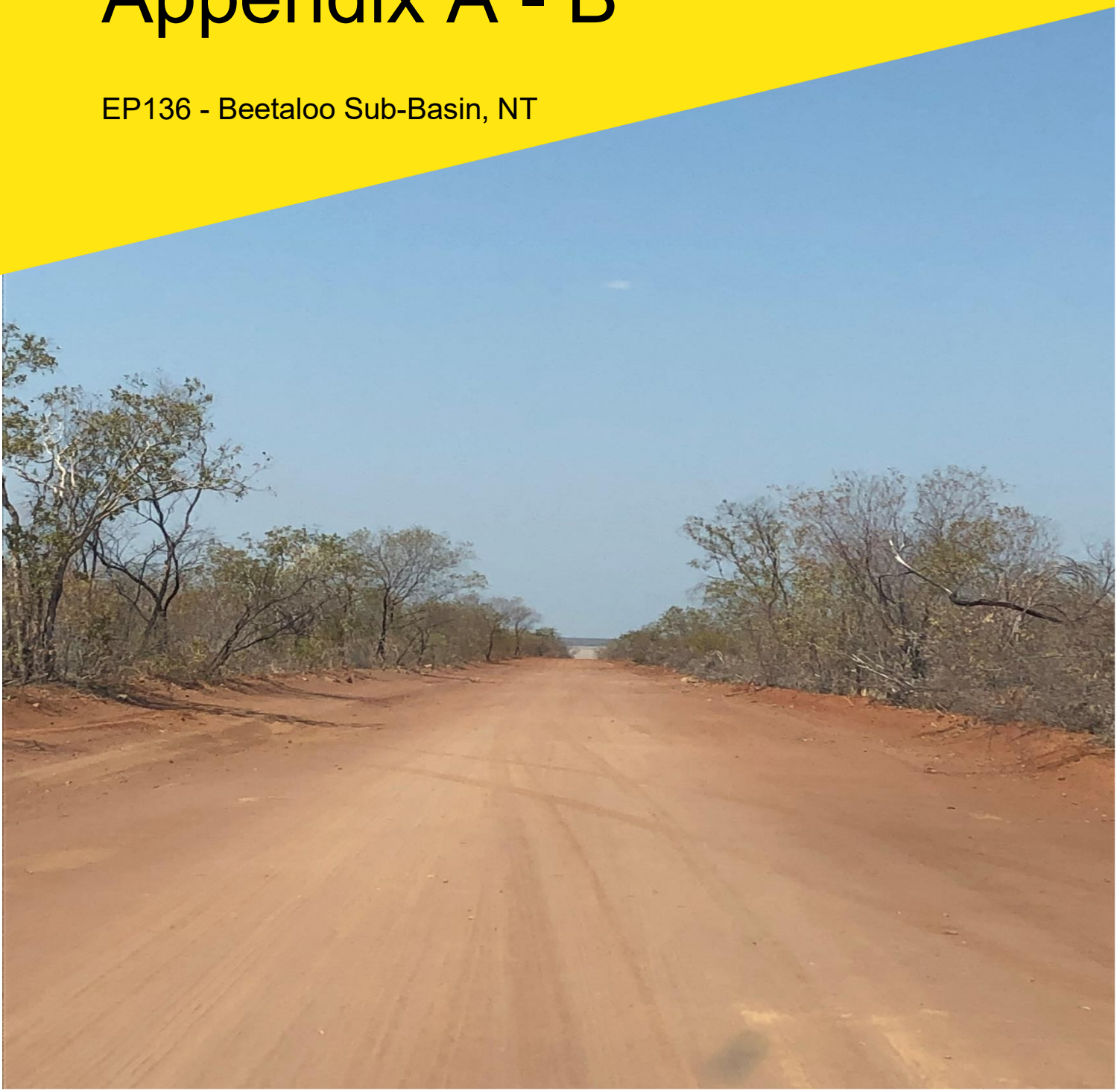
Seismic Exploration Program
Sweetpea Petroleum Pty Ltd
24-Sep-2020

Unique Reference No. SWP1-04

Seismic Environment Management Plan Appendix A - B

EP136 - Beetaloo Sub-Basin, NT



Seismic Environment Management Plan

Appendix A - B

EP136 - Beetaloo Sub-Basin, NT

Client: Sweetpea Petroleum Pty Ltd

ABN: 42 074 750 879

Prepared by

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24-Sep-2020

Job No.: 60611666

DENR Unique Reference No.: SWP01-04

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Cover Photo: Southwards view of Line 10 from its intersection of Line 3, Beetaloo Station, November 2019

Quality Information

Document	Seismic Environment Management Plan Appendix A - B
Ref	60611666 DENR Unique Reference No.: SWP01-04
Date	24-Sep-2020
Prepared by	William Riddell, Azrai Parish-Perandis, Kim Treglown, Jace Emberg
Reviewed by	Abe Francis, Alana Court

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	04-Dec-2019	For internal review	Abe Francis Principal Environmental Scientist	
0	24-Feb-2020	Pre-acceptance Submission	Alana Court Associate Director - Environment	
1	06-Aug-2020	Reg 6 EMP Submission	Alana Court Associate Director - Environment	
2	07-Sep-2020	Formal EMP Submission	Alana Court Associate Director - Environment	

Table of Contents

Appendix A

EP136 Land Condition Assessment

Appendix A EP136 Land Condition Assessment

AECOM Imagine it. Delivered.

Seismic Exploration Program
Sweetpea Petroleum Pty Ltd
07-Sep-2020

SWP1-04

Land Condition Assessment

EP136 - Beetaloo Sub-Basin, NT

Land Condition Assessment

EP136 - Beetaloo Sub-Basin, NT

Client: Sweetpea Petroleum Pty Ltd

ABN: 42074750879

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Quality Information

Document	Land Condition Assessment
Ref	60611666 DENR Unique Reference No. SWP1-04
Date	07-Sep-2020
Prepared by	Kim Treglown, William Riddell, Azrai Parish Perandis, David van den Hoek
Reviewed by	Alana Court, Abe Francis

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
1	25-Feb-2020	Appendix A for Seismic Exploration EMP	Alana Court Associate Director - Environment	Previously signed
2	22-Jul-2020	May 2020 Update for Seismic Exploration EMP submission	Alana Court Associate Director - Environment	Previously signed
3	07-Sep-2020	Final Update for Seismic Exploration EMP Submission	Alana Court Associate Director - Environment	

Table of Contents

List of Tables

List of Figures

Table of Acronyms

Acronym	Meaning
%	Percentage
ALA	Atlas of Living Australia
AS	Australian Standard
ASRIS	Australian Soil Resource Information System
BOM	Bureau of Meteorology
CLA	Cambrian Limestone Aquifer
DEE	Department of the Environment and Energy (Commonwealth)
DENR	Department of Environment and Natural Resources (NT)
DLRM	Department of Land Resource Management
EP##	Exploration Permit (e.g. EP136)
EMP	Environmental Management Plan
EPBC	Environment Protection and Biodiversity Conservation Act
GPS	Global Positioning Device
Ha	hectare
IECA	International Erosion Control Association
Km	Kilometre
km^2	Square Kilometres
km/hr	Kilometre per hour
LCA	Land Condition Assessment
Ma	Million years ago
m	metre
MNES	Matters of National Environmental Significance
mm	millimetre
NT	Northern Territory
NVIS	National Vegetation Information System
TPWC Act	*Territory Parks and Wildlife Conservation Act*
WoNS	Weed of National Significance

1.0 Introduction

1.1 Purpose of this Report

AECOM Australia Pty Ltd (AECOM) has been commissioned by Sweetpea Petroleum (Sweetpea) to conduct a land condition assessment (LCA) to support Sweetpea's proposed 2020 Seismic Exploration Program in Exploration Permit 136 (EP136) in the Beetaloo Sub-Basin, Northern Territory (NT).

The primary aim of the LCA is to identify and document site conditions (baseline) prior to activities occurring in the seismic survey footprint and guide the development of an Environmental Management Plan (EMP).

A baseline field survey initially covered a preliminary seismic line design which consisted of 410 km of seismic lines. In early February 2020, the survey design was modified for the northern survey area and included an additional two lines in the southern survey area. This LCA report summarises the results of the November 2019 and May 2020 surveys, and documents baseline conditions of seismic lines proposed for Sweetpea's exploration program.

1.2 Project Boundary

The seismic survey program occurs within two distinct areas, which are henceforth referred to as the northern survey area and the southern survey area.

The northern survey area is within the Beetaloo and Tanumbirini Stations and lies predominantly in the northern section of the EP136 permit area, extending in places into EP76, EP161 and EP(A)354 exploration permit areas (Figure 1). The proposed seismic activities within the northern survey area comprise 14 seismic lines, covering 480.29 km in total. The northern survey footprint is 242.15 ha in size (based on 5 m wide lines) with the inclusion of the proposed field camp, which has a footprint of approximately 2 ha. The proposed field camp is located on Tanumbirini Station in close proximity to the Carpentaria Highway.

The southern survey area is located in the southern section of EP136, approximately 84 km south of the northern survey area (Figure 1). Two seismic lines are proposed in the southern survey area. The southern survey area covers a distance of 68.99 km and has a footprint of around 36.50 ha with the inclusion of the proposed field camp at the intersection of the two lines, with footprint of approximately 2 ha.

The footprint of the northern and southern seismic lines are detailed in Table 1 and the location of the northern seismic lines and their alignment, as well as the proposed field camp is provided in Figure 2. The southern seismic lines and the proposed field camp is provided in Figure 3.

Appendix A presents the geographical coordinates of each line and field camp for the proposed program.

Table 1 Seismic Lines and Field Camps Footprint

Activity Area	Length by Permit Area (km) / Area of Field Camp (km2)						Total Length (km)	Total Area (Ha)*	Extent of Vegetation Disturbance (Ha)^
	EP136	EP161	EP76	EP(A)354	EP169	None			
Northern Exploration Area									
Line 1	17.79	0.00	-	5.13	-	-	22.92	11.46	1.39
Line 2	26.64	8.24	-	6.22	-	-	41.10	20.55	4.92
Line 3	26.64	1.51	-	5.17	-	-	33.32	16.66	3.34
Line 4	26.65	7.16	-	1.50	-	-	35.31	17.66	2.51
Line 5	26.66	4.26	-	4.96	-	-	35.88	17.94	4.23
Line 6	17.77	11.23	-	1.50	-	-	30.50	15.25	6.36
Line 7	17.78	8.04	-	1.49	-	-	27.31	13.66	6.08
Line 8	8.89	13.33	1.50	-	-	-	23.72	11.86	5.70
Line 9	8.89	10.18	8.82	-	-	-	27.89	13.95	6.85
Line 10	42.28	1.38	-	-	-	-	43.66	21.83	4.97
Line 11	42.26	1.49	-	-	-	-	43.75	21.88	6.88
Line 12	33.03	8.58	-	-	-	-	41.61	20.81	4.69
Line 13	33.04	8.57	-	-	-	-	41.61	20.81	5.88
Line 14	19.65	12.06	-	-	-	-	31.71	15.86	1.45
Field Camp	0.02#	0.00	-	-	-	-	-	2.00	0.2
Northern Total	**347.97**	**96.03**	**10.32**	**25.97**	**0.00**	**0.00**	**480.29**	**242.15**	**65.45**

* Footprint area based on 5 m wide seismic lines.

^ Total area of vegetation disturbance required has been calculated off GIS modelling of shrub and tree vegetation types only (Refer to Appendix D of the 2D Seismic EMP).

Area km^2 not included in total length for the two field camp locations.

Activity Area	Length by Permit Area (km) / Area of Field Camp (km2)						Total Length (km)	Total Area (Ha)*	Extent of Vegetation Disturbance (Ha)^
	EP136	EP161	EP76	EP(A)354	EP169	None			
Southern Exploration Area									
Line 1	20.45	-	-	-	9.44	0.30	30.19	15.10	0.74
Line 10	38.80	-	-	-	-	-	38.80	19.40	1.03
Field Camp	0.02[#]	-	-	-	-	-	-	2.00	-
Southern Total	**59.25**	**0.00**	**0.00**	**0.00**	**9.44**	**0.30**	**68.99**	**36.50**	**1.77**
Total Footprint	**407.22**	**96.03**	**10.32**	**25.97**	**9.44**	**0.30**	**549.28**	**278.65**	**67.22**

* Footprint area based on 5 m wide seismic lines.

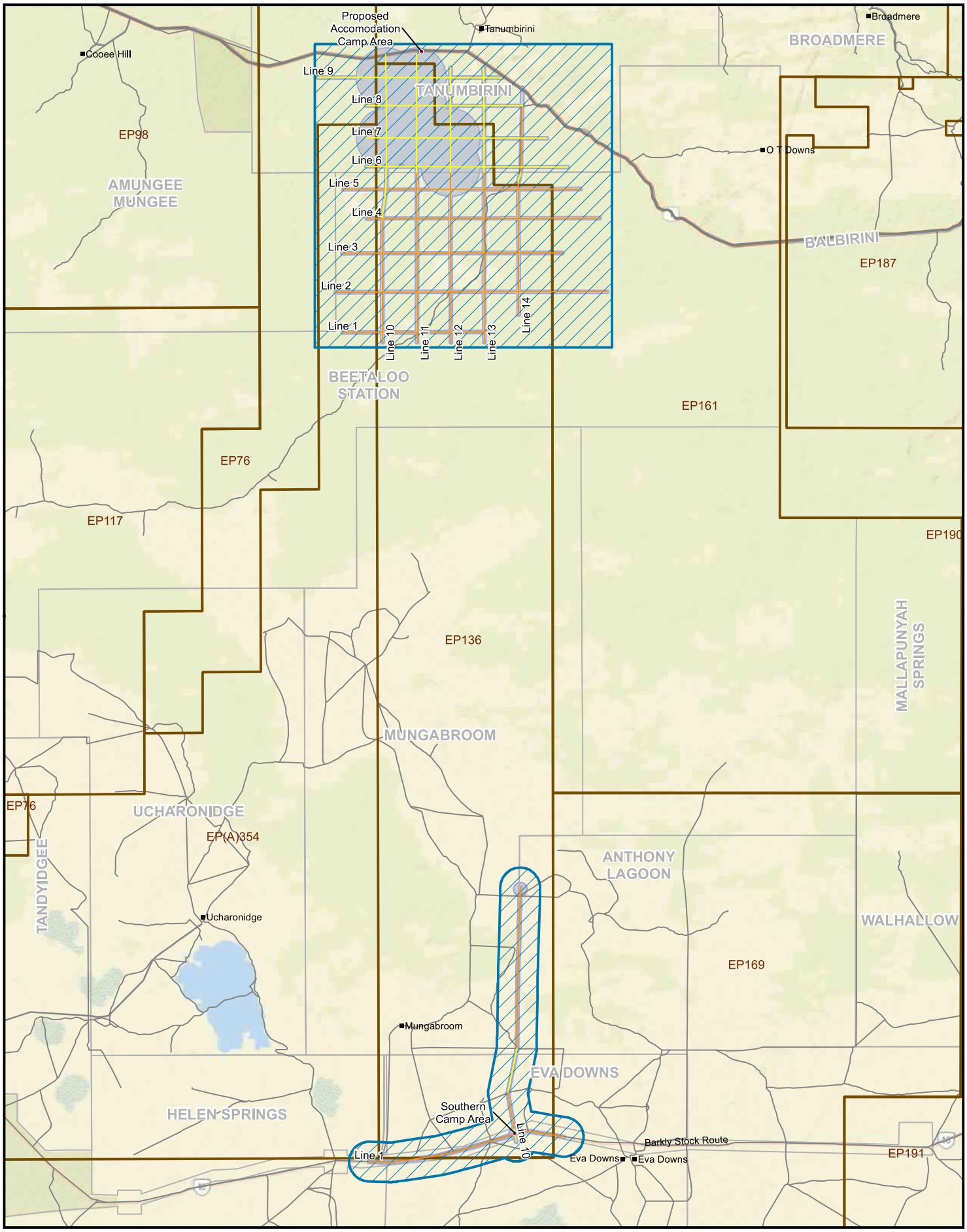
^ Total area of vegetation disturbance required has been calculated off GIS modelling of shrub and tree vegetation types only (Refer to Appendix D of the 2D Seismic EMP).

