg/L, with recharge occurring mostly by rainfall infiltration (WRC 2012).

The proposed clearing is mostly within areas with degraded vegetation and predominantly within grassland vegetation (Section 4.2). The extent of clearing is very limited (limited to discrete areas adjacent to existing infrastructure) and the clearing is therefore unlikely to significantly impact groundwater infiltration. Overall, the proposed clearing is considered unlikely to be at variance with Clearing Principle I.

4.11 FLOODING POTENTIAL

Clearing principle j: Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

The region experiences high seasonal rainfall during the summer months, with a high potential for flooding. A large amount of the proposed clearing is for the purposes of constructing and upgrading floodways, which will reduce the frequency and extend of flooding of the road and adjacent areas. The proposed clearing is not at variance to Principle j.

5. CONCLUSION

The proposed clearing was assessed as not at variance or unlikely to be at variance with nine of the ten clearing principles.

The proposed clearing may be at variance to Principle f, predominantly due to the proposed clearing within and adjacent to Sturt Creek.

Overall, given the small scale of the Project, and the degraded condition of vegetation within the proposed clearing areas, the impacts resulting from the proposed clearing will be minor and localised. All efforts will be made to minimise clearing and associated impacts to the environment.

6. REFERENCES

Bureau of Meteorology (BOM). 2019a. Climate Data Online. http://www.bom.gov.au./climate/data/index.shtml.

Bureau of Meteorology (BOM). 2019b. Groundwater Dependent Ecosystems Atlas. http://www.bom.gov.au/water/groundwater/gde/map.shtml (accessed 1 August 2019).

Department of Conservation and Land Management (CALM). 2002. A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002. Available at: https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/ord_victoria_plains02_p538-546.pdf

Department of Biodiversity, Conservation and Attractions (DBCA). 2018. DBCA Statewide Vegetation Statistics. Perth: DBCA. Available: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics.

Department of the Environment and Energy (DoEE). 2019a. *Consultation Document on Listing Eligibility and Conservation Actions: Falco hypoleucos (Grey Falcon).* Available: http://www.environment.gov.au/system/files/consultations/ad34afee-a901-4c94-8e71-654e9f15f29c/files/consultation-document-falco-hypoleucos.pdf (accessed 26 July 2019).

Department of the Environment and Energy (DoEE). 2019b. *Species Profile and Threats Database: Calidris acuminata — Sharp-tailed Sandpiper*. Available from: http://www.environment.gov.au/sprat (accessed 26 July 2019).

Department of Water (DoW). 2006. Ord River Water Management Plan. Water Resource Allocation and Planning Series: Report no. WRAP 15. Perth: DWER. https://www.water.wa.gov.au/__data/assets/pdf_file/0011/4700/70582.pdf.

Department of Water and Environmental Regulation (DWER). 2018a. Clearing Regulations - Environmentally Sensitive Areas (DWER-046). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046.

Department of Water and Environmental Regulation (DWER). 2018b. Hydrographic Catchments - Subcatchments (DWER-030). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-subcatchments.

Department of Water and Environmental Regulation (DWER). 2018c. RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/riwi-act-surface-water-areas-and-irrigation-districts.

Department of Water and Environmental Regulation (DWER). 2018d. RIWI Act, Groundwater Areas (DWER-034). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/riwi-act-groundwater-areas.

Graham, G. 2001a. Ord Victoria Plains 2 (OVP2- South Kimberley Interzone subregion). In: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, pp 538-546. Kensington, WA: Department of Conservation and Land Management (CALM).

Graham, G. 2001b. Tanami Desert 1 (Tan1-Tanami 1 subregion). In: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, pp 624-628. Kensington, WA: Department of Conservation and Land Management (CALM).

Landgate. 2018. Reserves (LGATE-227). Spatial data available from: https://catalogue.data.wa.gov.au/dataset/reserves.

MWH. 2014. Duncan/Gordon Downs Road Upgrade Project Level 1 Vegetation, Flora and Fauna Survey, December 2014. Report prepared for Northern Minerals Limited.

Tille, P.J. 2006. Soil-landscapes of Western Australia's rangelands and arid interior. Department of Agriculture and Food. Resource Management Technical Report 313.

Water and Rivers Commission (WRC). 2002. Halls Creek Water Reserve Water Source Protection Plan: Halls Creek Town Water Supply, Water and Rivers Commission, Water Resource Protection Series No WRP 48. https://library.dbca.wa.gov.au/static/Journals/930141/930141-48.pdf.

APPENDICES

APPENDIX 1: PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT (PEIA) 2019

DUNCAN RD AND GORDON DOWNS RD

PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

PREPARED FOR:

SHIRE OF HALLS CREEK

JUNE 2019

PREPARED BY:

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DUNCAN RD & GORDON DOWNS RD PEIA

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Document Control for Job Number: SHCPEIA

Document Status	Prepared By	Authorised By	Date
Draft Report	S. Stack	S. Shute	14 June 2019

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1. INTRODUCTION

The Shire of Halls Creek is seeking to complete a proposed upgrade of Duncan Rd and Gordon Downs Rd in the Shire of Halls Creek (total length of road approximately 161 km) (the Project).

The objectives of this Preliminary Impact Assessment (PEIA) are to:

- Describe and provide a preliminary assessment of the environmental values and constraints relevant to the proposed upgrade.
- Provide guidance regarding any technical studies (e.g. flora and vegetation surveys) likely to be required to support the required regulatory environmental approval(s) for the works.
- Provide guidance regarding the approval(s) (e.g. Native Vegetation Clearing Permits and Groundwater licences) likely to be required.

1.1 PROJECT PURPOSE

The Shire of Halls Creek is proposing to upgrade Duncan Rd and Gordon Downs Rd in the Shire of Halls Creek (total length of road approximately 161 km) (the Project). The Project includes the expansion of an existing ~20 gravel pits, development of ~20 proposed new gravel pits and the development of ~10 water bores and turkey's nests.

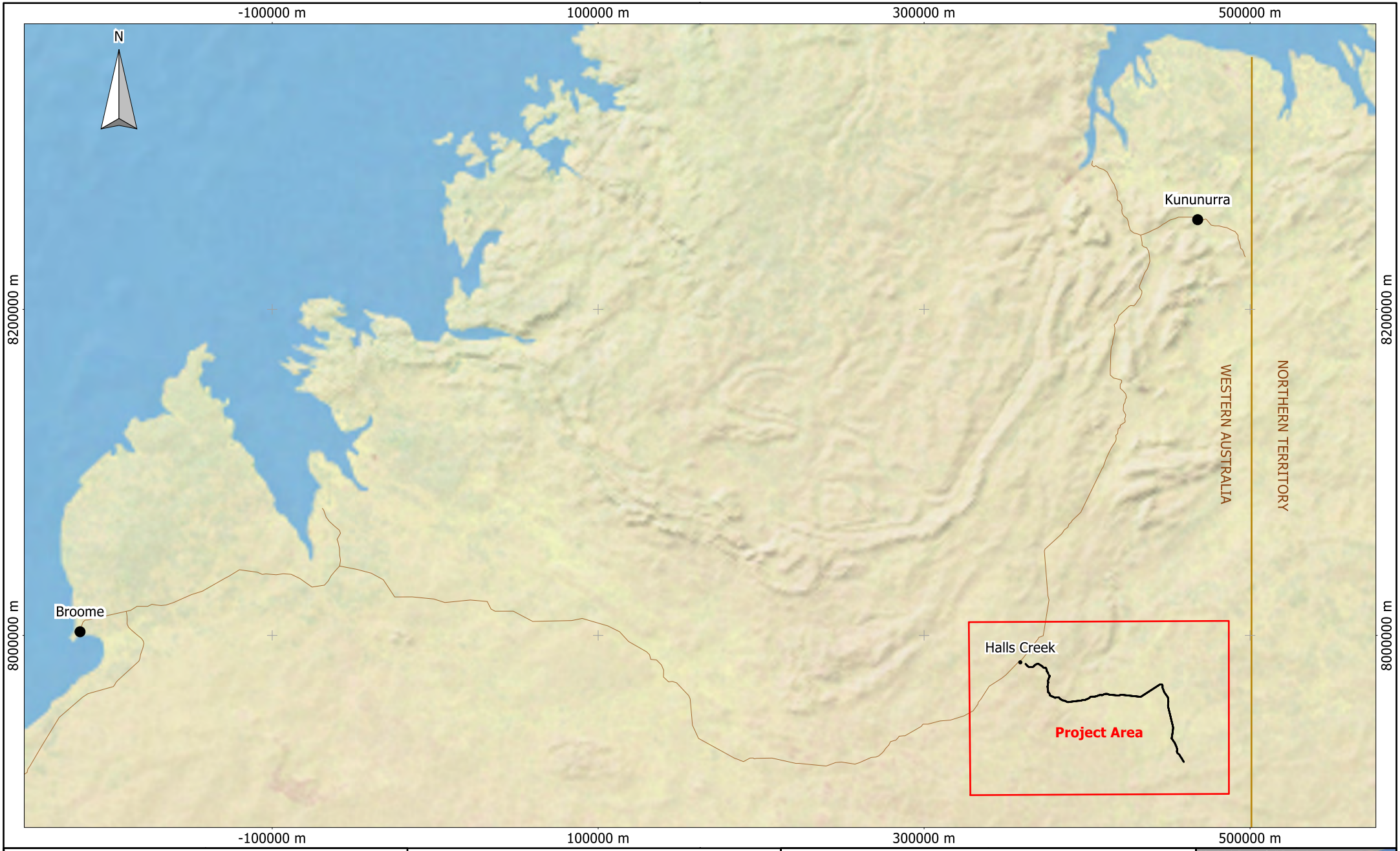
1.2 PROJECT LOCATION

The location of the Project area is shown in Figure 1. The description of the proposed upgrade is as follows:

- Commences approximately 6 km along the Duncan Rd (from the Great Northern Highway (GNH) intersection in Halls Creek).
- Extends approximately 115 km along the Duncan Rd from the GNH intersection to the intersection with the Gordon Downs Rd.
- Extends approximately 52 km along the Gordon Downs Rd to the Ringer Soak Community.

The area of potential disturbance, including the proposed road realignment sections, a 25 m buffer on either side of the road centreline, and the proposed new gravel pits and bore location, has been termed the Development Envelope within which all disturbance will occur. The PEIA (this document) assesses the environmental constraints associated with this Development Envelope, and implications for the final design and development of the Project.

The proposed road realignment sections total 256 ha, , the proposed new gravel pits total 155 ha and the remainder of the Development Envelope (representing a 25 m buffer on either side of the current road centreline) totals 831 ha.



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Grid: MGA94(52)

0 50 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
Preliminary Environmental Impact Assessment

Figure 1

Location Plan

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W:\Shire of Halls Creek\GIS\Location Map.map 12/06/2019 Location Plan Layout

2. PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

2.1 IDENTIFICATION OF KEY ENVIRONMENTAL ASPECTS

MRWA's '*Preliminary Environmental Impact Assessment Environmental Management Plan (PEIA/EMP)*' guidance identifies the following environmental aspects (and relevant Environmental Protection Authority (EPA) factor(s) in brackets if different) as needing to be considered:

- Aboriginal Heritage / Native Title (Social Surrounds).
- Acid Sulphate Soils (Terrestrial Environmental Quality).
- Air quality.
- Contamination (Terrestrial Environmental Quality).
- Dust (relevant to potential impacts on Flora and Vegetation, Terrestrial Fauna).
- Groundwater (Inland Waters).
- Hazardous substances (Terrestrial Environmental Quality, Inland Waters).
- Heritage (non-indigenous) (Social Surrounds).
- Land Vesting (Social Surrounds).
- Noise and vibration (Social Surrounds).
- Surface water/drainage (Inland Waters).
- Visual amenity (Social Surrounds).
- Wetlands (Inland Waters, Flora and Vegetation, Terrestrial Fauna).
- Reserves / Conservation areas (Social Surrounds).
- Declared plants (weeds) (Flora and Vegetation).
- Vegetation (Flora and Vegetation).
- Biodiversity (Flora and Vegetation, Terrestrial Fauna).
- Dieback and other diseases or pathogens (Flora and Vegetation).
- Other.

A review of the Project and associated activities, together with the desktop review of the local environment, has been completed to identify the key environmental aspects for the Project.

The following environmental aspects are considered relevant to the Project:

- Vegetation (Flora and vegetation).
- Biodiversity (Flora and vegetation, Terrestrial fauna).
- Acid Sulphate Soils (Terrestrial Environmental Quality).
- Surface water/drainage (Inland Waters).
- Groundwater (Inland Waters).
- Aboriginal Heritage / Native Title (Social Surrounds).
- Land Vesting (Social Surrounds).

For the purposes of this report, the proposed Development Envelope has been divided into five zones to allow appropriate detail to be provided and mapped. These zones are outlined in Figure 2.

360000 m 370000 m 380000 m 390000 m 400000 m 410000 m 420000 m 430000 m 440000 m 450000 m 460000 m

7980000 m 7970000 m 7960000 m 7950000 m 7940000 m 7930000 m 7920000 m

N

Halls Creek

Zone A

Zone B

Duncan Road

Zone C

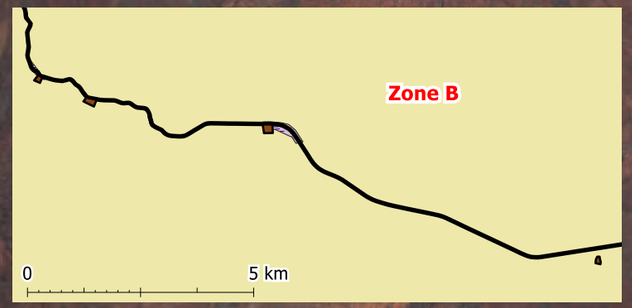
Duncan Road

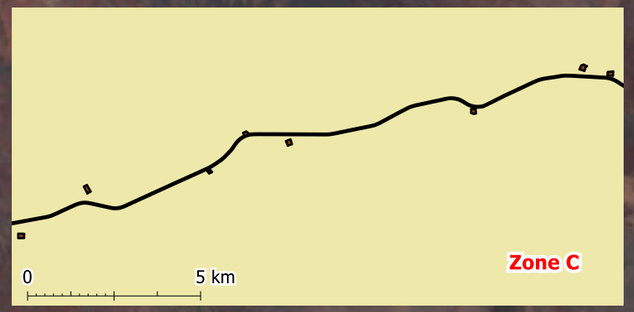
Zone D

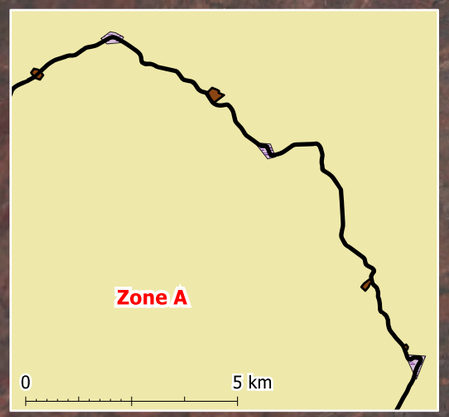
Gordon Downs Road

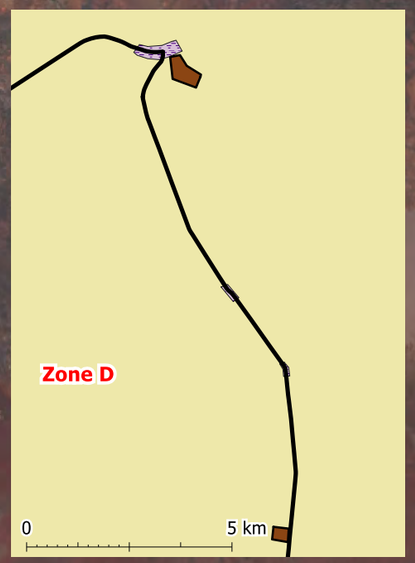
Gordon Downs

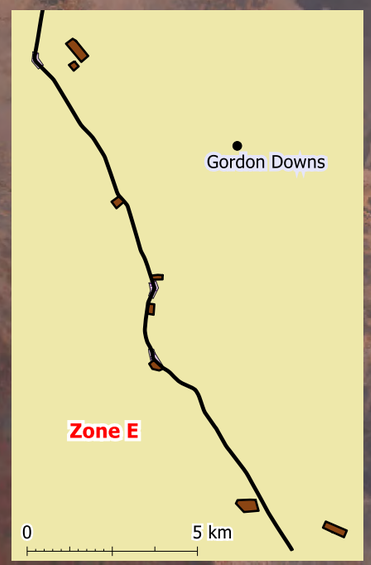
Zone E











Legend

Proposed Road Upgrades

Roads

Gravel Pits

Proposed Realignment Areas

Scale: 1:280000
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Grid: MGA94(52)

0 10 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
Preliminary Environmental Impact Assessment

Figure 2

Project Developement Envelope Zones

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W:\Shire of Halls Creek\Reporting\PEIA\Drawings\SOHC PEIA.map 12/06/2019 F2 DE Road Zones Layout

2.2 REVIEW OF DESKTOP DATA

2.2.1 Flora and Vegetation

2.2.1.1 Significant Flora Species

No Threatened Flora species under the EPBC Act were identified in database searches within a 50 km search radius (Appendix 1).

A Department of Biodiversity, Conservation and Attractions (DBCA) NatureMap database search for Threatened and Priority Flora identified no Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) within a 50 km buffer of Duncan Rd and Gordon Downs Rd. Seventeen Priority species were identified, with four occurring within 2 km of, but outside, the Development Envelope. These species are:

- *Pentalepis trichodesmoides* subsp. *incana* (P1).
- *Atriplex flabelliformis* (P3).
- *Fimbristylis sieberiana* (P3).
- *Goodenia crenata* (P3).

These species are discussed in further detail in the sections below. An overview of the locations of the Priority flora species in relation to the Development Envelope are shown in Figure 3, with detailed figures for each road zone displayed in Figure 4 – Figure 8. Results from the NatureMap database search are provided in Appendix 3.

A survey commissioned by Northern Minerals (MWH 2014) mapped *Goodenia crenata* (P3) adjacent to the current Gordon Duncan Rd alignment within Zone E (Plate 1).

