



Native Vegetation Clearing Permit

Supporting Document

22-Dec-2021
Square Kilometre Array

Native Vegetation Clearing Permit

Supporting Document

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1.0 Introduction

1.1 Project background

The Square Kilometre Array (SKA) Project is a large international radio telescope project which aims to answer key cosmological questions using radio waves from across the universe to look back into the cosmic dark ages. As with all big science projects, the SKA project will draw on the skills, experiences and support of 14 countries working collaboratively to construct and operate elements of the SKA project, with the first phase of the project being hosted by South Africa and Australia. Australia will host the SKA1-Low Frequency Aperture Array (SKA1-Low).

SKA1-Low is an entirely new array and will consist of up to 512 array stations. Each array station will consist of up to 256 individual antennas, representing more than 130,000 antennas in total. The majority of array stations will be in a densely populated core and the remainder located in groups of six stations at multiple locations along three spiral arms.

The SKA1-Low project is being developed in stages and this first stage of the project requires early site development works where native vegetation clearing will be required.

1.2 Project location

The native vegetation clearing which is the subject of this application will be located on the Murchison Radio Astronomy Observatory (MRO) that will expand to encompass Boolardy Pastoral Station. The project area is approximately 350 km northeast of Geraldton, and 770 km north of Perth (Figure 1), by road.

Boolardy Pastoral Station, located 350km north east of Geraldton, in the Murchison Region of Western Australia, was selected to host the SKA1-Low array due to its excellent radio-quiet environment and proximity to services and infrastructure. This area has been established for the development and use of future radioastronomy services and activities and the Murchison Radio-astronomy Observatory (MRO) which hosts the Australian SKA Pathfinder (ASKAP) and Murchison Widefield Array. The MRO was excised from Boolardy Station in 2009 and will now also host SKA1-Low and to do so expand to encompass Boolardy Pastoral Station.

Within the expanded MRO, native vegetation clearing areas are proposed to accommodate the following project components:

- construction camp
- AARNET fibre cable to Construction camp
- SKA core access road
- contractor Compound on Kalli road.

These components are shown in Figure 2.

1.3 Site tenure and zoning

The Proposal is located on Boolardy Station and the MRO in the Shire of Murchison. Boolardy Station is a 346,748 ha pastoral property (pastoral lease no. 3114/406) and the MRO is on Lot 502 on deposited plan 55945 in the arid rangeland region of mid-Western Australia (Figure 1). The pastoral lease and the MRO lease are held by Commonwealth Scientific and Industrial Research Organisation (CSIRO).

CSIRO leases both the MRO and Boolardy Station from the WA state government and plans to combine these in a new diversified lease with radio-astronomy being the primary use.

When the MRO and SKA ILUA has been signed it is expected that CSIRO will relinquish the existing leases with a new lease to be granted under the *Land Acquisition Act 1969*, by the Minister for Lands to CSIRO, with a permitted use that includes developing, operating, undertaking and decommissioning the SKA1-Low project.

The new lease area means the land comprising:

- Lot 18 on Deposited Plan 220344, the whole of the land comprised in Certificate of Crown land title Volume 3064 Folio 479
- Lot 31 on Deposited Plan 220344, the whole of the land comprised in Certificate of Crown land title Volume 3064 Folio 504
- Lot 226 on Deposited Plan 220344, the whole of the land comprised in Certificate of Crown land title Volume 3085 Folio 52
- Lot 502 on Deposited Plan 55945, the whole of the land comprised in Certificate of Crown land title Volume 3157 Folio 070.

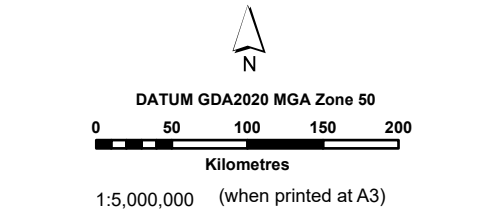
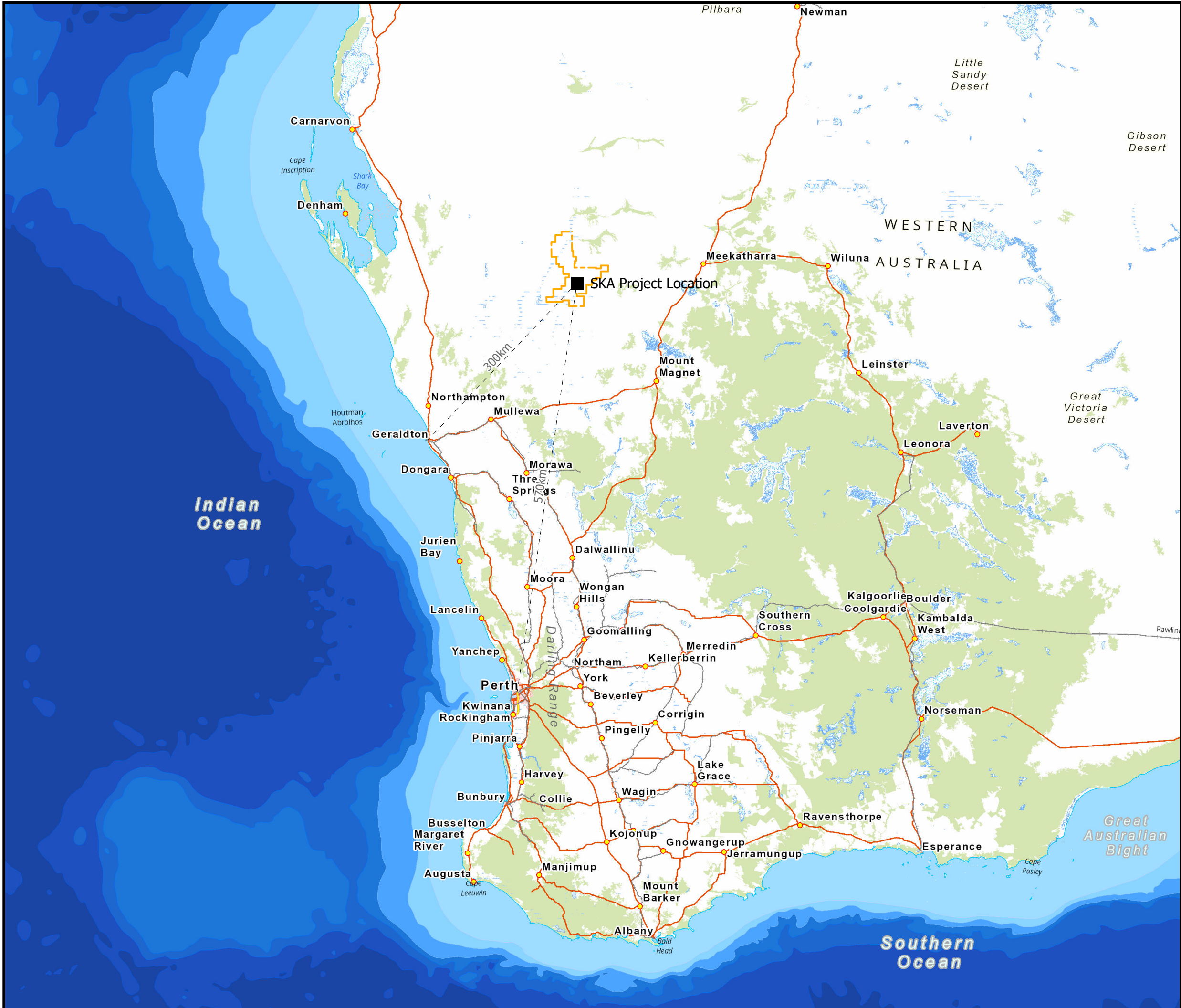
1.4 Approval history

The SKA1-Low project was referred to the Environmental Protection Authority and Department of Environment and Energy (now Department of Agriculture, Water and the Environment - DAWE) in 2017 at which time it was considered as 'Not Assessed' and 'Not a Controlled Action' respectively. It was accepted that it might be necessary to re-configure the design of SKA1-Low, to avoid culturally important sites on Boolardy Station. Subsequent heritage surveys (that remain confidential) identified several sites. This led to a significant change in the array configuration and subsequent environmental surveys and impact assessment.

In discussion with the Department of Water and Environmental Regulation (DWER) regarding the project impacts the EPA confirmed that the project was not significantly different to the previously referred project and therefore would still not require assessment under Part IV of the *Environmental Protection Act* (EP Act). Clearing impacts for Stage 1 can be assessed under the Part V Clearing Regulations.

Similarly, DAWE has advised that an EPBC referral is not required as the project is unlikely to be considered a controlled action.

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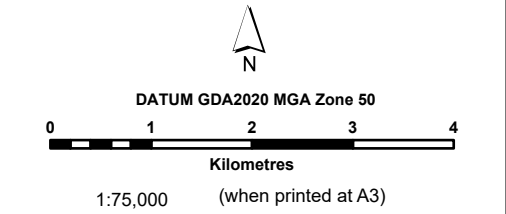
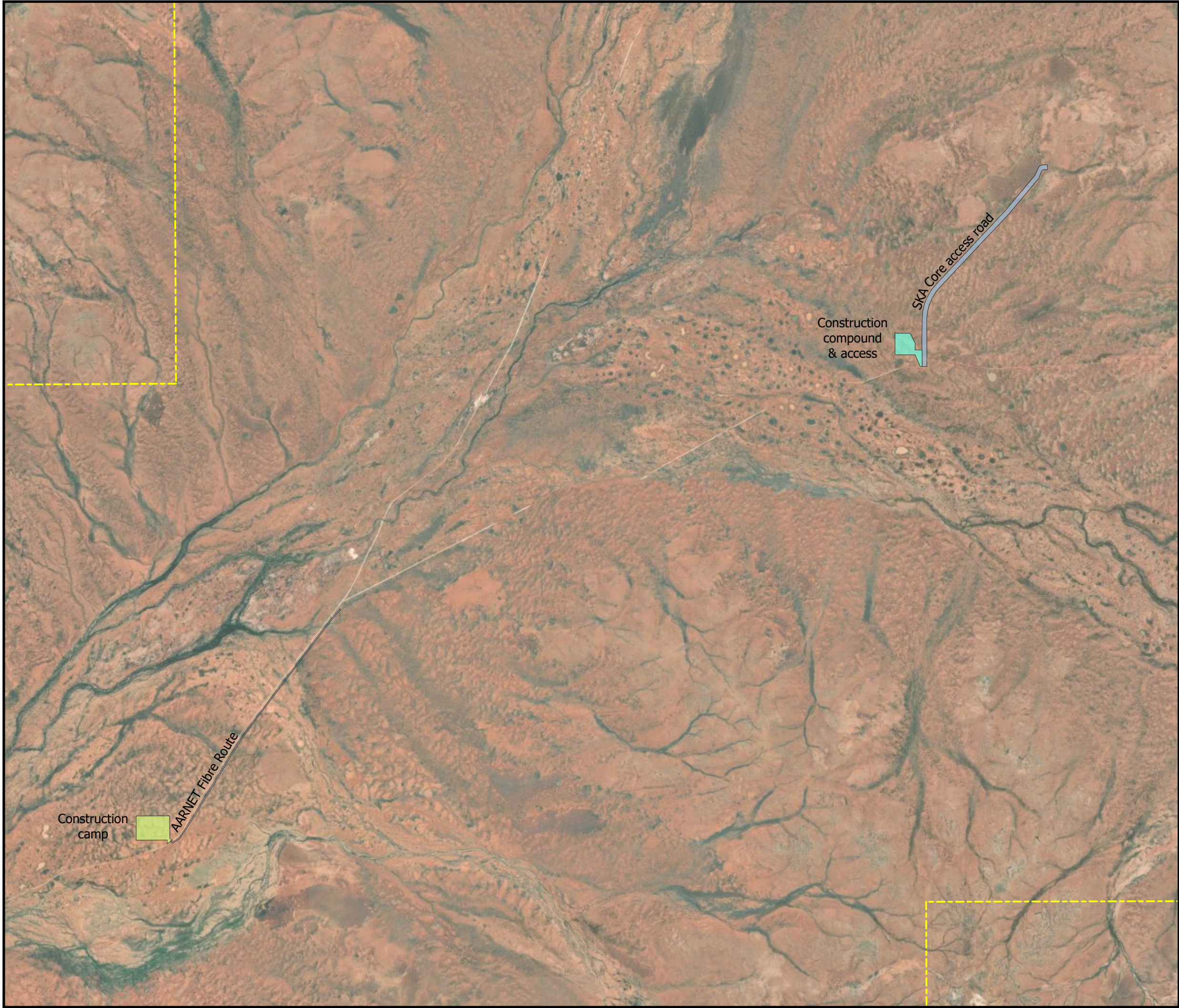
- Project Location
- Boolardy Station boundary