[#] Area km^2 not included in total length for the two field camp locations.

The northern survey area will require access to existing pastoral access tracks on Beetaloo Station and Tanumbirini Station. The total seismic line length on Beetaloo Station is 293.29 km which includes 293.29 km (91%) of existing station tracks and 26.20 km (9%) which require some vegetation disturbance, noting this includes where previous tracks have some regrowth. The total seismic line length on Tanumbirini Station is 187 km which includes 10.15 km (5%) of existing station track and requires 176.85 km (95%) of vegetation disturbance. Where vegetation is disturbed, it will be rehabilitated at completion of data acquisition.

Southern seismic line 10 follows the western boundary of Anthony Lagoon Station and continues into Eva Downs Station (running north/south). The line is 38.8 km in length, with 29.8 km located on the existing cleared pastoral track on Eva Downs Station. The remaining 9 km of uncleared line transects areas of grassland that will require no vegetation clearing during the seismic survey. Southern seismic line 1 is located along a 30.19 km section of the Barkly Stock Route which forms part of Eva Downs and Anthony Lagoon Station. It is noted that the section of the Barkly Stock Route was incorporated into Eva Downs PPL in 2016.

The southern seismic lines will use a total of 59.99 km (87%) of existing station track and 9 km (13%) where minor vegetation disturbance will occur.



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N

Projection: GDA 1994 MGA Zone 53

10 5 0 10 km

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Seismic Lines
- Vegetation Clearance Required
- Unsealed Road/ Existing Pastoral Track
- Accomodation Camp Areas
- Project Location
- AAPA Application Boundary
- Petroleum Exploration Permit

- Roads
- Cadastre

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Project Location

PROJECT ID	60611666
CREATED BY	sam.schroder
LAST MODIFIED	14-Jul-2020
VERSION	1

Figure 1

A3 size

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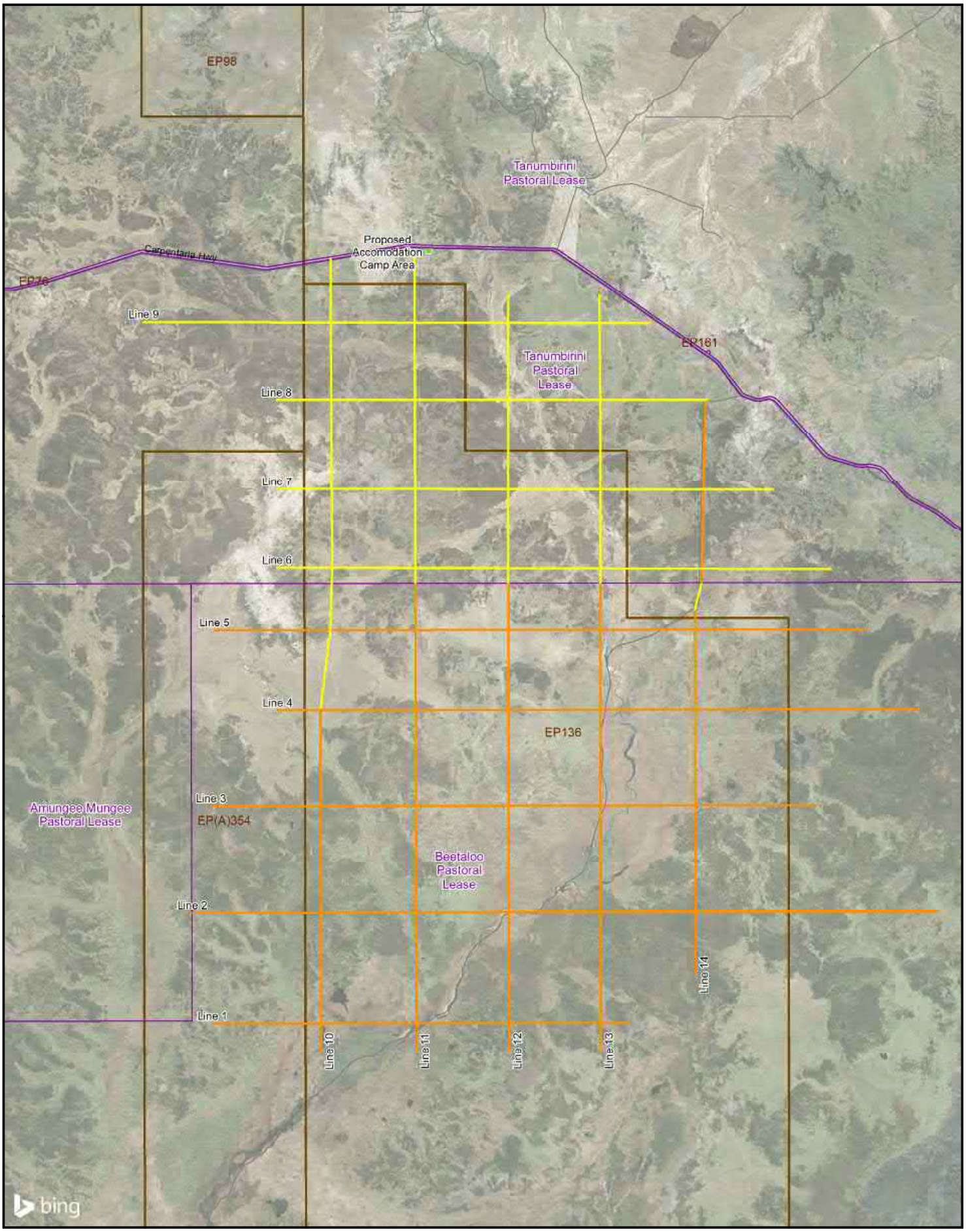

N

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Projection: GDA 1994 MGA Zone 53

5 2.5 0 5 km

1:192,500 (when printed at A3)

Seismic Lines

- Vegetation Clearing Required
- Existing Pastoral Track
- Native Title Register
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Location of Northern Seismic Exploration Lines and Field Camp

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 2

A3 size

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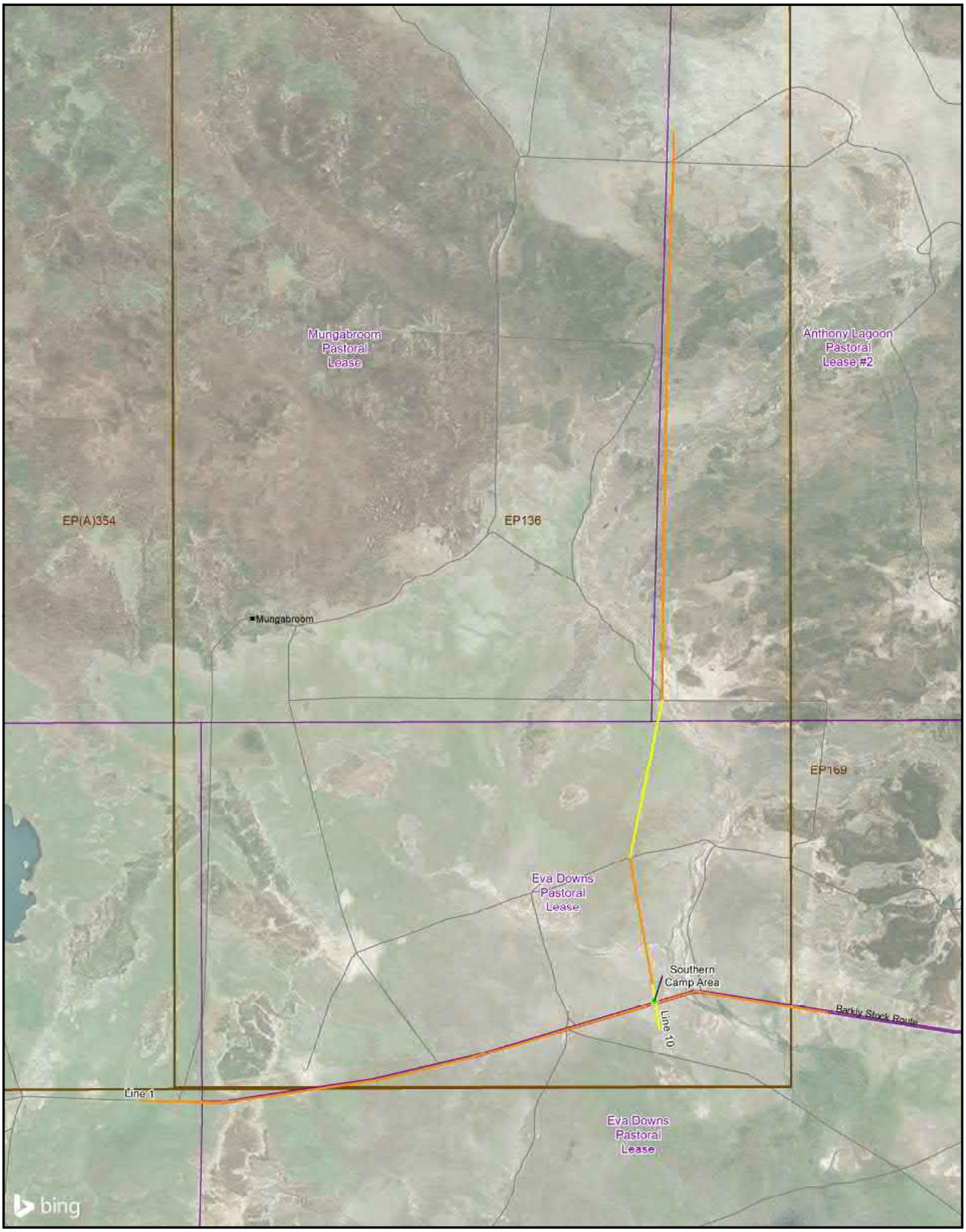

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Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

1:150,000 (when printed at A3)

Seismic Lines

- Vegetation Clearing Required
- Existing Pastoral Track/Road
- Accomodation Camp Area
- Native Title Register
- Petroleum Exploration Permit
- Roads

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Location of Southern Seismic Exploration Lines and Field Camp

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 3

A3 size

1.3 Scope of works

The scope of work for the LCA involved:

- a review of historical data and reports prepared during the previous Beetaloo onshore oil and gas exploration programs
- a search of the Commonwealth Department of the Environment and Energy (DEE) Protected Matters database (5 June 2020)
- a search of the NT Natural Resource Management InfoNet Database (flora and fauna database) (5 June 2020)
- a search of the NT Natural resource (NR) Maps web mapping tool (2020)
- a search of the Atlas of Living Australia (ALA) database for flora and fauna records (2020)
- completion of LCA field survey of the proposed exploration area for the seismic program. This was undertaken in two stages, in November 2019 and May 2020.
- Preparation and update of this report.

2.0 Assessment Method

2.1 Desktop Review

Field data collected between 2005 and 2020 within the permit areas was mapped based on image interpretation, with ground-truthing of the proposed survey areas being completed during field assessments (refer Section 2.2). This information was reviewed prior to the field work to identify the following:

- terrestrial vegetation types and flora and fauna species occurring within the region and with potential to occur within the survey area, using existing documents and aerial / satellite imagery.
- Commonwealth or NT listed threatened species or communities identified within the region and with potential to occur within the survey area.
- matters of national environmental significance or other matters protected by the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) that are likely to occur within the survey area.
- weeds or feral animals listed under the EPBC Act, *Weeds Management Act* or the *Territory Parks and Wildlife Conservation Act* (TPWC Act) and with potential to occur within the survey area.

Table 2 provides a chronological list of reports previously compiled for the permit area between 2004 and 2019, in relation to environmental approvals and management support for petroleum exploration activities in the Beetaloo Basin, NT.

The extent of work undertaken since 2004 has enabled a comprehensive understanding of the natural and cultural environment, which has been used in assessing the proposed exploration areas within the Permit Area.

Table 2 Summary of existing Environmental Assessments and Reports for the Beetaloo Basin (2004 to 2019)

Date	Report
Sweetpea Petroleum	
Jul- Aug 2004	Baseline land condition assessment
	Site database established
Jul 2005	Exploration EMP finalised and approved
Feb 2020	Land Condition Assessment for EP136 (Version 0 of this report)
Petrohunter Australia (Partner to Sweetpea)	
Dec 2006	Baseline vegetation assessment
Apr 2007	Drill site assessments
Apr 2007	Annual report
Jun 2007	Update of the existing EMP to include the new Exploration Permit areas
Jul 2007	Drill Site maps
Jul 2007	Supplemental Environmental Management Plan, Drilling Program 2007, Beetaloo Basin, NT
Jul 2007	Soil erosion assessment
Jul 2007	Groundwater quality
July 2007	Emergency Maps
Jul 2007	Environment & Heritage Induction Materials
Aug 2007	Site-based Drilling EMP

Date	Report
Paltar	
Apr 2015	Land Condition Assessment and Heritage Assessment of EP136 and EP143
Jun 2015	Environmental Management Plan for EP136 (did not proceed for approval)
Falcon Oil and Gas	
Dec 2010	Drill site condition assessments
Jan 2011	Archaeological survey
March 2011	Site-specific drilling EMP
2011	Falcon Shenandoah 1 Stimulation and Testing Groundwater Monitoring
2011/2012	Shenandoah 1 Re-Entry Environment Plan (EP)
July 2012	EP99 Archaeological Survey, Beetaloo Basin
2013	EP99 Seismic Exploration Environmental Management Plan
2013	Sweetpea 2006 Closeout Environmental Survey
Origin	
2015 and 2016	Beetaloo Basin Environmental and Heritage Assessment and preparation of Approval documentation.
October 2018	Land Condition Assessment and Heritage Assessment of Velkerri 76 S1-1, Velkerri 76, Velkerri 117, Velkerri 98, Kyalla 117 and Kyalla 98
July 2019	Weed Survey of Kyalla 117 N2-1 and access tracks
December 2019	Land Condition Assessment and Heritage Assessment of EP76, EP117 and EP98

2.2 Field assessment

The LCA field survey of the proposed seismic routes was conducted by AECOM in two stages. The initial survey was undertaken within the northern survey area from the 5 to 7 November 2019 by Environmental Scientists William Riddell and Jace Emberg, and Heritage Consultant Perry Braithwaite. The survey involved helicopter and ground survey of the proposed seismic lines and temporary accommodation camp. An additional survey was undertaken within the northern survey area and the southern survey area (refer to Figure 2), from 25 to 30 May 2020 by AECOM Senior Botanist David van den Hoek and Heritage Subconsultant Silvano Jung (Ellengowan Enterprises).

Both field surveys used an aerial rapid condition assessment method that have previously been undertaken by AECOM for pre-exploration assessments. The method allows for large areas to be surveyed over a relatively short period of time by enabling aerial assessment from a helicopter and access to remote locations for on-ground survey.

2.2.1 Aerial Survey

The LCA involved flying the entire seismic route at an average height of 45 m at approximately 60 to 80 km/hr (45 to 60 knots). During flight, spatially located digital images along the seismic line route were captured within each mapped vegetation boundary, land condition assessment sites and creek crossing. Observations on weed occurrence along the proposed seismic route were also recorded. Spatially referenced video footage was captured continuously using a dashcam during the May 2020 field survey. The assessment was carried out along a 10 m wide strip of the proposed seismic line route.

To minimise disturbance to native vegetation and facilitate access, proposed seismic lines predominantly aligned with existing tracks in the northern survey area, within the Beetaloo pastoral lease, and in the southern survey area, within the Anthony Lagoon and Eva Downs pastoral leases.