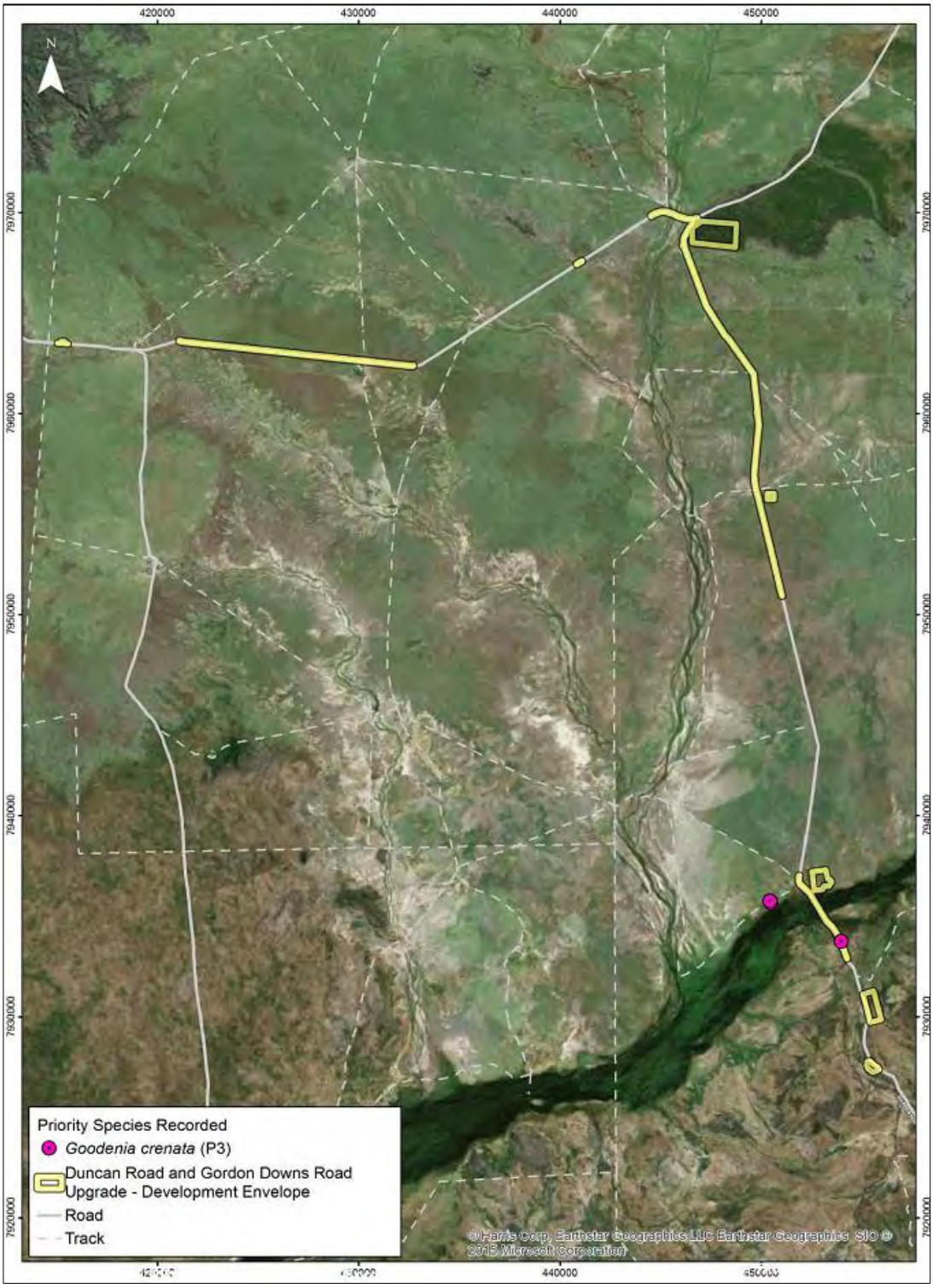

Plate 1: Mapped Priority Species (MWH 2014)

Pentalepis trichodesmoides* subsp. *incana

Pentalepis trichodesmoides subsp. *incana* is listed as a Priority 1 flora species by DBCA. It is a small shrub, growing up to 1 m in height with silvery grey leaves (Orchard and Cross 2012). The species is found in *Triodia* grassland and *Eucalyptus* woodland on skeletal soils (Orchard and Cross 2012). The species is endemic to Western Australian and is found within the Central Kimberley, Ord Victoria Plain and Pilbara IBRA Regions (Orchard and Cross 2012; WAH 2019).

The *Pentalepis trichodesmoides* subsp. *incana* species was recorded adjacent to Zone A, within the Halls Creek Township, over 5 km from the Development Envelope, with one individual recorded.

Atriplex flabelliformis

Atriplex flabelliformis is listed as a Priority 3 flora species by DBCA. It is a small, perennial herb which grown up to 35 cm high (WAH 2019). The species is typically found on saline flats or marshes in clay loam or loam soils (WAH 2019). The species has been recorded in the Great Sandy Desert, Pilbara and Tanami IBRA Regions (WAH 2019).

Only one record of this species was identified, with an individual specimen recorded 700 m east of the Development Envelope within Zone E.

Fimbristylis sieberiana

Fimbristylis sieberiana is listed as a Priority 3 flora species by DBCA. It is a grass-like, perennial herb that grows between 25 and 60 cm in height (WAH 2019). The species flowers from May to June and occurs on pool edges and sandstone cliffs comprising mud and skeletal soil pockets (WAH 2019). The species occurs across northern WA, with populations also recorded in the Pilbara IBRA Region (WAH 2019).

Three individuals of this species have been previously recorded in the region, with two individuals recorded 75 m north of the Development Envelope within Zone B.

Goodenia crenata

Goodenia crenata is listed as a Priority 3 flora species by DBCA. It is a small herb that grows up to 10 cm and flowers between May and July (WAH 2019). The species occurs on fine, red earth and red clays within flat sandplains and sandstone outcrops (WAH 2019). The species occurs within the Central Kimberley, Ord Victoria Plain and Tanami IBRA Regions (WAH 2019).

One *Goodenia crenata* individual has been recorded adjacent to Zone A, within the Halls Creek Township, over 5 km from the Development Envelope, from the same location as the *Pentalepis trichodesmoides* subsp. *incana* specimen.

2.2.1.2 Invasive Species

The EPBC Protected Matters Search identified six species of weeds that potentially occur within a 50 km radius of the proposed Development Envelope (Appendix 1). Under the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act), invasive species can be categorised into five legal status definitions:

- Declared Pest, Prohibited – s12.
- Declared Pest – s22(2).
- Permitted – s11.
- Permitted, Required Permit – r73.
- Unlisted – s14.

Declared pests can also be assigned different control and keeping categories. The species identified in the area and their statuses under the BAM Act are provided in Table 1 (DPIRD 2019). Mesquite and Prickly Acacia are both Prohibited species under the BAM Act, with a control focus of eradication across the State. Parkinsonia is a

Declared Pest and the control category requires some form of management be applied. The remaining invasive species are exempt or require no management actions.

Table 1: Invasive Species of the Project Area

Species	Legal Status	Control/ Keeping Category
Mesquite *(Prosopis* spp.)	Declared Pest, Prohibited - s12	C2 – Eradication / Prohibited
Prickly Acacia *(Vachellia nilotica)*	Declared Pest, Prohibited - s12	C2 – Eradication / Prohibited
Parkinsonia *(Parkinsonia aculeata)*	Declared Pest - s22(2)	C3 – Management / Exempt
Athel Pine *(Tamarix aphylla)*	Declared Pest - s22(2)	Exempt
Para Grass *(Brachiaria mutica)*	Permitted – s11	N/A
Buffel-grass *(Cenchrus ciliaris)*	Permitted – s11	N/A

Survey of the proposed alignment of a haul road for the Browns Range Project, which partially overlaps the section of Gordon Downs Rd within Zone E, recorded the introduced species *Cenchrus setiger* and *Stylosanthes hamata* immediately adjacent to Gordon Downs Rd (Outback Ecology 2014).

2.2.1.1 Vegetation Associations

The Development Envelope intersects a number of broad scale vegetation associations, as detailed in Table 2.

Table 2: Pre-European Vegetation Associations in the Development Envelope

System Association	SA Code	Description	Structure Description	IBRA Subregion	% Remaining (State-wide)	Area in DE (ha)	% Total DE
Ord Plains_91	91	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum Triodia spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Purnululu	100	6.3	0.51
Ord Plains_91	91.2	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum Triodia spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Tanami Desert	99.82	86.7	6.98
Ord Plains_816	816.1	Short grasses with scattered trees e.g. Bauhinia and snappy gum *Enneapogon* spp., *Aristida* spp. with *Lysiphyllum cunninghamii, Eucalyptus brevifolia*	Grasslands, short bunch-grass low-tree savanna	Punrululu	99.84	193.2	15.55
Ord Plains_816	816.1	Short grasses with scattered trees e.g. Bauhinia and snappy gum *Enneapogon* spp., *Aristida* spp. with *Lysiphyllum cunninghamii, Eucalyptus brevifolia*	Grasslands, short bunch-grass low-tree savanna	South Kimberly Interzone	100	1.8	0.14
Halls Creek Ridges_831	831	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia*, *C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Hart	99.57	0.3	0.02
Halls Creek Ridges_831	831	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia*, *C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Purnululu	99.96	131.8	10.6
Bow River Hills_837	837.1	Short grasses with scattered trees e.g. Bauhinia and snappy gum *Enneapogon* spp., *Aristida* spp. with *Lysiphyllum cunninghamii, Eucalyptus brevifolia*	Grasslands, short bunch-grass low-tree savanna	Hart	99.82	9.8	0.79
Ord Plains_847	847	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Purnululu	100	20.1	1.62

System Association	SA Code	Description	Structure Description	IBRA Subregion	% Remaining (State-wide)	Area in DE (ha)	% Total DE
Sturt Plateau_848	848.1	Hummock grassland with scattered bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia, Eucalyptus leucophloia*	Low tree-steppe	South Kimberly Interzone	99.78	78.4	6.31
Ord Plains_850	850.2	Mainly Mitchell grass *Astrebla* spp.	Grasslands, tall bunch-grass savanna	South Kimberly Interzone	99.93	507.6	40.84
Halls Creek Ridges_851	851.1	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia, C. opaca, Eucalyptus leucophoia*	Sparse low tree-steppe	Purnululu	99.95	93.7	7.54
Bow River Hills_871	871.1		Curly spinifex or short grass low tree savanna / Grass-steppe	Hart	99.86	4.8	0.38
Sturt Plateau_894	894	Coolibah over ribbon/blue grass (rivers) *Eucalyptus microtheca, Chrysopogon* spp., *Dichanthium* spp.	Grasslands, tall bunch-grass open savanna woodland	South Kimberly Interzone	99.76	30.1	2.42
Tanami_895	895.1	Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp	Shrub-steppe	Tanami Desert	99.37	53.4	4.3
Sturt Plateau_1893	1893	Hummock grassland with scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species, *Triodia* spp.	Spinifex complexes	South Kimberly Interzone	100	21	1.69
Sturt Plateau_1893	1893	Hummock grassland with scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species, *Triodia* spp.	Spinifex complexes	Tanami Desert	100	3.7	0.3
TOTAL						1,242.7	100

To encompass current recognised levels of remnant native vegetation retention, the EPA uses a standard level of native vegetation retention of at least 30% of the pre-clearing extent of the ecological communities. These levels have been most recently recognised in the National Objectives and Targets for Biodiversity Conservation 2001-2005, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (Department of the Environment and Heritage 2001). The Pre-European vegetation types occupying the Development Envelope all have at least 99% remaining at a State-wide scale (Government of Western Australia 2018). This is well above the 30% threshold set by the EPA and neither would the clearing of the vegetation within the Survey Area result in it falling below this threshold.

Survey of the proposed alignment of a haul road for the Browns Range Project, which partially overlaps the section of Gordon Downs Rd within Zone E, recorded vegetation associations '*Eucalyptus brevifolia* (rocky hills)', '*Eucalyptus cupularis* (rocky hills)' and '*Acacia synchronicia* over Tussock Grassland (broad flats)' in proximity to the Development Envelope (Outback Ecology 2014).

A further survey commissioned by Northern Minerals (MWH 2014) mapped Grassland (Grazed Plains) adjacent to the current Gordon Duncan Rd alignment within Zone E (Plate 2) and adjacent to a section of the current Duncan Rd alignment within Zone D (Plate 3).

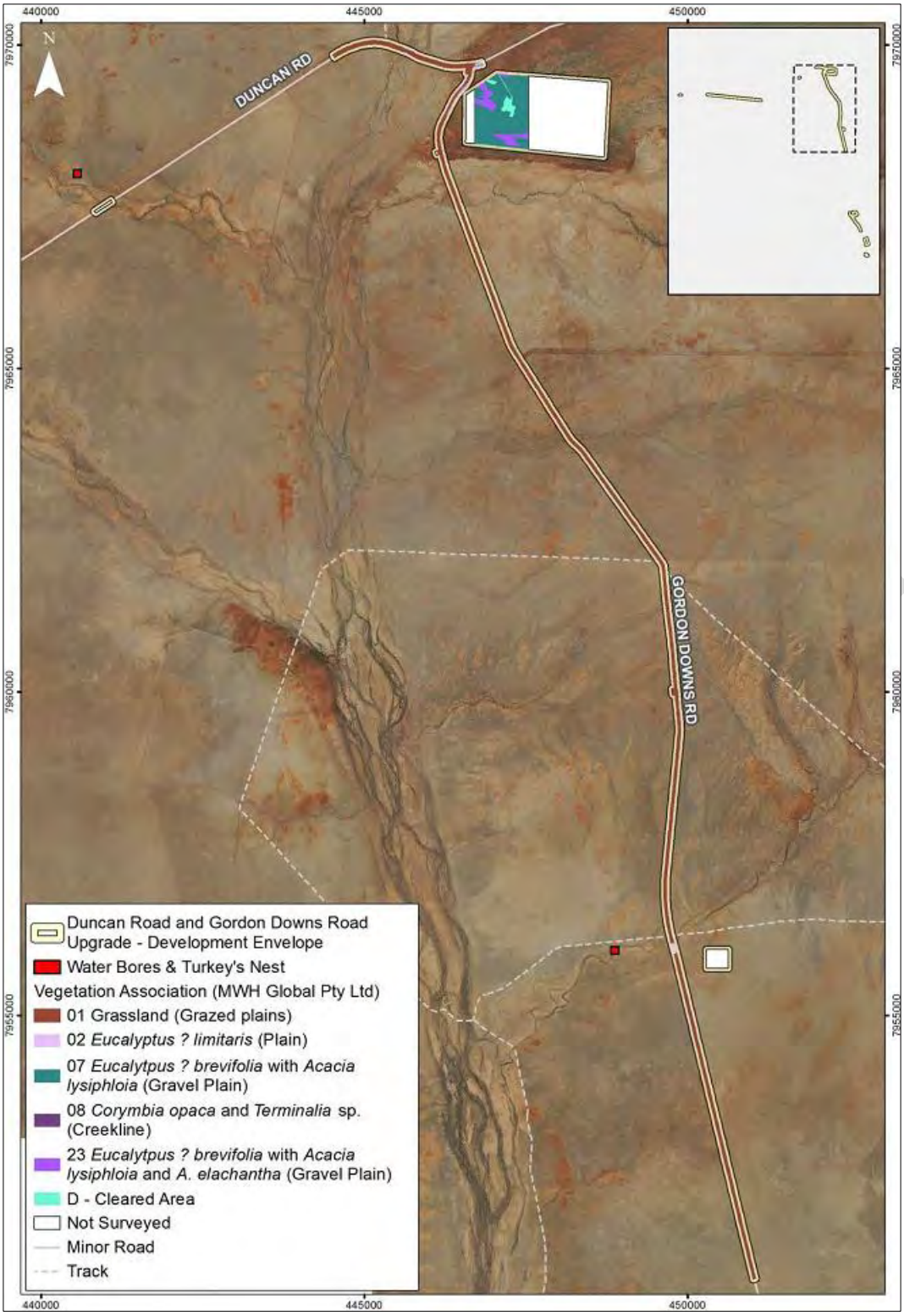

Plate 2: Mapped Vegetation Associations (MWH 2014)

Plate 3: Mapped Vegetation Associations (MWH 2014)

The MWH survey (MWH 2014) mapped the majority of vegetation adjacent to the current Gordon Duncan Rd alignment within Zone E and adjacent to a section of the current Duncan Rd alignment within Zone D as 'Totally Degraded' (Plate 4, Plate 5).

Plate 4: Mapped Vegetation Condition (MWH 2014)

Plate 5: Mapped Vegetation Condition (MWH 2014)

2.2.1.2 Threatened Ecological Communities

No Threatened Ecological Communities (TEC) listed under the EPBC Act were identified within a 50 km search radius (Appendix 1).

The DBCA NatureMap database search identified three Priority Ecological Communities intersecting the proposed Development Envelope (Appendix 3). These are:

- Kimberley Vegetation Association 834 (Grasslands, tall bunch grass savanna, mitchell & blue grass).
- Kimberley Vegetation Association 850 (Grasslands, tall bunch grass savanna, mitchell & blue grass).
- Gordon Land System (Low hilly to undulating limestone country on inland and coastal erosional plains).

The extents of these communities are displayed in Figure 3. and Figure 4 to Figure 8.

2.2.2 Terrestrial Fauna

The Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) (Appendix 2) and DBCA NatureMap Database Searches (Appendix 3) identified 33 Threatened and Priority Fauna species, as listed under the BC Act or listed on the DBCA Priority Fauna List, as potentially occurring within a 50 km search radius of Duncan Road and Gordon Downs Road (Table 3). Of these species, 25 have previously been recorded in the region based on the NatureMap records, with 16 species recorded within 2 km of the Development Envelope.

Table 3: Significant Fauna Species within the Region as Returned from the Database Searches

Species	Conservation Status		Observed in the Region	Recorded within 2 km of Development Envelope
	EPBC Act	BC Act/ DBCA Listing		
Birds				
Australian Painted-snipe *(Rostratula australis)*	EN, M	EN		
Barn Swallow *(Hirundo rustica)*	MI, M	MI		
Black-tailed Godwit *(Limosa limosa)*	MI, M	IA	Yes	Yes
Caspian Tern *(Hydroprogne caspia)*	MI, M	MI	Yes	
Common Sandpiper *(Actitis hypoleucos)*	MI	MI	Yes	Yes
Common Greenshank *(Tringa nebularia)*	MI	MI	Yes	
Curlew Sandpiper (*Calidris ferruginea)*	CR, M	CR, IA	Yes	Yes
Fork-tailed Swift *(Apus pacificus)*	MI	MI	Yes	
Glossy Ibis *(Plegadis falcinellus)*	MI	MI	Yes	
Gouldian Finch *(Erythrura gouldiae)*	EN	P4	Yes	Yes
Greater Sand Plover *(Charadrius leschenaultii)*	VU, MI, M	VU, IA	Yes	Yes
Grey Falcon *(Falco hypoleucos)*	-	VU	Yes	Yes
Grey Wagtail *(Motacilla cinerea)*	MI, M	MI		
Gull-billed Tern *(Gelochelidon nilotica)*	MI, M	IA	Yes	Yes
Little Curlew *(Numenius minutus)*	MI	MI	Yes	
Marsh Sandpiper, Little Greenshank *(Tringa stagnatilis)*	MI, M	IA	Yes	Yes
Night Parrot *(Pezoporus occidentalis)*	EN	EN		
Oriental Plover *(Charadrius veredus)*	MI	MI	Yes	
Oriental Pratincole *(Glareola maldivarum)*	MI	MI	Yes	
Peregrine Falcon *(Falco peregrinus)*	-	OS	Yes	Yes
Princess Parrot *(Polytelis alexandrae)*	VU	P4		
Red Goshawk *(Erythrotriorchis radiatus)*	VU	VU		
Red-rumped Swallow *(Cecropis daurica)*	MI, M	MI		
Sharp-tailed Sandpiper *(Calidris acuminata)*	MI, M	IA	Yes	Yes
White-winged Black Tern, White-winged Tern *(Chlidonias leucopterus)*	MI, M	IA	Yes	Yes
Wood Sandpiper *(Tringa glareola)*	MI, M	IA	Yes	Yes
Yellow Wagtail *(Motacilla flava)*	MI, M	MI		
Mammals				
Ghost Bat *(Macroderma gigas)*	VU	VU	Yes	Yes
Greater Bilby *(Macrotis lagotis)*	VU	VU	Yes	
Northern Brushtail Possum (Kimberley)	-	VU	Yes	Yes

Species	Conservation Status		Observed in the Region	Recorded within 2 km of Development Envelope
	EPBC Act	BC Act/ DBCA Listing		
(Trichosurus vulpecula arnhemensis)				
Yellow-lipped Cave Bat *(Vespadelus douglasorum)*	-	P2	Yes	Yes
Reptiles				
Australian Freshwater Crocodile *(Crocodylus johnstonii)*	M	OS	Yes	Yes
Gravel Dragon *(Cryptagama aurita)*	-	P1	Yes	

CR – Critically Endangered, E – Endangered, VU – Vulnerable, MI – Migratory, M – Marine, IA – International Agreement

The species recorded within 2 km of the Development Envelope comprise 12 birds, three mammals and one reptile. .These species were recorded adjacent to Zones A, B and D of the Development Envelope.