Data sources:
Topographic Base Map: © Commonwealth of Australia (Geoscience Australia) 2016. Creative Commons Attribution 4.0 International Licence.
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010).

Project Location

INDUSTRY AUSTRALIA, CSIRO	Figure
SQUARE KILOMETRE ARRAY	1
BOLLARDY STATION, WESTERN AUSTRALIA	

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Construction Camp Fibre Route - 7.5ha

Construction camp - 20ha

Construction compound & access - 21.5ha

SKA Core access road - 30ha

Typically, the area that has been subject to a heritage survey has been much larger than the area likely to be cleared. The area noted in this Legend is the area expected to be cleared.

Areas to be cleared shown on the map and legend are indicative and include an amount that allowed flexibility while finalising the project design. The project design and specified requirements have focused on minimising the amount of clearing required and it is expected to be less than the areas shown.

Data sources:
World Imagery: Earthstar Geographics

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010).

Proposed Clearing Areas

INDUSTRY AUSTRALIA, CSIRO	Figure 2
SQUARE KILOMETRE ARRAY	
BOLLARDY STATION, WESTERN AUSTRALIA	

2.0 Biological surveys

A detailed flora and vegetation assessment was undertaken by AECOM in 2014 for the SKA1-Survey and SKA1-Low Project. These surveys covered an extensive area on Boolardy Station, incorporating the SKA1-Survey (6,195 ha) and SKA1-Low (4,538 ha) arrays.

The survey area was essentially aligned with the areas that have been the subject of Aboriginal heritage surveys. The areas displayed in Figure 3 and Figure 4 are not to be interpreted as representing areas to be cleared.

This dataset was supplemented by additional baseline surveys in 2020 (AECOM, 2021) that incorporated the updated SKA1-Low array location.

In addition, a Level 1 (equivalent of 'basic') fauna assessment was completed by AECOM in 2014 for the SKA Project.

Following identification of a (then) Threatened Shield-backed Trapdoor Spider *Idiosoma nigrum*, targeted surveys were undertaken by Phoenix in 2015.

A basic fauna assessment was undertaken by AECOM in 2020 targeting areas not previously surveyed in 2014.

3.0 Environmental values

3.1 Vegetation

A detailed flora and vegetation assessment was undertaken by AECOM in 2014 for the SKA1-Survey and SKA1-Low Project. These surveys covered an extensive area on Boolardy Station, incorporating the SKA1-Survey (6,195 ha) and SKA1-Low (4,538 ha) arrays.

This dataset was supplemented by additional baseline surveys in 2020 (AECOM, 2021) that incorporated the updated SKA1-Low array. The focus of the survey included targeted flora searches and supplementing the floristic dataset by traversing areas that deviated significantly from the 2014 surveys.

3.1.1 Vegetation communities



The survey area for the updated SKA1-Low array (AECOM, 2014) intersects with six vegetation associations mapped by Beard (1976) representing pre-European vegetation (Table 1). All associations have more than 99% remaining within the Murchison IBRA region and the Shire of Murchison (Govt. of WA, 2019).



No TECs or PECs were anticipated to occur and none were recorded in the updated SKA1-Low survey area (Figure 3). Ten native vegetation communities were defined and mapped during the SKA1 – Low survey by comparing floristic data from 32 relevés and 65 quadrats (Table 2). The vegetation was largely homogenous, characterised by Mulga Open Woodlands on hard clay on flat terrain, sometimes with quartz on the surface. Distinct areas included deep sand plains dominated by shrubs, and granite outcrops with sparse vegetation. Granite boulders and outcrops were noted to be statistically similar to adjacent Mulga on plains, however they were described separately as the landform was considered significantly different. Further, the granite outcrops provide suitable habitat for several Priority flora and fauna species, therefore the distinction was considered important.



Table 1 Pre-European vegetation associations that intersect with the survey area



Veg. Assoc.	Description	Area (ha)	% Remaining	
			Murchison IBRA Region	Shire of Murchison
18	Low woodland; Mulga (<i>Acacia aneura</i>)	998.34	99.68	100.00
29	Sparse low woodland; Mulga, discontinuous in scattered groups	4,190.53	99.98	100.00
39	Shrublands; Mulga scrub	360.09	99.10	99.99
204	Succulent steppe with open scrub; scattered Mulga & <i>Acacia sclerosperma</i> over Saltbush & Bluebush	526.76	99.60	100.00
341	Low woodland over scrub; Mulga over <i>Acacia sclerosperma</i> , Bowgada, <i>A. victoriae</i> & Minnieritchie (<i>A. grasbyi</i>)	100.05	100.00	100.00
2081	Shrublands; Bowgada and associated spp. scrub	30.43	99.87	100.00
Total Area (ha)		4,918.33	-	-



Table 2 Vegetation communities recorded in the survey area

Description	Site details	Photo
Plains		
<p>AfSa Acacia Woodland</p> <p><i>Acacia fuscaneura</i>, <i>Acacia incurvaneura</i> and occasional <i>Acacia pruinocarpa</i> low open woodland over <i>Senna artemisioides</i> subsp. <i>helmsii</i>, <i>Acacia tetragonophylla</i> and <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) mid to tall sparse shrubland.</p>	<p>Plains, rarely with quarts on the surface. Red clay soils.</p> <p>Species richness:</p> <ul style="list-style-type: none"> • 2020 – 7 native species • Total – 41 native species <p>Quadrats:</p> <ul style="list-style-type: none"> • 2020 – 1 site • 2014 – 4 quadrats 	
<p>AfEfPo Acacia Woodland</p> <p><i>Acacia fuscaneura</i>, <i>Acacia incurvaneura</i> and <i>Acacia victoriae</i> subsp. <i>victoriae</i> low open woodland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>Acacia tetragonophylla</i> and <i>Eremophila phyllopoda</i> low to tall open shrubland over <i>Ptilotus obovatus</i>, <i>Solanum lasiophyllum</i> and <i>Maireana planifolia</i> low sparse shrubland.</p>	<p>Common community found across variety of landscapes including hardpan clays, clay loams and clay sandy soils on flat terrain. May have quarts or granite rocks (small to large) on surface.</p> <p>Species richness:</p> <ul style="list-style-type: none"> • 2020 – 58 native species • Total – 110 native and 1 weed species <p>Quadrats:</p> <ul style="list-style-type: none"> • 2020 – 11 sites • 2014 – 10 quadrats 	