During the survey these tracks were generally allocated a score of ‘Very Poor’, ‘Poor’ or ‘disturbed’ depending on the amount of regrowth that had occurred and this information was supplied to the

seismic contractors to inform the level of work required along existing tracks to provide access for the seismic survey program. Newly updated seismic lines located on the northern survey area, within Tanumbirini pastoral lease propose to transect areas of intact native vegetation and will require clearing to undertake the Seismic Exploration Program (Refer to figures presented in Section 4.6).

The captured video and still imagery was analyse to classify land condition along a 10 m wide strip centred on the seismic line. Scores were applied to sections of the seismic line according to a five-part scale based on the presence of native vegetation, fire impact, weeds, extent of bare ground, and the presence of erosion (refer Table 3). The assessment of video and still imagery at georeferenced points provides a baseline for future assessment of land condition following the seismic survey. This approach enables better repeatability and verification of the results compared to assessment in the field.

Table 3 Land Condition Assessment Scale

1	2	3	4	5
Very Poor	**Poor**	**Disturbed**	**Good**	**Excellent**
No native vegetation/ extreme erosion	Little native vegetation/ high erosion	Medium extent of native vegetation/ some erosion	High level of native vegetation/ limited erosion	Intact native vegetation/ no erosion
No native vegetation – all exotic plants/non local plants or almost completely bare ground/ eroded.	Clumps of native vegetation with extensive weeds or large patches of bare ground. Vegetation structure destroyed.	Native vegetation distributed throughout interspersed with significant patches of weeds or bare ground and/or some erosion. Vegetation structure damaged.	Mostly all native vegetation with some weedy patches or some damage to vegetation structure and/or limited erosion. Vegetation structure mostly intact.	Native vegetation with only minor, dispersed weed invasion or isolated disturbances and/or minimal evidence of a track.

Aerial photos were also taken at each of the creek crossings and an assessment was made in the air as to whether the crossing was trafficable on the ground. If there was any question of creek crossing trafficability a ground assessment was undertaken (see Section 2.2.2). The aerial creek crossing assessments were undertaken during the May 2020 field survey (following 2019-2020 wet season):

- Northern survey area – 41 creek crossings
- Southern survey area – 5 creek crossings.

2.2.2 Ground Survey

Ground based surveys undertaken by AECOM during November 2019 and May 2020 included the following:

- November 2019 field survey (northern survey area, within Tanumbirini and Beetaloo pastoral lease)
  - Assessment of vegetation types and soil types (a minimum of two sites in each mapped vegetation type), identified in the desktop review, to ground truth the results of the desktop review; and,
  - Assessment of an additional five sites in areas with specific landscape features, such as drainage lines/creeks and elevated areas, or areas with high habitat value for threatened species identified in the desktop review.
- May 2020 field survey (northern survey area, within the Beetaloo pastoral lease)
  - Assessment of proposed creek crossings (5 sites).
  - Survey for weeds.
- May 2020 field survey (northern survey area, within the Tanumbirini pastoral lease)

  - Assessment of proposed creek crossings (3 sites).
  - Survey for weeds.
  - Heritage assessment was undertaken at creek crossing sites.
- May 2020 field survey (southern survey area, within the Anthony Lagoon and Eva Downs pastoral leases)
  - Assessment of proposed creek crossings (4 sites).
  - Survey for weeds.
  - Assessment of vegetation and soil types (a minimum of one site in each mapped vegetation type) identified in the desktop review (7 sites).

Vegetation and habitat assessments were based on a survey of 20m x 20m quadrats in representative vegetation types, and collection of data to allow a floristic and structural classification of the vegetation communities described at NVIS level V - .dominant growth form, height, cover and three dominant species for the three dominant strata. The results of the vegetation survey quadrats were extrapolated to cover the areas likely to be affected, using aerial photography, photos and video collected during the aerial survey and existing broad scale vegetation maps.

Soil was also assessed at each of the vegetation assessment sites. Soil samples were dug to a depth of 100 mm and collected within ziplock bags for off-site assessment of texture, colour and percentage of course fragments (>2mm). Observations on the percentage of surface gravel cover were made in the field.

A record of weed occurrence was undertaken at each of the ground survey sites. Weed records were limited to those classified under the Northern Territory Weeds Act. Weed attributes required by the Northern Territory Weed Branch guidelines were collected during the May 2020 field survey and included the following:

- weed name
- patch size (5m, 20m, 50m or 100m)
- patch density (<1%, 1-10%, 11-50%, >50%)
- whether seed has dropped.

In addition, fuel load assessments at each vegetation and habitat survey site was undertaken to assess fire risk to inform fire-related mitigation actions in the EMP. This included assessment of the type of fuel present (grasses, shrubs, trees, perennial species vs. annual species, etc.), its stage of curing, its height, topography, weather patterns and values at risk (e.g. high conservation value area, pasture, fences and infrastructure).

Other site-based characteristics of the proposed seismic lines recorded included:

- the presence of drainage lines and the direction of surface flows
- the distance to the nearest sensitive receptors (such as significant vegetation communities or fauna habitats)
- fauna habitat features, such as hollows, logs and burrows (the fauna habitat quality for each mapped vegetation community type would be assessed)
- incidental fauna sightings
- the presence of weeds animals (i.e. indication of scats, tracks, wallows, etc.)
- evidence of past fire.

Land condition assessments were undertaken in different seasons. The November 2019 assessment was undertaken during 5 to 7 November in a period known as the ‘build-up’, which represents the seasonal change from the end of the dry season to the onset of monsoonal rains. At the time of the survey the permit area was yet to experience significant rainfall. Consequently, several forb and grass species were unable to be identified, however sufficient data was able to be captured to obtain a good

understanding of the land condition within the permit area to inform management measures required for the protection of the environment.

The May 2020 assessment was undertaken at the beginning of the dry season when the chance of rainfall was low. Fire was yet to occur within the permit areas and vegetation was mainly identifiable.

The proposed seismic lines in the northern survey area traverses 41 creek lines. A total of five creek lines are encountered in the southern survey area. Many of the creeks are ephemeral, however some of the larger creeks such as Newcastle Creek support waterholes which hold water for extended periods following wet season rainfall.

A heritage survey was undertaken at each of the northern survey ground survey sites undertaken within the newly proposed seismic route, predominantly located within Tanumbirini pastoral lease. Heritage assessment was also undertaken at ground survey sites within the southern survey area, in the Anthony Lagoon and Eva Downs pastoral leases. A detailed heritage survey report has been prepared in addition to this LCA report.

2.2.3 Satellite Imagery Analysis

Satellite imagery captured in August 2019 was used to conduct various analyses to support the field-based land condition assessment, map vegetation and provide a regional landscape context to the results. The following analyses were carried out using unsupervised analysis techniques within a 1 km buffer each side of the proposed seismic lines:

1. Proportion of bare earth within 1 ha grid squares across the study area.
2. Vegetation structure classified into:

a. “open – wet” corresponding with open country located in lower-lying parts of the landscape

b. “open – dry” corresponding with open country in more elevated parts of the landscape

c. “trees” corresponding to closed or dense canopy vegetation (such as Bullwaddy and Lancewood forest)

d. “bare” corresponding to areas with very low vegetation biomass, typically associated with creek lines.

3. vegetation type – noting that only limited ground truthing was possible across an area of this size and should be treated with caution.

3.0 Physical Environment

3.1 Climate

The climate of the permit area is arid to semi-arid, with rainfall decreasing in frequency and quantity from north to south. The climate is monsoon-influenced, with a distinctive wet and dry season experienced through the year. Approximately 90% of the rainfall occurs during the Wet Season, and annual totals show moderate variability from year to year. October through to March are dominated by hot and wet conditions, while mild days and cool nights are experienced from May to August (Holt & Bertram, 1981). April and September are transitional months, with occasional rainfall. Drought conditions are known to occur in the region once every ten years (Holt & Bertram, 1981).

Table 4 presents the climate averages for Bureau of Meteorology (BoM) weather stations located at Daly Waters, Newcastle Waters and Elliot. The average annual rainfall in the north of the permit area (Daly Waters) is 680 mm becoming drier at the southern portion with an average annual rainfall of 608 mm at Elliott and 535 mm at Newcastle Waters.

The maximum temperature in the permit area exceeds 30ºC from August to May. November is usually the hottest month, with maximum temperatures reaching 40ºC (Table 4). Minimum monthly temperatures range from 11 to 24ºC, with July being the coldest month.

Relative humidity and evaporation are highest during the summer months. The 9 am maximum average for relative humidity ranges from 68% to 73% and occurs during February across all three monitoring sites. The maximum mean daily evaporation level is 8.8 mm at Daly Waters, 9.6 mm at Newcastle Waters and 9.8 mm at Elliott. The evaporation rate is high because of the high temperatures, moderate humidity, wind and (indirectly) the high number of sunshine hours that are experienced in the area (Holt & Bertram, 1981). The prevailing wind in the permit area is from the south east; with wind velocities in the range of 6 to 9 km/hr.

3.2 Topography

The proposed northern survey area is predominantly situated on flat laterite plains, which were formed by laterite capping on Cretaceous aged sedimentary rocks (Tickell, 2003). The northern laterite plains are approximately 250 m to 280 m above sea level and located along the drainage divide that separates inland drainage from the north flowing streams (Nutwood Downs), which lead into the Gulf of Carpentaria. From there, the land gently slopes towards the south and south west. The northern survey area falls south of this drainage divide with surface water flow draining in a south westerly direction and discharging into Lake Woods (Tickell, 2003).

The proposed southern survey area is predominantly situated on black soil plains. The seismic route transects lateritic plains in two places, the first section is around 2 km in length around 3.7 km from the northern most point and the second section around 14.2 km in length, beginning around 7.5 km from the northern most point of the transect line. Surface water within the southern survey area drains to the south, discharging into Lake Tarrobool (Tickell, 2003)

3.3 Land Systems

Land systems are classified according to recurring patterns of geology, topography, soils and vegetation. Land systems mapped for the northern survey area are shown in Figure 4 and the southern survey area in Figure 5. Table 5 comprises the following Land system mapping data sets (Department of Land Resource Management 2013):

- *Land Systems of the Northern Part of the Northern Territory* based on 16 land system surveys developed as part of the Australian Soil Resource Information System (ASRIS) national soils database at scale 1:250,000
- *Land Systems of the Southern Part of the Northern Territory* based on three land system surveys and the Atlas of Australian Soils (scale 1:2,000,000).

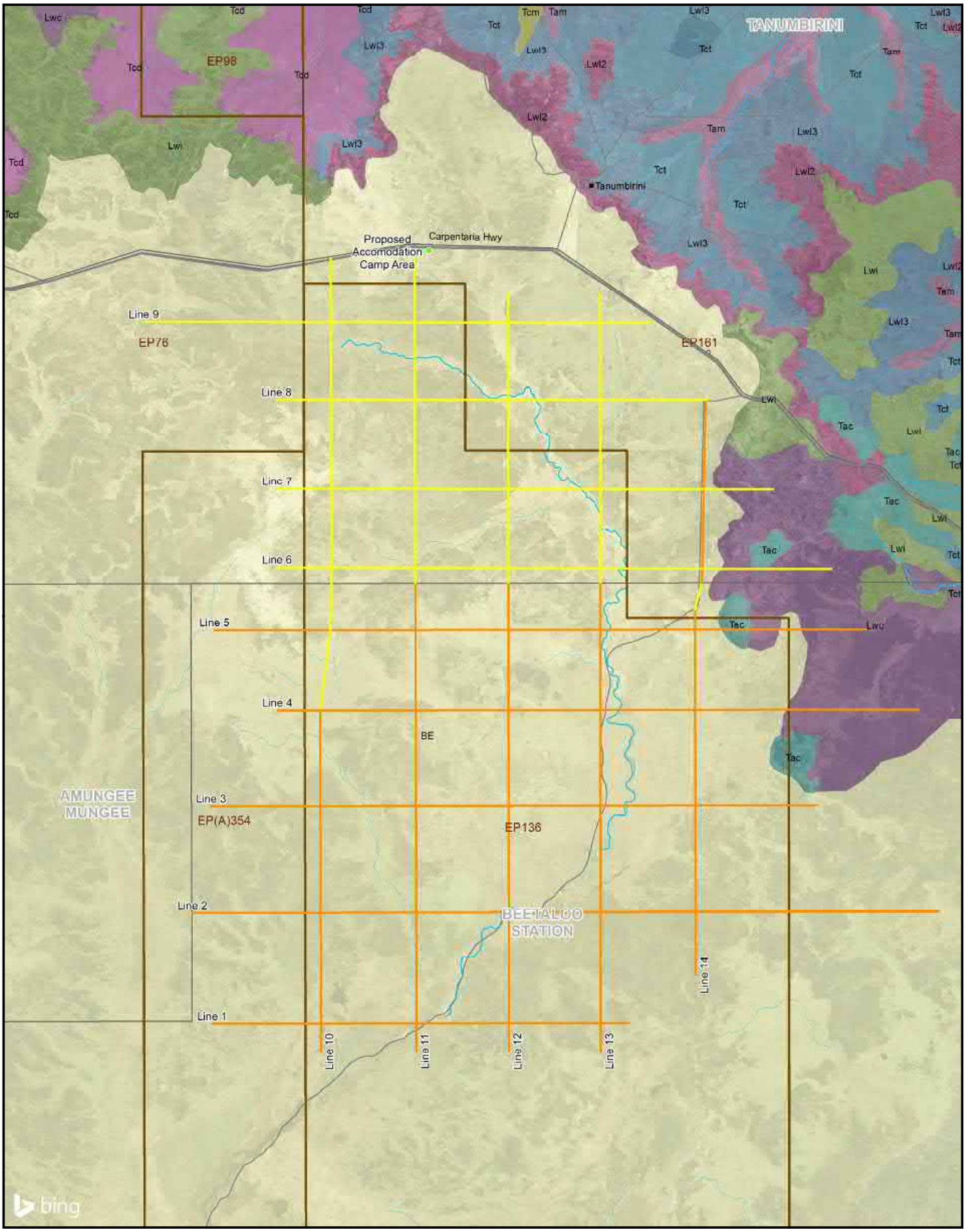
The majority of the northern survey area is situated within the Beetaloo Land System which is characterised by gently undulating lateritic plains and rises of lateritic red earths and podzolic soils dominated by *Acacia shirleyi* (Lancewood) forest.

The southern survey area crosses a range of land systems, including the Creswell land systems which is characterised by black soil clay plains and is located in the northern and southern ends of the proposed seismic line. The Barkly1 Land System is also found on the southern end of the line and similarly supports black soil clay soils. Black soils plains within the Barkly Region are typically dominated by *Astrebla sp.* (Mitchell Grass) tussock grasslands. The centre of the seismic line transects two Land Systems (Pollyarra/Creswell and Wonorah/Creswell) that are both characterised by lateritic plains and rises.