An overview map displaying the locations of the Threatened Fauna species in relation to the Development Envelope are shown in Figure 3, with detailed figures for each zone displayed in Figure 4 – Figure 8.

355000 m 375000 m 395000 m 415000 m 435000 m 455000 m

7990000 m
7970000 m
7950000 m
7930000 m

N

Halls Creek

Zone A

Zone B

Zone C

Zone D

Zone E

Duncan Road

Gordon Downs Road

Gordon Downs

Legend

Proposed Road Upgrades
- Roads
- Proposed Realignment Areas
- Gravel Pits

- Priority Flora
- Threatened and Priority Fauna

Threatened Ecological Communities
- Gordon Land System
- Kimberley Vegetation Association 834
- Kimberley Vegetation Association 850

355000 m 375000 m 395000 m 415000 m 435000 m 455000 m

Scale: 1:300000
Original Size: A3
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 10 km

Shire of Halls Creek
Duncan Rd and Gordon Downs Rd
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Figure 3

Overview of Threatened Flora, Fauna and Ecological Communities for the Project

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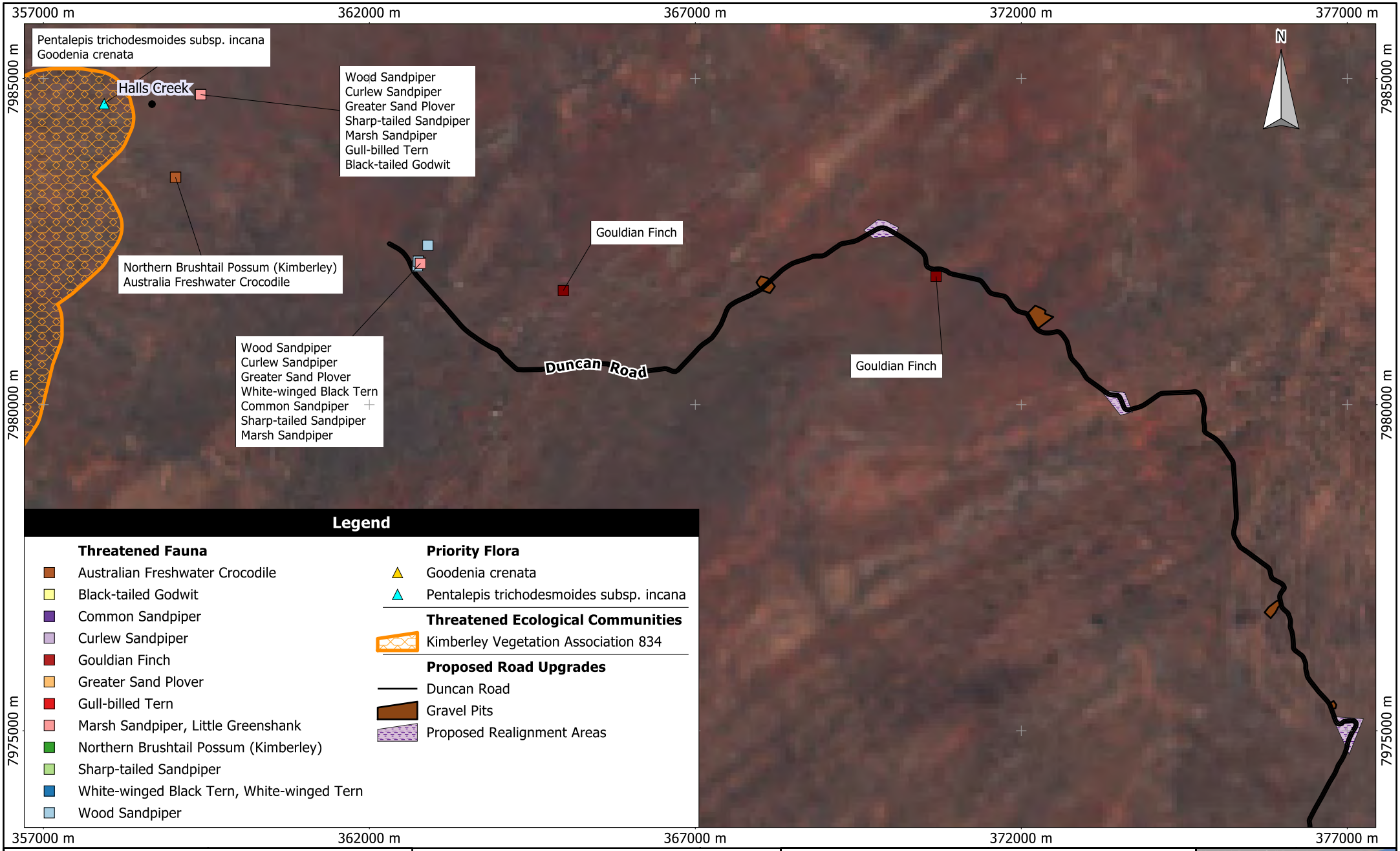

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Grid: MGA94(52)

0 2 km

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Figure 4

Zone A - Threatened Flora, Fauna and Ecological Communities

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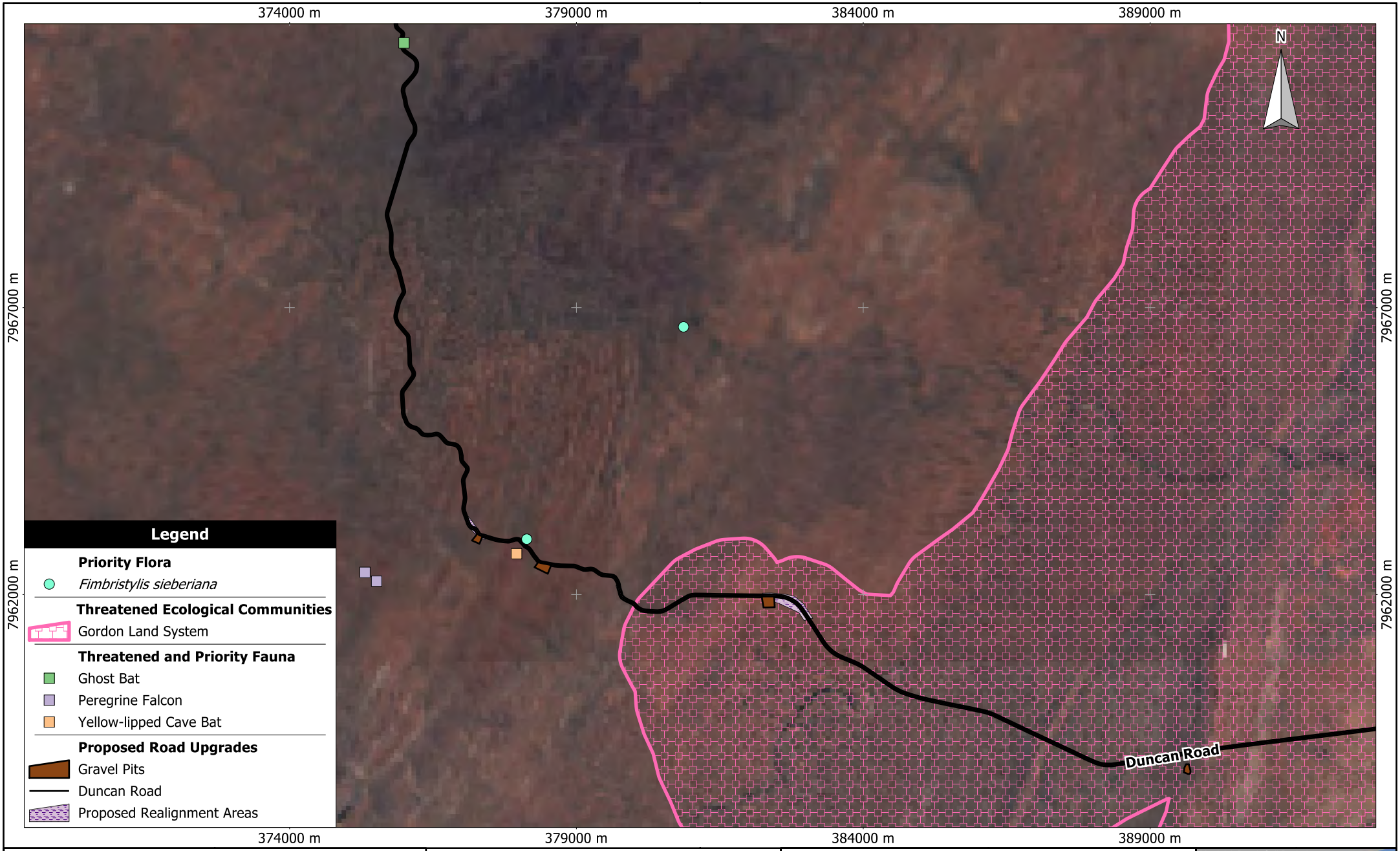

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Grid: MGA94(52)

0 2 km

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Figure 5

Zone B - Threatened Flora, Fauna and Ecological Communities

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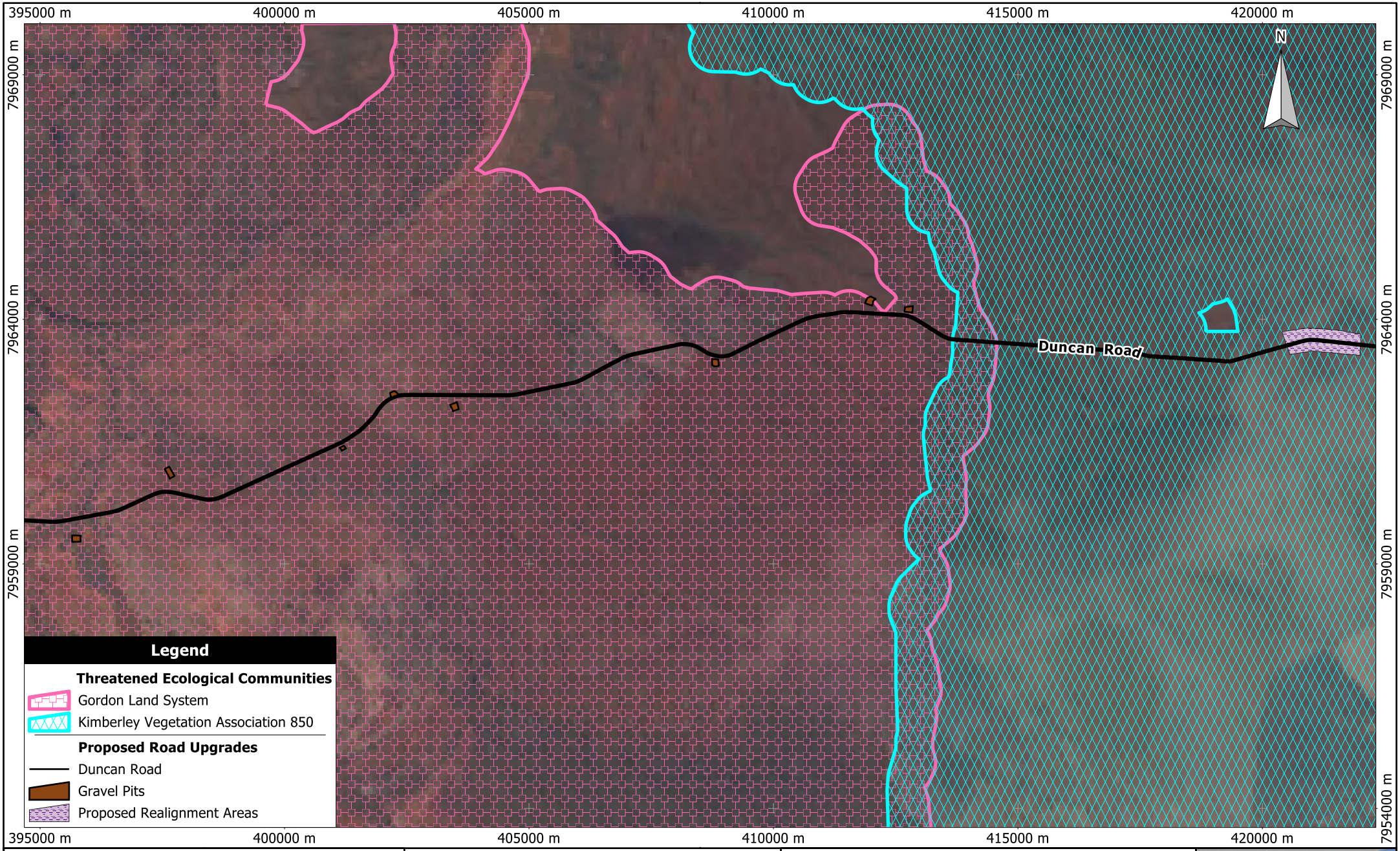

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Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

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Figure 6

Zone C - Threatened Ecological Communities

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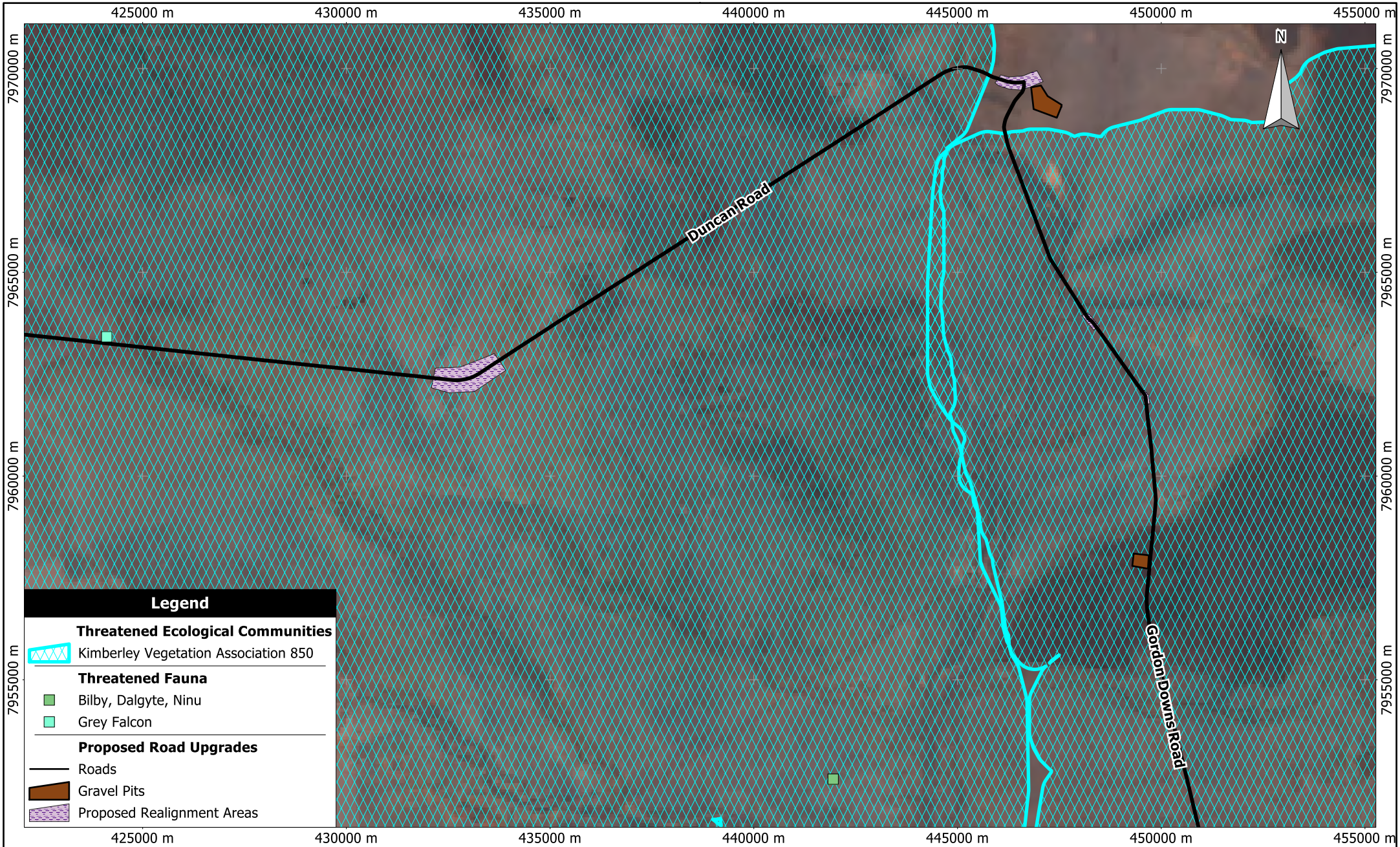

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Grid: MGA94(52)

0 2 km

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Figure 7

Zone D - Threatened Fauna and Ecological Communities

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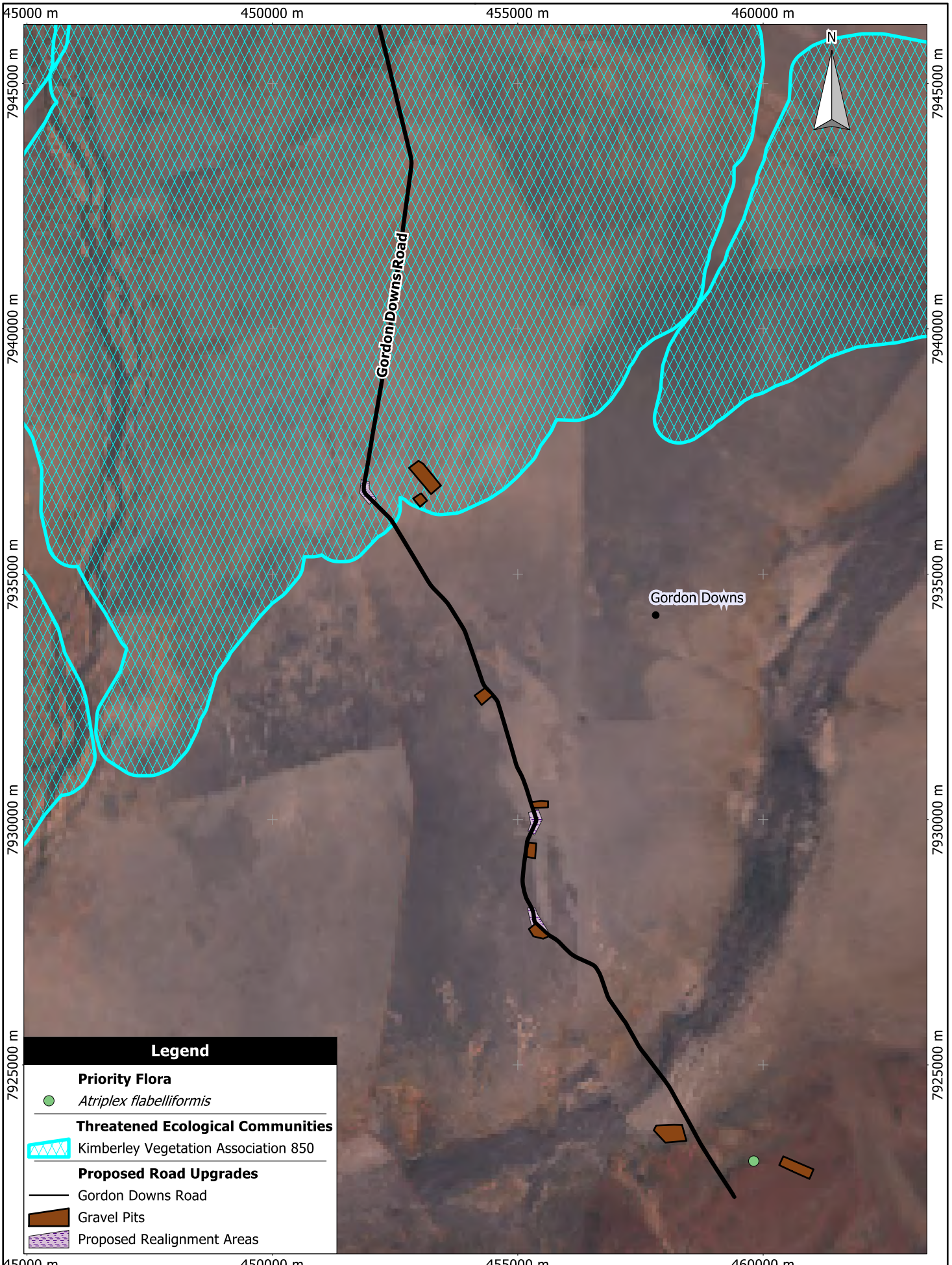