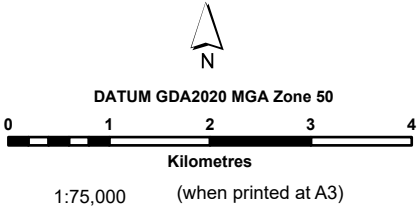
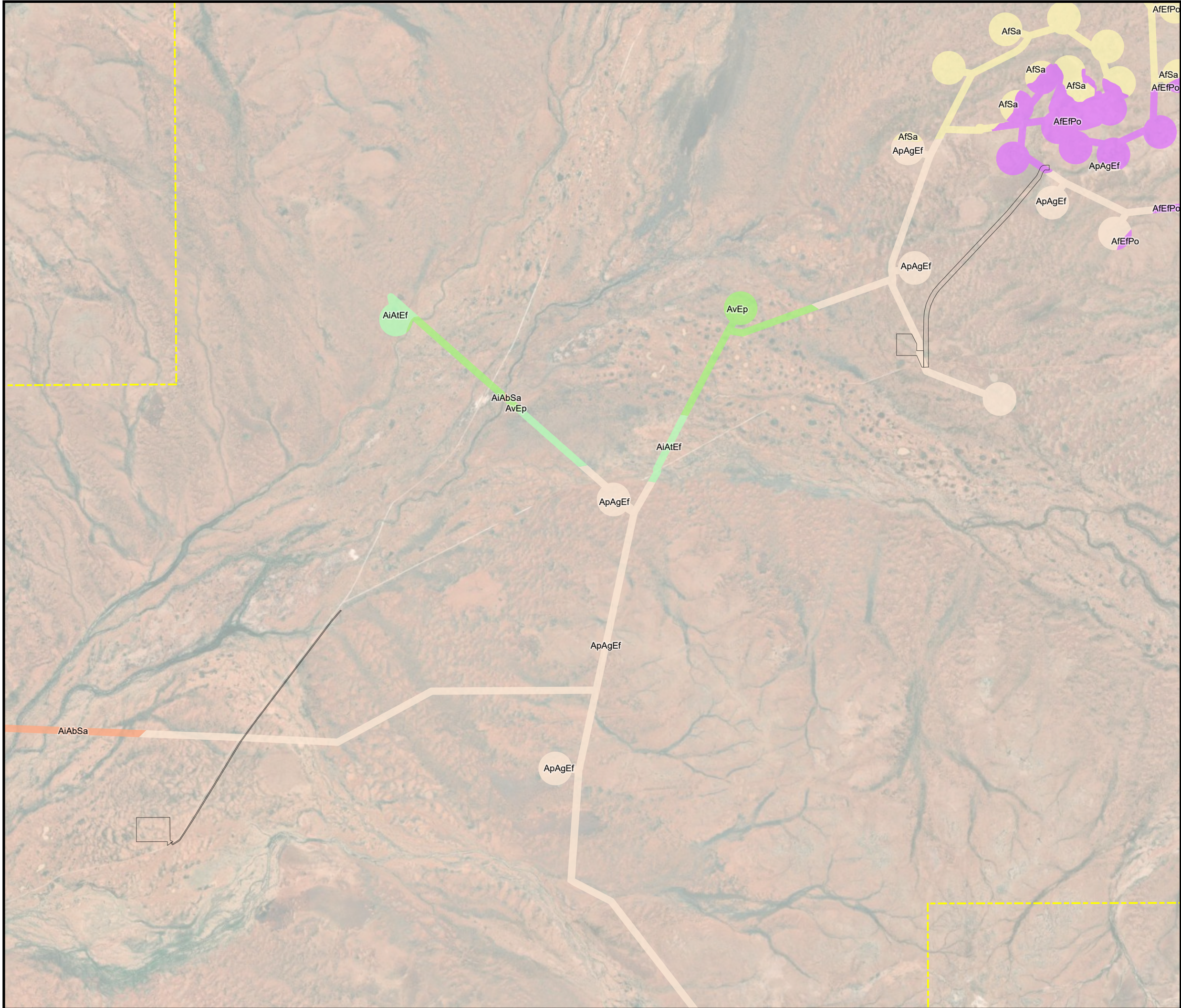
Description	Site details	Photo
<p>AiAtEf Acacia Woodland</p> <p><i>Acacia incurvaneura</i>, <i>Acacia craspedocarpa</i> and <i>Acacia fuscaneura</i> low open woodland over <i>Acacia tetragonophylla</i>, <i>Acacia kempeana</i> and <i>Acacia oswaldii</i> sparse tall shrubland over <i>Eremophila fraseri</i> subsp. <i>parva</i>, <i>Senna artemisioides</i> subsp. <i>helmsii</i> and <i>Eremophila macmillaniana</i> sparse mid shrubland.</p>	<p>Flat terrain with red clay with a variable soil profile reflecting erosion. Alluvial sands found close to drainage channels transition to clay loams on flats.</p> <p>Species richness:</p> <ul style="list-style-type: none"> • 2020 – 29 native species • Total – 76 native and 2 weed species <p>Quadrats:</p> <ul style="list-style-type: none"> • 2020 – 4 sites • 2014 – 13 quadrats 	
<p>AvEp Acacia Woodland</p> <p><i>Acacia victoriae</i> subsp. <i>victoriae</i>, <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>Acacia tetragonophylla</i> tall shrubland over <i>Eremophila pterocarpa</i> subsp. <i>pterocarpa</i>, <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) and <i>Atriplex amnicola</i> mixed chenopod shrubland</p>	<p>Hardwash plains with red-brown sandy loam clay soils.</p> <p>Species richness:</p> <ul style="list-style-type: none"> • 2020 – 19 native species • Total – 50 native and 3 weed species <p>Quadrats:</p> <ul style="list-style-type: none"> • 2020 – 1 site • 2014 – 5 quadrats <p>In 2014 a population of Priority 3 <i>Gunniopsis divisa</i> was recorded (outside the 2020 survey area).</p>	

Description	Site details	Photo
<p>AaEcPo Acacia Woodland</p> <p><i>Acacia aptaneura</i>, <i>Acacia aneura</i> and <i>Acacia incurvaneura</i> low open woodland over <i>Eremophila compacta</i>, <i>Eremophila simulans</i> and <i>Eremophila gilesii</i> mid open shrubland over <i>Ptilotus obovatus</i>, <i>Ptilotus drummondii</i> and <i>Aristida</i> sp. low mixed shrub and grassland.</p>	<p>Low rises or plains with deep sandy red soils.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – 42 native species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – 8 sites 	
<p>ApAgEf Acacia Woodland</p> <p><i>Acacia pteraneura</i> low woodland to open woodland over <i>Acacia grasbyi</i> and <i>Acacia tetragonophylla</i> tall sparse shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>Senna artemisioides</i> subsp. <i>helmsii</i> and <i>Eremophila fraseri</i> subsp. <i>parva</i> mid shrubland.</p>	<p>Undulating flat terrain with red-brown sandy loam soils.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – NA Total – 48 native species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – 0 sites 2014 – 8 quadrats 	

Description	Site details	Photo
Granite		
<p>AiTdPb Mixed Shrubland</p> <p><i>Acacia incurvaneura</i>, <i>Acacia fusca</i> and <i>Acacia caesaneura</i> low isolated clumps of trees over <i>Thryptomene decussata</i>, <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Acacia oswaldii</i> mid open shrubland over <i>Ptilotus drummondii</i>, <i>Eragrostis eriopoda</i> and <i>Solanum lasiophyllum</i> low sparse mixed shrub and grassland.</p>	<p>Granite outcrops on undulating terrain.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – 29 native species Total – 29 native species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – 4 sites 2014 – 1 quadrat <p>In 2014 populations of Priority 3 <i>Ptilotus beardii</i> and <i>Verticordia jamiesonii</i> were recorded (outside the 2020 survey area).</p>	
<p>ArCc Mixed Shrubland</p> <p><i>Acacia rhodophloia</i> low open woodland over <i>Corchorus crozophorifolius</i>, <i>Cymbopogon ambiguus</i> and <i>Eremophila platycalyx</i> subsp. <i>platycalyx</i> mixed low to mid shrub and grassland.</p>	<p>Granite domes and boulders with light brown sand loam soils. Also includes <i>Dodonaea viscosa</i> subsp. <i>spathulata</i> and <i>Eremophila latrobei</i> subsp. <i>latrobei</i>.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – 20 native species Total – 31 native species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – 2 sites 2014 – 2 quadrats <p>In 2014 populations of Priority 3 <i>Ptilotus beardii</i> were recorded (outside the 2020 survey area). In 2020 populations of Priority 3 <i>Petrophile pauciflora</i> were recorded.</p>	

Description	Site details	Photo
Drainage		
<p>AiAbSa Acacia Woodland</p> <p><i>Acacia incurvaneura</i>, <i>Hakea lorea</i> subsp. <i>lorea</i> and <i>Acacia aneura</i> low open woodland over <i>Acacia burkittii</i>, <i>Acacia tetragonophylla</i> and <i>Acacia victoriae</i> subsp. <i>victoriae</i> tall shrubland over <i>Senna artemisioides</i> subsp. <i>helmsii</i>, <i>Ptilotus obovatus</i> and <i>Senna artemisioides</i> subsp. <i>x sturtii</i> low to mid sparse shrubland.</p>	<p>Undefined broad drainage and flat terrain. Red-brown sandy loam soils.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – 12 native species Total – 33 native and 1 weed species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – 1 site 2014 – 3 quadrats 	
<p>AcAsTd Casuarina Woodland</p> <p><i>Allocasuarina campestris</i> low to mid woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>, <i>Exocarpos aphyllus</i> and <i>Scaevola spinescens</i> mid to tall open shrubland over <i>Tecticornia doliiformis</i>, <i>Atriplex amnicola</i> and <i>Tecticornia ?indica</i> mid chenopod shrubland.</p>	<p>Associated with major drainage channels. Exposed granite at some locations. Soils are light red sand to sandy clay. Trees are confined to banks of channels.</p> <p>Species richness:</p> <ul style="list-style-type: none"> 2020 – NA Total – 46 native and 2 weed species <p>Quadrats:</p> <ul style="list-style-type: none"> 2020 – no sites 2014 – 3 quadrats <p>In 2014 a population of Priority 3 <i>Frankenia confusa</i> was recorded in this community (outside the 2020 survey area).</p>	

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LEGEND

The areas displayed in Figure 3 are areas surveyed (aligned with Aboriginal heritage survey corridors and areas) and do not indicate areas to be cleared. The areas that are the subject of this clearing permit application are highlighted in Figure 2 and below.

- Vegetation Communities
- AaEcPo
 - AfEfPo
 - AfSa
 - AiAbSa
 - AiAtEf
 - AItdPb
 - ApAgEf
 - ArCc
 - AvEp
 - MRO

- Areas subject to clearing permit application
- Maximum amount of clearing expected
- Construction Camp Fibre Route - 7.5ha
 - Construction camp - 20ha
 - Construction compound & access - 21.5ha
 - SKA Core access road - 30ha

Data sources:
World Imagery: Earthstar Geographics

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010).

Vegetation Communities

INDUSTRY AUSTRALIA, CSIRO

SQUARE KILOMETRE ARRAY

BOLLARDY STATION,
WESTERN AUSTRALIA

Figure

3

3.1.2 Vegetation condition

Boolardy station has been used for sheep and cattle grazing since 1876. The impact of this, combined with a drying climate, is prevalent across the survey area (Plate 1). It has resulted in a loss of total biomass, erosion of the surface, and soil compaction. The 'native vegetation' currently present is unlikely to be a good reflection of pre-European vegetation. Lacking a suitable reference of condition, the entire survey area has been considered in 'Very Good' condition.



Plate 1 Dry conditions prevail at Boolardy Station

3.1.3 Threatened and Priority Ecological Communities

There are no EPBC listed Threatened Ecological Communities (TECs) on Boolardy Station. This was confirmed by the EPBC Protected Matters Search report and DBCA database searches (AECOM, 2021).

One Priority 1 PEC was identified during the desktop assessment, "Meka calcrete groundwater assemblage type on Murchison palaeodrainage on Meka Station". This PEC occurs 7 km south of the nearest infrastructure corridor. No TECs or PECs were anticipated to occur in the development envelope, and none were recorded.

3.1.4 Fauna

A Level 1 (equivalent of 'basic') fauna assessment was completed by AECOM in 2014 for the SKA Project. An additional basic fauna assessment was also undertaken by AECOM in 2020 targeting areas not previously surveyed in 2014.

Eight species of current conservation significance were recorded during field surveys (AECOM; 2014, AECOM 2021) including:

- Western Spiny-tailed Skink *Egernia stokesii* (EPBC Act Vulnerable, BC Act Endangered)
- Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (DBCA listed as Priority 3)
- Black-faced Cuckoo-shrike *Coracina novae-hollandiae* (EPBC Act Marine)
- Magpie Lark *Grallina cyanoleuca* (EPBC Act Marine)
- Whistling Kite *Haliastur sphenurus* (EPBC Act Marine)
- Australian Kestrel *Falco cenchroides* (EPBC Act Marine)
- Welcome Swallow *Hirundo neoxena* (EPBC Act Marine)
- Australian Pipit *Anthus australis* (EPBC Act Marine).