Table 4 Average climate at Daly Waters, Newcastle Waters and Elliot

Month	Daily Maximum Temperature (ºC)			Daily Minimum Temperature (ºC)			Mean Monthly Rainfall (mm)			Relative Humidity (%)#			Mean Daily Evaporation (mm)			Wind Speed (km/hr)#			Wind Direction#		
	DW	NW	E	DW	NW	E	DW	NW	E	DW	NW	E	DW	NW	E	DW	NW	E	DW	NW	E
January	36.6	37.3	37.4	24.0	24.1	24.2	165.4	125.5	138.2	69	63	65	7.1	8.2	7.9	5.9	8.8	5.5	NW	NW	NW
February	35.5	35.6	36.6	23.4	23.7	23.8	165.4	130.9	154.8	73	68	70	6.0	7.0	7.3	4.8	9.4	5.8	NW	E,SE	W
March	34.6	34.7	35.8	22.4	22.6	22.4	120.1	93.7	81.0	70	62	64	5.9	6.3	7.3	4.5	11.0	6.9	SE	E,SE	E
April	33.7	33.3	34.5	19.3	19.4	19.7	23.6	24.6	20.9	53	54	50	6.2	6.4	7.5	6.7	14.0	9.2	SE	E,SE	SE
May	31.4	30.0	31.3	15.8	16.1	16.0	5.0	9.3	6.6	50	51	47	5.9	5.1	6.5	7.8	16.7	10.4	SE	E,SE	SE
June	28.7	27.7	28.4	12.9	12.7	12.6	5.6	5.3	4.6	50	51	46	5.5	4.4	5.6	7.5	15.2	11.6	SE	E,SE	E
July	28.9	27.5	28.4	11.8	11.3	11.3	1.5	3.4	2.9	47	47	42	5.6	4.6	5.7	7.8	15.0	10.8	SE	E,SE	SE
August	31.9	30.8	31.1	13.5	13.7	13.1	1.7	1.0	1.0	44	42	37	6.6	6.2	6.7	6.6	15.3	11.2	SE	E,SE	SE
September	35.0	34.1	35.4	17.2	17.4	17.4	4.9	5.4	5.6	43	41	36	8.4	8.2	8.4	7.8	14.2	11.4	SE	E,SE	E
October	37.7	37.1	38.0	21.1	21.2	20.9	22.5	20.9	20.9	45	42	41	8.8	9.1	9.4	7.8	14.5	11.2	SE	N	N
November	38.4	38.4	39.0	23.5	23.3	23.4	59.4	35.7	48.0	52	43	45	8.5	9.2	9.5	6.7	12.5	8.6	NW	N	NW
December	38.2	38.5	38.5	24.0	24.1	24.4	110.0	77.3	104.0	59	51	56	8.1	9.1	8.7	5.5	10.1	6.5	NW	N	N
Annual			34.5			19.1	680.5	535.4	596.6			50			7.5			9.1			
Minimum	28.7	27.5	28.4	11.8	11.3	11.3	1.5	1.0	1.0	43	41	36	5.5	4.4	5.6	4.5	8.8	5.5			
Maximum	38.4	38.5	39.0	24.0	24.1	24.4	165.4	130.9	154.8	73	68	70	8.8	9.2	9.5	7.8	16.7	11.6			
Average	34.2	33.8	34.5	19.1	19.1	19.1	57.1	44.4	49.0	54	51	50	6.9	7.0	7.5	6.6	13.1	9.1			

DW – Daly Waters, NW – Newcastle Waters, E – Elliott, # data recorded at 9am daily, - No data recorded.
Data sourced from Bureau of Meteorology, *Climate Averages and Wind Frequency Analysis for Station 014618 Daly Waters recorded from 1873-2013, 015089 Newcastle Waters recorded from 1941-1980 and 015131 Elliott recorded from 1949-2019*.



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Projection: GDA 1994 MGA Zone 53

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Seismic Lines

- Vegetation Clearing Required
- Unsealed Road
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads
- Cadastre

Northern Territory Land Systems

- Beetaloo (BE)
- Coolibah (Tac)
- Cresswell (Lwc)
- Dalglese (Tcd)
- Inacumba (Lwi)
- Lancewood 2 (Lwl2)
- Lancewood 3 (Lwl3)
- McArthur (Tam)
- Miller (Tcm)
- Tanumbirini (Tct)

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Land Systems within the Northern Exploration Area

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 4

A3 size

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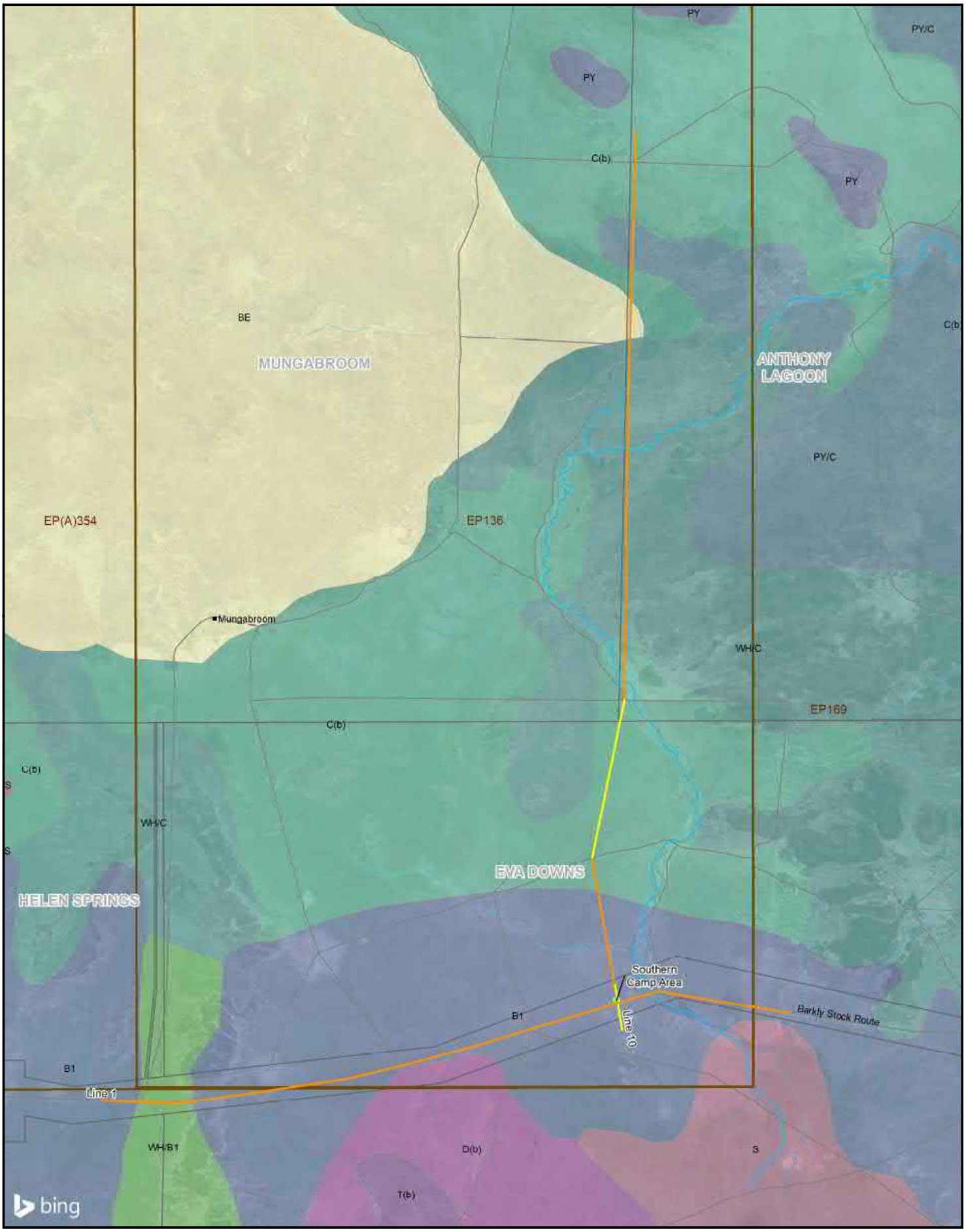

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Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

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Seismic Lines
- Vegetation Clearing Required
- Existing Pastoral Track
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads
- Cadastre

Northern Territory Land Systems
- Barkly1 (B1)
- Beetaloo (BE)
- Creswell (C(b))
- Drylake (D(b))
- Pollyarra (PY)
- Pollyarra/Creswell (PY/C)
- Sylvester (S)
- Tobermorey (T(b))
- Wonorah/Barkly1 (WH/B1)
- Wonorah/Creswell (WH/C)

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Land Systems within the Southern Exploration Area

PROJECT ID	60611666
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LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 5

A3 size

Table 5 Land Systems of the Northern and Southern Survey Areas

Map Unit	Name	Description	Reference
Northern Survey Area			
BE	Beetaloo	Gently undulating country with various lateritic soils, mostly with Lancewood Forest in the north-west corner of the region.	Christian *et al.*, 1951
Lwc	Creswell	Covers two landscape classes: intact elevated plateaus, and plains and rises on deeply weathered sediments. Very gently undulating. Northern heavy grey pedicels. *Eulalia fulva* and *Dichanthium fecundum* grassland.	Christian *et al.*, 1951
Tac	Coolibah	Level to gently undulating plains on unconsolidated transported materials, rarely sedentary. Grey and brown clays, minor black earths. Tall open grassland of *Chrysopogon fallax* and *Eulalia fulva* with some *Eucalyptus microtheca* and *E. pruinosa*.	Aldrick & Wilson, 1990
Southern Survey Area			
B1	Barkly1	Very gently undulating plains with heavy grey pedicels. *Astrebla spp*. tussock grasslands and drainages with *Eucalyptus microtheca*	Christian *et al.*, 1951
C(b)	Creswell	Covers two landscape classes: intact elevated plateaus, and plains and rises on deeply weathered sediments. Very gently undulating. Northern heavy grey pedicels. *Eulalia fulva* and *Dichanthium fecundum* grassland.	Christian *et al.*, 1951
PY/C	Pollyarra/Creswell	Gently undulating country with deep lateritic red soils. Woodlands of *Eucalyptus leucophloia* or *Corymbia dichromophloia*, some low eucalypt mallees and *Acacia spp.* shrubland	Christian *et al.*, 1951
WH/C	Wonorah/Creswell	Gently undulating country with deep lateritic red soils. Woodlands of *Eucalyptus leucophloia* or *Corymbia dichromophloia*, some *Acacia shirleyi* (Lancewood)	Christian *et al.*, 1951

3.4 Geology

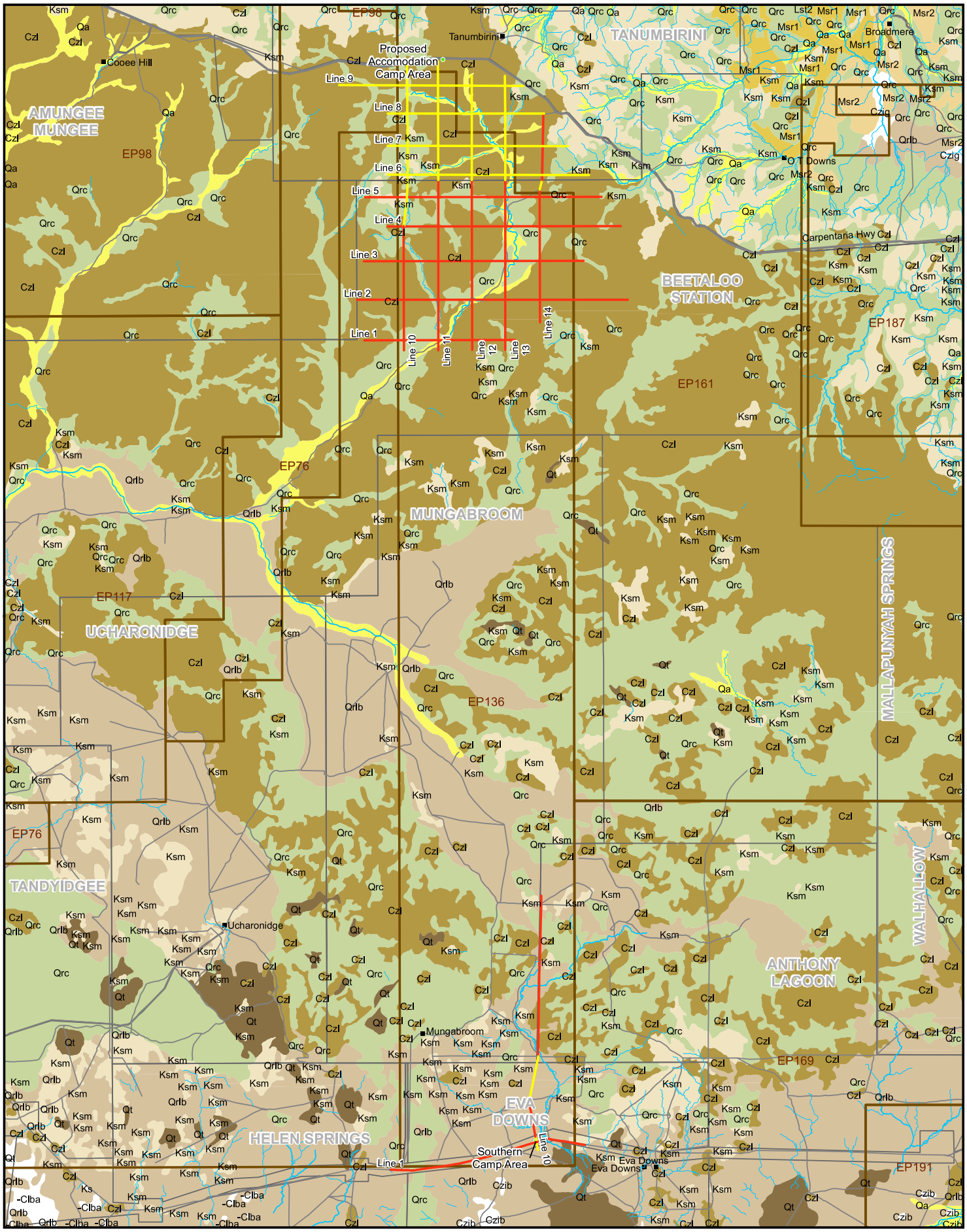
The proposed seismic survey area occurs within the Western Gulf sub-basin, part of the larger Carpentaria Basin formed during the Jurassic and Cretaceous periods (Ahmed *et al*., 2013). Soft clays and sandstone are the primary rock formation in the basin and overlay the older Pre-Cambrian and Cambrian rocks. Isolated freshwater lakes were formed during the Miocene Period (15 million years ago) when erosion and the gradual sinking of some areas produced small and patchy occurrences of freshwater limestone accumulations (Tickell, 2003). The geology of the northern and southern survey area (refer Figure 6) was primarily formed over three main periods – the Precambrian (> 550 million years ago), the Cambrian (500 million years ago) and the Cretaceous (100 million years ago).

Pre-Cambrian rock formations, known as the Roper Group, are generally located at depth beneath the younger formations across the proposed seismic survey area, and are exposed only in the bedrock hills located to the north of the survey area on Tanumbirini Station (Tickell, 2003).

Cambrian formations, comprising limestone, siltstone and sandstone, are expressed only in the south west region of the northern survey area. The rock formation is near flat, rarely cut by faults and forms distinct layers. The Cambrian sediments are characterised by sub-artesian water storage, pedocalcic soils, Cambrian dolomite, limestone, and tertiary alluvium (Tickell, 2003).

Following the deposition of Cretaceous sediments, a period of geomorphic activity occurred during the Tertiary period. This resulted in the area, being gently folded and warped, which exposed it to a long period of erosional forces (Christian *et al*., 1951). These forces resulted in the area being dominated by undulating plains that contain extensive swampland and lakes, such as Lake Tarrabool to the south east of the southern survey area.

Following a period of lateritisation during the end of the Tertiary period, rivers were at grade and erosion was reduced to a state that allowed deep stable soil profiles to be established and be preserved (Christian *et al*., 1951), resulting in the 'black' soil clay plains and the lateritic rises that occur within the southern survey area (Randal, 1967). With the onset of a more arid climate during the post–Miocene period, lakes and swamps dried up, resulting in high concentrations of lime and silica deposits that were leached from the lateritic soils into the ground and surface waters, which in turn formed a number of Tertiary limestone outcrops within the permit area. During the Quaternary period (less than 2 million years ago), the minor alluvial and lake deposits throughout the permit area were formed.