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Grid: MGA94(52)
0 2 km

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Duncan Road and Gordon Downs Road
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Figure 8

Zone E - Threatened Flora and Ecological Communities

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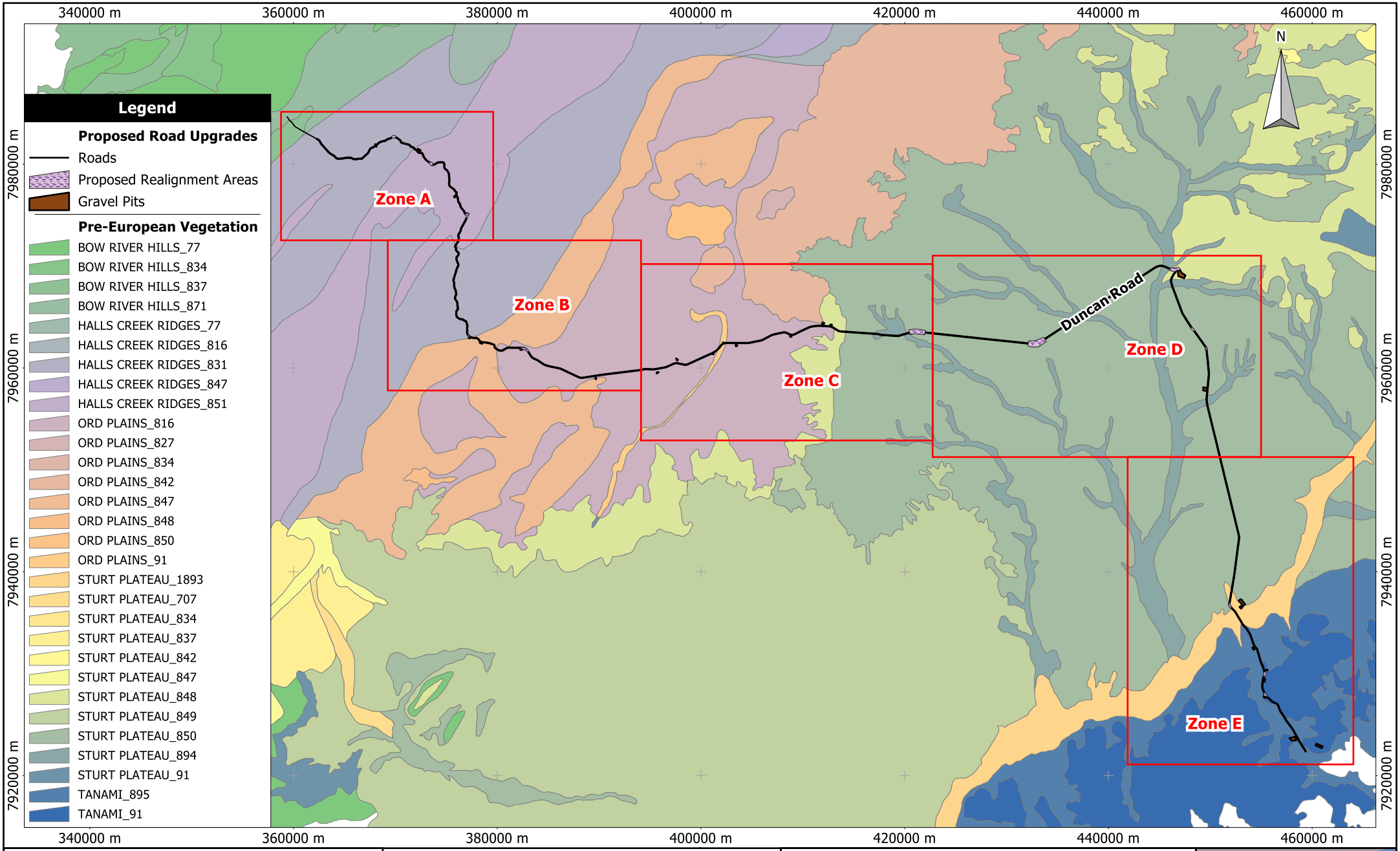

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Grid: MGA94(52)
Source: Adapted from Beard (2013)

0 10 km

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Figure 9

Pre-European Vegetation of the Project Area

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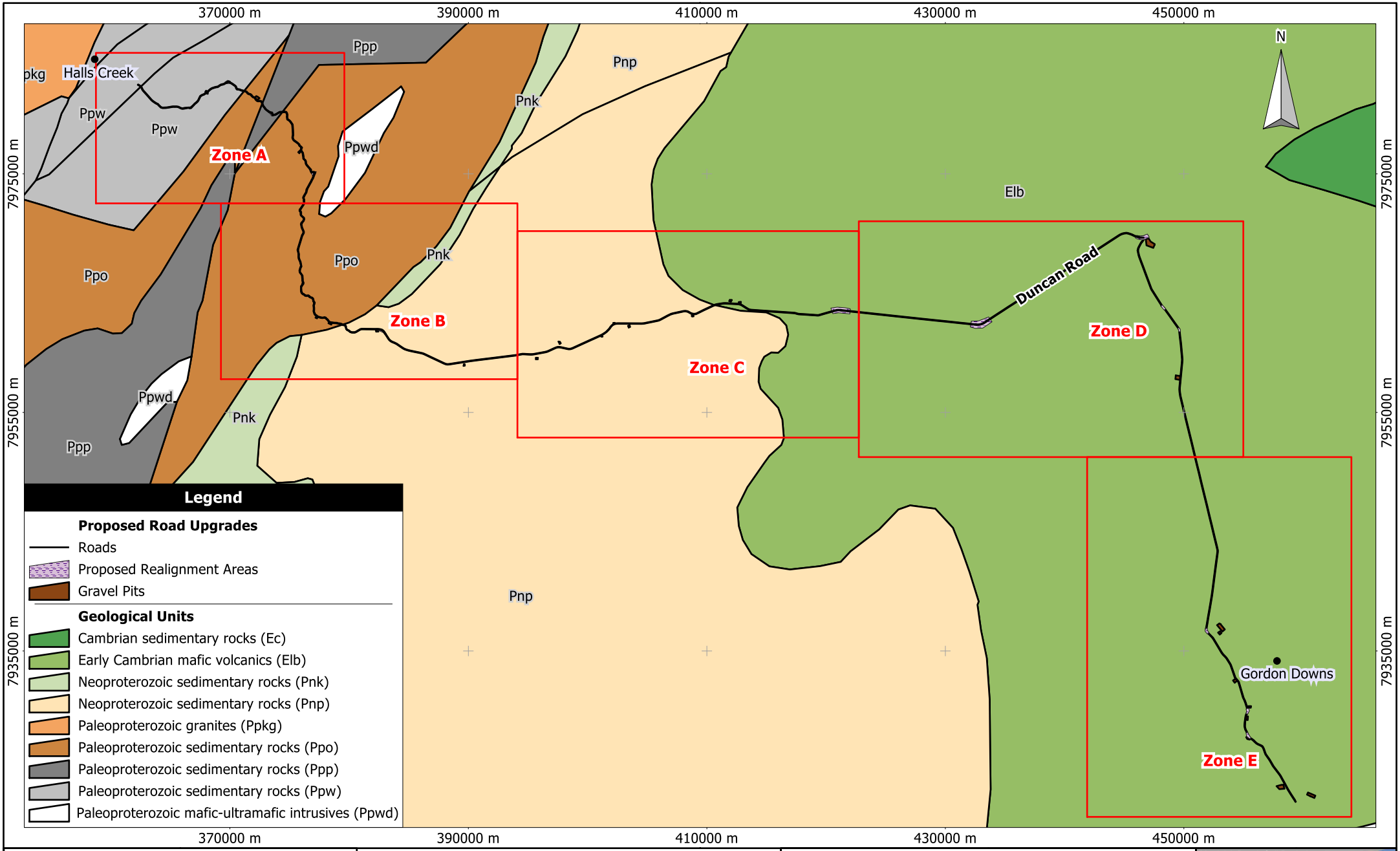
2.2.3 Terrestrial Environmental Quality

2.2.3.1 Geology

The Development Envelope crosses a number of geological and tectonic units (Table 4 and Figure 10), comprising predominantly sedimentary, igneous felsic intrusive, igneous mafic intrusive and igneous mafic volcanic lithologies (Geoscience 2012).

Table 4: Geological Units of the Project Area

Geological Unit		Description	Road intersects?
Symbol	Name		
Elb	Early Cambrian mafic volcanics (76519)	Mainly basaltic rocks; may include minor ultramafic volcanics	Yes
Pnp	Neoproterozoic sedimentary rocks (76672)	Predominantly sedimentary rocks; includes sedimentary rocks of low metamorphic grade and diapiric breccias	Yes
Ppo	Paleoproterozoic sedimentary rocks (76610)		Yes
Ppp	Paleoproterozoic sedimentary rocks (76613)		Yes
Ppw	Paleoproterozoic sedimentary rocks (76608)		Yes
Ec	Cambrian sedimentary rocks (76536)		No
Pnk	Neoproterozoic sedimentary rocks (76676)		No
Ppkg	Paleoproterozoic granites (76586)	Mainly felsic intrusive rocks. Range in composition from alkali feldspar granite to tonalite; includes associated rocks such as migmatite and minor gabbro and diorite.	No
Ppwd	Paleoproterozoic mafic-ultramafic intrusives (76576)	Dolerite, gabbro and other mafic igneous rocks; commonly as dykes and sills; may include some metamorphosed mafic intrusions and subordinate ultramafic rocks.	No



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Original Size: A4
Grid: MGA94(52)
0 10 km

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Figure 10

Geological Units in the Region

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2.2.3.2 Soil and Landforms

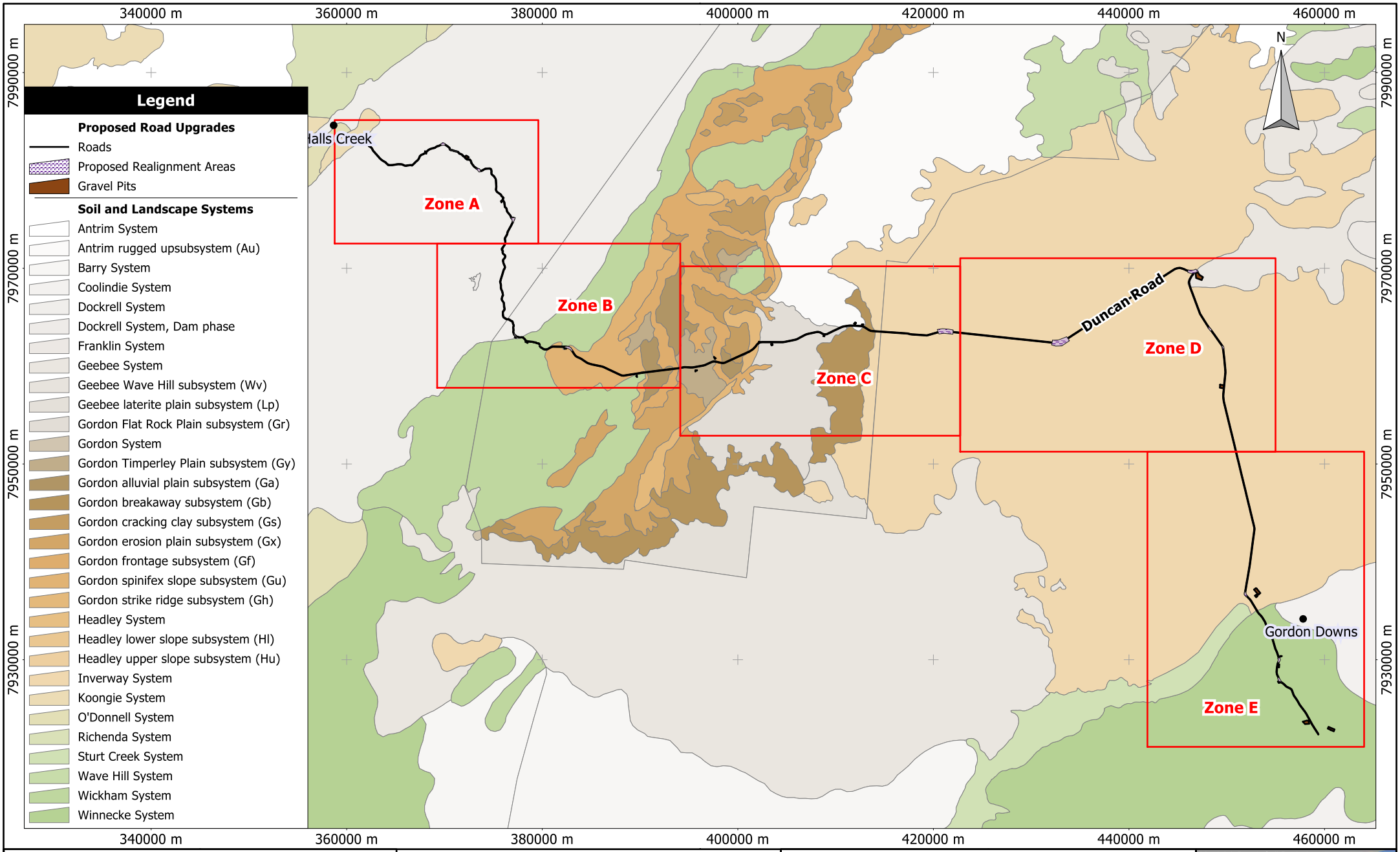
State-wide soil-landscape mapping identified a number of soil and landscape systems along the Development Envelope. Systems are characterised by areas of recurring patterns of landforms, soils and vegetation (Tille 2006). The descriptions for each soil and landscape system are detailed in Table 5 and the extents of the systems in the region are displayed in Figure 11.

Table 5: Soil and Landscape Systems in the Project Area (DPIRD 2017)

System	Name	Description
314Do	Dockrell System	Ridges and hills on metamorphic rocks with skeletal soils supporting snappy gum, bloodwood or box low woodlands over hard spinifex or upland tall grass.
314Do	Dockrell System	Ridges and hills on metamorphic rocks with skeletal soils supporting snappy gum, bloodwood or box low woodlands over hard spinifex or upland tall grass.
421Wn	Winnecke System	Low linear or rounded hills and associated valley floors and marginal sandplains, supporting soft spinifex hummock grasslands or sparse low snappy gum woodlands with spinifex.
422Gb	Geebee System	Lateritic plains with gravelly red soils supporting snappy gum and bloodwood sparse low woodlands over soft spinifex.
422In	Inverway System	Level upland plains with black cracking clay soils supporting barley Mitchell grass grasslands.
422In	Inverway System	Level upland plains with black cracking clay soils supporting barley Mitchell grass grasslands.
721An4A__Au	Antrim rugged upsubsystem (Au)	Rugged Uplands: Mesas, buttes and structural benches on volcanics, hard spinifex on lithosols, no erosion
721Go2F__Gb	Gordon breakaway subsystem (Gb)	Breakaways: Between elevated lateritic plain (Lp) and lower erosion plain (Gx), hard spinifex, moderate erosion
721Go4H__Gh	Gordon strike ridge subsystem (Gh)	Strike Ridges: Up to 80 m on Nyuless sandstone, hard spinifex on lithosols, no erosion
721Go5C__Gu	Gordon spinifex slope subsystem (Gu)	Spinifex Slopes: Sandstones of Albert Edward Range, hard spinifex on lithosols with pockets of BSP vegetation on flatter areas, some degradation
721Go6G__Gr	Gordon Flat Rock Plain subsystem (Gr)	Flat Rock Plains: Low hills and plains on sandstone, hard spinifex, BSP and annuals on stony loams and clays, extensive degradation
721Go6H__Gy	Gordon Timperley Plain subsystem (Gy)	Timperley Plains: Plains on Timperley shale, hard spinifex and short grass on shallow gravelly loams, some degradation
721Go7L__Ga	Gordon alluvial plain subsystem (Ga)	Alluvial Plains: Mosaic of juvenile cracking clays and scalds, Quarternary alluvium, BSP vegetation, severe degradation
721Go7L__Ga	Gordon alluvial plain subsystem (Ga)	Alluvial Plains: Mosaic of juvenile cracking clays and scalds, Quarternary alluvium, BSP vegetation, severe degradation
721Go7L__Gs	Gordon cracking clay subsystem (Gs)	Cracking Clays: Plains of cracking clays on Quarternary alluvium, BSP vegetation, some degradation
721Go8L__Gf	Gordon frontage subsystem (Gf)	Frontage: Banks and levees on fluviatile deposits, Birdwood on lower reaches and hard spinifex on upper reaches, severe degradation and erosion
721Wk	Wickham System	Ridges, hogbacks, cuestas, and structural plateaux of sandstone, siltstone, and shale supporting snappy gum low woodlands over soft spinifex and curly spinifex.

A review of the Atlas of Australian Acid Sulphate Soils (ASS) database identified that the Development Envelope occurs in areas of predominantly Extremely Low Probability of Occurrence of ASS (Figure 12) (CSIRO 2011). Isolated areas mapped as having a High Probability of Occurrence for ASS are present in the region but are restricted to drainage lines in proximity to the Development Envelope.

Two sites were identified in the Contaminated Site Register as being 'remediated for restricted use' (DWER 2019a). Both sites occur within the Halls Creek Township, with the closest site located approximately 2.3 km from Zone A of the Development Envelope.