The six avian species are listed as Marine under the EPBC Act and are therefore only considered significant when on Commonwealth land.

3.1.4.1 Western Spiny-tailed Skink

The Western Spiny-tailed Skink *Egernia stokesii badia* is listed under the EPBC Act as Endangered and under the WC Act as Vulnerable. It belongs to the cunninghamii group; a group of moderately large, rock-dwelling reptiles (Chapple, 2003). Two colour forms exist; the brown form and black form, the latter is delineated from the former by its black colouration, lack of patterning in adults and differing head and scale morphology (DotEE, 2020). Western Spiny-tailed Skinks are saxicolous (rock dwelling), occupying rock crevices in large, isolated rocky outcrops, typically granite (Duffield & Bull, 2002). Occasionally, hollow logs or semi-arboreal habitats are utilised for shelter, with the brown form predominantly occupying York Gum woodland (Chapple, 2003). Crevices occupied by the black form of Western Spiny-tailed Skink are usually identifiable by a "latrine" or scat pile, resulting from regular defecation of all family members, in close proximity to the entrance (Chapple, 2003).

Granite outcrops within the footprint and surrounding area were subject to intense searches during the 2014 and 2020 field surveys, during which direct and indirect evidence of the skink was recorded a total of five times, with two direct observations and three scat piles and latrines recorded. However, none of these records are now within the current footprint area, due to a refinement of the footprint after the 2014 survey. The latrine recorded during this survey is also well outside of the footprint (4 km east). Generally, the footprint avoids the more significant outcrops in the area, and minimal quality habitat for the Western Spiny-tailed Skink exists.

3.1.4.2 Northern Shield-back Trapdoor Spider

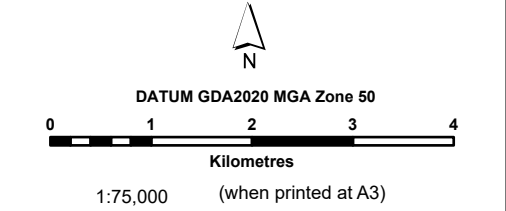
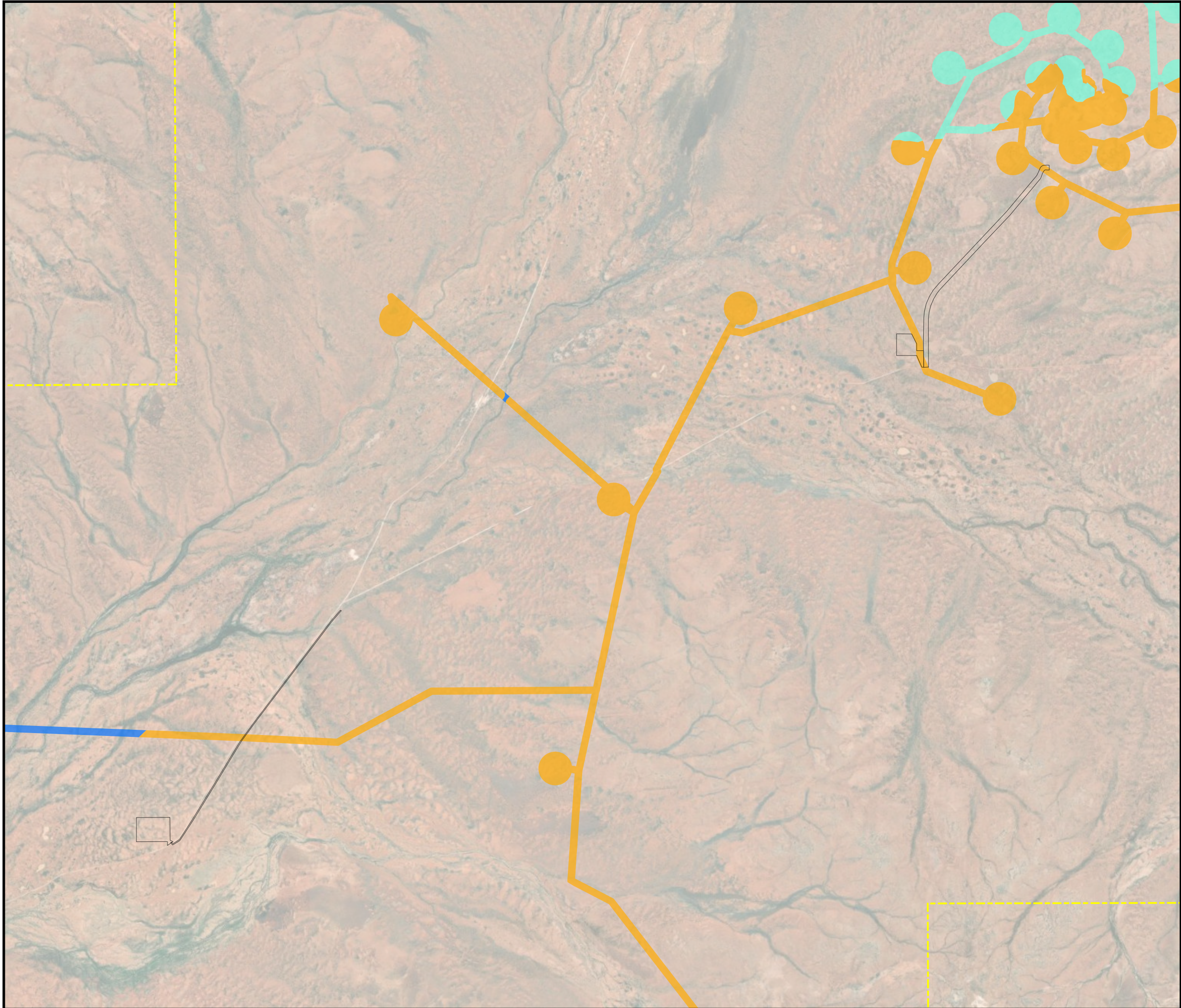
AECOM (2014) and a subsequent targeted survey by Phoenix (2015) recorded a threatened trapdoor spider species (*Idiosoma nigrum*) twice within the survey and surrounding area. However, in 2018, a conservation systematics review was published (Rix *et al.*, 2018) that detailed the revision of the genus *Idiosoma*. One of the results of this review was that *I. nigrum* was shown to contain multiple species and the distribution of *I. nigrum* included only those populations within the central and central-western Wheatbelt bioregion (Rix *et al.*, 2018). The *Idiosoma* populations recorded through the Murchison bioregion are now regarded as the Northern Shield-backed Trapdoor Spider *I. clypeatum* (Rix *et al.*, 2018). The review concluded that *I. clypeatum* is the only known species from this genus in the Murchison bioregion (Rix *et al.*, 2018) and its distribution seems to be strongly correlated with annual rainfall of less than 250 mm. The species is Priority 3 listed by the DBCA.

The Northern Shield-backed Trapdoor Spider was recorded twice in rocky areas with scattered *Acacia* and *Eremophila*. However, none of these records are within the current footprint, due to a refinement of the footprint after the 2014 survey.

3.1.5 Reserves and conservation areas

The nearest conservation areas are the Toolonga nature reserve located approximately 120km west and Lakeside National Park 150km south-east of the SKA Project location.

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.



LEGEND

The areas displayed in Figure 4 are areas surveyed (aligned with Aboriginal heritage survey corridors and areas) and do not indicate areas to be cleared. The areas that are the subject of this clearing permit application are highlighted in Figure 2 and below.

- Fauna Habitat
- Channels and creek line
 - Granite boulders and heaps
 - Granite domes
 - Hardpan plain with intermittent sandplain
 - MRO
 - Non saline stony or gritty surfaced plains
 - Rocky breakaway and plateau edges
 - Saline lower footslopes below breakaways
 - Sandplain

- Areas subject to clearing permit application
- Maximum amount of clearing expected
- Construction Camp Fibre Route - 7.5ha
 - Construction camp - 20ha
 - Construction compound & access - 21.5ha
 - SKA Core access road - 30ha

Data sources:
World Imagery: Earthstar Geographics

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010).

Fauna Habitat

4.0 Potential impact of the project

4.1 Scale of the proposed clearing

The SKA1-Low Stage 1 native vegetation clearing will be at the same location (Boolardy Station) as ASKAP and MWA already constructed on the MRO (within the bounds of Boolardy Station).

The total clearing footprint for the Early Works is anticipated to be no more than 79 ha within the 346,748 ha Boolardy Station pastoral property which is considered to be the development envelope. The vegetation type is most likely to be ApAgEf. The project footprint will require flexibility to enable avoidance of all sensitive habitats and areas of cultural significance. Indicative locations of the camp, compound, fibre route and access track are shown in Figure 2.

4.2 Clearing Principles

The proposed clearing works were assessed against the 10 Clearing Principles for native vegetation as listed in Schedule 5 of the *Environmental Protection Act* (Table 3).

Table 3 Clearing Principles evaluation

Assessment	Source & Tools for Assessment	Outcome
Principle (a) - Native vegetation should not be cleared if it comprises a high level of biological diversity		
<p>A detailed flora and vegetation survey was conducted in spring 2014 with an additional survey completed in spring 2020.</p> <p>A total of 44 native flora species from 24 genera and 19 families were recorded in the ApAgEf vegetation type. No weed species were recorded during the survey.</p> <p>No species listed under the EPBC Act or the BC Act were recorded during the field survey.</p> <p>Three Priority 3 flora species were recorded:</p> <ul style="list-style-type: none"> <i>Petrophile pauciflora</i> <i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94) <i>Eremophila simulans</i> subsp. <i>megacalyx</i> may have been recorded. <p>The ApAgEf vegetation community was defined and mapped and no record of these priority species was identified in this vegetation community. The vegetation was largely homogenous, characterised by Acacia Woodlands on hardpan plain with intermittent sandplain.</p> <p>Given the low species diversity and homogenous nature of the native vegetation, the proposed clearing of 79 ha of ApAgEf vegetation is not likely to be at variance with this Principle.</p>	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p> <p><i>Technical Guide Flora and Vegetation Assessment – EPA, 2016a</i></p>	<p>The proposal is not likely to be at variance with this clearing principle</p>
Principle (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		
<p>The desktop fauna assessment identified 4 conservation significant fauna species that could potentially occur within the vegetation type ApAgEf (Figure 4). This included Priority 4 species, Australian Bustard (<i>Ardeotis australis</i>), Bush Stone-curlew (<i>Burhinus grallarius</i>) and Brush-tailed Mulgara (<i>Dasyurus blythi</i>) of specific interest to DBCA.</p> <p>Conservation species recorded in the field surveys include:</p> <ul style="list-style-type: none"> Western Spiny-tailed Skink <i>Egernia stokesii badia</i> (EPBC Act Vulnerable, BC Act Endangered) 	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p>	<p>The proposal is not likely to be at variance with this clearing principle</p>