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Projection: GDA 1994 MGA Zone 53

10 5 0 10 km

1:530,000 (when printed at A3)

Seismic Lines
- Vegetation Clearing Required
- Unsealed Road/ Existing Pastoral Track
- Petroleum Exploration Permit
- Accomodation Camp Areas
- Roads
- Cadastre

Geology
- Czl-lateritic duricrust
- Ksm-sandstone
- Lst2-sandstone, mudstone
- Msr1-sandstone
- Msr2-sandstone
- Qa-alluvial sediment
- Qrc-sand, gravel
- Qrlb-soil
- Qt-mud

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd Environmental Management Plan

Geology within EP136

PROJECT ID	N/A
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 6

A3 size

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3.5 Soils

3.5.1 Soil Types

The northern and southern survey areas are located across a number of bioregions. The northern survey area falls mainly within the Sturt Plateau bioregion which comprises of undulating plains on sandstones, with mostly neutral sandy red (Tenosol) and yellow earth (Kandosol) soils. Cracking clay soils (Vertosols) occur in the southeast of the bioregion (ANRA, 2008). The soils within the Sturt Plateau have been derived from ancient rock formations and ancestral soils that were formed during earlier weathering cycles. The soils have been deeply weathered, leached and are relatively infertile because they have not been enriched by any recent geological events (Orr & Holmes, 1984). The soil types located within the plateau range from the very strongly leached lateritic soils of the Tertiary land surface to the calcareous desert soils and desert loams in the southern drier areas.

The lateritic plains, which encompass the proposed northern survey area, are classed as very strongly leached soils of the Tertiary land surface. Three main soil types are located within this area, including:

- Tertiary Lateritic Red Earths (Red Kandosols), which occur on the gently undulating topography
- Tertiary Lateritic Red Sands (Red Tenosols), which occur on gently undulating to undulating topography of the Tertiary Lateritic Plain, formed from sandstones and complex parent materials of the deep sandy soils
- Tertiary Lateritic Podzolic Soils, formed on the gently undulating topography over a variety of rocks. These soils occur in the northern section of the Barkly Basin and the Gulf Falls.

The southern survey area falls within the Gulf Fall and Uplands bioregion in the north and runs into the Mitchell Grass Downs bioregion in the southern section of the line. Gulf Fall and Uplands is described as consisting of undulating terrain overlaid with lateritised tertiary material, skeletal soils and shallow sands (EA 2000). The Mitchell Grass Downs bioregion generally supports grey and brown vertosols soils overtopping fine texture calcareous materials (Fisher et.al. 2002).

Field Surveys

During the November 2019 field survey, soil profiles were excavated in the northern survey area to depths of 0.1 – 0.3m, usually covering the top two soil horizons.

Surface soils tested during the field survey were slightly acidic, with pH ranging from 5 to 6.5 across the survey area, with the exception of Ph 7 (neutral) recorded at Sites NL7 and NL19.

Field surveys confirmed that black Vertosol soils are common on alluvial plains. In the southern survey area these landscapes typically support *Sorghum timorensis* and *Astrebla spp.* grasslands. The soil surface usually cracks widely upon drying and is self-mulching. Black soils are neutral to alkaline, calcareous and commonly have depths to one metre (Fisher, 2001). Cracking clay soils occur mostly on flat or gently undulating plains (‘downs’) and are associated with the exposure and weathering of sedimentary or basic volcanic rocks. The Black soils also occur on the more recent depositional landscapes in the form of alluvial clays associated with drainage lines and major river systems. The soils located on lateritic plains and gently undulating plains consisted of brown earths (Kandosol) that frequently contained ironstone gravels. These landscapes typically support *Corymbia spp.* woodlands.

Results of the northern and southern survey area soil assessments are summarised in Table 6. During May 2020 soils testing consisted of texture tests of the top 10 cm (A1 horizon). Soil results are also results are included in the land condition site descriptions presented in Section 6.0.

Table 6 Soil descriptions of the Survey Area

Site	Soil type (broad)	Top Horizon				Second Horizon				Gravels
		Depth	Colour	pH	Texture	Depth	Colour	Texture	pH	
Northern Survey Area										
NL1	Poorly drained clays (Vertosol)	A1: 0-0.05	2.5Y 3/1 very dark grey	6.5	sandy clay loam	B1: 0.05 - 0.1	10YR 5/1 Grey	medium clay	6.5	-
NL2	Gravelly brown earths (Kandosol)	A1: 0-0.05	7.5 YR 3/2 dark brown	6.5	sandy loam	B1: 0.05 - 0.1	7.5 YR 4/3 brown	sandy clay loam	6.5	50% sub-rounded, 3mm gravels (ironstone)
NL3	Poorly drained clays (Vertosol)	A1: 0-0.05	7.5 YR 4/3 brown	6	sandy clay loam	B1: 0.05 - 0.1	7.5YR 5/3 brown	light clay	6	50% sub-rounded, 3-10mm gravels (ironstone)
NL4	Poorly drained clays (Vertosol)	A1: 0-0.05	10 YR 3/2, very dark greyish brown	6.5	sandy clay loam	B1: 0.05 - 0.1	10YR 3/2 very dark greyish brown	light clay	6	10% sub-angular 3-5mm ironstone fragments
NL5	Gravelly brown earths	A1: 0-0.05	7.5 YR 4/3 brown	5	silty clay loam	A3: 0.05-0.1	7.5YR 5/3 brown	light clay	6.5	50% sub-angular, 10-50mm
NL6	Poorly drained mottled earths	A1: 0-0.03	7.5 YR 3/2 dark brown	6	sandy loam	B1: 0.03 - 0.3	7.5 YR 4/1 dark grey	sandy loam	6.5	10% sub-rounded and sub-angular ironstone, 10-20mm
NL7	Brown earths	A1: 0-0.03	2.5YR 5/4, reddish brown	7	sandy loam	B1: 0.03-0.05	10YR 5/4, yellowish brown	sandy clay loam	6.5	-
NL8	Gravelly brown earths	A1: 0 – 0.05	5YR 3/3, dark reddish brown	6	sandy loam (heavy)					75% sub-rounded and sub-angular 10-30mm ironstone
NL10	Gravelly brown earths	A1: 0-0.03	2.5Y 3/3, dark olive brown	6	sandy loam (heavy)	A3: 0.03 - 0.1	2.5 Y 4/3, olive brown	sandy clay loam	5.5	20% 3mm sub-rounded ironstone
NL11	Brown earths	A1: 0-0.03	7.5YR ¾ dark brown	5	sandy loam (heavy)	A3: 0.03 - 0.1	7.5YR ¾, dark brown	sandy loam (heavy)	4.5	-

Site	Soil type (broad)	Top Horizon				Second Horizon				Gravels
		Depth	Colour	pH	Texture	Depth	Colour	Texture	pH	
Northern Survey Area										
NL13	Gravelly brown earths	A1: 0-0.03	7.5YR 3/3, dark brown	6.5	sandy loam (heavy)	B1: 0.03 - 0.15	7.5YR 4/2 brown	sandy clay loam	6.5	75% sub-rounded and sub-angular 5-30mm ironstone
NL14	Brown earths	A1: 0-0.05	7.5YR ¾, dark brown	5.5	sandy loam (heavy)	B1: 0.05 - 0.15	7.5YR 4/3, brown	sandy clay loam	6	
NL15	Mottled brown earths	A1: 0-0.05	7.5YR 3/3, dark brown	4.5	sandy loam	B1: 0.05 - 0.1	10YR 4/4, dark yellowish brown	sandy loam	5	30% sub-rounded ironstone 3-5mm
NL16	Brown earths	A1: 0-0.03	5YR 2.5/2, dark reddish brown	6	sandy loam	B1: 0.03 - 0.1	7.5YR 3/3, dark brown	sandy loam (heavy)	5.5	10% sub-rounded 3mm ironstone
NL17	Gravelly red earths (Kandosol)	A1: 0-0.03	2.5YR 3/3 dark reddish brown	6.5	sandy loam	B1: 0.03 - 0.1	2.5YR 5/3 reddish brown	sandy loam (heavy)	7	20% 3-5mm sub-rounded ironstone
NL18	Rudosol									95% gravel cover, rocks SA 5-100mm
NL19	Brown earths	A1: 0-0.05	10YR 2/2 very dark brown	7	sandy loam	B1/A3 0.05 -0.1	10YR 3/2 very dark greyish brown	sandy loam (heavy)	7	-
NL20	Poorly drained clays (Vertosol)	A1: 0-0.03	7.5YR 3/1 very dark grey	6	sandy clay loam (heavy)	B1: 0.03 - 0.1	7.5YR 4/4 brown	light clay	6.5	-
Southern Survey Area										
SL1	Poorly drained clays (Vertosol)	A1: 0-0.1	10YR 5/1 grey	6.5	light clay	-	-	-	-	-
SL2	Brown earths	A1: 0-0.1	7.5YR 3/2 dark brown	6	sandy loam	-	-	-	--	-

Site	Soil type (broad)	Top Horizon				Second Horizon				Gravels
		Depth	Colour	pH	Texture	Depth	Colour	Texture	pH	
Northern Survey Area										
SL3	Brown earths	A1: 0-0.1	10YR 3/3 dark brown	7	sandy loam	-	-	-	-	-
SL4	Mottled brown earths	A1: 0-0.1	10YR 4/3 brown	7	sandy clay loam	-	-	-	-	-
SL5	Mottled brown earths	A1: 0-0.1	7.5YR 4/3 brown	7	clay loam	-	-	-	-	-
SL6	Gravelly red earths (Kandosol)	A1: 0-0.1	5YR 3/4 dark reddish brown	6.5	loamy sand	-	-	-	-	10% sub-rounded ironstone 2-10 mm
SL7	Brown earths	A1: 0-0.1	10YR 3/3 dark brown	6.5	sandy loam	-	-	-	-	-

3.5.2 Erosion Susceptibility

Soil erosion susceptibility varies throughout the permit area, dependent upon the soil types, slope and extent of ground disturbance. Apart from the erosive impact of climatic conditions, soil erosion is influenced mainly by the inherent properties of the soils and the processes which occurred during the formation of the landscapes (Aldrick & Wilson, 1992).

Erosion will occur in the permit area if the land is used beyond its capacity, as is seen if land is overstocked or vehicle movements not controlled, for example. The location of proposed lease areas has been examined on the ground, to determine the risk of erosion occurring. Factors considered include the following.

- Soil type – Soils with higher clay content are prone to generation of bulldust and are easily eroded by wind and water. Gravelly soils tend to be more robust to disturbance on the scale expected for Sweetpea exploration activities. The primary soil type encountered during the baseline investigations for the 2020 project area can be described as silty SAND, SM with some gravel. These soils are considered to have a low to medium erodibility potential when the soils are disturbed.
- Slope – The slope of the site is one of the characteristics that will help to determine the risk of erosion during rainfall events, with steeply inclined areas a higher risk than small undulations in the landform. The Sweetpea project area is not considered to be at risk from erosion regarding slope, there is slight undulation that occurs throughout the region, generally being less than 2% gradient, however, some isolated areas in excess of 2% do exist and a rating has been applied for this. Treatments are defined for sections less than 2% and greater than 2%. The relevant treatment will need to be selected on a case by case basis on site.
- Aspect – the position of the seismic lines, access tracks and camp pads in relation to the direction of the contour should be considered and creation of tracks across (as opposed to parallel with) the contour should be avoided.
- Rainfall – Table 7 and Table 8 present the erosion risk rating based on average monthly rainfall using the rating system provided in the IECA (2008) for Daly Waters and Elliott. The timing of the project works will be Quarter 4 2020, prior to the onset of the wet season (BOM, 2020). Due to the timing of the survey close to the onset of the wet season additional mitigation will be required for wet season contingency. Based on the average rainfall the timing of the survey will occur during very low risk factor periods, increasing to high risk factor in November in the northern permit area and very low risk factor to moderate risk factor in the southern permit area.

Table 7 Erosion Risk Rating based on average monthly rainfall at Daly Waters

-Item	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	165.4	165.4	120.1	23.6	5.0	5.6	1.5	1.7	4.9	22.5	59.4	110
Erosion Risk*	H	H	H	VL	VL	VL	VL	VL	VL	VL	M	H

Table 8 Erosion Risk Rating based on average monthly rainfall at Elliot

-Item	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	140.0	156.8	80.4	20.8	6.6	4.6	2.9	1.0	5.5	20.6	47.3	102.4
Erosion Risk*	H	H	M	VL	VL	VL	VL	VL	VL	VL	M	H

** E = Extreme (>225 mm); H = High (100+ to 225 mm); M = Moderate (45+ to 100 mm); L = Low (30+ to 45 mm); VL = Very Low (0 to 30 mm)*

Certain sections of the seismic line will comprise more erodible soils, such as at waterway crossings. Total of 20 of the 41 waterway crossings are existing tracks that have been created by the pastoralists and are trafficable without modification. The balance of the waterway crossings, while new, are trafficable without modifications to the profile of the creeks. The only disturbance will be wheel ruts from vehicles moving through the crossing.

The main issues to be managed in relation to soils during exploration activities in the permit areas includes the generation of bull dust along seismic lines. Previous surveys have identified bull dust forming where the surface crust had been disturbed and then subjected to repeated disturbance (AECOM 2015). This was primarily in grassland areas and creek crossings.

3.6 Hydrology

3.6.1 Surface water

The proposed seismic survey area is located within two drainage basins, Wiso Basin comprises most of the survey area and Limmen Bight River Basin comprises a small portion in the north-east. The Wiso Basin is drained by the Georgina River and its major tributaries (Ranken, James, Buckley and Woodroffe Rivers). The Limmen Bight River Basin is drained by the Limmen Bight and Cox rivers and Lagoon, Bauhinia and October Creeks.

Newcastle Creek and several small ephemeral creeks, including Yaroo Creek, are located close to seismic lines and are crossed by existing and proposed access tracks (refer Figure 7). The creeks flow for only short periods during the wet season, with waterholes forming at the beginning of the dry season. The extent of inundation depends on the severity of the wet season and can range from remaining completely dry to widespread flooding.

Wiso Basin primarily drains towards Lake Woods, which is located south of Newcastle Waters Station. The area of Lake Woods is approximately 50,000 ha in normal rainfall years, extending to 80,000ha in exceptionally wet years, after which it can retain water for several years (HLA, 2005). Lake Woods is described as a major quasi-permanent surface water body in the region, although some semi-permanent and many ephemeral waterholes are located across the survey area (HLA, 2006a). Surface water in the southern exploitation lease generally flow to the south into Lake Tarrabool (refer Figure 8).

3.6.2 Creek crossings

A total of 41 ephemeral creeks and drainage lines (also referred to as intermittent streams) will be crossed in the northern survey area. Of these crossings, 20 occur on existing pastoral access tracks while the remaining 21 (on Tanumbirini Station) will be new disturbances. A total of five ephemeral creeks and drainages lines will be crossed along the southern survey area. All creek crossings are proposed along existing fence lines, tracks and roadways. The location of creek crossings are shown in Figure 7 for the northern seismic survey area and Figure 8 for the southern seismic survey area. Table 9 outlines the creek reference number and line number, location, stream order, condition description and field photos (Plate 1 to Plate 58) for each of the proposed crossing points.

All creeks and drainage lines were considered easily trafficable with only some that require some specific controls to minimise disturbance from the movement of the exploration vehicles (i.e. deeper depressions, minor gully erosion or lined with vegetation).

At the time of the May 2020 field survey, a number of crossings along the existing tracks on Beetaloo Station in the northern survey area were cut off due to the seasonal presence of water. The pastoral station has existing detours already in place for access along these sections of the proposed seismic line.

