HASTINGS
Technology Metals Limited

APPENDIX 1-2

Flora and Fauna Memo: Access Road

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Our ref: 11128-3397-15L Desktop Memo Access Road

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Environment Manager
Hastings Technology Metals
C/- Wave International
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Dear Lara

PRELIMINARY ASSESSMENT OF VEGETATION TYPES AND FAUNA HABITAT OF PROPOSED ACCESS ROAD

In 2015, Ecoscape conducted Level 2 flora, vegetation and fauna surveys within Hastings Technology Metals (Hastings), Yangibana Rare Earths Project (Yangibana) study area, in the Gascoyne region of Western Australia. The survey area included proposed sites for project infrastructure including an access road. The proposed access road has now been moved and extends south of the original study area by approximately 13 kilometres (km).

Hastings requested Ecoscape undertake a preliminary desktop assessment of vegetation types and fauna habitats that may occur along the new access road alignment.

VEGETATION TYPES

LAND SYSTEMS

The proposed access road alignment intersects six land systems: Nadara, Augustus, Gascoyne, George, Jamindie and Winmar (Wilcox & McKinnon 1972). Two of these land systems (George and Winmar) are not represented within the Yangibana study area. They are described as:

- George Land system: very stony lower slopes and interfluves below hill systems, supporting stunted acacia, eremophila and cassia shrublands.
- Winmar Land system: Stony plains with sandy banks supporting mulga and other acacia shrublands with eremophila and cassia low shrubs and wanderrie grasses on banks.

PRE-EUROPEAN VEGETATION ASSOCIATIONS

The proposed access road alignment intersects four mapped vegetation associations based on pre-European mapping (DAFWA 2012):

- 18: low woodland; mulga (*Acacia aneura*)
- 29: sparse low woodland; mulga, discontinuous in scattered groups
- 165: low woodland; mulga and snakewood (*Acacia eremaea*)
- 181: shrublands; mulga & snakewood scrub.

One of these vegetation associations, '29', was not present within the Yangibana study area that was surveyed during 2015. This vegetation association occupies a substantial proportion of the proposed access road outside of the main Yangibana study area.

ASSESSMENT OF AERIAL IMAGERY AND SITE PHOTOGRAPHS

Based on a preliminary assessment of aerial imagery and site photographs, the proposed access road may intersect vegetation types analogous with or similar to the following documented by Ecoscape:

- **AcEt**; '*Acacia cyperophylla* var. *cyperophylla* low open woodland over *Eragrostis tenellula, Eragrostis cumingii* and *Eriachne aristidea* low tussock grassland major drainage line'. This vegetation type is associated with mid to minor drainage lines and is considered likely to occupy such habitats along the proposed road corridor.
- **EcBp**; '*Eremophila cuneifolia* and *Scaevola spinescens* mid sparse shrubland over *Brachyachne prostrata* and *Sclerolaena eriacantha* low sparse grassland/chenopod shrubland'. This vegetation is considered likely to within the northernmost section of the proposed road, adjacent to the main Yangibana study area, associated with plains of the Nadara Landsystem.
- **AaEpDr**; '*Acacia aptaneura* low open woodland over *Eremophila phyllopoda* subsp. *obliqua*, *Acacia tetragonophylla* and *Dodonaea petiolaris* mid open shrubland over *Dysphania rhadinostachya, Bulbostylis barbata* and *Gomphrena cunninghamii* low open forbland/ sedgeland'. This vegetation type (or similar) may occupy the proposed road corridor based on an apparent continuation of the landform signature observed within the Yangibana study area.
- **EcMgCc**; '*Eucalyptus camaldulensis* mid woodland over *Melaleuca glomerata* and *Acacia coriacea* subsp. *pendens* tall shrubland over **Cenchrus ciliaris* mid tussock grassland'. This vegetation type (or **EvCc**) is considered likely to intersect this proposed road corridor near the southernmost extent based on the aerial imagery.
- **EvCc**; '*Eucalyptus victrix* and *Acacia citrinoviridis* mid open forest over **Cenchrus ciliaris* and **C. setiger* mid tussock grassland'. As with **EcMgCc**, this vegetation type may correspond with the drainage lines intersecting the southernmost extent of the proposed road corridor.
- **EpAc**; *Eremophila phyllopoda* subsp. *obliqua, Acacia tetragonophylla* and *Senna artemisioides* subsp. *helmsii* mid open shrubland over *Aristida contorta, Eriachne pulchella* subsp. *dominii* and *Portulaca oleracea* low grassland/forbland.