Assessment	Source & Tools for Assessment	Outcome
<ul style="list-style-type: none"> Northern Shield-backed Trapdoor Spider <i>Idiosoma clypeatum</i> (P3). <p>Secondary evidence of the Western Spiny-tailed Skink <i>Egernia stokesii badia</i> was recorded adjacent to the project area, with granite boulders and heaps providing suitable habitat located outside but in the vicinity of the project area.</p> <p>The area proposed to be cleared consists of Mulga Open Woodlands on hard clay on flat terrain which does not provide suitable habitat for the Skink. In accordance with the Environmental Management Plan: <i>Egernia stokesii</i> subsp. <i>badia</i>, a pre-clearing surveys will be undertaken to confirm the absence of the skink within demarcated clearing areas and establishment of a 50 metre buffer around any confirmed skink populations.</p> <p>The Northern Shield-backed Trapdoor Spider was recorded twice in rocky areas with scattered <i>Acacia</i> and <i>Eremophila</i>. However, none of these records are within the current project area.</p> <p>No impacts are expected to significant habitat for fauna and therefore the Project is not at variance to this Principle.</p>	<p>Technical Guide – Fauna Surveys, EPA 2020</p>	
Principle (c) - Native vegetation should not be cleared if it includes or is necessary for the continued existence of, rare flora		
<p>No species listed as Threatened under the EPBC Act or the BC Act were recorded during the field survey.</p> <p>The lack of historical known records of Threatened flora in the project area support the field observations that no conservation significant flora are likely to be present therefore clearing vegetation for the early works is unlikely to be at variance to this principle.</p>	<p>Square Kilometre Array Ecological Assessment, AECOM 2021</p> <p>Square Kilometre Array Ecological Assessment, AECOM 2014</p>	The proposal is not likely to be at variance with this clearing principle
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		
<p>No Threatened Ecological Communities were anticipated to occur and none were recorded in any of the field surveys. Ten native vegetation communities were recorded and mapped. None are considered regionally significant as vegetation communities were widespread and common in the area, despite some supporting populations of Priority species. The area comprises largely of <i>Acacia</i> open woodland with pockets of granite outcrops and ephemeral drainage lines.</p> <p>No impacts are expected to occur to TECs, therefore the Project is not at variance to this Principle.</p>	<p>Square Kilometre Array Ecological Assessment, AECOM 2021</p> <p>Square Kilometre Array Ecological Assessment, AECOM 2014</p>	The proposal is not likely to be at variance with this clearing principle
Principle (e) - Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been significantly cleared		
<p>The National Objectives and Targets for Biodiversity Conservation 2001-2005 (Commonwealth of Australia, 2001) recognises that the retention of 30% or more of the pre-clearing extent of each ecological community is necessary if Australia's biodiversity is to be protected. This is consistent with the EPA Position Statement No. 2 on Environmental Protection of Native Vegetation in Western Australia (EPA, 2000).</p> <p>The project area intersects with six vegetation associations mapped</p>	<p>Square Kilometre Array Ecological Assessment, AECOM 2021</p> <p>Square Kilometre Array Ecological Assessment, AECOM 2014</p>	The proposal is not likely to be at variance with this clearing principle

Assessment	Source & Tools for Assessment	Outcome
by Beard (1976) representing pre-European vegetation. All associations have more than 99% remaining within the Murchison IBRA region and the Shire of Murchison (Govt. of WA, 2019) (Table 1). For this reason the project is not at variance to this Principle.		
<i>Principle (f) - Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or a wetland</i>		
The early works project area is not bisected by any surface water features. There are no wetlands or watercourses within or in close proximity to the project area therefore this Project is not at variance to this Principle.	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p>	<i>The proposal is not likely to be at variance with this clearing principle</i>
<i>Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation</i>		
<p>The early works project area covers 79 ha of which the majority is in very good condition. Boolardy station has been used for sheep and cattle grazing since 1876. The impact of this, combined with a drying climate, is prevalent across the survey area. It has resulted in a loss of total biomass, erosion of the surface, and soil compaction. The 'native vegetation' currently present is unlikely to be a good reflection of pre-European vegetation. Lacking a suitable reference of condition, the entire survey area was mapped as being in 'Very Good' condition.</p> <p>Clearing of small patches of vegetation scattered across the stations is unlikely to cause appreciable land degradation and therefore the Project is not at variance to this Principle.</p>	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p>	<i>The proposal is not likely to be at variance with this clearing principle</i>
<i>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</i>		
<p>The Project Area does not occur within or immediately adjacent to a conservation area. The closest conservation areas to the Project Area are the Toolonga nature reserve located approximately 120km west and Lakeside National Park 150km south-east. Additionally, land surrounding the Project Area does not provide a buffer or ecological link to a conservation area.</p> <p>As there are no conservation areas or environmentally sensitive areas adjacent to or nearby to the clearing area, clearing of up to 79 ha of vegetation within the 346,748 ha Development Envelope, is not at variance to this principle.</p>	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p>	<i>The proposal is not likely to be at variance with this clearing principle</i>
<i>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</i>		
<p>The project area is not bisected by any surface water features. There are no wetlands or watercourses within or in close proximity to the project area.</p> <p>Clearing of small patches of vegetation scattered across the stations is unlikely to cause deterioration in the quality of surface or underground water and therefore this Project is not at variance to this Principle.</p>	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p>	<i>The proposal is not likely to be at variance with this clearing principle</i>

Assessment	Source & Tools for Assessment	Outcome
<i>Principle (j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause or exacerbate the incidence or intensity of flooding</i>		
This Principle need only be considered for large clearing proposals (DER 2014). The amount of native vegetation proposed to be cleared is not expected to cause any exacerbated incidence or intensity of flooding.	<p><i>Square Kilometre Array Ecological Assessment, AECOM 2021</i></p> <p><i>Square Kilometre Array Ecological Assessment, AECOM 2014</i></p> <p>Clearing of native vegetation Offsets procedure DER 2014</p>	<i>The proposal is not likely to be at variance with this clearing principle</i>

4.3 Stakeholder consultation

CSIRO has attended and spoken at forums and town hall meetings with Mid-West residents about the SKA and other projects at the MRO. MRO Indigenous Land Use Agreement (ILUA) Liaison meetings have been held annually since 2009/10. The project has held regular meetings and additional meetings when required, with the following WA Government agencies:

- Department of the Premier and Cabinet
- Department of Premier and Cabinet (Office of Science)
- Department of Primary Industries and Regional Development
- Main Roads, Western Australia
- Department of Planning, Lands and Heritage
- Department of Jobs, Tourism, Science and Innovation
- Department of Local Government, Sport and Cultural Industries
- Shire of Murchison
- Shire of Geraldton
- Shire of Mount Magnet
- Shire of Cue
- Shire of Yalgoo

The project has set up a Stakeholders Group and holds regular meetings every three to six months. Organisations who have been part of the consultation process and have received information about the project include:

- Astronomy WA
- Astrotourism WA
- AusIndustry State Office - WA
- Chamber of Minerals and Energy of WA (Mid-West Region)
- City of Greater Geraldton
- Curtin Institute of Radio Astronomy
- Curtin University
- Department of Industry, Science, Energy and Resources
- Durack Institute of Technology
- Geraldton Universities Centre
- Gravity Discovery Centre and Observatory (Gingin)
- Horizon Power
- International Centre for Radio Astronomy Research (ICRAR)
- Main Roads WA (Mid-West Region)
- Meenangu Wajarri Aboriginal Corporation (MWAC)
- Meekatharra School of the Air
- Mid-West Chamber of Commerce & Industry
- Mid-West Development Commission
- Mitsubishi Development/Oakajee Port and Rail

- Murchison Country Zone of WALGA
- Murchison Shire Councillors
- National Indigenous Australians Agency (NIAA) – Geraldton Office
- Perth Observatory
- Pastoral leaseholders adjoining
- Pawsey Supercomputing Research Centre
- Pia Wadjarri Community and Trustee's
- Pia Wadjarri school students
- Regional Development Australia Mid-West Gascoyne
- Scinapse Mid-west Science Engagement
- Scitech
- Science Teachers Association WA
- Shire of Murchison Pastoralists
- Sinosteel Midwest Corporation Limited
- Square Kilometre Array Observatory
- University of Western Australia
- Wajarri Yamatji Aboriginal Corporation RNTBC (WYAC)
- Wajarri Yamatji community and elected representative (meetings and presentations)
- Wajarri Yamatji Enterprises Ltd (WEL)
- West Australian Museum Geraldton
- Western Australian Museum Boola Bardip
- Yamatji Marlpa Aboriginal Corporation (YMAC)

5.0 Environmental management

The construction of infrastructure, antennas and buildings at the existing MRO site utilised a site management document “HSE and Site Information for Contractors” (2013) that sets out environmental management requirements for anyone entering the site based on an environmental guidance document prepared for CSIRO by Parsons Brinkerhoff (April 2010). Management protocols were established for:

- Chemicals – Storage, Management and Spill Response
- Dust Generating Work – Erosion and Sediment control
- Environmentally Sensitive Areas – Flora
- Vegetation – Clearing and Revegetation
- Groundwater
- Waste management and Recycling
- Weed Control – Earthmoving Vehicle Inspections.

Those documents have informed the preparation of HSE documents currently in use at the MRO.

In order to minimise erosion and maintenance CSIRO prepared access tracks with the objective of maintaining existing ground levels and minimising windrows so channelling and erosion due to stormwater flows did not occur (Pers. Comm. Antony Schinckel, 2016). This methodology also minimises the requirement for regular maintenance of the access tracks and the potential for any additional disturbance during this process.

In terms of water use, the existing geo-exchange cooling uses rainwater collected from the roof and this has proved to be sufficient to maintain operation of the facility.

Populations of the Western Spiny-tailed Skink (*Egernia stokesii* subsp. *Badia*) identified at the proposal site are EPBC Act listed threatened fauna and will be managed accordingly under a significant species environmental management plan (AECOM, 2021). This will include pre-clearing surveys to confirm the absence of the skink within demarcated clearing areas and establishing a 50 metre buffer around any confirmed skink populations.

5.1 Vegetation clearing management

Vegetation clearing will be closely managed and monitored to ensure the adjacent very good condition vegetation is protected and not impacted by the clearing activities as outlined in Table 4.

Table 4 Vegetation Clearing Management

Vegetation Clearing	
Key Standards / References	
<ul style="list-style-type: none"> • <i>Biodiversity Conservation Act 2016</i> • <i>Environment Protection and Biodiversity Conservation Act 2012</i> (EPBC Act) • <i>Environmental Protection Act 1986</i> (EP Act) • Clearing Permit conditions 	
Objectives and Targets	
<ul style="list-style-type: none"> • Clearing of native vegetation will not exceed the total area proposed on the Clearing Permit Application • Clearing of native vegetation will not occur in areas outside of the proposed clearing permit area 	
1. Key Performance Indicators	
Ref	Details
1.1	No damage to native vegetation outside approved disturbance boundary
1.2	No unauthorised clearing of native vegetation within the approved disturbance boundary.