Table 9 Creek crossings in both the northern and southern survey areas

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
Northern Survey Area					
NC1 Line 9 (E-W) Tanumbirini Station	-16.517940°	134.602306°	Intermittent Stream (1)	Overland flow following rainfall. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 1 NC01 - Line 9**
NC2 Line 9 (E-W) Tanumbirini Station	-16.518087°	134.638753°	Not assigned	Overland flow path following rainfall. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 2 NC02 - Line 9**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC3 Line 10 (N-S) Tanumbirini Station	-16.529349°	134.515187°	Not assigned	Shallow depression holding water following 2019-2021 wet season. Generally considered an overland flow path following rainfall. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 3 NC03 – Line 10**
NC4 Line 11 (N-S) Tanumbirini Station	-16.535721°	134.558630°	Intermittent Stream (1)	Shallow depression holding water following 2019-2021 wet season. Generally considered an overland flow path following rainfall. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 4 NC04 – Line 11**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC5 Line 12 (N-S) Tanumbirini Station	-16.532457°	134.606784°	Intermittent Stream (1) Newcastle Creek	Overland flow with some shallow depressions holding water following 2019-2021 wet season. Pastoral activity in area with existing tracks. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 5 NC05 – Line 12**
NC6 Line 9 (E-W) Tanumbirini Station	-16.553430°	134.606736°	Intermittent Stream (1) Newcastle Creek	Shallow depression holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 6 NC06 – Line 12**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC7 Line 8 (E-W) Tanumbirini Station	-16.556496°	134.621824°	Intermittent Stream (2) Newcastle Creek	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 7 NC07 – Line 8**
NC8 Line 8 (E-W) Tanumbirini Station	-16.556558°	134.667130°	Intermittent Stream (1)	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 8 NC08 – Line 8**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC9 Line 14 (N-S) Tanumbirini Station	-16.573355°	134.708028°	Not assigned	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 9 NC09 – Line 14**
NC10 Line 13 (N-S) Tanumbirini Station	-16.580307°	134.654208°	Intermittent Stream (1)	Seismic line passes parallel nearby to the drainage channel. The channel will be avoided. Crossing is not required	 **Plate 10 NC10 – Line 13**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC11 Line 13 (N-S) Tanumbirini Station	-16.585358°	134.654190°	Intermittent Stream (1)	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 11 NC11 – Line 13**
NC12 Line 7 (E-W) Tanumbirini Station	-16.601016°	134.645299°	Creek (3) Newcastle Creek	Shallow depression holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 12 NC12 – Line 7**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC13 Line 7 (E-W) Tanumbirini Station	-16.601318°	134.739667°	Intermittent Stream (2)	Hyptis was recorded at the proposed creek crossing. It is recommended this creek crossing be avoided by the seismic program.	 **Plate 13 NC13 – Line 7**  **Plate 14 NC13 – Line 7, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC14 Line 13 (N-S) Tanumbirini Station	-16.611534°	134.654097°	Creek (3) Newcastle Creek	Overland flow with some shallow depressions holding water following 2019-2021 wet season. Pastoral activity in area with existing tracks. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 15 NC14 – Line 13**
NC15 Line 13 (N-S) Tanumbirini Station	-16.620775°	134.654064°	Creek (3) Newcastle Creek	Overland flow with some shallow depressions holding water following 2019-2021 wet season. Pastoral activity in area with existing tracks. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 16 NC15 – Line 13**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC16 Line 12 (N-S) Tanumbirini Station	-16.616920°	134.606589°	Intermittent Stream (2)	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 17 NC16 – Line 12**  **Plate 18 NC16 – Line 12, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC17 Line 10 (N-S) Tanumbirini Station	-16.635308°	134.515523°	Intermittent Stream (1)	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 19 NC17 – Line 10**  **Plate 20 NC17 – Line 10, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC18 Line 6 (E-W) Tanumbirini Station	-16.639638°	134.526308°	Intermittent Stream (1)	Shallow channel evident with shallow depression holding water following the 2019 – 2020 wet season. Trafficable with no vegetation clearance necessary.	 **Plate 21 NC18 – Line 6**
NC19 Line 11 (N-S) Tanumbirini Station	-16.634210°	134.558580°	Intermittent Stream (2)	Shallow channel evident with shallow depression holding water following the 2019 – 2020 wet season. Trafficable with no vegetation clearance necessary.	 **Plate 22 NC19 – Line 11**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC20 Line 6 (E-W) Tanumbirini Station	-16.640301°	134.666486°	Creek (3) Newcastle Creek	Overland flow with some shallow depressions holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 23 NC20 – Line 6**
NC21 Line 5 (E-W) Beetaloo Station	-16.671021°	134.658055°	Creek (3) Newcastle Creek	Overland flow with some shallow depressions holding water following the wet season. Pastoral activity in area with existing tracks. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 24 NC21 – Line 5**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC22 Line 13 (E-W) Beetaloo Station	-16.687064°	134.653983°	Intermittent Stream (1)	Existing pastoral track crossing a minor watercourse that flows into nearby Newcastle Creek. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 25 NC22 – Line 13**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC23 Line 10 (E-W) Beetaloo Station	-16.685810°	134.512589°	Intermittent Stream (1)	Shallow channel evident with shallow depression holding water following wet season. Trafficable with no vegetation clearance necessary.	 **Plate 26 NC23 – Line 10**  **Plate 27 NC23 – Line 10, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC24 Line 4 (E-W) Beetaloo Station	-16.710781°	134.504429°	Intermittent Stream (1)	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 28 NC24 – Line 4**
NC25 Line 10 (E-W) Beetaloo Station	-16.713949°	134.509250°	Intermittent Stream (1)	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 29 NC25 – Line 10**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC26 Line 10 (E-W) Beetaloo Station	-16.710784°	134.512664°	Intermittent Stream (2)	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 30 NC26 – Line 10**
NC27 Line 4 (E-N) Beetaloo Station	-16.710810°	134.663682°	Creek (3) Newcastle Creek	Existing pastoral track crossing major watercourse. Overland flow with some shallow depressions holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 31 NC27 – Line 4**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC28 Line 10 (E-W) Beetaloo Station	-16.727088°	134.509267°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 32 NC28 – Line 10**
NC29 Line 3 (E-W) Beetaloo Station	-16.758336°	134.531569°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 33 NC29 – Line 3**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC30 Line 3 (E-W) Beetaloo Station	-16.758387°	134.667117°	Creek (3) Newcastle Creek	Existing pastoral track crossing major watercourse. Overland flow with some shallow depressions holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 34 NC30 – Line 3**
NC31 Line 13 (N-S) Beetaloo Station	-16.782209°	134.653958°	Creek (3) Newcastle Creek	Existing pastoral track crossing major watercourse. Overland flow with some shallow depressions holding water following 2019-2021 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 35 NC31 – Line 13**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC32 Line 13 (N-S) Beetaloo Station	-16.797492°	134.653953°	Extent of Creek (3) Newcastle Creek	Existing pastoral track crossing a minor watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 36 NC32 – Line 13**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC33 Line 2 (E-W) Beetaloo Station	-16.811604°	134.622306°	Creek (3) Newcastle Creek	Existing pastoral track crossing a major watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 37 NC33 - Line 2**  **Plate 38 NC33 - Line 2, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC34 Line 2 (E-W) Beetaloo Station	-16.811613°	134.609790°	Creek (3) Newcastle Creek	Existing pastoral track crossing a major watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 39 NC34 – Line 2**  **Plate 40 NC34 – Line 2, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC35 Line 2 (E-W) Beetaloo Station	-16.811608°	134.601864°	Creek (3) Newcastle Creek	Existing pastoral track crossing a minor watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 41 NC35 – Line 2**  **Plate 42 NC35 – Line 2, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC36 Line 2 (E-W) Beetaloo Station	-16.811560°	134.554040°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 43 NC36 – Line 2**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC37 Line 11 (N-S) Beetaloo Station	-16.822944°	134.558535°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 44 NC37 - Line 11**  **Plate 45 NC37 - Line 11, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC38 Line 11 (N-S) Beetaloo Station	-16.836419°	134.558530°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 46 NC38 – Line 11**  **Plate 47 NC38 – Line 11, ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC39 Line 11 (N-S) Beetaloo Station	-16.853759°	134.558524°	Intermittent Stream (2) Yaroo Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 48 NC39 – Line 11**
NC40 Line 1 (E-W) Beetaloo Station	-16.866681°	134.562520°	Creek (3) Newcastle Creek	Existing pastoral track crossing a watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 49 NC40 – Line 1**

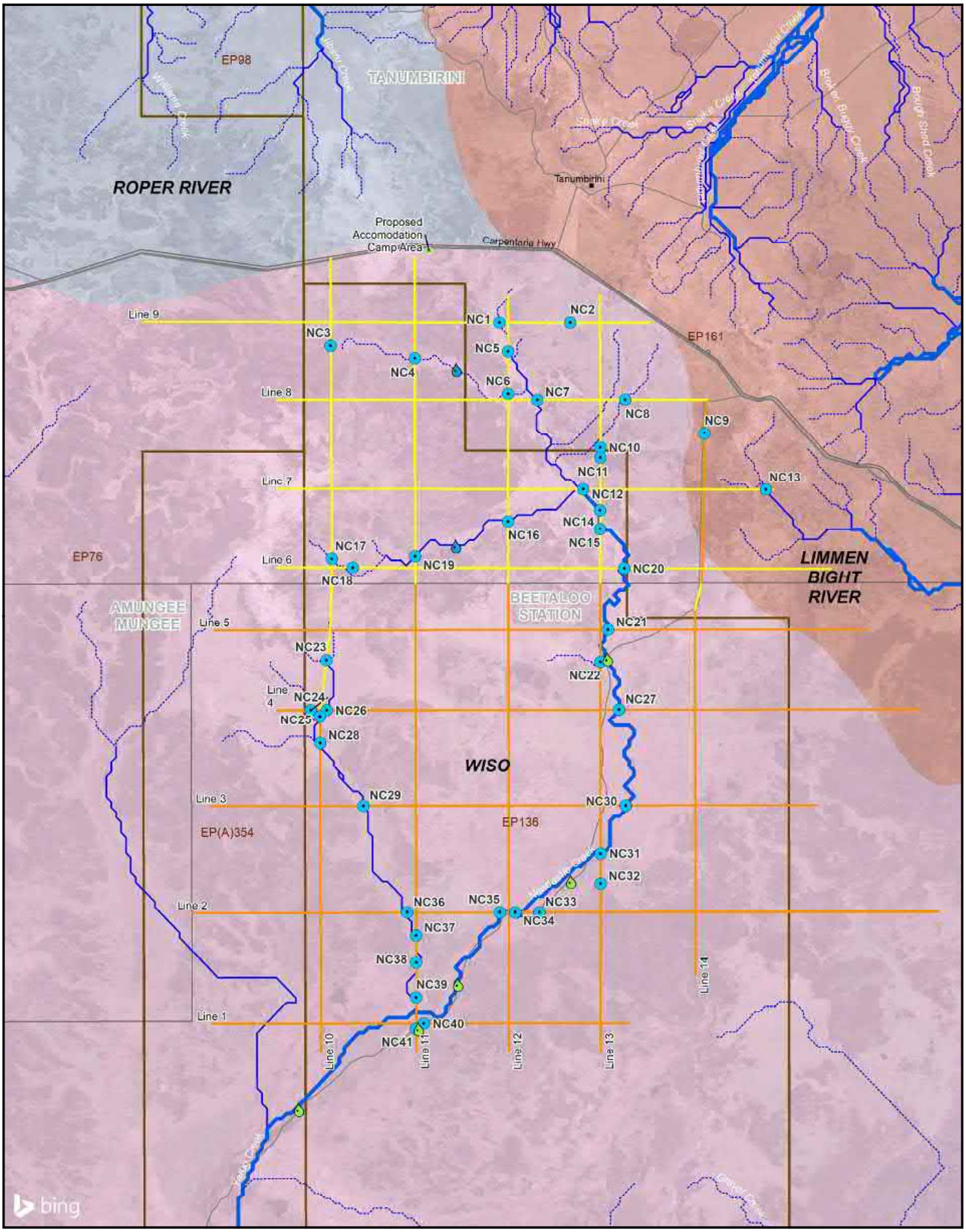
Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
NC41 Line 11 (N-S) Beetaloo Station	-16.869353°	134.558519°	Creek (3) Newcastle Creek	Existing pastoral track crossing a watercourse. Detour in place around depression holding water from the 2019-2020 wet season. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 50 NC41 – Line 11**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
Southern Creek Crossings					
SC1 Line 10 (south) Anthony Lagoon Station	-17.727180°	134.701408°	Intermittent Stream (1)	Existing pastoral track crossing a major watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 51 SC01 – Line 10 (south)**  **Plate 52 SC01 – Line 10 (south), ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
SC2 Line 10 (south) Anthony Lagoon	-17.692102°	134.702228°	Intermittent Stream (2)	Existing pastoral track crossing a major watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 53 SC02 - Line 10 (south)**  **Plate 54 SC02 – Line 10 (south), ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
SC3 Line 10 (south) Anthony Lagoon Station	-17.842060°	134.699065°	Creek (3) Broad Creek	Existing pastoral track crossing a major watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 55 SC03 – Line 10 (south)**  **Plate 56 SC03 – Line 10 (south), ground**

Creek Reference Line Number Station	Location		Stream Order	Condition Description	Plate
	Latitude	Longitude			
SC4 Line 10 (south) Eva Downs Station/Barkly Stock Route	-17.943113°	134.692035°	Creek (2) Billycan Creek	Existing pastoral track crossing a minor watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 57 SC04 – Line 10 (south)**
SC5 Line 10 (south) Eva Downs Station/Barkly Stock Route	-17.964019°	134.709447°	Creek (3) Billycan Creek	Existing Barkly Stock Route track crossing a major watercourse. No clearing of vegetation necessary for vehicle access during seismic survey.	 **Plate 58 SC05 – Line 1 (south)**



AECOM

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N

Projection: GDA 1994 MGA Zone 53

5 2.5 0 5 km

1:192,400 (when printed at A3)

Creek Crossings
Surface Water 2007
Surface Water 2015

Seismic Lines
Vegetation Clearing Required
Unsealed Road/ Pastoral Track

Stream Order
Intermittant Streams
1
2
Creeks
3
Petroleum Exploration Permit
Proposed Accomodation Camp Area
Roads
Cadastre

River basins
Limmen Bight River
Roper River
Wiso

DARWIN
EP136

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

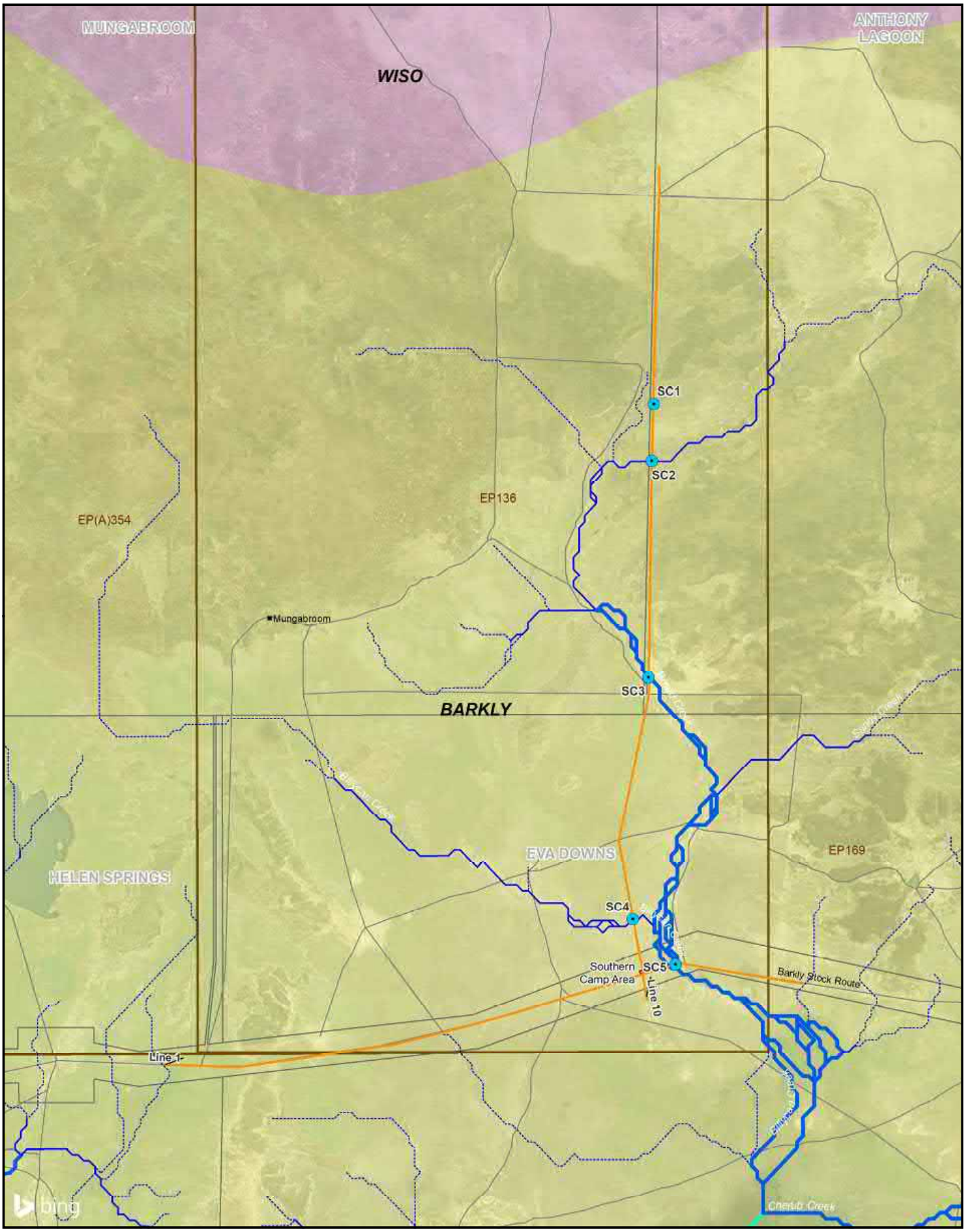
Sweetpea Petroleum Pty Ltd Environmental Management Plan