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0 10 km

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Figure 11

Soil and Landscape Systems of the Project Area

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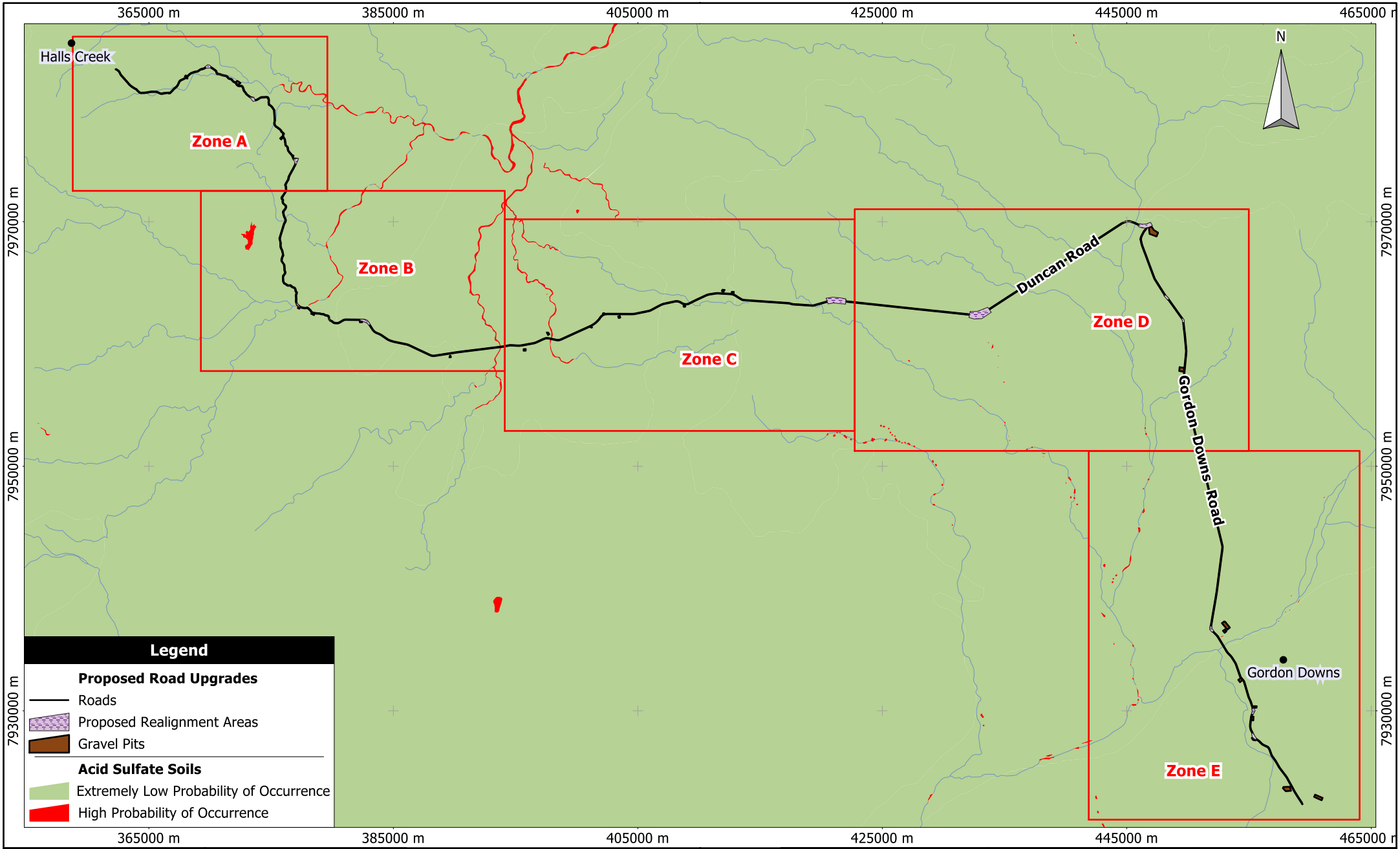

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Grid: MGA94(52)

0 10 km

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Figure 12

Acid Sulfate Soils in the Project Area

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2.2.4 Inland Waters

2.2.4.1 Surface Water

Australia is divided up into drainage divisions that are sub-divided into regions, basins and then catchments (BOM 2012). The Development Envelope occurs within two topographic drainage divisions; the Tanami-Timor Sea Coast (TTS) and the North Western Plateau (NWP) (Figure 13). The portion of the Development Envelope within the NWP Division is in the Lake Gregory Sub-Catchment of the Sturt Creek Catchment, located in the Mackay Basin. The northern remainder of the Development Envelope in the TTS Division is in the Ord River Sub-Catchment of the Upper Ord River Catchment, within the Ord River Basin (DWER 2018a).

Two Ramsar wetlands were identified during the EPBC Protected Matters Search (Appendix 2). Lake Argyle and Lake Kununurra occur 100 to 150 km upstream and the Ord River Floodplain and 200 to 300 km upstream of the Development Envelope.

The 'Ord Irrigation District' and 'Ord River and Tributaries' Surface Water Irrigation Areas, as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act), span across Zones A, B and C of Duncan Road and the Halls Creek Township (DWER 2018b). These are both managed under the Ord River Water Management Plan (DoW 2006).

The Ord River, O'Donnell River and Margaret River are present in the region, but occur outside of the Development Envelope (Geoscience Australia 2017). Lake Gregory occurs 200 km to the south of the Development Envelope. Within the Development Envelope, a number of smaller watercourses cross the proposed road corridor, including Halls Creek, Black Elvire River, Fox River and Johnston River, all of which are non-perennial, intermittent systems.

2.2.4.2 Groundwater

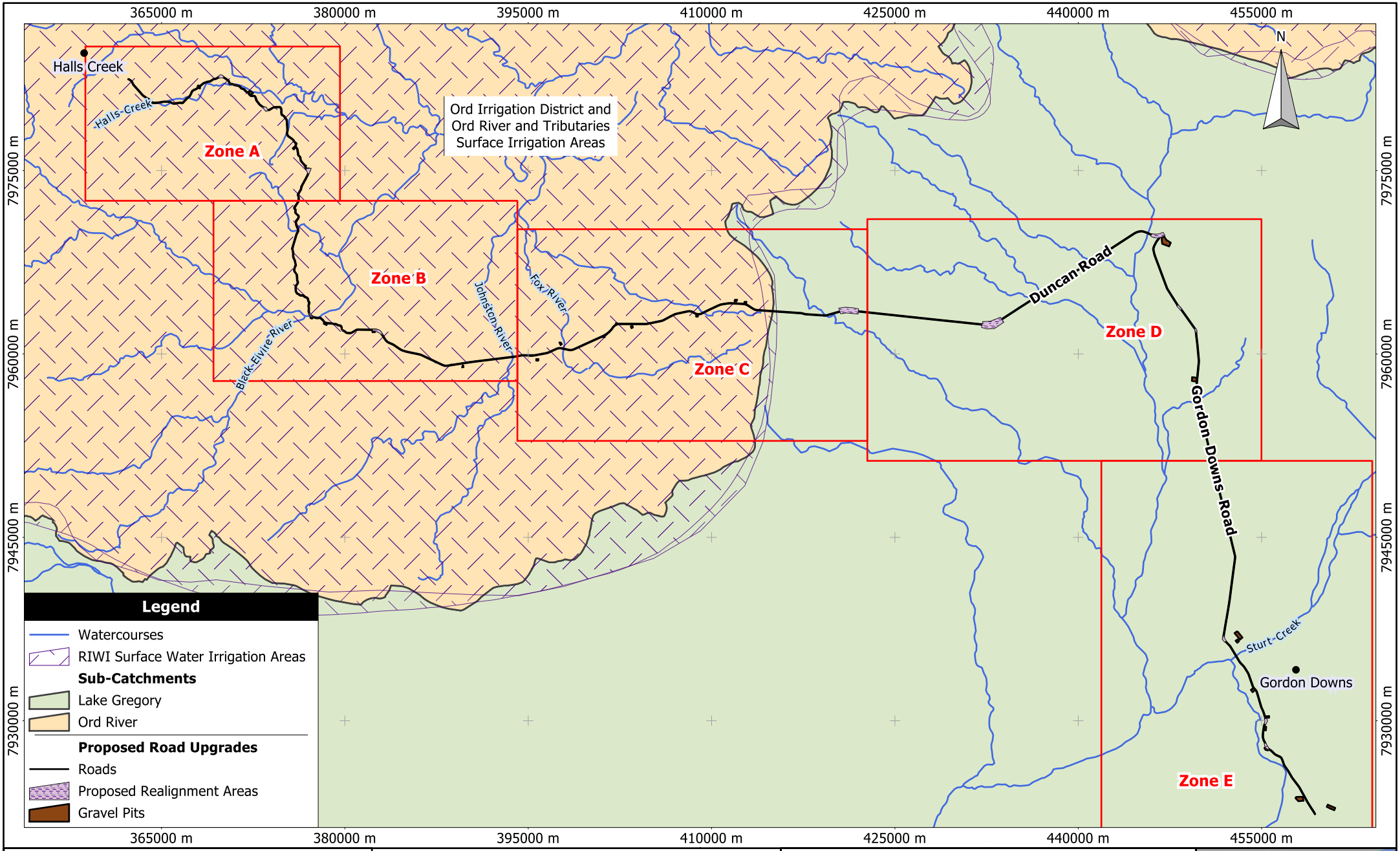
The Development Envelope occurs within the Canning-Kimberley Groundwater Area, as proclaimed under Section 26B (1) of the RIWI Act (DWER 2018c). The Halls Creek Water Reserve covers the start of Duncan Road within the Halls Creek Township (Figure 17), and is categorised into three separate areas based on their priority level (P1, P2 and P3) (DWER 2019b), as follows:

- Priority 1 (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of risk avoidance and so land development is generally not permitted.
- Priority 2 (P2) source protection areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of risk minimisation and so some conditional development is allowed.
- Priority 3 (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through management guidelines rather than restrictions on land use. If the water source does become contaminated, then water may need to be treated or an alternative water source found..

These public drinking water source areas are proclaimed under the *Country Areas Water Supply Act 1947* and is managed under the *Halls Creek Water Reserve Water Source Protection Plan* (WRC 2002) and the *Halls Creek Water Reserve drinking water source protection review* (DoW 2012).

The main groundwater source for Halls Creek occurs within the King Leopold Sandstone, which overlies the Moola Bulla Formation (WRC 2012). Groundwater is considered to likely have salinity values of below 1000 mg/L, with

recharge occurring mostly by rainfall infiltration (WRC 2012). Given the relatively small storage capacity of the King Leopold Sandstone aquifer, contaminants could move quickly along the joints and fractures towards bores under the influence of pumping (WRC 2012).



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Grid: MGA94(52)

0 10 km

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Figure 13

Regional Surface Hydrology

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2.2.5 Social Surrounds

2.2.5.1 Aboriginal Heritage

The townships of Balgo (Wirrimanu), Billiluna (Mindibungu), Mulan, Ringer Soak (Kundat Djaru), Warmun (Turkey Creek), Kundat Djaru and Yiyili are key Aboriginal communities within the Shire of Halls Creek (SoHC 2019).

The proposed road upgrades occur across four registered Native Title Claims (Table 6). The boundaries for the four Native Title Claims are displayed in Figure 14, with the majority of Duncan Road and Gordon Downs Road within the Jaru Native Title Area.

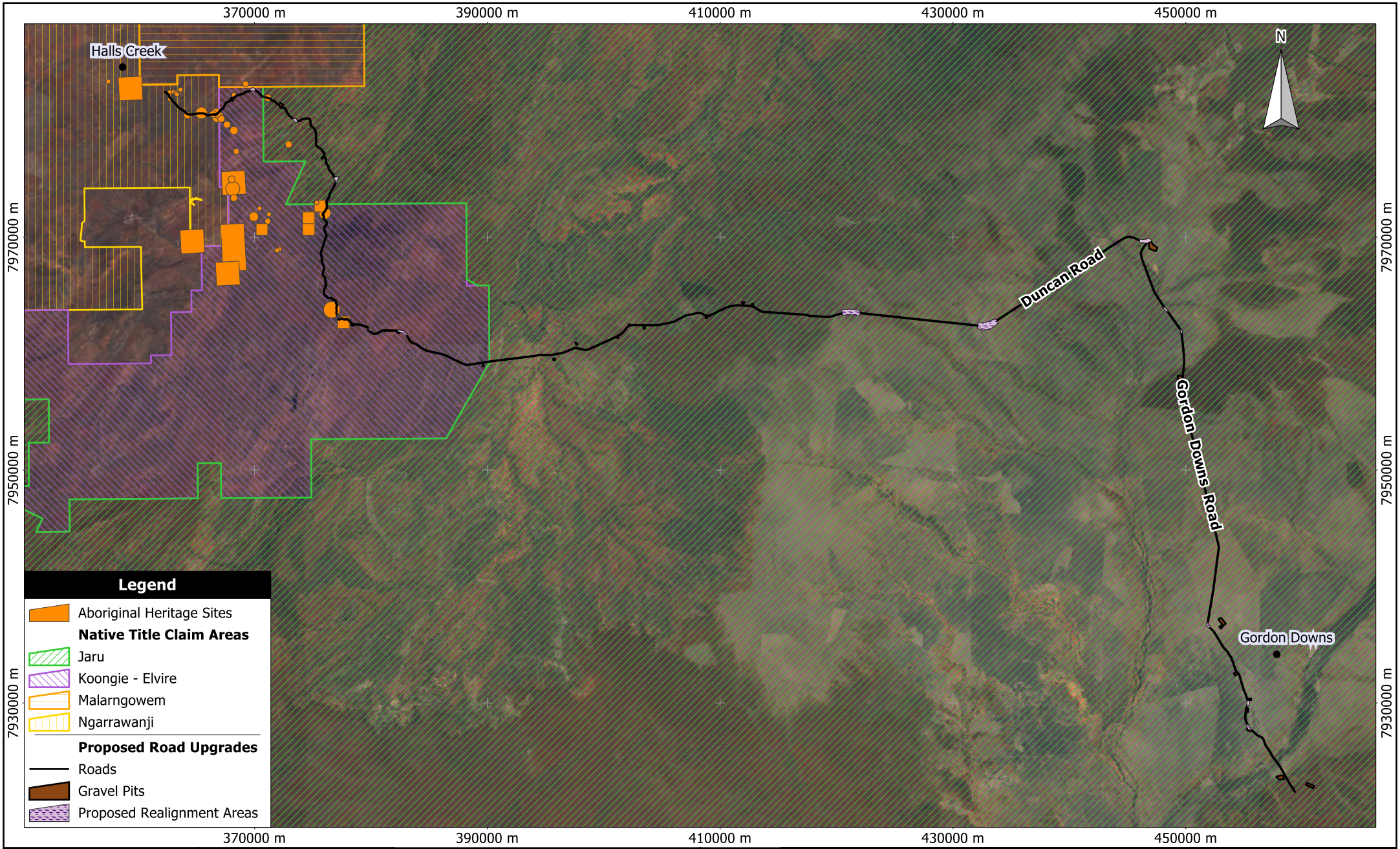
A number of registered Aboriginal Heritage sites are present within the Development Envelope and within 100 m of the proposed works (Table 7). These occur solely within the Zones A and B (Figure 15 and Figure 16).

Table 6: Registered Native Title Claims in the Development Envelope

Applicant Name	Tribunal File No.	Federal Court File No.	Representative	Date Registered
Ngarrawanji	WC1996/075	WAD41/2019	Kimberley Land Council	25/06/1996
Koongie - Elvire	WC1999/040	WAD45/2019		15/11/1999
Jaru	WC2012/003	WAD42/2019		16/03/2012
Malarngowem	WC1999/044	WAD43/2019		4/02/2000

Table 7: Aboriginal Heritage Sites in 100m Buffer of Development Envelope

Site ID	Site Name	Site Type
12618	Old Halls Creek	Skeletal material/Burial
13013	Butchers Gully Hill	Artefacts / Scatter
13020	Butchers Gully Burial	Skeletal material/Burial
13022	Butchers Gully	Artefacts / Scatter
13870	Halls Creek	Artefacts / Scatter
13871	Halls Creek	Artefacts / Scatter
13872	Halls Creek	Artefacts / Scatter
13901	Halls Creek	Artefacts / Scatter
13905	Widgingali	Artefacts / Scatter
13912	Palm Spring.	Quarry, Artefacts / Scatter
14325	Palm Spring	Engraving
16011	Halls Creek East 1	Artefacts / Scatter
14324	Halls Creek	Mythological, Painting
12643	Old Halls Creek	Skeletal material/Burial
13869	Upper Halls Creek	Artefacts / Scatter



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Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 10 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
Preliminary Environmental Impact Assessment

Figure 14

Overview of Native Title Claim Areas and Aboriginal Heritage Sites

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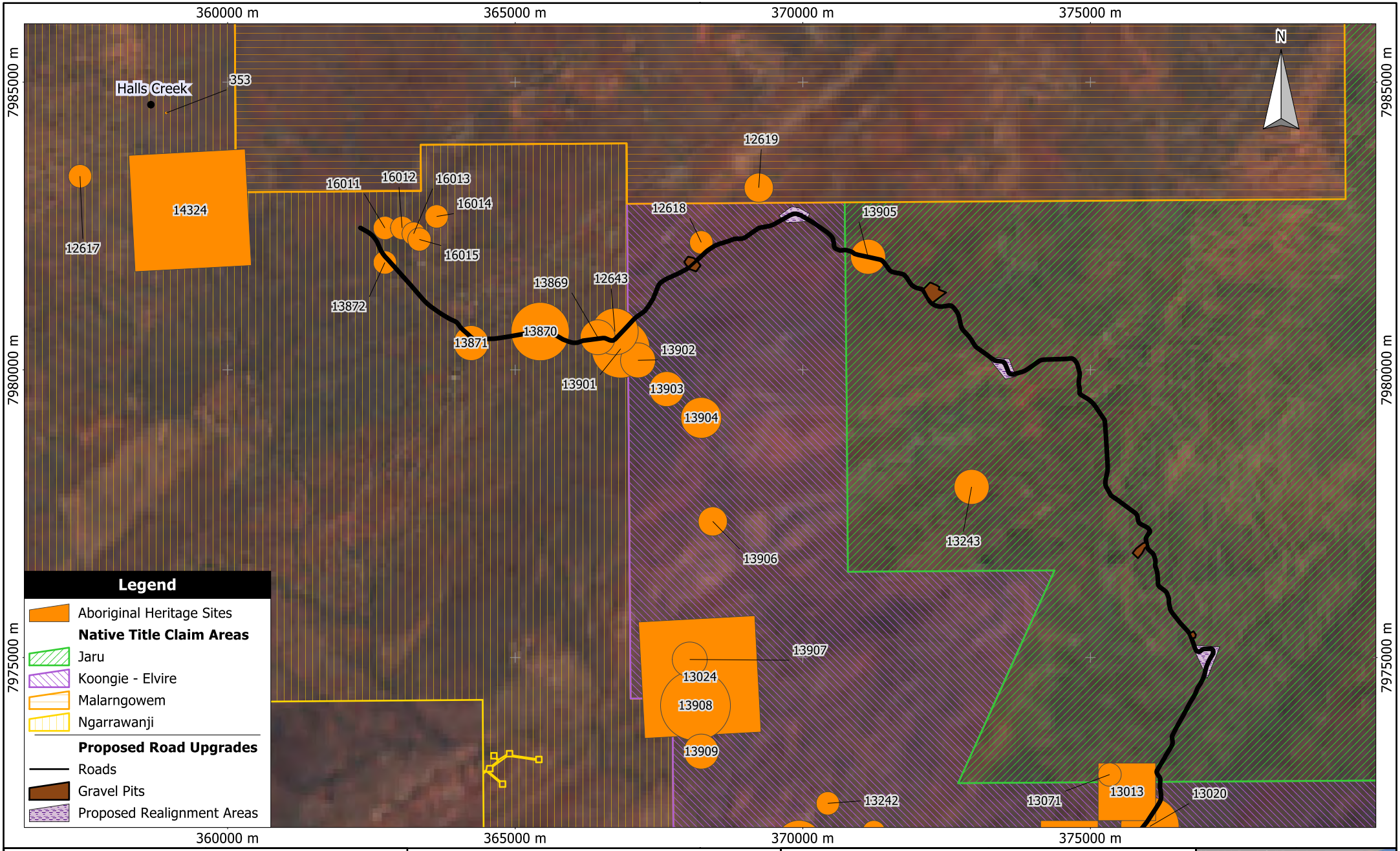

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Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