Vegetation Clearing				
2. Management Actions				
Ref	Description	Responsibility	Timing	
1.1	Demarcate approved clearing area using GPS coordinates and flagged star pickets.	CSIRO	Prior to clearing	
1.2	Demarcate any native vegetation within the site boundary that will be retained.	CSIRO	Prior to clearing	
1.3	Demarcate topsoil, weed and dieback management boundaries.	CSIRO	Prior to clearing	
1.4	Demarcate approved site boundary with flagging and temporary fencing during construction.	CSIRO	Immediately after clearing	
1.5	Demarcate a 50-meter buffer around the location of any confirmed Western Spiny-tailed Skink populations.	CSIRO	Prior to clearing	
1.6	Restrict access by personnel, vehicles and plant into vegetated areas adjacent to project boundary.	CSIRO	At all times	
1.7	Stockpile all cleared vegetation separately and mulch for use either on-site (for stabilisation) or for other rehabilitation projects.	Clearing Contractor	During clearing	
1.8	Ensure no new informal tracks arise and all vehicle and personnel movements are limited to the approved project boundary.	Clearing Contractor	At all times	
1.9	Report all incidents relating to these Vegetation Clearing Management actions to CSIRO within 24 hours of incident.	Cleaning Contractor	Within 24 hours of incident	
3. Monitoring				
Ref	Description and Location	Parameter	Responsibility	Frequency
1.1	Inspect clearing area to ensure flagging is intact and no boundary breach has occurred.	Clearing boundary	CSIRO	Daily during clearing.
1.2	Inspect felled and cleared vegetation and identify those suitable for use in rehabilitation and revegetation works.	Rehabilitation timber	CSIRO	Weekly during clearing
Contingency and Corrective Actions				
Incident or Consequence	Corrective Action			Responsibility
Unauthorised Clearing	Report immediately to CSIRO.			Clearing Contractor
	Investigate as an Incident.			CSIRO
	Halt activities on site until site investigation is completed			CSIRO
	Report clearing to Regulator if required			CSIRO
	Re-establish the approved boundary demarcation.			CSIRO
	Rehabilitate impacted area.			CSIRO

5.2 Weeds

Strong hygiene management practises will be implemented to prevent the introduction of new weeds and limit the spread of existing weeds. The hygiene management actions are presented in Table 5.

Table 5 Weed Hygiene Management

Weed Management				
Key Standards/References				
<ul style="list-style-type: none">Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)Environmental Protection Act 1986 (EP Act)Biosecurity and Agriculture Management Act 2007 (BAM Act)Weeds in Australia (DotE 2012)				
Objectives and Targets				
Construction within the Development Area will aim to prevent the:				
<ul style="list-style-type: none">Spread of weeds from the site to new locations.Introduction of new weeds into Project area.				
1. Key Performance Indicators				
Ref	Details			
2.1	No introduction of new weed species into Boolardy Station.			
2.2	No evidence of weeds being spread to adjacent sites within 5 years of clearing.			
2. Management Actions				
Ref	Description	Responsibility	Timing	
2.1	Conduct weed control if weeds are noted.	CSIRO	Where noted	
2.2	Ensure all vehicles, equipment and plant undergo a complete quarantine inspection prior to access to site.	Clearing Contractor	At all times	
2.3	Ensure fill, if used is uncontaminated, and free of weeds and disease as specified in the Landfill Waste Classification and Waste Definitions (DWER 2019).	CSIRO	At all times	
2.4	Control, with the aim to eradicate, any infestation of High to Very High priority weeds.	CSIRO	As required	
2.6	Locate topsoil and cleared vegetation stockpiles away from areas where runoff from rainfall may occur.	Clearing Contractor	During clearing	
3. Monitoring				
Ref	Description and Location	Parameter	Responsibility	Frequency
2.1	Visual inspection of site.	Weed infestations <ul style="list-style-type: none">No Declared PestsNo High to Very High priority weeds	CSIRO	Every 3 months
Contingency and Corrective Actions				
Incident or Consequence		Corrective Action	Responsibility	
Vehicle or equipment does not meet quarantine inspection requirement (i.e. not free of plant material or soil).		Report and investigate as an incident.	CSIRO	
		Arrange for vehicle/equipment to be cleaned or washed down at an external facility.	Clearing Contractor	
		Re-inspect vehicle/equipment.	CSIRO	
New weed or Declared Pest or High to Very High priority infestation occurring onsite.		Report and investigate as an incident.	CSIRO	
		Arrange for weed control by a suitably trained contractor.	CSIRO	
		Increase monitoring frequency to weekly until no weed occurrence for 1 month.	CSIRO	
		Review hygiene measures and conduct additional toolbox meetings as required.	CSIRO	

6.0 Offset proposal

Clearing permits may be granted subject to conditions which aim to prevent, control, abate or mitigate environmental harm or conditions which require offsetting the loss of the cleared vegetation. The management strategy for native vegetation within the development site is to: avoid impacts; minimise impacts and offset significant residual impacts.

As per the Clearing of native vegetation Offsets procedure (2014), offsets are required when clearing is at variance with one or more of the biodiversity related clearing principles (Principles a – f, h) and a significant residual impact remains. An assessment against the ten Clearing Principles (Section 4.2) has indicated that the proposed clearing is not at variance with the ten Clearing Principles therefore an offset is not required.

7.0 References

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Appendix A

Environmental
Management Plan -
Egernia stokesii subsp.
badia



Environmental Management Plan

Egernia stokesii subsp. *badia*

22-Dec-2021
SKA Telescope

Environmental Management Plan

Egernia stokesii subsp. badia

Client: Department of Industry, Science, Energy and Resources

ABN: 74 599 608 295

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Quality Information

Document Environmental Management Plan

Ref 60647200

Date 22-Dec-2021

Prepared by C House

Reviewed by L Kirchner

Revision History


Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	18-Jun-2021	DAWE information	Linda Kirchner Technical Director - Impact Assessment and Permitting	
1	29-Jun-2021	DAWE information	Linda Kirchner Technical Director - Impact Assessment and Permitting	
2	22-Dec-2021	Updated Project Description	Linda Kirchner Technical Director - Impact Assessment and Permitting	

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1.0 Purpose of MNES Mitigation and Monitoring Plan

1.1 Background

The Department of Industry, Science, Energy and Resources (DISER) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) intend to construct the Square Kilometre Array (SKA) radio telescope, comprising the SKA Low Frequency Aperture Array (SKA1-Low) on Boolardy Station. The project has been discussed with reference to referral under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) with the Department of Agriculture, Water and the Environment (the department). This management plan has been updated to demonstrate how the proponents intend to address management and mitigation of potential impacts and to include changes that have occurred since the first draft in 2015.

1.2 Project description

The proposed action involves the development of the Square Kilometre Array (SKA) on the Murchison Radio-astronomy observatory that is expanding beyond its current footprint to cover all of Boolardy Station and is also intended to extend south and east into Kalli Station. Boolardy Station is a 346,748ha pastoral property (pastoral lease no. 3114/406) located on the Pindar-Beringarra Road in the arid rangeland region of the midwest of Western Australia (Crown lease 3146/1966), approximately 194km north-north-east of Pindar and 200km west-south-west of Meekatharra (Figure 1). Kalli Station is located on Crown lease 574/1966 and remains a pastoral station with cattle. Access to Boolardy Station is via the Beringarra Pindar Road and Kali Road.

The SKA1-Low pre-construction design considers various factors, including avoiding sources of radio frequency interference and avoiding geophysical, environmental and cultural constraints largely based on desktop analysis but also considering the information available from a recent heritage mapping survey and a separate environmental survey conducted by AECOM Australia Pty Ltd. The SKA infrastructure will be at the same general location (Boolardy Station) as the Australian Square Kilometre Array Pathfinder (ASKAP) and Murchison Widefield Array (MWA) already constructed on the land the MRO currently covers (currently a separate lease excised from but within the bounds of Boolardy Station).

The design for the SKA1-Low telescope provides locations for up to 512 individual array stations of approximately 39 m in diameter (Figure 2) and the other field stations are positioned in clusters (groups of 6) along the spiral arms with a total number of 131,072 antenna installed, standing approximately two metres tall. From the core to the Central Processing Facility (CPF) there will be a track and buried high density cable management structure that will carry approximately 300 fibre optic cables along each arm from cluster to cluster. This combined track and cable trench will be about 8 - 10 m wide.