Location of Proposed Northern Seismic Line Creek Crossings

PROJECT ID	N/A
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 7

A3 size



AECOM

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N

Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

1:162,000 (when printed at A3)

Creek Crossings

Seismic Lines

- Vegetation Clearing Required
- Existing Pastoral Track/Road

Stream Order

- 1
- 2
- 3
- 4

- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads
- Cadastre

River basins

- Barkly
- Wiso

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Location of Proposed Southern Seismic Line Creek Crossings

PROJECT ID	N/A
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 8

A3 size

3.7 Groundwater

The Beetaloo Sub-basin comprises a thick sequence of flat-lying mudstone and sandstone formations (Roper Group) that were deposited between 1,500 and 1,430 million years ago. The Roper Group is estimated to reach 5 km in thickness at the centre of the basin, with the north and eastern margins occurring at an average depth of about 500 m. The Roper Group is overlain by the Georgina Basin (630 – 497 Ma), which includes widespread basalts and a thick limestone sequence that forms the Cambrian Limestone Aquifer (CLA), which provides an important water resource for the pastoral industry and communities within the region. The Georgina Basin is capped by Cretaceous mudstone and sandstone (145 – 66 Ma) and recent alluvial and laterite deposits (CloudGMS, 2015).

Beetaloo Sub-basin Hydrostratigraphy is summarised in Table 10.

Table 10 Summary of Beetaloo Sub-basin Hydrostratigraphy

Province	Period/Age	Formation		Aquifer Status	Thickness (m)	Yield (L/s)	Ave EC (µs/cm)
Carpentaria Basin	Cretaceous 145 – 66 Ma	Undifferentiated		Local aquifer	0 - 130	0.3 - 4	1,800
Georgina Basin	Cambrian 497-630 Ma	Cambrian Limestone Aquifer (CLA)	Anthony Lagoon Beds	Regional aquifer	0 - 200	1 – 10	1,600
			Gum Ridge Formation	Regional aquifer	0 - 300	0.3 - >20	1,400
		Antrim Plateau Volcanics		Regional aquitard	0 - 440	0.3 – 5	900
		Bukalara Sandstone		Local Aquifer (not regionally connected)	0 - 75	0.3- 5	1,000
Beetaloo Sub-basin (Roper group)	Not known	Hayfield Mudstone		Regional aquitard	0 - 450	-	32,000
		Jamison Sandstone		Local Aquifer (not regionally connected)	0 - 150	-	138,000
	Meso-Proterozoic 1,430-1,500 Ma	Kyalla Formation		Regional aquitard	0 - 800	-	-
		Moorak Formation		Local Aquifer (not regionally connected)	0 - 500	0.5 – 5	131,000
		Velkerri Formation		Regional aquitard	700 - 900	-	-
		Bessie Ck Sandstone		Local Aquifer (not regionally connected)	450	0.5 - 5	-

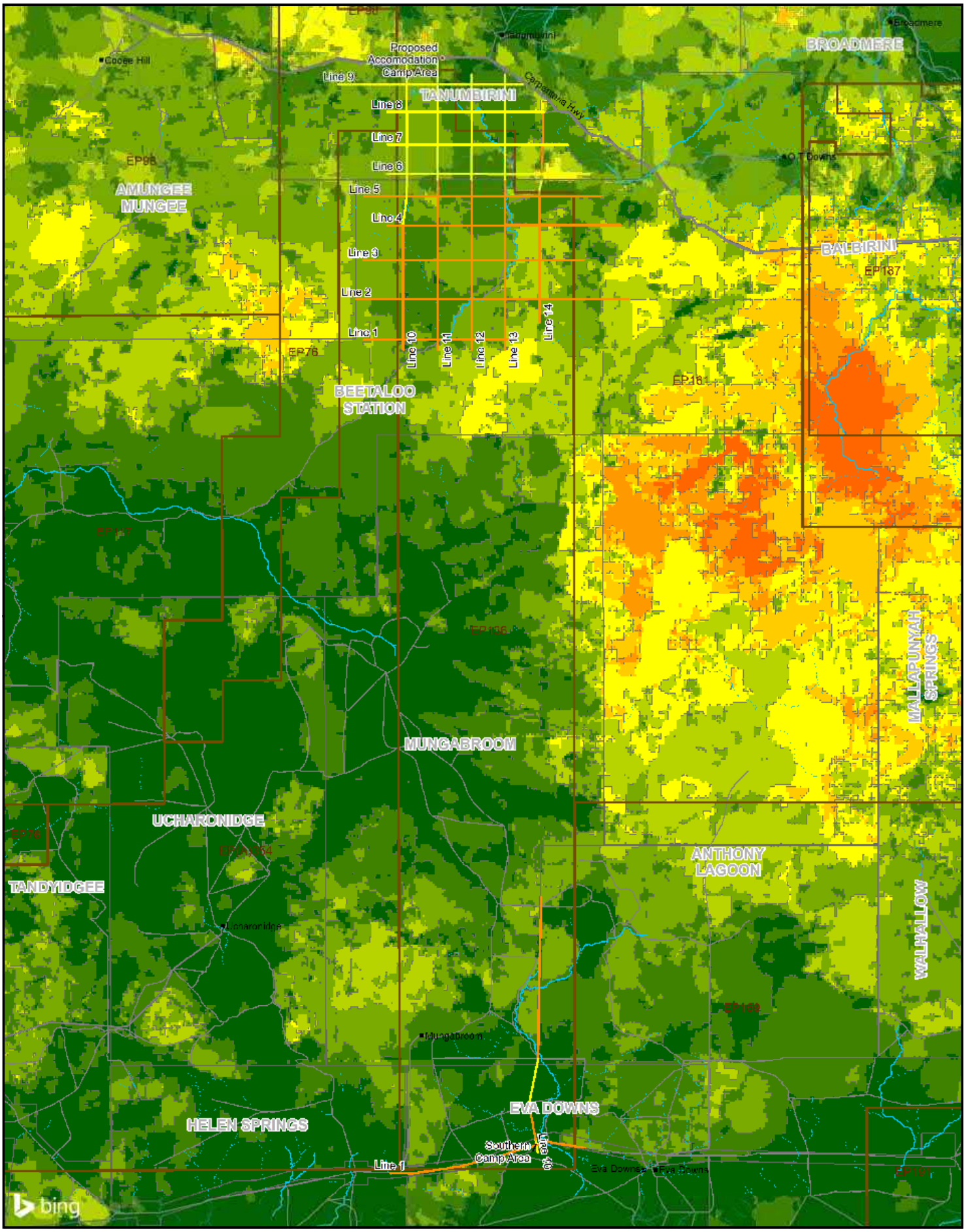
Groundwater resources within the permit area are associated with the Gum Ridge Formation and Anthony Lagoon Formation at a depth between 0 and 300 mbgl. This aquifer provides an important water resource for the pastoral industry and communities within the region. The Gum Ridge Formation is recognised to have the best potential for water production due to the higher yields (Tickell, *et al.*, 2019).

3.8 Bushfire

Fire is an intrinsic part of the Australian environment and has shaped the evolution of most natural ecosystems within it, however since European settlement, fire regimes have changed leading to corresponding changes in vegetation structure, composition and flammability. Bullwaddy and Lancewood communities, which occur throughout the permit area, are fire sensitive and vulnerable to frequent or high intensity fires. High intensity fires can also reduce habitat quality for a variety of flora and fauna species, with research suggesting that fauna diversity may be adversely impacted by high intensity fires, particularly diurnal reptiles (Legge *et al.*, 2008).

Field investigations indicate that fire disturbance varies throughout the northern and southern survey areas, with most sites showing evidence of fire occurring within the last 1-3 years. Fire scars were usually less than 1 m, and occasionally 1-4 m, indicating low to moderate fire intensity. However, some trees and shrubs had been killed by fire at four sites suggesting that high intensity fires do sometimes occur (NAFI, 2020).

Figure 9 shows the fire frequency within the survey area over the past 11 years (2009 to 2020). The majority of the northern survey area has been burnt between one and two times since 2009. Fire frequency in the southern area ranged from unburnt to area being burnt twice in the last decade.



AECOM

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N

Projection: GDA 1994 MGA Zone 53

5 2.5 0 5 km

1:528,000 (when printed at A3)

Seismic Lines

- Vegetation Clearing Required
- Existing Track/Gravel Road
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads
- Cadastre

Number of Years Burnt since 2009

0 1 2 3 4 5 6 7

DARWIN

EP136

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Fire Frequency within EP136

PROJECT ID	N/A
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 9

A3 size

4.0 Natural Environment

4.1 Bioregions

The Interim Biogeographic Regionalisation of Australia (IBRA) is a nationally recognised ecosystem classification system (Thackway & Creswell, 1995). Bioregions are large, geographically distinct ecosystems that are distinguished by broad physical and biological characteristics, which can be further classified into Subregions. These regions and subregions are used as the basis for regional comparisons and conservation of flora and floristic communities. Of the 85 bioregions mapped nationally, 20 occur within the Northern Territory. The northern survey area is situated within two mapped bioregions: the Sturt Plateau bioregion and Gulf Fall and Uplands bioregion with the majority of the survey area occuring within the Sturt Plateau Bioregion. The southern survey area is situated within the Gulf Fall and Uplands and Mitchell Grass Downs bioregion.

The following provides the description of the bioregions based on the biodiversity audit carried out by Parks and Wildlife Services (Baker *et al*, 2005):

- Sturt Plateau Bioregion - comprises undulating plains on sandstone, with predominantly neutral sandy red and yellow earth soils. Dominant vegetation is eucalypt woodland (dominated by variable-barked bloodwood *Eucalyptus dichromophloia*) with spinifex understorey, as well as extensive areas of Lancewood (*Acacia shirleyi*) - Bullwaddy (*Macropteranthes kekwickii*) vegetation association and associated fauna, including the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus*). Land condition in the bioregion is moderate to good but is threatened by impacts from weeds, feral animals, pastoralism and changed fire regimes.
- Gulf Fall and Uplands – comprises of undulating terrain with scattered, low, steep hills and gorges, water holes and dissected sandstone plateaus. Soils are mostly skeletal or shallow sands. The most extensive vegetation is woodland dominated by Darwin Stringybark (*Eucalyptus tetrodonta*) and Variable-barked bloodwood (*Corymbia dichromophloia*) with spinifex understorey, and woodland dominated by Northern Box (*Eucalyptus tectifica*) with tussock grass understorey. The bioregion is in good condition but faces threats from an increasing number of feral animals (Pigs, Buffalo, Donkey and Cattle) and changing fire regimes.
- Mitchell Grass Downs – lies over the Georgina and Dunmurra Basins containing sedimentary rocks of Cretaceous, Tertiary and Cambrian ages. Soils within this bioregion are predominantly cracking clays. Vegetation consists mostly of *Eucalyptus microtheca* low open woodland with Bluebush (*Chenopodium auricomum*) sparse shrubland understorey, and Mitchell Grass (Astrebla) grassland on the Barkly Tableland. The climate is semi-arid with annual rainfall between 400 and 500 mm.

4.2 Vegetation Communities

The northern survey area is typically dominated by *Corymbia* spp. and *Eucalyptus* spp. open woodlands and tall shrublands and woodlands of Bullwaddy and Lancewood with open grassland understorey. On alluvial plains and in drainage areas, *Eucalyptus chlorophylla*, *E. microtheca* and *E. pruinosa* low woodlands predominate, while on the plains *Corymbia dichromophloia* and *E. leucophloia* woodlands are more dominant.

Lancewood forests are the most extensive acacia dominated communities across northern NT. The Lancewood/Bullwaddy communities typically have a dense shady shrub layer, including vines and creepers, and a sparse grass understorey. This compares to the sparse canopy and tall grass understory of other tall dense grasslands (PWCNT, 2005). Lancewood/Bullwaddy communities are fire sensitive and inappropriate fire regimes may result in a change from Bullwaddy-dominated vegetation through Lancewood to a Eucalypt dominated open woodland (PWCNT, 2005). This process may be accelerated by the invasion of exotic pasture grasses such as Buffel Grass (*Cenchrus ciliaris*) which increases the flammability of the vegetation and hence the frequency and severity of fires.

Vegetation in the southern survey area is typically characterised by grasslands dominated by *Sorghum timorense* in the northern part of the survey area and *Astrebla spp*. in the south. Areas of lateritic plains are dominated by *Corymbia dichromophloia*, *C. terminalis* and *Eucalyptus leucophloia.*

AECOM has conducted vegetation baseline assessments within the Beetaloo Sub-basin in 2004, 2006, 2010, 2014 and 2016. Most recently, surveys were undertaken in the northern survey area during the November 2019 and in both the northern and southern survey areas during the May 2020 survey. During the survey, eight vegetation communities were identified in the northern survey area and six vegetation communities in the southern survey area. These communities are described below in Table 11 and mapped in Figure 10 and Figure 11.

Field assessments undertaken in November 2019 and May 2020 confirmed that the main vegetation communities within the northern survey area are woodlands, typically dominated by bloodwoods (*Corymbia spp*.) and tall shrublands and woodlands of Bullwaddy (*Macropteranthes kekwickii*) and Lancewood (*Acacia shirleyi*) with open grassland understorey. Vegetation communities within the southern survey area are dominated by grasslands. Areas of lateritic soils are dominated by Eucalypts (*Eucalyptus spp.*) and Bloodwoods (*Corymbia spp*.). Land Condition Assessment Sites are described further in Section 6.0.