None of the vegetation types listed above were identified as Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs), (Ecoscape 2016). **EcMgCc** is considered to represent a Groundwater Dependent Ecosystem (GDE) and **EvCc** may be representative of a GDE. It is possible that other vegetation types may be present within the proposed access road.

POTENTIAL FOR CONSERVATION SIGNIFICANT FLORA

There is potential for the majority of conservation significant flora species identified by the 2015 Level 2 flora and vegetation assessments to occur within the proposed access road. Additionally, during the 2015 assessments, an area adjacent to the proposed access road was opportunistically assessed due to the observation of an unusual species of *Acacia*, subsequently identified as *Acacia atopa*. This species is listed as Priority 3. It dominates the linear ridgelines that occur immediately adjacent to the proposed access road. There is potential for the population of this species to extend within the boundary of the proposed access road.

CONCLUSION

The proposed access road contains both land systems and mapped pre-European vegetation associations that are not represented within the main Yangibana study area that was subject to a detailed Level 2 flora and vegetation assessment in 2015. The region surrounding the Yangibana study area remains relatively unsurveyed with regards to flora and vegetation. It is considered likely, based on an assessment of the aerial imagery and photographs provided by Hastings, that vegetation types may be analogous or similar to those encountered within the Yangibana tenements. There is the potential for conservation significant flora and vegetation (groundwater dependent ecosystems). This assumption is based on the presence of unique land systems and pre-European vegetation associations that did not occur within the Yangibana study area. A Level 1 flora and vegetation survey of the proposed access road is recommended.

FAUNA HABITATS

A desktop fauna assessment was undertaken that extrapolated the habitat mapping from the 2015 Level 2 fauna survey and compared the route of the proposed access road with similar habitats and landforms. The following fauna habitat types may occur along the proposed access road.

Rocky Plains and Hills

This habitat is characterised by gravelly/stony undulating hills of fine, red clay/loam soil with >70% cover of ironstone gravel or >40% of quartz stones with occasional granite rocks. The vegetation is sparse and consists of scattered *Acacia xiphophylla* and *Exocarpos psydrax* tall shrubs, over low *Eremophila fraseri*, *Ptilotus obovatus* and *Senna* spp shrubland. Some patches of *Dysphania rhadinostachya* open herbland and *Eriachne pulchella* subsp. *dominii* and *Aristida contorta* open tussock grassland can be found. It also comprises some undulating hills and smaller hillslopes in particular in the south of the study area as well as plains which were recorded throughout the study area. This habitat is the most common in the study area.

Sandy Plains

The sandy plain habitat type is dominated by an open layer of *Acacia xiphophylla* tall shrubs over scattered *Senna ferraria* mid shrubs over occasional *Maireana* spp. low, isolated chenopod shrubs. This habitat types is also characterised by sandy fine, orange clay/loam soil with occasional calcrete and quartz pebbles. Rocks were rarely encountered. Leaf litter and wood litter is rare but was sometimes observed accumulated underneath shrubs.

Major River

This habitat type consists of *Eucalyptus camaldulensis* trees over mid shrubland of *Acacia citrinoviridis* and *Acacia coriacea* over lower shrubs and *Cenchrus ciliaris* and *Eragrostis tenellula* closed tussock grassland. The substrate consists of coarse sand with occasional quartz/granite pebbles. Leaf and wood litter is usually accumulated against tree trunks, or in some cases entirely absent. After heavy rainfall events, semi-permanent water pools may be present to support a large number of fauna species.

The fauna assemblages associated with the habitats found along the access road are expected to comparable to those recorded from the initial study area.

CONCLUSION

Based on our preliminary desktop assessment and assessment of aerial imagery and photographs provided, it is considered likely that fauna habitat types may be analogous or similar to those encountered within the Yangibana tenements. Consequently, a Level 1 fauna survey of the proposed access road is recommended.