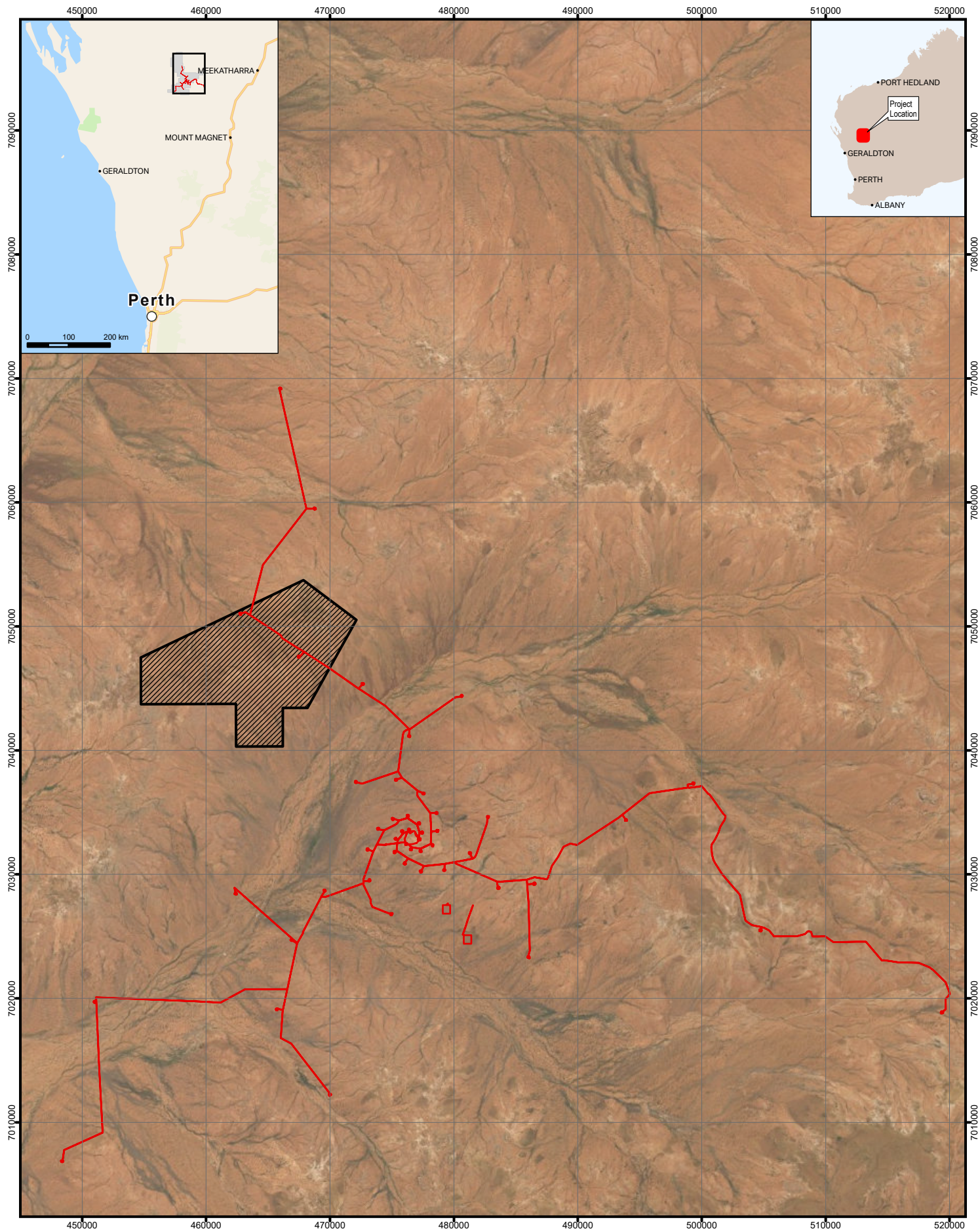
1.3 Purpose

This management plan has been prepared to commence the preparation of formal procedures intended to maximise the ongoing protection and long-term conservation of the EPBC Act listed threatened fauna species, *Egernia stokesii* subsp. *badia*, Western Spiny-tailed Skink population, located on Boolardy Station. The management plan has been revised in 2021 due to the removal of a trapdoor spider species located within the Boolardy Station from the EPBC Act threatened species list. A conservation systematics review was published in 2018 revising the genus *Idiosoma*, which concluded that the species found within the Murchison bioregion is the Northern Shield-backed Trapdoor Spider *I. clypeatum* (Rix et al, 2018). This species is not listed under the EPBC Act and is therefore not included within this significant species environmental management plan.

The main purpose of the management plan will be to avoid project activities having direct impacts to *E. stokesii* habitat and mitigate indirect impacts during construction and operation. The plan has been developed by Ecologists and Environmental Scientists, and addresses the following:

- measures to avoid or minimise the mortality of *E. stokesii* species during construction and operation of the SKA array
- measures to protect species and their habitat in and adjacent to the project footprint (the project area)
- annual internal reporting on milestones and compliance with this plan.

This revised plan will be submitted to the department.



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LAST MODIFIED 13 DEC 2021

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Datum: GDA 1994 MGA Zone 50
1:400,000
(when printed at A4)

0 2 4 6 8
kilometres

Data sources:
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2021) Geoscience Australia, Streetpro

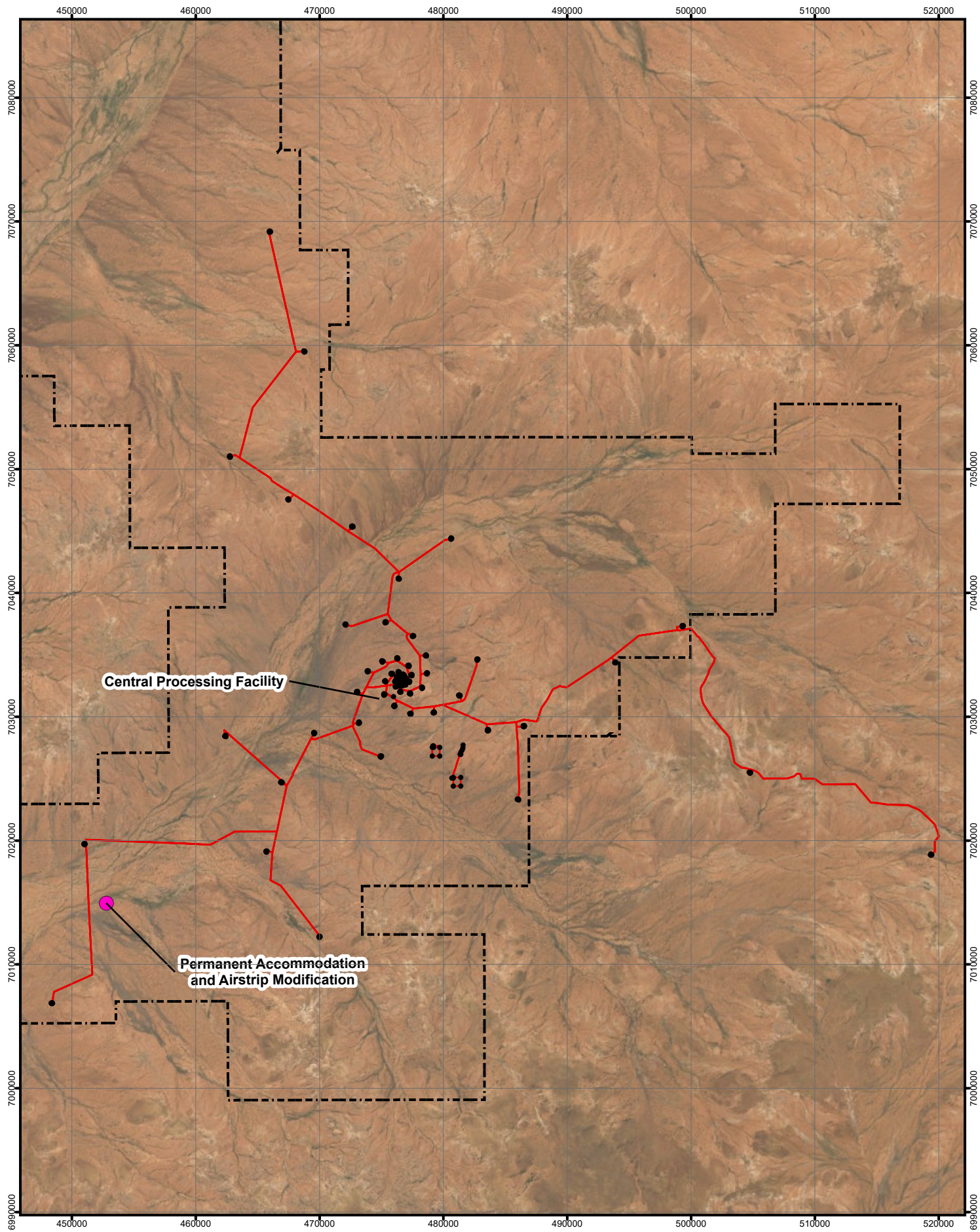
- LEGEND**
- Indicative Clearing Footprint 2021
 - Murchinson Radio Astronomy Observatory (MRO)
Current/Old MRO boundary prior to expansion to cover all of Boolardy and as proposed Kalli station.

Proposal Location

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SKA1-LOW REFERRAL SUPPORTING DOCUMENT

**Figure
1**



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- LEGEND
- Array Points
 - Indicative Infrastructure
 - Indicative Clearing Footprint 2021
 - ▭ Boolardy Station

Proposal Area

WAJARRI CORPORATION

SKA1-LOW REFERRAL SUPPORTING
DOCUMENT

Figure

2

1.4 Responsible persons

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2.0 Baseline Studies

2.1 Species description - *Egernia stokesii* subsp. *badia*

Egernia stokesii is a stout-bodied skink with well-developed limbs each with 5 digits. There are large variations in adult size between populations, ranging from 81-195mm snout-vent length. The tail is short and broad, tapering sharply to a point and is covered by long spinose scales which are prickly to touch. The head is short and strong with eyes protected by a strong brow ridge. Colours vary from dark brown to black. The population on Boolardy Station is glossy black with no patterning and possesses a less spinose tail (DEC, 2012).

2.2 Habitat

E. stokesii subsp. *badia* (Black Form) populations are restricted to massive granite exposures with variable cover of loose boulders and pockets of soil and low shrubland vegetation (DEC, 2012). These outcrops are geographically separated by open low woodland and shrubland. All the black form populations are significant due to their overall small geographic range and ongoing degradation of habitat from uncontrolled grazing (DEC, 2012).

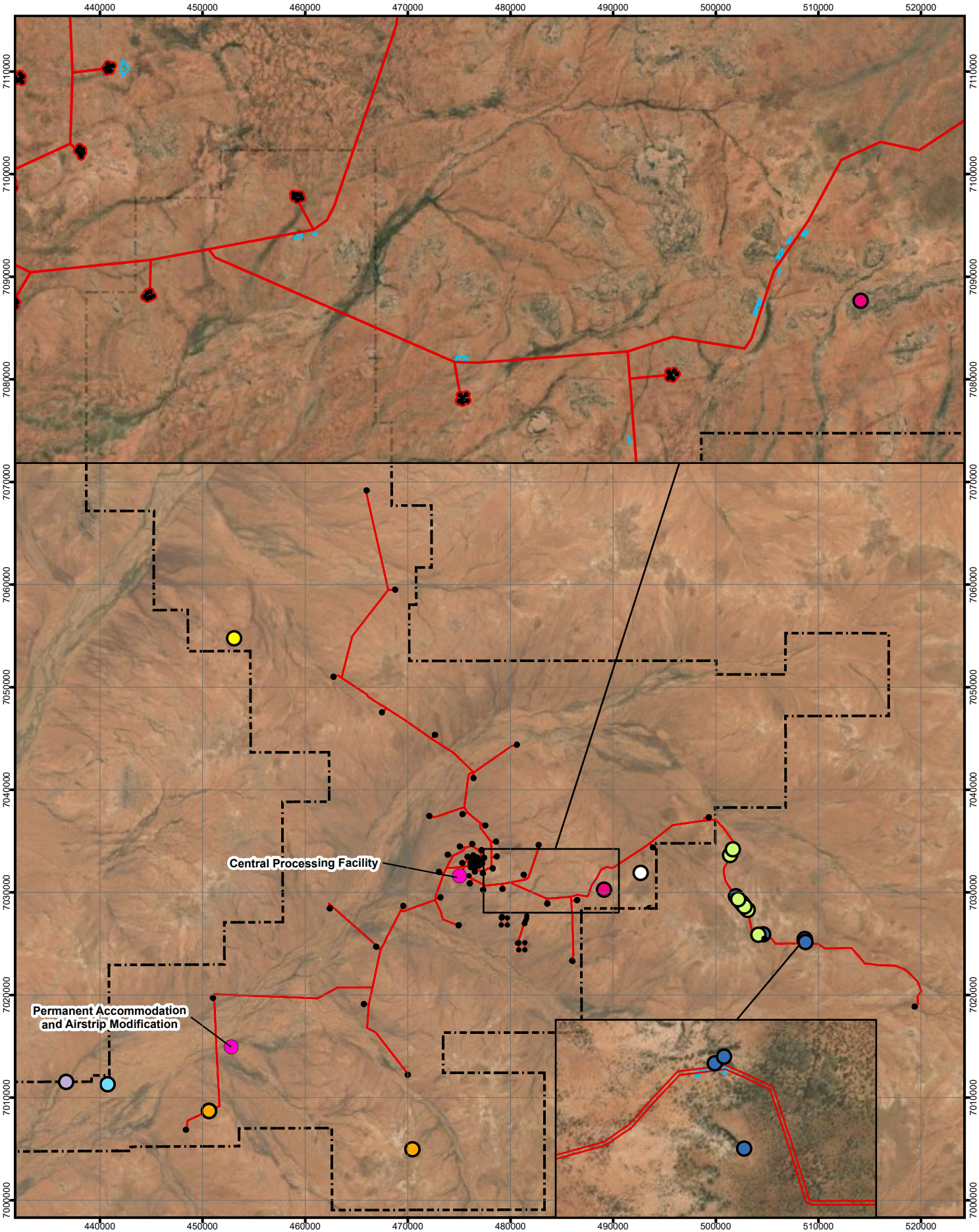
Presence of the Skink is determined by direct sightings or suitable habitat (i.e. rocky crevices).