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Figure 15

Zone A - Aboriginal Heritage Sites

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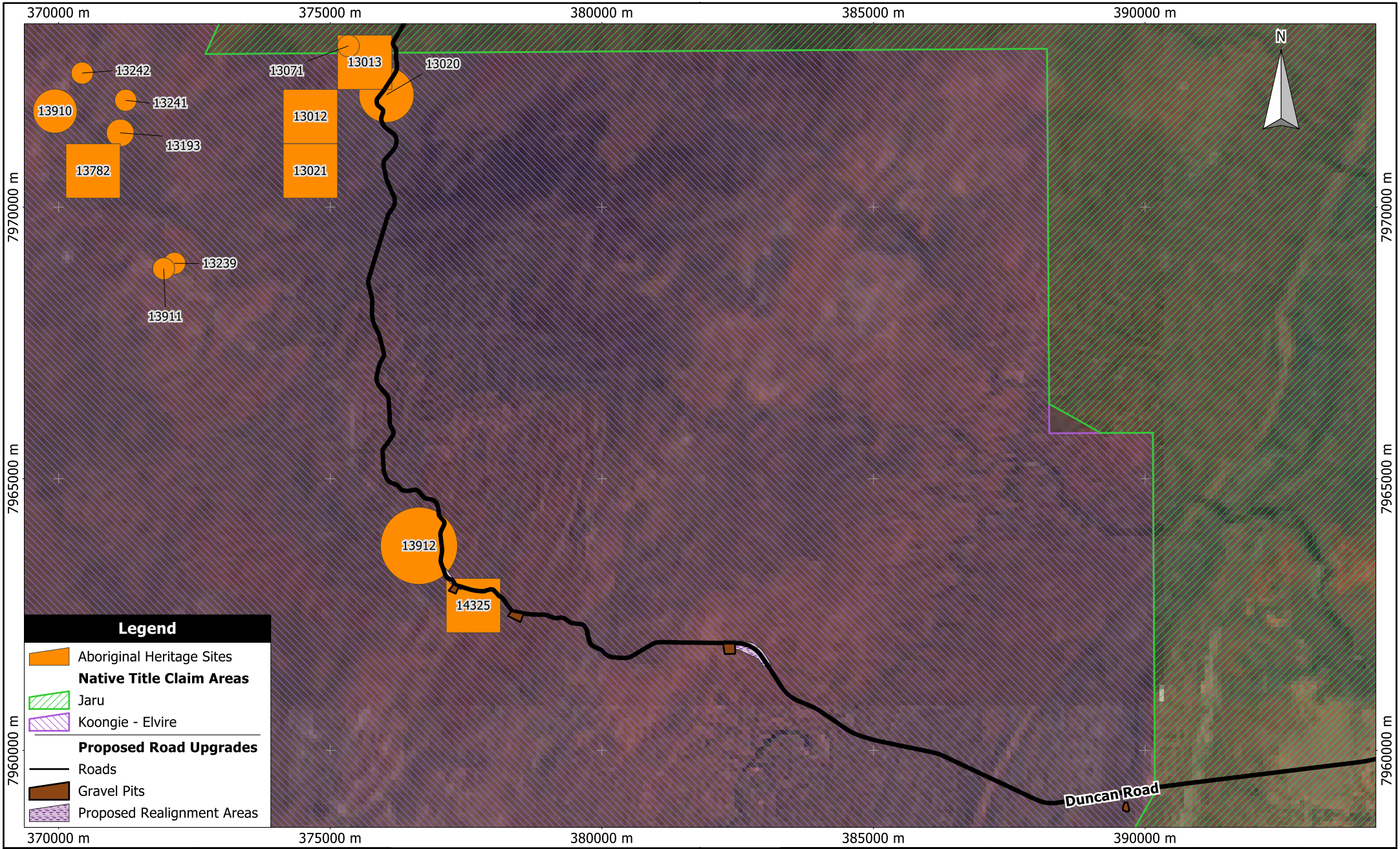

Scale: 1:90000
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Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

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Figure 16

Zone B - Aboriginal Heritage Sites

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2.2.5.2 Land Vesting and and Reserves

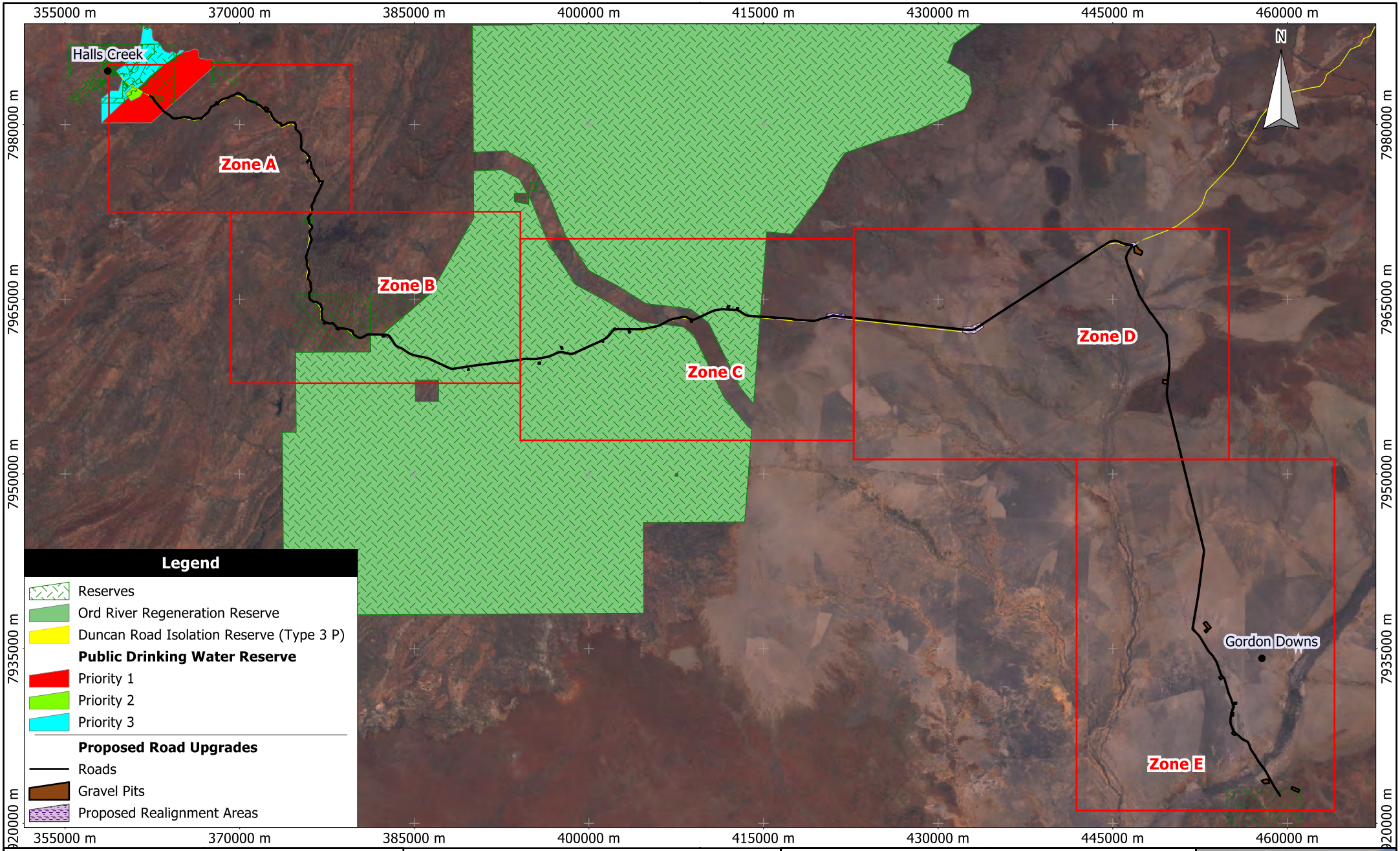
The Development Envelope crosses four pastoral properties within the Shire of Halls Creek, these being Flora Valley Station, Elvire Station, Gordon Downs Station and Burks Park Station. Two State-registered heritage sites are located in the region, the Halls Creek Trackers' Hut and the Old Halls Creek Post Office Ruins, however both sites are located over 4 km from the Development Envelope (Heritage Council 2017).

A number of reserves exist along the proposed Development Envelope (Figure 17). Within Zone A, reserves cover the Halls Creek Township, as well as the Old Halls Creek Townsite, a heritage site located about 11 km east of Halls Creek (Landgate 2018; Heritage Council 2017). A reserve in Zone E covers the community of Kundat Djaru, which is allocated for the 'use or benefit of aboriginal inhabitants' (Landgate 2018) (refer Figure 18-22).

The Ord River Regeneration Reserve exists in Zones B and C and is a DBCA Legislated Land under the *Conservation and Land Management Act 1984* (CALM Act). It extends north to the Northern Territory border covering an area of 5,680 km^2 (Landgate 2018). The reserve was established for the regeneration of eroded areas in the Ord River Dam catchment area (Landgate 2018).

No Environmentally Sensitive Areas (ESA) as declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* occur along or adjacent to the Development Envelope (DWER 2018d).

Cadastre data identified that the current alignment of Duncan Road is not within the Road Isolation Reserve (Type 3 P) throughout the entire extent of the road and no road reserve exists for Gordon Downs Road (Landgate 2018) (Figure 17). It should be noted that inconsistencies such as this commonly occur for regional and historic roads, but will need to be taken into consideration for the proposed road upgrades. It is understood that MRWA has an authority under the *Land Administration Act 1997* to construct on Crown Land (this follows initial discussions with MRWA and should be verified). Subject to the *Main Roads Act 1930* and the *Public Works Act 1902*, the local government within the district of which a road is situated has the care, control and management of the road.



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Original Size: A4
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 10 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
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Figure 17

Overview of Cadastre and Reserves

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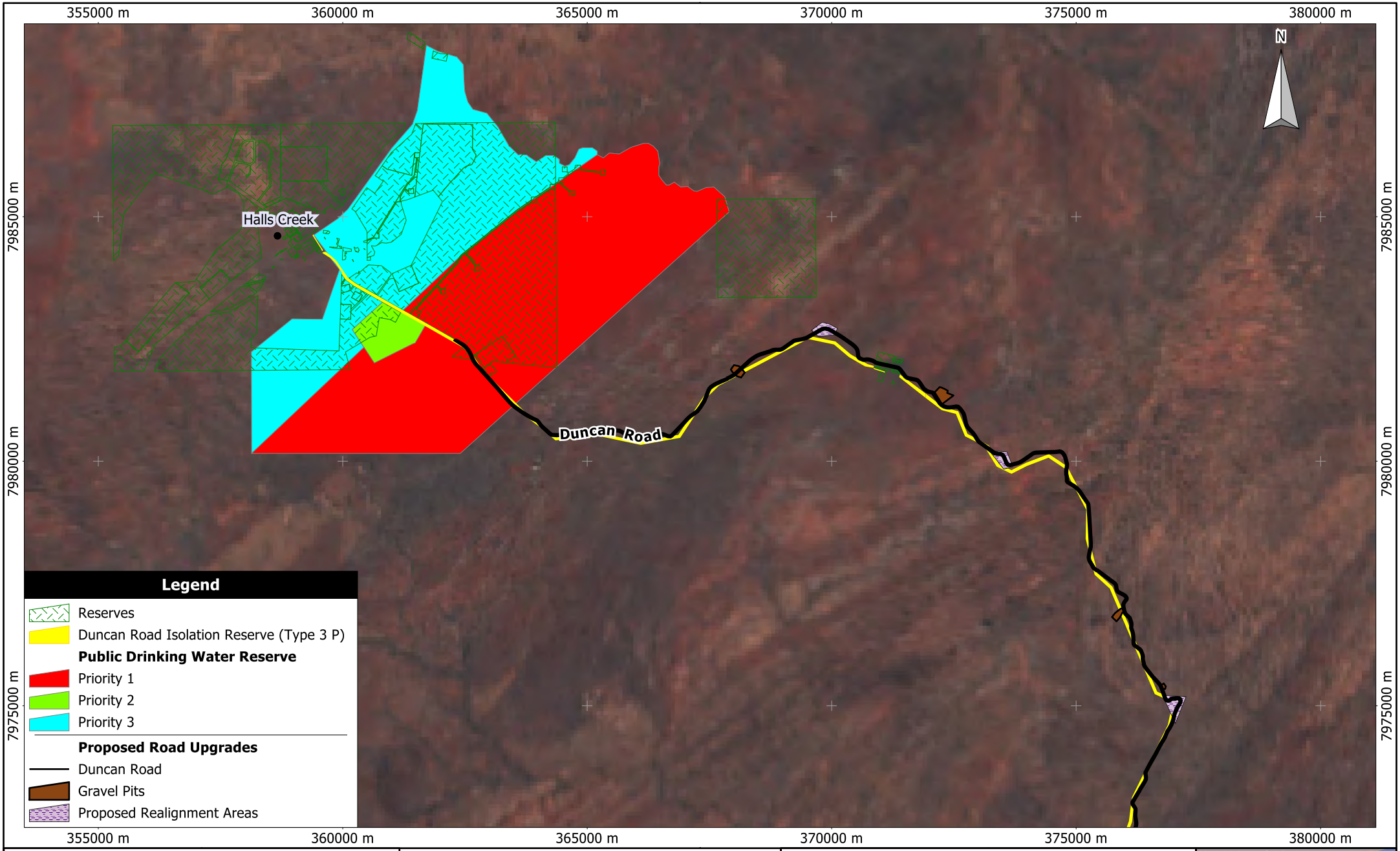

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Original Size: A4
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
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Figure 18

Zone A - Cadastre and Reserves

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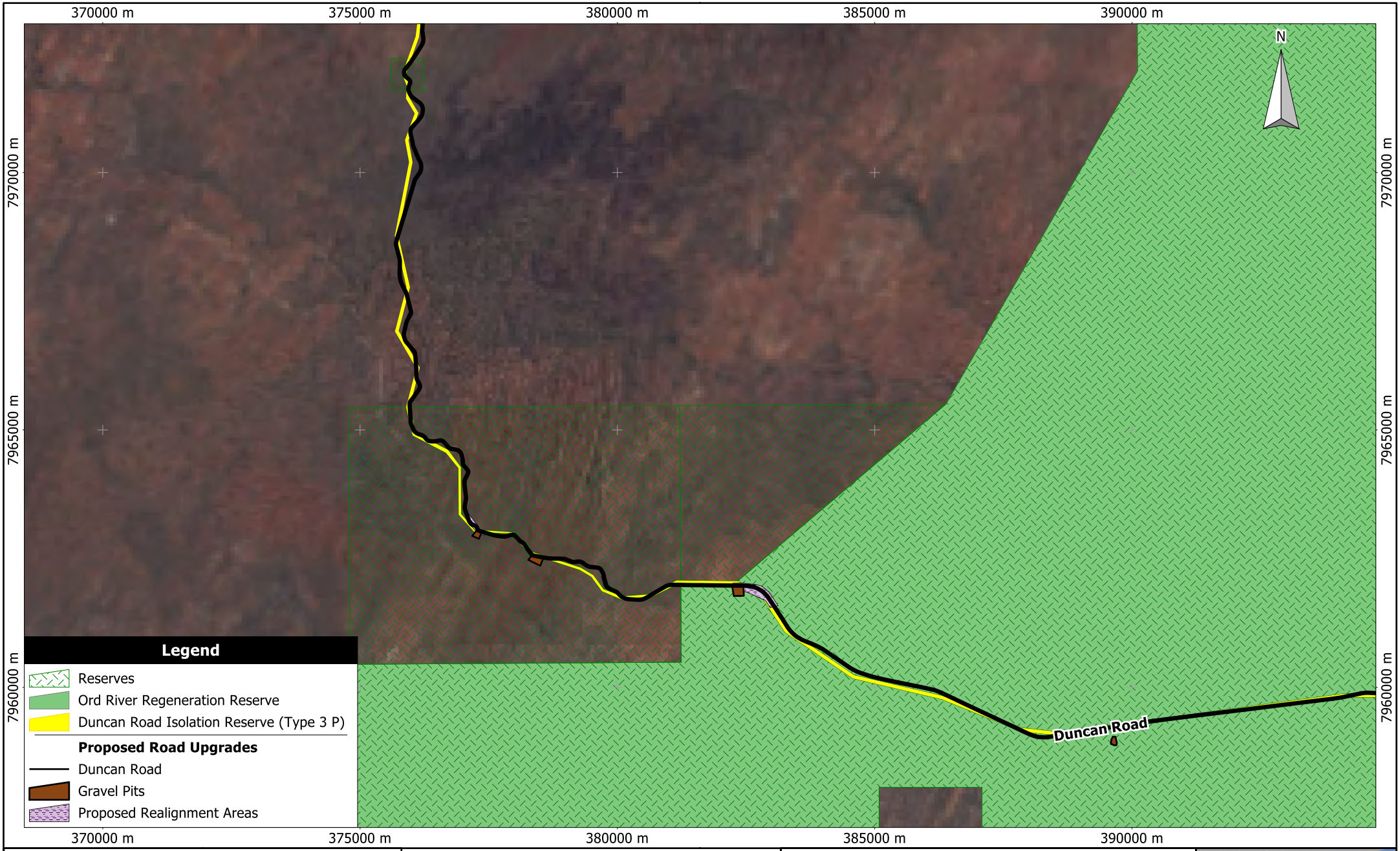

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Grid: MGA94(52)

0 2 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
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Figure 19

Zone B - Cadastre and Reserves

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Scale: 1:120000
Original Size: A4
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
Preliminary Environmental Impact Assessment

Figure 20

Zone C - Cadastre and Reserves

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Scale: 1:120000
Original Size: A4
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)

0 2 km

Shire of Halls Creek
Duncan Road and Gordon Downs Road
Preliminary Environmental Impact Assessment

Figure 21

Zone D - Cadastre and Reserves

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Scale: 1:120000
Original Size: A4
Air Photo Date: Sentinel Imagery 2019
Grid: MGA94(52)
0 2 km

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Duncan Rd and Gordon Downs Rd
Preliminary Environmental
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Figure 22

**Zone E -
Cadastre and Reserves**

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2.3 ASSESSMENT OF POTENTIAL ENVIRONMENTAL AND HERITAGE ASPECTS AND IMPACTS

Table 8 presents a brief evaluation of potential impacts from the Project to all environmental aspects.

Table 8: Evaluation of Potential Impacts to all Environmental Aspects

Aspect	Evaluation of Potential Impacts
Aboriginal Heritage / Native Title	A large number of registered Aboriginal heritage sites occur in the area, with 28 sites located within a 2 km radius of the proposed Development Envelope. Fifteen sites overlap with, or lie within 100 m of, the Development Envelope and should be avoided, or a Section 18 consent to disturb under the *Aboriginal Heritage Act 1972* (WA) will be required. Four Native Title Claim areas occur across the Development Envelope, however the majority of the road upgrades are within the Jaru Native Title Claim. Agreement with the Native Title holders is likely to be required to disturb new areas and abstract groundwater within the Development Envelope.
Acid Sulphate Soils	Acid Sulfate Soils have a high probability of occurrence along watercourses in the region (only 0.12% (0.78 ha) of the Development Envelope). Testing and management of any Acid Sulfate Soils will be required if undertaking excavations in these areas.
Air quality	Not relevant to the project.
Contamination	A review of the Contaminated Sites Register did not identify any sites within the Development Envelope. Thus, this is not a consideration for the project.
Dust	Dust may be generated locally during the proposed road works. Significant impacts to flora and vegetation would not be expected. Given the absence of sensitive receptors close to the Development Envelope, impacts to social surrounds (amenity) are not expected. Not relevant to the project.
Groundwater	The initial 2 km of Duncan Road occurs within the Halls Creek Water Reserve, however the remainder of the Development Envelope does not occur over any groundwater reserves. Consultation with the Department of Water and Environmental Regulation (DWER) and an application for a groundwater abstraction licence(s) will be required if construction water is to be provided through groundwater abstraction.
Hazardous substances	Not relevant to the project.
Heritage (non-indigenous)	No registered heritage sites occur within a 2 km radius of the Development Envelope. Two sites are located in the region over 4 km from the proposed road upgrades.
Land Vesting	The existing Duncan Road alignment occurs partially outside of the Road Isolation Reserve (Type 3 P) throughout the Development Envelope and no Road Reserve exists for Gordon Downs Road. Thus landowner/manager consent is likely to be needed prior to the approval of a Native Vegetation Clearing Permit.
Noise and vibration	Not relevant to the project.
Surface water/drainage	A number of key watercourses exist across the Development Envelope. The 'Ord Irrigation District' and 'Ord River and Tributaries' Surface Irrigation Areas intersect approximately the first (eastern) 75 km of Duncan Road within the Development Envelope. The Ord Surface Water Allocation Plan applies to these areas, setting out how the DWER allocates and licenses surface water in the region to manage the demands of irrigation, hydroelectricity generation, and urban and individual supply. Consultation with DWER will be required during the permitting of any proposed groundwater abstraction.
Visual amenity	Given the absence of sensitive receptors or recreation areas close to the Development Envelope, this is considered not relevant to the project.