Yours sincerely

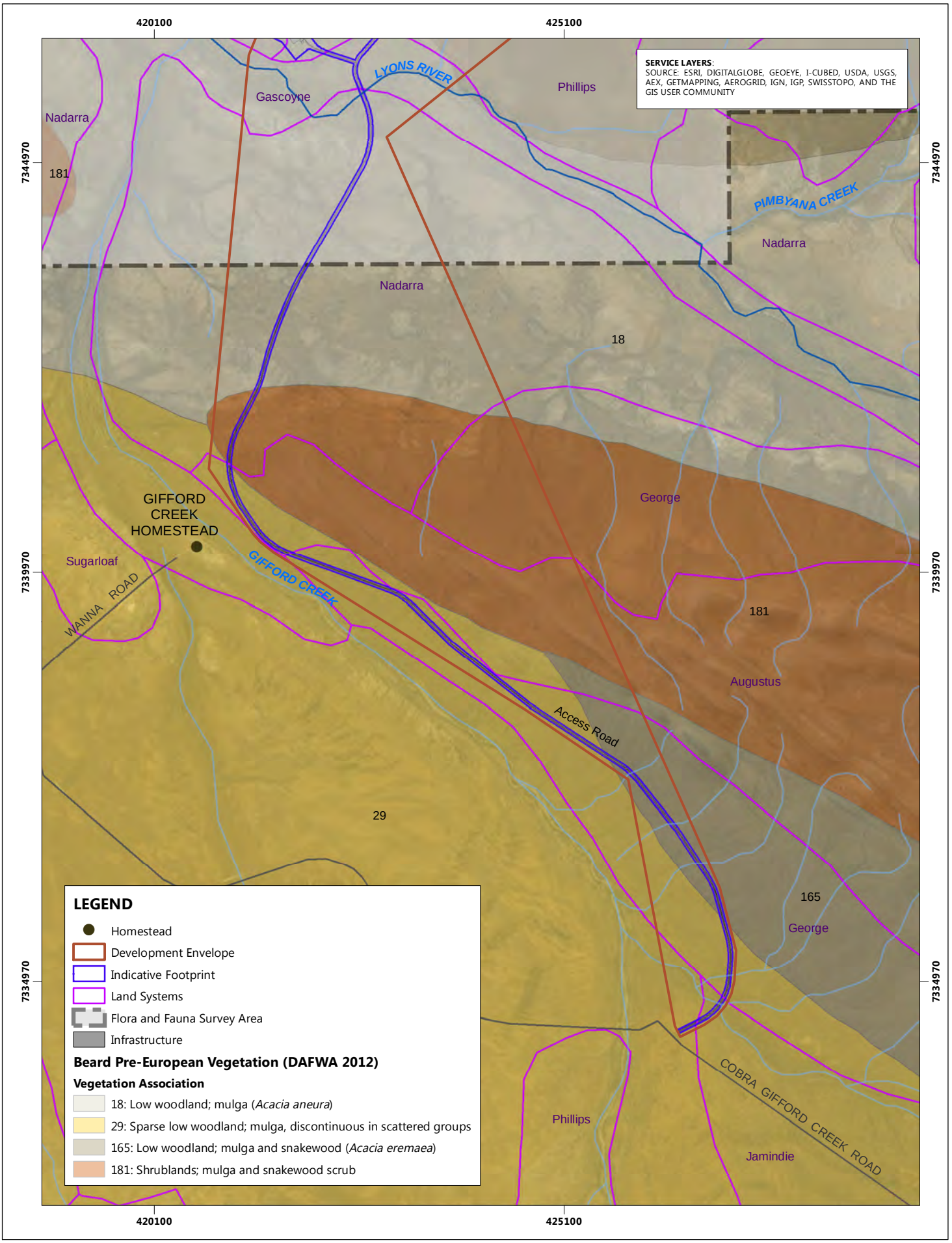
Ecoscape (Australia) Pty Ltd

Jared Nelson

Group Leader - Environment

QA Approved by:	Marc Wohling-Director, Environment		**Date:**	27/01/2017

[science+design]



SCALE: 1:60,000 @ A4

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

DATA SOURCES:
TOPOGRAPHIC LAYERS: GEOSCIENCE AUSTRALIA

ecoscape

PROJECT NO: 3402-15

REV	AUTHOR	APPROVED	DATE
0	JN	SK	30/01/2017

N

0 0.5 1 1.5 km

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YANGIBANA RARE EARTHS PROJECT

CLIENT: HASTINGS

FIGURE 01