2.3 Studies

Granite outcrops were subject to targeted *E. stokesii* subsp. *badia* (the Skink) micro-habitat searches during the 2014 and 2020 field surveys. Direct and indirect evidence of the skink was recorded a total of five times in the 2014 and 2020 surveys. However, none of these records are within the current project footprint due to a refinement of the survey area after the 2014 survey. The latrine recorded during the 2020 survey is also just outside of the current project footprint (AECOM, 2014; 2021).

Evidence of the Skink's presence was previously recorded at two locations isolated at one granite outcrop in the area surveyed for the SKA1-Low project. One individual Skink was recorded at one location to the north outside the SKA1-Low project footprint. One individual was recorded by Alexander Holm & Associates (2008) on a granite outcrop located south of the MRO, outside the project footprint. This record was reconfirmed during the field survey (Phoenix, 2015) (Figure 3).

This indicates that despite the construction and operation of the Australian SKA Pathfinder, associated Control Building, access tracks and trenches for power distribution cables and Fibre Optic cabling, this population has continued to survive.



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0 2 4 6 8
kilometres

Data sources:
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2021) Geoscience Australia, Streetpro

LEGEND

- Clearing Footprint
- Potential habitat for Western Spiny-tailed Skink *Egernia stokesii badia* (Endangered)
- Boleardy Station
- Indicative Infrastructure
- Array Points
- Conservation Significant Flora (all P3)
- Eremophila simulans*
- Frankenia confusa*
- Gunnopsis divisa*
- Hemigenia tysonii*
- Petrophile pauciflora*
- Ptilotus beardii*
- Sauropus* sp.
- Woolgorong (M. Officer s.n. 10/8/94)
- Verticordia jamiesonii*

Conservation Significant Flora and Fauna

WAJARRI CORPORATION

SKA1-LOW REFERRAL SUPPORTING DOCUMENT

Figure 3

3.0 Mitigation measures

Mitigation measures for minimising impacts on the Skink will focus on avoiding, but if not possible, minimising any disturbance to known habitat, by demarcating and temporarily fencing Skink population locations and their known rocky habitat during construction and whenever possible apply a 50 m or greater buffer zone.

Additional skink management in proximity to those locations will include providing ramps at the ends of trenches open for more than 24 hours to enable fauna, particularly lizards, to escape before the heat of the day. All contractors will be encouraged and generally required to provide ramps at the ends of trenches open for more than 24 hours, to enable all fauna to escape before the heat of the day.

3.1 Procedure

The procedure for managing the Skink during design, construction and operation of telescopes on the MRO is outlined below:

- CSIRO and other organisations authorised to conduct activities on the MRO will ensure their staff members and contractors working on the MRO participate in Environmental management awareness and compliance sessions and are trained to identify the Skink and their preferred habitat.
- All sightings of the Skink are to be reported by staff and contractors to the organisation they report to and then reported by that organisation to the MRO Site Entity (MROSE).
- Any injuries/deaths/disturbance to the Skink will be reported including a detailed description of circumstances.
- Potential new sightings of the Skink in previously unmarked locations in areas where construction or operational activities may disturb and displace the fauna will be inspected by a qualified Zoologist with experience in identifying the Skink. This will confirm whether realignment of the track is required.
- Access to areas demarcated and being managed as Skink habitat will require staff and contractors to obtain permission to access the areas prior to entry from the organisation they report to.
- An annual internal report will summarise all incidents relating to the Skink. Further analysis to be conducted on incidents to inform and improve on existing management measures and known occurrences of the species.
- Key Performance Indicators (KPIs) to be established based on a Skink no-injury/death basis.

4.0 Monitoring measures

4.1 Pre-development monitoring

Pre-clearance surveys will be conducted by an organisation authorised to conduct activities on the MRO prior to it clearing or disturbing potential habitat for access tracks and antenna locations. The survey objective is to confirm the absence (or presence) of the Skink within demarcated cleared areas. This will include:

- identifying any Skink populations within the proposed clearing area (following demarcation of the clearing area by the proponent organisation)
- confirming presence of these species in the event that a population or evidence of the skink is identified by the proponent
- a 50 m or greater buffer will be applied wherever possible to any confirmed populations of the Skink
- establishing a degree of certainty around whether the Skink occurs within and outside the project footprint.

4.2 Post-development annual monitoring

Post-development monitoring will aim to:

- determine whether the Skink are still present at known locations on the MRO (Boolardy and Kalli Stations)
- collect information on the numbers of individuals over time to contribute to knowledge of the species and enable interpretation of trend data over time
- collect mortality data to determine safe operational conditions for the species, thereby informing the adaptive management approach
- report findings in annual technical monitoring report.

All data will be provided to the department and/or Department of Biodiversity, Conservation and Attractions to improve our knowledge of these threatened species.

5.0 Environmental incident management

5.1 Determining an environmental incident

Incidents are to be reported to the MROSE and records retained (Incident, Accident and Near Miss Report). KPIs will be set and communicated to construction and supervision teams. Consider describing and using contractual remedies and disciplinary actions to demonstrate the consequences arising from the severity of any impacts.

Reportable incidents in relation to this fauna management plan include:

- injury/death of the Skink
- sightings of the Skink
- damage to known habitat within the buffer zone resulting in control measures as per section 5.2 being required.

5.2 Control measures for a suspected environmental incident

Actions to be undertaken in the event of an environmental incident include the following in relation to the specific event.

Injury/death of significant fauna:

1. Cease work in the immediate area
2. Report to the organisations Environmental Manager who will report the incident to the MROSE and in consultation with the MROSE determine further action
3. Investigate the health of the injured fauna population and/or individual and remove from further harm
4. Determine whether other fauna individuals or population are nearby and may be in the line of harm
5. Investigate whether the footprint (including track or pad) can be moved to avoid further impacts.

Sightings of significant fauna:

1. Cease work in the immediate area
2. Report to the relevant organisation's Environmental Manager who will report the incident to the MROSE and in consultation with the MROSE determine further action
3. Determine whether the fauna may be harmed or indirectly impacted
4. Investigate whether the footprint (including track or pad) can be moved to avoid further impacts.

Damage to demarcated or temporarily fenced significant fauna habitat

1. Cease work in the immediate area:
2. Report to the organisation's Environmental Manager who will report the incident to the MROSE and in consultation with the MROSE determine further action
3. Investigate if significant fauna is nearby and may be in the line of harm
4. Investigate whether the footprint (including track or pad) can be moved to avoid further impacts.

5.3 Reporting an environmental incident

When CSIRO or another organisation operating on the MRO is responsible for an environmental incident the organisations Environmental Manager is to investigate incidents and implement preventative actions as required.

If the Skinks are killed or injured, contact the Environmental Manager or the organisations other suitably qualified personnel.

Report any environmental incident resulting in the death of an individual or population of the Skink to the Environmental Manager.

5.4 Remediation of an environmental incident

The Environmental Manager is to investigate the cause of the incident to prevent further incidents occurring.

Examine possible remedial actions including rehabilitation or additional demarcation and/or fencing of habitat.

Record details of incident and remedial actions taken.

5.5 Post environmental incident training

Conduct a 'lessons learnt' meeting to determine the cause of the incident and possible breakdowns in procedure or communications. Apply these lessons and update procedures and/or communication protocols to prevent further incidents to inform this adaptive management plan.

6.0 References

AECOM, 2021. Square Kilometre Array Ecological Assessment. Unpublished Report for the Department of Industry. Prepared in Perth, Western Australia.

AECOM, 2014. Square Kilometre Array Ecological Assessment. Unpublished Report for the Department of Industry. Prepared in Perth, Western Australia.

Department of Environment and Conservation (DEC), 2012. Western Spiny-tailed Skink *Egernia stokesii* Recovery Plan. Department of Environment and Conservation, Western Australia.

Phoenix, 2015. Reconnaissance survey for the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) for the Square Kilometre Array. Unpublished report prepared for AECOM Pty Ltd, January 2015, draft report.

Rix, M. G., Huey, J. A., Cooper, S. J., Austin, A. D., & Harvey, M. S., 2018. Conservation systematics of the shield-backed trapdoor spiders of the nigrum-group (Mygalomorphae, Idiopidae, Idiosoma): integrative taxonomy reveals a diverse and threatened fauna from south-western Australia. ZooKeys, (756), 1

Appendix B

Index of NVCP Application Supporting Information

Index of documentation attached to permit application	
Proof of land ownership	See attached: <ul style="list-style-type: none"> • Boolardy Station Pastoral Lease • Murchison Radio-astronomy Observatory (MRO) Crown Lease
An aerial photograph and/or map with a north arrow that clearly shows the areas of vegetation for proposed clearing or an ESRI shapefile.	See above Figure 2: Proposed Clearing Areas
Payment of the prescribed fee.	See - Part 10 of Purpose Permit Application form
Copy of written authority to act on behalf of landowner.	NA
Evidence of the pending transfer of land ownership, such as the offer and acceptance, or written notice from the current landowner.	NA
<i>Form Annex C7 – Assessment bilateral agreement</i> , if the clearing is also to be assessed under an EPBC Act accredited process.	NA
Appendix A of the <i>Clearing of native vegetation offsets procedure</i> guideline, if the application includes a proposal for clearing permit offsets.	NA
IBSA number has been provided in Part 6.	Yes – see Part 6 of Purpose Permit Application form
Photos of the application area.	See above Section 3: Vegetation
Marine surveys, submitted in accordance with the requirements of the EPA's <i>Instructions for the preparation of data packages for the Index of Marine Surveys for Assessments (IMSA)</i> .	NA