Aspect	Evaluation of Potential Impacts
Wetlands	Two Ramsar wetlands occur upstream of the Development Envelope, however they are both located over 100 km and will not be impacted by the proposed road upgrades. Therefore, these are not a consideration for the project.
Reserves / Conservation areas	The Ord River Regeneration Reserve occurs approximately 32 km of the Development Envelope along Duncan Road. Therefore, this is not a consideration for the project.
Declared plants (weeds)	Four species of declared pests under the BAM Act were identified as potentially occurring within a 50 km radius of the Development Envelope. Occurrences of these species within the disturbance area should be identified and treated prior to clearing to prevent their spread.
Vegetation	The broad vegetation associations across the region are well presented and high proportions of the pre-European extents remain. More detailed mapping of vegetation associations along sections of the Development Envelope have been undertaken previously (MWH 2014). No Threatened species, TECs or PECs are known to occur within or adjacent to the Development Envelope. Small numbers of Priority flora are likely to occur within or adjacent to the Development Envelope.
Biodiversity	A total of 12 birds, three mammals and one reptile species, as listed under the BC Act or listed on the DBCA Priority Fauna List, have been recorded within 2 km of the Development Envelope. The majority of these species are highly mobile and are unlikely to rely on the habitat immediately adjacent to the current Duncan Rd and Gordon Downs Rd. No Threatened species, TECs or PECs are known to occur within or adjacent to the Development Envelope. Small numbers of Priority flora are likely to occur within or adjacent to the Development Envelope. The proposed works are unlikely to significantly impact biodiversity at a regional or local scale.
Dieback and other diseases or pathogens	The project is well outside of the confirmed Dieback distribution in WA and is therefore not a consideration for the project.

Based on the information presented in Table 8, it is considered unlikely that a significant environmental impact would occur as a result of the Project. This is on the assumption that matters relating to Aboriginal Heritage and Native Title can be managed through other processes. Thus the referral of the Project to the EPA is unlikely to be required. However, to support a Native Vegetation Clearing Permit (NVCP) application, a flora and vegetation survey of the sections of the Project footprint not previously surveyed on behalf of Northern Minerals is likely to be required.

2.4 ASSESSMENT OF ALL MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE AND OTHER MATTERS AS PROTECTED UNDER THE EPBC ACT

Table 9 presents a brief evaluation of potential impacts from the Project to Matters of National Environmental Significance (MNES).

Table 9: Evaluation of Potential Impacts to MNES

Matter of NES	Existing Environment and Likely Impact
Nationally listed threatened species or ecological communities	No Threatened Flora species or Threatened Ecological Communities (TEC) listed under the EPBC Act were identified within 50 km of the Development Envelope. The Gouldian Finch (*Erythrura gouldiae*) (EN), Greater Bilby (*Macrotis lagotis*) (VU) and Ghost Bat (*Macroderma gigas*) (VU) are listed under the EPBC Act and have been recorded within 2 km of the Development Envelope. The Gouldian Finch inhabits open woodlands that support a grass groundcover (DoEE 2019). The species is dependent on a nearby source of surface water and unburnt hollow-bearing Eucalyptus trees (DoEE 2019). The broad vegetation associations across the region are predominantly grasslands with sparse trees, and are not considered likely to represent key habitat. The Gouldian Finch may occur in and adjacent to the Development Envelope, but given the wide distribution of the vegetation associations, the generally degraded quality of vegetation adjacent to the roads, and the small scale of vegetation loss at a regional scale, a significant impact is not expected. The Greater Bilby generally exhibits a preference for three major vegetation types: • Open tussock grassland (both grasses and forbs) growing on uplands and hills. • Mulga woodland/shrubland (both pure mulga and mixed stands of mulga/witchetty bush) growing on ridges and rises. • Hummock grassland growing on sand plains and dunes, drainage systems, salt lake systems and other alluvial areas. In WA the Greater Bilby has been found to inhabit mulga shrublands on stony plains and along the lower slopes of ranges, sandplains, sand dune systems, recently burnt sandplains, interdune corridors and stony plains dominated by *Triodia* grasses and *Acacias*. The species also occupies the edges of salt-lakes where samphire (*Halosarcia* spp.) or *Melaleucas* dominate (Pavey 2006). While the soil types in proximity to the Development Envelope do not include the soft sandy plains known to be Bilby habitat, the vegetation associations include tussock grassland and hummock grassland which the Bilby is known to frequent. The Ghost Bat occupies a range of habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Particular threats include the loss, or disturbance of, breeding or roosting sites or the degradation of foraging habitat (particularly by livestock grazing, fire or weed encroachment). Gully or gorge systems that open onto a plain or riparian line that provides good foraging opportunities are key requirements for the persistence of small colonies (Commonwealth of Australia 2016). The Ghost Bat was recorded in 1964 from a single location ('Blakey's Mine') in close proximity to the Development Envelope, within Zone B. Examination of remote imagery for this location does not indicate that a roost site is present.
Justification of likely impact	The Gouldian Finch may occur in and adjacent to the Development Envelope, but given the wide distribution of the vegetation associations, the generally degraded quality of

	vegetation adjacent to the roads, and the small scale of vegetation loss at a regional scale, a significant impact is not expected. The Greater Bilby may occur in Proximity to the Development Envelope though the habitat may not represent key habitat. Given the wide distribution of the soil types and vegetation associations in the region and the small scale of habitat removal at a regional scale, a significant impact is not expected. The Ghost Bat is likely to forage in proximity to the Development Envelope, especially if a roost is located within 2 km of the Development Envelope. Given the absence of a known roost site in proximity to the Development Envelope and the small scale of habitat removal at a regional scale, a significant impact is not expected.
Methodology	Review of habitat preferences, with reference to the DoEE Species Profile and Threats Database (SPRAT), vegetation information available for the Development Envelope, the National Recovery Plan for the Greater Bilby and Conservation Advice for the Ghost Bat.
Migratory species	The following migratory species, listed under the EPBC Act, have been recorded within 2 km of the Development Envelope: • Black-tailed Godwit (*Limosa limosa*). • Common Sandpiper (*Actitis hypoleucos*). • Curlew Sandpiper (*Calidris ferruginea*). • Greater Sand Plover (*Charadrius leschenaultii*). • Gull-billed Tern (*Gelochelidon nilotica*). • Marsh Sandpiper, Little Greenshank (*Tringa stagnatilis*). • Sharp-tailed Sandpiper (*Calidris acuminata*). • White-winged Black Tern, White-winged Tern (*Chlidonias leucopterus*). • Wood Sandpiper (*Tringa glareola*).
Justification of likely impact	These species may be short-term visitors to the area but are not expected to rely on the habitat immediately adjacent to the current Duncan Rd and Gordon Downs Rd, in particular due to the lack of wetland habitat. No significant impact is expected.
Methodology	Review of species habitat preferences and review of habitat types within the Development Envelope (with reference to geology, soil types and vegetation associations).
Wetlands of International Importance	NA
Justification of likely impact	NA
Methodology	NA
World Heritage Properties	NA
Justification of likely impact	NA
Methodology	NA
National Heritage Places	NA
Justification of likely impact	NA
Methodology	NA

Commonwealth Land or Marine Areas	NA
Justification of likely impact	NA
Methodology	NA
Nuclear Actions	NA
Justification of likely impact	NA
Methodology	NA
Water Resource	NA
Justification of likely impact	NA
Methodology	NA

Based on the information presented in Table 9, it is considered unlikely that a significant impact to MNES would occur as a result of the Project. However, a survey of the proposed new gravel pits and realignmernt sections would assist in confirming the presence or absence of the Greater Bilby in these areas. In the event that suitable Bilby habitat, or evidence of usage, is not found then a referral of the Project to the DoEE is unlikely to be required.

3. RECOMMENDATIONS

It is considered unlikely that a significant environmental impact would occur as a result of the Project. This is on the assumption that matters relating to Aboriginal Heritage and Native Title can be managed through other processes. Thus the referral of the Project to the EPA is unlikely to be required. However, to support a Native Vegetation Clearing Permit (NVCP) application, a flora and vegetation survey of the sections of the Project footprint not previously surveyed (on behalf of Northern Minerals) is likely to be required.

It is considered unlikely that a significant impact to MNES would occur as a result of the Project. However, a survey of the proposed new gravel pits and realignment sections would assist in confirming the presence or absence of the Greater Bilby in these areas. In the event that suitable Bilby habitat, or evidence of usage, is not found then a referral of the Project to the DoEE is unlikely to be required.

Following the confirmation of the proposed Development footprint (i.e. the actual areas of clearing associated with the realignment sections, gravel pits and road upgrades) it is recommended that an application for a NVCP be prepared. Given the historic flora and vegetation data available for some sections of the current road alignment, a staged approach to the Project could be followed, under which approval for works within these sections would be sought initially. Approval for the remaining sections (including realignment sections and gravel pits) could then be sought following the completion of the recommended surveys. It is noted that the optimum timing for flora and vegetation surveys has passed for the year, so this approach would lead to a significant delay to approvals for some sections of the Project.

Concurrently with the NVCP process(es), approvals under 5C and 26D of the Rights in Water and Irrigation Act 1914 (RIWI Act) should be progressed to allow the development of bores and the abstraction of groundwater for use during construction. This work would involve a description of the proposed bores and abstraction rates and would need to demonstrate an appropriate understanding of the local superficial aquifer.

4. REFERENCES

Bureau of Meteorology (BOM). 2012. Topographic Drainage Divisions and River Regions. http://www.bom.gov.au/water/about/riverBasinAuxNav.shtml.

Commonwealth of Australia. 2016. Conservation Advice *Macroderma gigas* ghost bat. Threatened Species Scientific Committee.

CSIRO. 2011. Atlas of Australia Acid Sulphate Soils. Spatial data available at: https://data.csiro.au/dap/landingpage?execution=e1s2&_eventId=viewDescription.

Department of Primary Industries and Regional Development (DPIRD). 2017. Soil Landscape Mapping – Best Available (DAFWA_033). Perth: DPIRD. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available.

Department of Primary Industries and Regional Development (DPIRD). 2019. Western Australian Organism List. Perth: DPIRD. https://www.agric.wa.gov.au/organisms (accessed 10th June 2019).

Department of Water (DoW). 2006. Ord River Water Management Plan. Water Resource Allocation and Planning Series: Report no. WRAP 15. Perth: DWER. https://www.water.wa.gov.au/__data/assets/pdf_file/0011/4700/70582.pdf.

Department of Water (DoW). 2012. Halls Creek Water Reserve drinking water source protection review. Halls Creek town water supply: Looking after all our water needs. Perth: DWER. https://www.water.wa.gov.au/__data/assets/pdf_file/0011/4403/101514.pdf

Department of Water and Environmental Regulation (DWER). 2018a. Hydrographic Catchments - Subcatchments (DWER-030). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-subcatchments.

Department of Water and Environmental Regulation (DWER). 2018b. RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/riwi-act-surface-water-areas-and-irrigation-districts.

Department of Water and Environmental Regulation (DWER). 2018c. RIWI Act, Groundwater Areas (DWER-034). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/riwi-act-groundwater-areas.

Department of Water and Environmental Regulation (DWER). 2018d. Clearing Regulations - Environmentally Sensitive Areas (DWER-046). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046.

Department of Water and Environmental Regulation (DWER). 2019a. Contaminated Sites Database. Perth: DWER. https://dow.maps.arcgis.com/apps/webappviewer/index.html?id=c2ecb74291ae4da2ac32c441819c6d47.

Department of Water and Environmental Regulation (DWER). 2019b. Public Drinking Water Source Areas (DWER-033). Perth: DWER. Spatial data available from: https://catalogue.data.wa.gov.au/dataset/public-drinking-water-source-areas.

Geoscience Australia. 2012. Surface Geology of Australia 1:2.5 million scale dataset 2012 edition. Spatial data available from: https://www.data.gov.au/dataset/ds-ga-b4088aa1-f875-2444-e044-00144fdd4fa6/details?q=1:2.5.

Geoscience Australia. 2017. Australian Surface Hydrology (Web Mercator) MapServer. Spatial data available from: https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/100246.

Heritage Council. 2017. Search Heritage Places. http://inherit.stateheritage.wa.gov.au/public (accessed 5th June 2019).

Landgate. 2018. Reserves (LGATE-227). Spatial data available from: https://catalogue.data.wa.gov.au/dataset/reserves.

MWH. 2014. Duncan/Gordon Downs Road Upgrade Project Level 1 Vegetation, Flora and Fauna Survey, December 2014.

Orchard, A.E. and E.W. Cross. 2012. "A revision of the Australian endemic genus *Pentalepis* (Asteraceae: Ecliptinae)." *Nuytsia* 22, 6: 371-392.

Outback Ecology. 2014. Northern Minerals - Browns Range Project. Level 2 Vegetation and Flora Survey and Impact Assessment.

Pavey, C. 2006. National Recovery Plan for the Greater Bilby *Macrotis lagotis*.

Shire of Halls Creek (SoHC). 2019. Communities. https://www.hallscreek.wa.gov.au/community/communities (accessed 5th June 2019).

Tille, P.J. 2006. Soil-landscapes of Western Australia's rangelands and arid interior. Department of Agriculture and Food. Resource Management Technical Report 313.

Water and Rivers Commission (WRC). 2002. Halls Creek Water Reserve Water Source Protection Plan: Halls Creek Town Water Supply, Water and Rivers Commission, Water Resource Protection Series No WRP 48. https://library.dbca.wa.gov.au/static/Journals/930141/930141-48.pdf

Western Australian Herbarium (WAH). 2019. Search the Western Australian Flora. https://florabase.dpaw.wa.gov.au/search/advanced.

APPENDICES

APPENDIX 1: EPBC PROTECTED MATTERS SEARCH

Australian Government
Department of the Environment and Energy

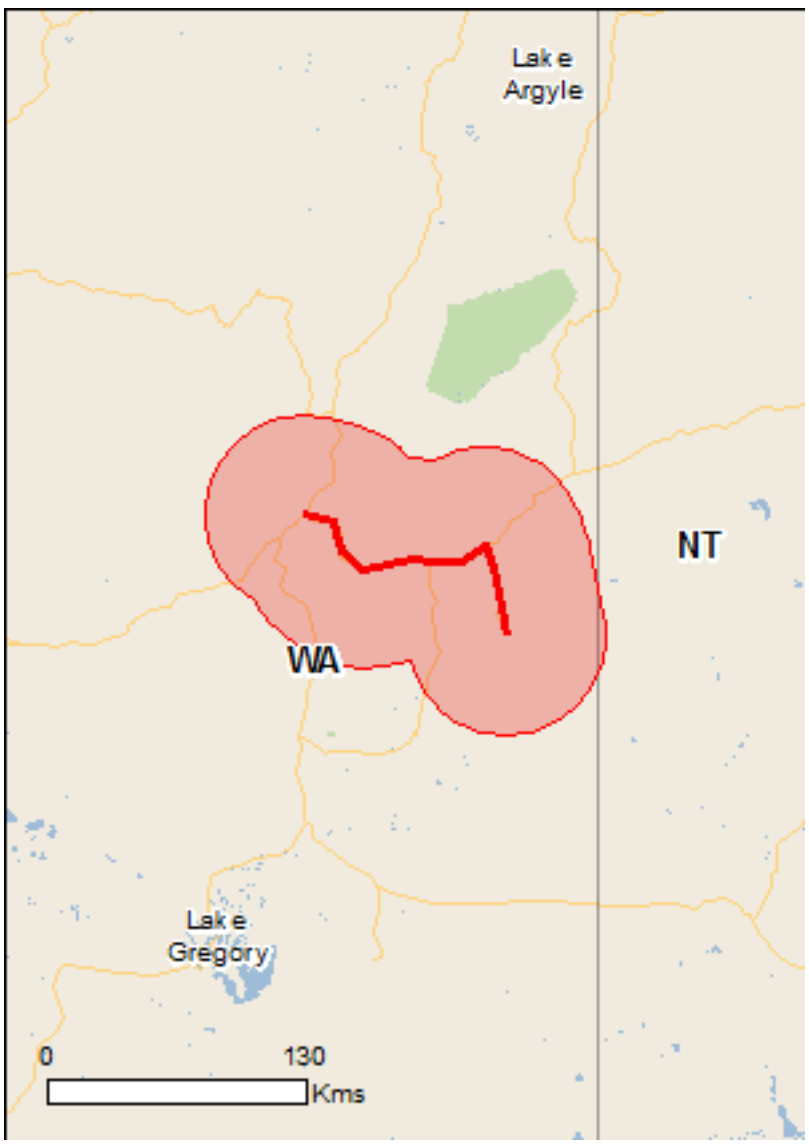
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

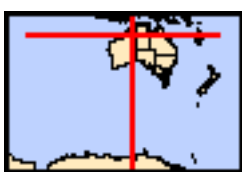
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 20/05/19 19:25:04



Coordinates

Buffer: 50.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Lakes argyle and kununurra	100 - 150km upstream
Ord river floodplain	200 - 300km upstream

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Ord River Regeneration Reserve	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-18.226842 127.670223,-18.258145 127.803432,-18.387208 127.833645,-18.457565 127.936642,-18.411966 128.161861,-18.426299 128.260738,-18.427601 128.377468,-18.362445 128.488705,-18.449749 128.52441,-18.620318 128.557369,-18.745207 128.584835,-18.745207 128.584835

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX 2: NATUREMAP DATABASE SEARCH

NatureMap Species Report

Created By Guest user on 30/05/2019

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	18° 13' 33" S,127° 40' 01" E 18° 13' 53" S,127° 40' 55" E 18° 15' 25" S,127° 42' 47" E 18° 15' 40" S,127° 44' 04" E 18° 14' 32" S,127° 46' 01" E 18° 16' 04" S,127° 48' 47" E 18° 18' 35" S,127° 50' 09" E 18° 20' 17" S,127° 49' 35" E 18° 24' 06" S,127° 49' 40" E 18° 25' 04" S,127° 50' 14" E 18° 25' 38" S,127° 51' 47" E 18° 25' 48" S,127° 53' 24" E 18° 27' 25" S,127° 56' 29" E 18° 26' 37" S,128° 02' 29" E 18° 24' 55" S,128° 07' 46" E 18° 24' 40" S,128° 09' 47" E 18° 25' 14" S,128° 14' 00" E 18° 25' 38" S,128° 21' 57" E 18° 21' 35" S,128° 29' 16" E 18° 25' 58" S,128° 31' 27" E 18° 28' 58" S,128° 31' 17" E 18° 36' 60" S,128° 33' 19" E 18° 39' 31" S,128° 32' 30" E 18° 43' 10" S,128° 34' 32" E 18° 44' 37" S,128° 34' 42" E
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	375	2338
Other specially protected fauna	2	2
Priority 1	1	1
Priority 2	1	1
Priority 3	2	3
Priority 4	1	2
Protected under international agreement	7	14
Rare or likely to become extinct	5	8
TOTAL	**394**	**2369**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
2.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
3.	24473	*Falco hypoleucos (Grey Falcon)*		T	
4.	24180	*Macroderma gigas (Ghost Bat)*		T	
5.	24157	*Trichosurus vulpecula subsp. arnhemensis (northern brushtail possum (Kimberley))*		T	
Protected under international agreement					
6.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
7.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
8.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
9.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
10.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
11.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
12.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
Other specially protected fauna					
13.	24858	*Crocodylus johnstoni (Australian freshwater crocodile)*		S	
14.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
Priority 1					
15.	42007	*Pentalepis trichodesmoides subsp. incana*		P1	
Priority 2					
16.	24204	*Vespadelus douglasorum (Yellow-lipped Cave Bat)*		P2	
Priority 3					
17.	882	*Fimbristylis sieberiana*		P3	
18.	19121	*Goodenia crenata*		P3	
Priority 4					
19.	24632	*Erythrura gouldiae (Gouldian Finch)*		P4	
Non-conservation taxon					
20.	4898	*Abutilon macrum*			
21.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
22.	4901	*Abutilon otocarpum (Desert Chinese Lantern)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
23.	3198	*Acacia acradenia*			
24.	11215	*Acacia adoxa var. adoxa*			
25.	3209	*Acacia ampliceps*			
26.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
27.	3222	*Acacia argyraea*			
28.	40300	*Acacia calligera*			
29.	13403	*Acacia colei*			
30.	17013	*Acacia colei var. colei*			
31.	17014	*Acacia colei var. ileocarpa*			
32.	3417	*Acacia leptophleba*			
33.	3430	*Acacia lysiphloia (Turpentine Wattle)*			
34.	13401	*Acacia neurocarpa*			
35.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
36.	15217	*Acacia retivenea subsp. retivenea*			
37.	16173	*Acacia thomsonii*			
38.	19641	*Acacia tumida var. tumida*			
39.	16155	*Acacia wickhamii subsp. wickhamii*			
40.		*Acariformes sp.*			
41.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
42.	25536	*Accipiter fasciatus (Brown Goshawk)*			
43.	25537	*Accipiter novaehollandiae (Grey Goshawk)*			
44.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
45.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
46.	24300	*Aegotheles cristatus subsp. leucogaster (Australian Owlet-nightjar)*			
47.	2646	*Aerva javanica (Kapok Bush)*	Y		
48.	2651	*Alternanthera nana (Hairy Joyweed)*			
49.	5278	*Ammannia multiflora*			
50.	30831	*Amphibolurus gilberti (Ta-ta, Gilbert's Dragon)*			
51.	2371	*Amyema dolichopoda*			
52.	24312	*Anas gracilis (Grey Teal)*			
53.	24316	*Anas superciliosa (Pacific Black Duck)*			
54.		*Ancylidae sp.*			
55.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
56.	24317	*Anseranas semipalmata (Magpie Goose, Pied Goose)*			
57.	24719	*Aprosmictus erythropterus (Red-winged Parrot)*			
58.	24285	*Aquila audax (Wedge-tailed Eagle)*			
59.	25559	*Ardea intermedia (Intermediate Egret)*			
60.	41324	*Ardea modesta (great egret, white egret)*			
61.	24341	*Ardea pacifica (White-necked Heron)*			
62.	24610	*Ardeotis australis (Australian Bustard)*			
63.	211	*Aristida hygrometrica (Northern Kerosene Grass)*			
64.	221	*Aristida pruinosa (Gulf Feathertop Wiregrass)*			
65.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
66.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
67.	24355	*Artamus minor (Little Woodswallow)*			
68.	24356	*Artamus personatus (Masked Woodswallow)*			
69.	225	*Arundinella nepalensis (Reedgrass)*			
70.	230	*Astrebla squarrosa (Bull Mitchell Grass)*			
71.	24318	*Aythya australis (Hardhead)*			
72.		*Baetidae sp.*			
73.	12757	*Bauhinia cunninghamii*			
74.	5184	*Bergia pedicellaris*			
75.	7866	*Blumea tenella*			
76.	2773	*Boerhavia paludosa*			
77.	6608	*Bonamia pannosa*			
78.	4603	*Bridelia tomentosa*			
79.	750	*Bulbostylis barbata*			
80.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
81.	25716	*Cacatua sanguinea (Little Corella)*			
82.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
83.	25599	*Cacomantis variolosus (Brush Cuckoo)*			
84.		*Caenidae sp.*			
85.	11150	*Cajanus pubescens*			
86.	13696	*Cajanus reticulatus var. grandifolius*			
87.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
88.	5457	*Calytrix exstipulata (Kimberley Heather)*			
89.	3748	*Canavalia papuana*			
90.	48913	*Celtis strychnoides*			
91.	25600	*Centropus phasianinus (Pheasant Coucal)*			
92.		*Ceratopogonidae sp.*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
93.	47905	*Ceyx azureus (Azure Kingfisher)*			
94.		*Chironominae sp.*			
95.	273	*Chrysopogon fallax (Golden Beard Grass)*			
96.	24288	*Circus approximans (Swamp Harrier)*			
97.	24289	*Circus assimilis (Spotted Harrier)*			
98.	25756	*Cisticola exilis (Golden-headed Cisticola)*			
99.		*Coenagrionidae sp.*			
100.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
101.	24615	*Colluricincla woodwardi (Sandstone Shrike-thrush)*			
102.	24399	*Columba livia (Domestic Pigeon)*	Y		
103.	24566	*Conopophila rufogularis (Rufous-throated Honeyeater)*			
104.	24361	*Coracina maxima (Ground Cuckoo-shrike)*			
105.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
106.	25569	*Coracina papuensis (White-bellied Cuckoo-shrike, Little Cuckoo-shrike)*			
107.	25570	*Coracina tenuirostris (Cicadabird)*			
108.		*Corbiculidae sp.*			
109.		*Corixidae sp.*			
110.	24416	*Corvus bennetti (Little Crow)*			
111.	25593	*Corvus orru (Torresian Crow)*			
112.	17092	*Corymbia opaca*			
113.	25701	*Coturnix ypsilophora (Brown Quail)*			
114.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
115.	25595	*Cracticus tibicen (Australian Magpie)*			
116.	25596	*Cracticus torquatus (Grey Butcherbird)*			
117.	25397	*Crinia bilingua (Bilingual Froglet)*			
118.	11903	*Crotalaria dissitiflora subsp. rugosa*			
119.	3780	*Crotalaria juncea (Sunnhemp)*	Y		
120.	20179	*Crotalaria medicaginea var. neglecta*			
121.	12324	*Crotalaria montana*			
122.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
123.	3787	*Crotalaria verrucosa (Blueflower Rattlepod)*			
124.	24870	*Ctenophorus caudicinctus subsp. macropus (Ring-tailed Dragon)*			
125.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
126.	17118	*Cullen leucanthum*			
127.	17116	*Cullen martinii*			
128.	17438	*Cullen plumosum*			
129.	25371	*Cyclorana australis (Giant Frog)*			
130.	25374	*Cyclorana longipes (Long-footed Frog)*			
131.	280	*Cymbopogon bombycinus (Silky Oilgrass)*			
132.	6585	*Cynanchum pedunculatum*			
133.	788	*Cyperus dactylotes*			
134.	12806	*Cyperus microcephalus subsp. chersophilus*			
135.	814	*Cyperus squarrosus*			
136.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
137.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
138.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
139.	25001	*Delma nasuta*			
140.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
141.	7317	*Dentella asperata*			
142.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
143.	25228	*Diporiphora arnhemica*			
144.	24892	*Diporiphora bennettii*			
145.	4777	*Dodonaea polyzyga*			
146.	44508	*Duma florulenta*			
147.	2504	*Dysphania plantaginella*			
148.	2506	*Dysphania rhadinostachya*			
149.		*Dytiscidae sp.*			
150.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
151.		*Egretta garzetta*			
152.		*Egretta novaehollandiae*			
153.		*Elanus axillaris*			
154.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
155.	24631	*Emblema pictum (Painted Finch)*			
156.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
157.	365	*Enneapogon polyphyllus (Leafy Nineawn)*			
158.		*Entomyzon cyanotis*			
159.		*Eolophus roseicapillus*			
160.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
161.	375	*Eragrostis cumingii (Cuming's Love Grass)*			
162.	381	*Eragrostis falcata (Sickle Lovegrass)*			

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163.	398	*Eragrostis tenellula (Delicate Lovegrass)*			
164.	7183	*Eremophila bignoniiflora (Gooramurra)*			
165.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
166.	404	*Eriachne ciliata (Slender Wandarrie Grass)*			
167.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
168.	16485	*Eriachne pulchella subsp. dominii*			
169.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
170.	5566	*Eucalyptus brevifolia (Snappy Gum)*			
171.	5603	*Eucalyptus coolabah (Coolibah)*			
172.	5609	*Eucalyptus cupularis (Halls Creek White Gum)*			
173.	44533	*Eucalyptus leucophylla*			
174.	15187	*Eucalyptus limitaris*			
175.	18219	*Eucalyptus tephrodes*			
176.	35303	*Euphorbia australis var. subtomentosa*			
177.	4621	*Euphorbia cinerea*			
178.	17342	*Euphorbia cyathophora*	Y		
179.	4629	*Euphorbia hirta (Asthma Plant)*	Y		
180.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
181.	24368	*Eurostopodus argus (Spotted Nightjar)*			
182.	25591	*Eurystomus orientalis (Dollarbird)*			
183.	25621	*Falco berigora (Brown Falcon)*			
184.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
185.	25623	*Falco longipennis (Australian Hobby)*			
186.	24476	*Falco subniger (Black Falcon)*			
187.	1748	*Ficus coronulata (River Fig)*			
188.	1755	*Ficus racemosa (Stem-fruit Fig, Ong U)*			
189.	862	*Fimbristylis microcarya*			
190.	867	*Fimbristylis nutans*			
191.	25727	*Fulica atra (Eurasian Coot)*			
192.	24401	*Geopelia cuneata (Diamond Dove)*			
193.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
194.	25585	*Geopelia striata (Zebra Dove)*			
195.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
196.		*Gerridae sp.*			
197.		*Gmelina arborea*			
198.		*Gomphidae sp.*			
199.	18363	*Gomphrena canescens subsp. canescens*			
200.	18372	*Gomphrena lanata*			
201.	7532	*Goodenia odonnellii*			
202.	4910	*Gossypium australe (Native Cotton)*			
203.	24443	*Grallina cyanoleuca (Magpie-lark)*			
204.	16476	*Grevillea refracta subsp. refracta*			
205.	13440	*Grevillea wickhamii subsp. aprica*			
206.	24484	*Grus rubicunda (Brolga)*			
207.	24295	*Haliastur sphenurus (Whistling Kite)*			
208.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
209.	6706	*Heliotropium cunninghamii*			
210.	10992	*Heliotropium glabellum*			
211.	17309	*Heliotropium pachyphyllum*			
212.	24633	*Heteromunia pectoralis (Pictorella Mannikin)*			
213.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
214.	24963	*Heteronotia planiceps*			
215.	443	*Heteropogon contortus (Bunch Speargrass)*			
216.	4933	*Hibiscus leptocladus*			
217.	47965	*Hieraaetus morphnoides (Little Eagle)*			
218.	25734	*Himantopus himantopus (Black-winged Stilt)*			
219.	24491	*Hirundo neoxena (Welcome Swallow)*			
220.	11346	*Hybanthus enneaspermus subsp. enneaspermus*			
221.		*Hydrophilidae sp.*			
222.		*Hydroptilidae sp.*			
223.	453	*Imperata cylindrica (Kunai Grass)*			
224.	3981	*Indigofera linnaei (Birdsville Indigo)*			
225.	3982	*Indigofera monophylla*			
226.	6636	*Ipomoea plebeia (Bellvine)*			
227.	457	*Iseilema ciliatum*			
228.	458	*Iseilema dolichotrichum*			
229.	13553	*Jacquemontia pannosa*			
230.	25571	*Lalage leucomela (Varied Triller)*			
231.		*Leiopotherapon unicolor*			
232.	3038	*Lepidium pholidogynum*			

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233.		*Leptoceridae sp.*			
234.		*Leptophlebiidae sp.*			
235.		*Libellulidae sp.*			
236.	25661	*Lichmera indistincta (Brown Honeyeater)*			
237.	25380	*Litoria caerulea (Green Tree Frog)*			
238.	25385	*Litoria inermis (Bumpy Rocket Frog)*			
239.	25390	*Litoria pallida (Pale Rocket Frog)*			
240.	25392	*Litoria rubella (Little Red Tree Frog)*			
241.	11567	*Lophostemon grandiflorus subsp. riparius*			
242.	4060	*Lotus australis (Austral Trefoil)*			
243.		*Lymnaeidae sp.*			
244.	2400	*Lysiana subfalcata*			
245.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
246.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
247.	25653	*Malurus melanocephalus (Red-backed Fairy-wren)*			
248.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
249.	24583	*Manorina flavigula (Yellow-throated Miner)*			
250.	16537	*Marsdenia angustata*			
251.	5879	*Melaleuca bracteata (River Teatree)*			
252.	47997	*Melanodryas cucullata (Hooded Robin)*			
253.	5051	*Melhania oblongifolia*			
254.	24585	*Melithreptus albogularis (White-throated Honeyeater)*			
255.	25665	*Melithreptus gularis (Black-chinned Honeyeater)*			
256.	24589	*Melithreptus gularis subsp. laetior (Black-chinned Honeyeater)*			
257.	24736	*Melopsittacus undulatus (Budgerigar)*			
258.	24598	*Merops ornatus (Rainbow Bee-eater)*			
259.		*Mesoveliidae sp.*			
260.		*Microcarbo melanoleucos*			
261.	25693	*Microeca fascinans (Jacky Winter)*			
262.	25542	*Milvus migrans (Black Kite)*			
263.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
264.		*Missulena occatoria*			
265.	17365	*Mitrasacme nudicaulis var. nudicaulis*			
266.	25194	*Morethia ruficauda subsp. ruficauda*			
267.	25610	*Myiagra inquieta (Restless Flycatcher)*			
268.	6201	*Myriophyllum verrucosum (Red Water Milfoil)*			
269.		*Nematalosa sp.*			
270.	25684	*Neochmia phaeton (Crimson Finch)*			
271.	4112	*Nomismia rhomboidea*			
272.		*Notonectidae sp.*			
273.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
274.	24742	*Nymphicus hollandicus (Cockatiel)*			
275.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
276.	24975	*Oedura gracilis*			
277.	7341	*Oldenlandia pterospora*			
278.		*Oligochaeta sp.*			
279.	24608	*Oriolus sagittatus (Olive-backed Oriole)*			
280.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
281.		*Palaemonidae sp.*			
282.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
283.	25682	*Pardalotus striatus (Striated Pardalote)*			
284.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
285.	546	*Perotis rara (Comet Grass)*			
286.	48060	*Petrochelidon ariel (Fairy Martin)*			
287.	48061	*Petrochelidon nigricans (Tree Martin)*			
288.	24659	*Petroica goodenovii (Red-capped Robin)*			
289.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
290.	25699	*Phalacrocorax varius (Pied Cormorant)*			
291.	25668	*Philemon citreogularis (Little Friarbird)*			
292.	4680	*Phyllanthus maderaspatensis*			
293.		*Planorbidae sp.*			
294.	24842	*Platalea regia (Royal Spoonbill)*			
295.	24749	*Platycercus venustus (Northern Rosella)*			
296.	42305	*Platyplectrum ornatum (Ornate Burrowing Frog)*			
297.		*Pleidae sp.*			
298.	17816	*Pluchea ferdinandi-muelleri*			
299.	25703	*Podargus strigoides (Tawny Frogmouth)*			
300.	25704	*Podiceps cristatus (Great Crested Grebe)*			
301.	24643	*Poephila acuticauda (Long-tailed Finch)*			
302.	25688	*Poephila personata (Masked Finch)*			

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303.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
304.	6653	*Polymeria ambigua (Morning Glory)*			
305.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
306.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
307.	2884	*Portulaca oleracea (Purslane, Wakati)*			
308.	25261	*Pseudechis australis (Mulga Snake)*			
309.	25304	*Pseudonaja textilis (Eastern Brown Snake)*			
310.		*Psitteuteles versicolor*			
311.	8190	*Pterocaulon niveum*			
312.	25725	*Ptilonorhynchus nuchalis (Great Bowerbird)*			
313.	24758	*Ptilonorhynchus nuchalis subsp. nuchalis (Great Bowerbird)*			
314.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
315.	2705	*Ptilotus capitatus*			
316.	2713	*Ptilotus corymbosus*			
317.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
318.	2725	*Ptilotus fusiformis*			
319.	2761	*Ptilotus spicatus*			
320.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
321.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
322.	48096	*Rhipidura albiscapa (Grey Fantail)*			
323.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
324.	13150	*Scaevola browniana subsp. browniana*			
325.	601	*Schizachyrium pseudeulalia*			
326.	16257	*Schoenoplectus subulatus*			
327.	25605	*Scythrops novaehollandiae (Channel-billed Cuckoo)*			
328.	604	*Sehima nervosum (Whitegrass)*			
329.	12280	*Senna artemisioides subsp. oligophylla*			
330.	4196	*Sesbania cannabina (Sesbania Pea)*			
331.		*Sesbania sp.*			
332.	31859	*Sida sp. Articulation below (A.A. Mitchell PRP 1605)*			
333.	30948	*Smicrornis brevirostris (Weebill)*			
334.	7021	*Solanum lucani*			
335.	7032	*Solanum quadriloculatum (Tomato Bush)*			
336.	620	*Sorghum stipoideum (Annual Sorghum)*			
337.	28345	*Spermacoce dolichosperma*			
338.	43943	*Sphaeromorphaea littoralis*			
339.		*Spinasteron mjobergi*			
340.	629	*Sporobolus australasicus (Fairy Grass)*			
341.	4731	*Stackhousia intermedia*			
342.	24482	*Stiltia isabella (Australian Pratincole)*			
343.	7729	*Stylidium fluminense*			
344.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
345.		*Synsphyronus absitus*			
346.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
347.	25552	*Tadorna radjah (Radjah Shelduck)*			
348.	30872	*Taeniopygia bichenovii (Double-barred Finch)*			
349.	30870	*Taeniopygia guttata (Zebra Finch)*			
350.		*Tanypodinae sp.*			
351.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
352.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
353.	4252	*Templetonia egena (Round Templetonia)*			
354.	4261	*Tephrosia brachycarpa*			
355.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
356.	19529	*Tephrosia rosea var. rosea*			
357.	15951	*Tephrosia sp. F Kimberley Flora (B.R. Maslin 5139)*			
358.	4283	*Tephrosia stipuligera*			
359.	4285	*Tephrosia supina*			
360.	4287	*Tephrosia virens*			
361.	5298	*Terminalia arostrata (Crocodile Tree)*			
362.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
363.	673	*Themeda triandra*			
364.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
365.	7364	*Timonius timon*			
366.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
367.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
368.	44261	*Trianthema oxycalyptrum var. oxycalyptrum*			
369.	44362	*Trianthema triquetrum*			
370.	4368	*Tribulopis angustifolia*			
371.	4383	*Tribulus terrestris (Caltrop)*	Y		
372.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			

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373.	11750	*Trichodesma zeylanicum var. zeylanicum*			
374.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
375.	48201	*Trigastrotheca molluginea*			
376.	685	*Triodia inaequiloba*			
377.	686	*Triodia intermedia (Lobed Spinifex)*			
378.	696	*Triodia pungens (Soft Spinifex)*			
379.	704	*Triodia wiseana (Limestone Spinifex)*			
380.	16225	*Triumfetta antrorsa*			
381.	24848	*Turnix pyrrhothorax (Red-chested Button-quail)*			
382.	25437	*Uperoleia borealis (Northern Taodlet)*			
383.	710	*Urochloa decumbens*	Y		
384.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
385.	25577	*Vanellus miles (Masked Lapwing)*			
386.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
387.		*Veliidae sp.*			
388.	24203	*Vespadelus caurinus (Western Cave Bat, Northern Cave-bat)*			
389.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
390.	11576	*Vigna lanceolata var. lanceolata*			
391.	5106	*Waltheria indica*			
392.	729	*Xerochloa barbata (Rice Grass)*			
393.	730	*Xerochloa imberbis (Rice Grass)*			
394.	4326	*Zornia albiflora*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.