Table 11 Vegetation communities (northern survey area sites)

Vegetation Community	Description	LCA Sites	Photo Ref
Acacia shirleyi forest / open forest	*Acacia shirleyi* forest/ open forest with *A. shirleyi* and *Macropteranthes kekwickii* open shrubland over *Chrysopogon fallax* (mixed) low open tussock grassland.	NL8, NL16	 **Plate 59 *Acacia shirleyi* forest / open forest**
Macropteranthes kekwickii shrubland / open shrubland	*Macropteranthes kekwickii* shrubland/ open shrubland (mixed) over *Chrysopogon fallax* and *Dichanthium fecundum* low open tussock grassland.	NL7, NL13	 **Plate 60 *Macropteranthes kekwickii* shrubland / open shrubland**
Corymbia dichromophloia open woodland	*Corymbia dichromophloia* &/or *Corymbia terminalis* and *Erythrophleum chlorostachys* with mixed open shrubland over *Triodia sp.* low open hummock grassland and mixed tussock grassland.	NL2, NL6, NL10, NL14, NL17, NL19	 **Plate 61 *Corymbia* (mixed) open woodland**

Vegetation Community	Description	LCA Sites	Photo Ref
Eucalyptus leucophloia open woodland	*Eucalyptus leucophloia* subsp. *euroa* low open woodland + - *Corymbia dichromophloia* with *Acacia* sp. (mixed) open shrubland over *Triodia bitextura* hummock grassland	NL5, NL18	 **Plate 62** ***E. leucophloia*** **open woodland**
Eucalyptus chlorophylla low open woodland	*Eucalyptus chlorophylla* low open woodland over +- *Melaleuca* sp. shrubs over *Dichanthium* sp and *Chrysopogon fallax* tussock grassland.	NL3, NL9	 **Plate 63** ***E. chlorophylla*** **low open woodland**
Eucalyptus microtheca woodland/ isolated trees	*Eucalyptus microtheca* woodland/isolated trees +- *Eucalyptus camaldulensis* var *obtusa* (near creek lines) over *Dichanthium fecundum*, *Chrysopogon fallax* (mixed) low open tussock grassland.	NL11, NL15	 **Plate 64** ***E. microtheca*** **woodland/isolated trees**
Eucalyptus pruinosa open woodland	*Eucalyptus pruinosa* open woodland over *Dichanthium* sp. (mixed) low open tussock grassland.	NL1, NL4	 **Plate 65** ***E. pruinosa*** **open woodland**
Eucalyptus camaldulensis isolated trees	*Eucalyptus camaldulensis* var. *obtusa* isolated trees with *Atalaya hemiglauca* open shrubland over *Dichanthium* sp. tussock and *Triodia* sp. hummock low open tussock grassland.	NL20	 **Plate 66** ***E. camaldulensis*** **isolated trees**

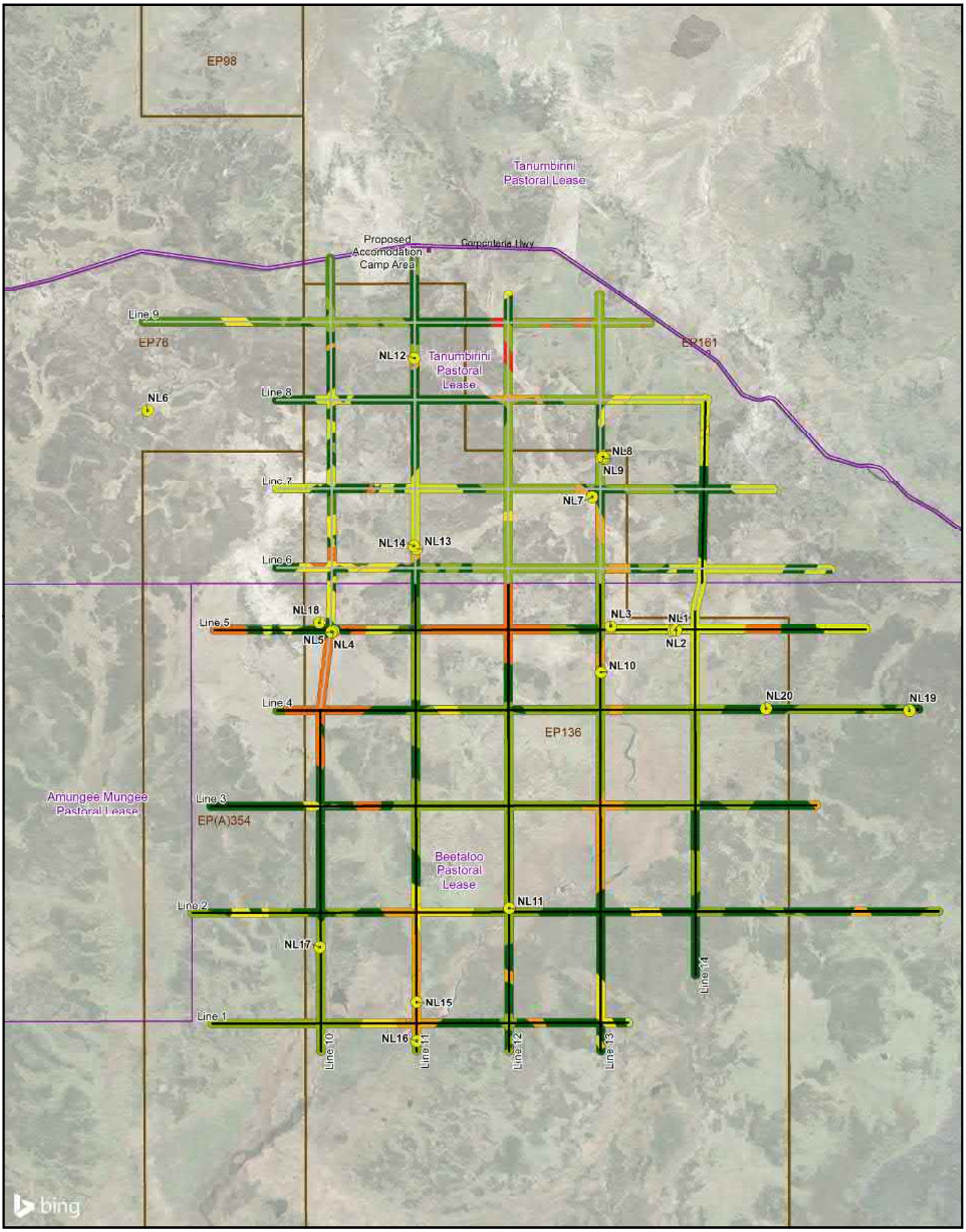
Table 12 Vegetation communities (southern survey area sites)

Vegetation Community	Description	LCA Sites	Photo Ref
Sorghum timorense open tussock grassland	*Sorghum timorense* open tussock grassland with *Iseilema vaginiflorum* and *Sesbania muelleri*	SL1	 **Plate 67 *Sorghum timorense* open tussock grassland**
Astrebla spp. open tussock grassland	*Astrebla* spp. open tussock grassland	Incidental	 **Plate 68 *Astrebla* spp. open tussock grassland**
Eucalyptus leucophloia open woodland	Eucalyptus leucophloia low open woodland with Eucalyptus pruinosa trees and Carissa lanceolata shrubs mid-storey over *Eulalia aurea* tussock and *Triodia bitextura* hummock grassland	SL2	 **Plate 69 *E. leucophloia* open woodland**
Corymbia dichromophloia open woodland	*Corymbia dichromophloia* open woodland mid-high open woodland with *Hakea arborescens* and *Terminalia canescens* mid-story over *Triodia bitextura* hummock grassland	SL6	 **Plate 70 *Corymbia dichromophloia* open woodland**

Vegetation Community	Description	LCA Sites	Photo Ref
Corymbia terminalis and Eucalyptus chlorophylla open woodland	*Corymbia terminalis* and *Eucalyptus chlorophylla* low open woodland with *Eucalyptus pruinosa* and *Hakea arborescens* mid-storey over *Triodia bitextura* hummock grassland	SL7	 **Plate 71** ***Corymbia terminalis* and *E. chlorophylla* open woodland**
Eucalyptus microtheca open woodland	*Eucalyptus microtheca* low open woodland with *Carissa lanceolata* and *Ehretia saligna* mid-storey over mixed (+ - *Eulalia aurea*, *Chrysopogon pallidus*, *Aristida inaequiglumis*. and *Eriachne armitii* tussock grassland	SL3, SL5	 **Plate 72** ***E. microtheca* open woodland**

4.2.1 Threatened Ecological Community

A search of the DEE Protected Matters database of nationally significant flora (PMST), the NT Government flora database, and records from the Atlas of Living Australia (ALA) was undertaken for the survey area with a 10 km buffer applied. No threatened vegetation communities were listed as likely to occur within the northern or southern seismic survey area.



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Projection: GDA 1994 MGA Zone 53

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Land Condition Assessment Site

Seismic Lines

- Vegetation Clearing Required
- Unsealed Road/ Existing Pastoral Track

Vegetation Community

- *Acacia shirleyi* forest / open woodland
- *Macropteranthes kekwickii* shrubland / open woodland
- *Corymbia dichromophloia* open woodland
- *Eucalyptus leucophloia*open woodland
- *Eucalyptus chlorophylla* low open woodland
- *Eucalyptus microtheca* woodland / isolated trees
- *Eucalyptus pruinosa* open woodland
- *Eucalyptus camaldulensis* isolated trees
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Highway

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Location of Northern Seismic Line Land Condition Assessment Sites and Vegetation Community Boundaries

PROJECT ID	60611666
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Figure 10

A3 size

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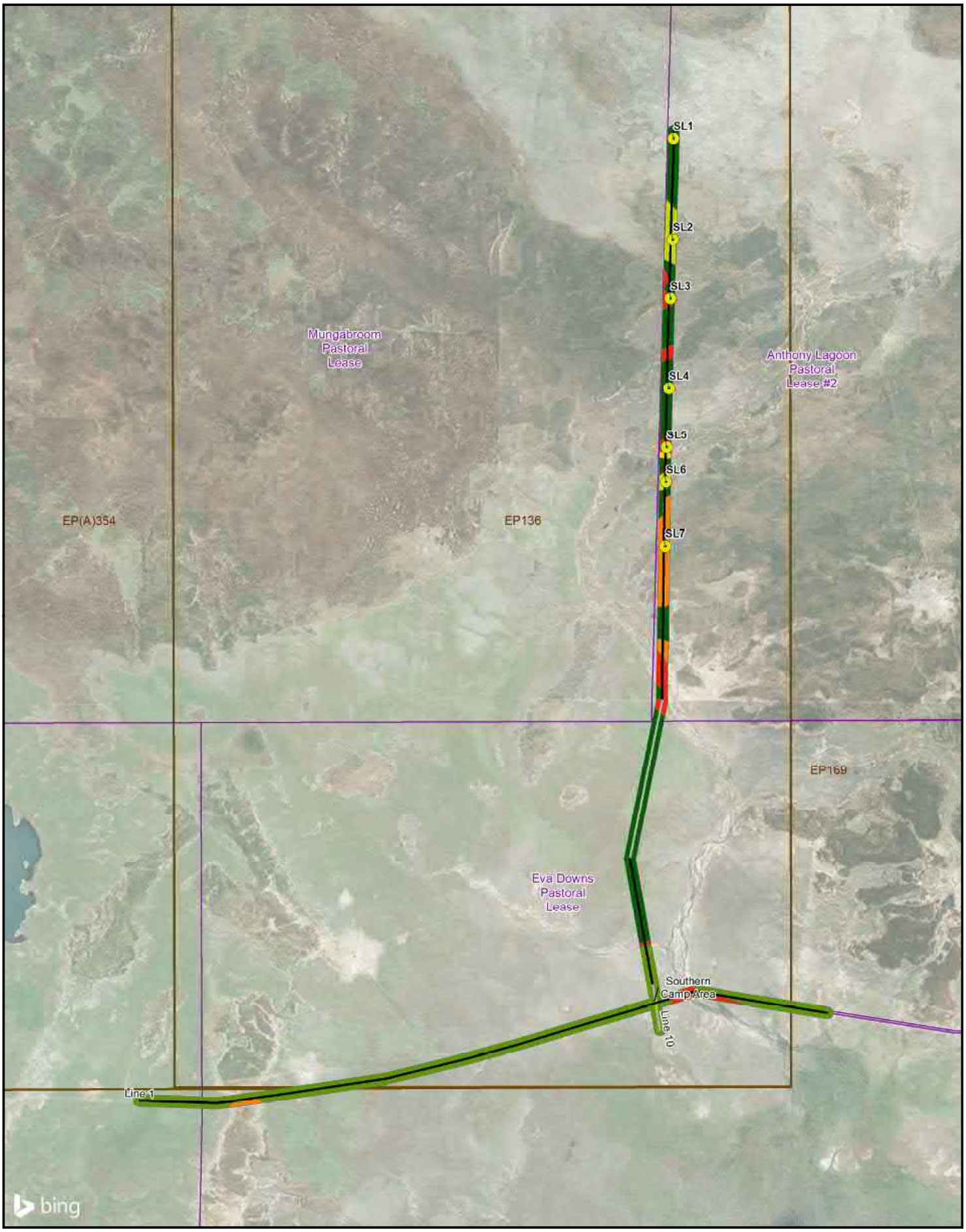

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Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

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Legend

- Land Condition Assessment Site

Seismic Lines

- Vegetation Clearing Required
- Existing Pastoral Track/Road

Vegetation Community

- *Sorghum timorense* open tussock grassland
- *Astrebla spp.* open tussock grassland
- *Eucalyptus leucophloia* open woodland
- *Corymbia dichromophloia* open woodland
- *Corymbia terminalis* and *Eucalyptus chlorophylla* open woodland
- *Eucalyptus microtheca* open woodland
- Petroleum Exploration Permit

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Location of Southern Seismic Line Land Condition Assessment Sites and Vegetation Community Boundaries

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VERSION	1

Figure 11

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4.3 Native Flora

A search on the Atlas of Living Australia (ALA) of the overall survey area identified a total of 221 plant species previously recorded in the area (Appendix A). During the November 2019 and May 2020 field surveys a total of 49 native flora species were recorded across the seismic lines (Table 13). These surveys focused on recording dominant species within vegetation communities rather than a comprehensive floristic assessment.

Table 13 Flora Species Recorded, November 2019 and May 2020 Field Surveys

Family	Genus	Species
APOCYNACEAE	*Carissa*	*lanceolata*
BORAGINACEAE	*Ehretia*	*saligna*
COMBRETACEAE	*Terminalia*	*canescens*
	Terminalia	*volucris*
	Macropteranthes	*kekwickii*
EUPHORBIACEAE	*Petalostigma*	*banksii*
		pubescens
FABACEAE	*Acacia*	*hammondii*
		holosericea
		lysiphloia
		nuperrima
		shirleyi
		wickhamii
	Cullen	*plumosum*
	Erythrophleum	*chlorostachys*
	Sesbania	*muelleri*
MALVACEAE	*Grewia*	*retusifolia*
	Waltheria	*indica*
MYRTACEAE	*Corymbia*	*dichromophloia* var. *obtusa*
		ferruginea
		polycarpa
		terminalis
	Eucalyptus	*camaldulensis*
		chlorophylla
		leucophloia subsp. *euroa*
		microtheca
		pruinosa
		tectifica
	Melaleuca	*citrolens*
		nervosa
		viridiflora

Family	Genus	Species
PHYLLANTHACEAE	*Flueggea*	*virosa*
POACEAE	*Aristida*	*inaequiglumis*
	Chrysopogon	*fallax*
	Chrysopogon	*pallidus*
	Dichanthium	*fecundum*
	Eragrostis	*cumingii*
	Eriachne	*armitii*
	Eulalia	*aurea*
	Iseilema	*vaginiflorum*
	Mnesithea	*formosa*
	Panicum	*effusum*
	Paspalidium	*rarum*
	Schizachyrium	*fragile*
	Sorghum	*timorense*
	Triodia	*bitextura*
PROTEACEAE	*Grevillea*	*pyramidalis*
	Hakea	*arborescens*
RHAMNACEAE	*Ventilago*	*viminalis*
SAPINDACEAE	*Atalaya*	*hemiglauca*
	Dodonaea	*coriacea*

4.3.1 Threatened Flora Species

The PMST and ALA database searches found that no Commonwealth-listed threatened plant species have been identified as potentially occurring within the survey area. *Ipomoea argillicola*, listed as Near Threatened under the *Territory Parks and Wildlife Conservation Act 2000* (TPWC Act), could potentially occur within the survey area as it has previously been recorded from the Bullwaddy Conservation Reserve and at locations surrounding the area (ALA 2020; NTG, 2013).

Three species recorded within the permit area are listed as being 'Data Deficient' under the *TPWC Act*. Data Deficient species are known only from a few locations and there is currently insufficient information on population sizes, trends and threats for accurate classification. The recorded species are:

- *Acrachne racemosa* (an annual grass)
- *Paspalidium gracile* (an annual grass)
- *Isotoma* sp. "Tanumbirini" (a forb).

The region supports fragmented stands of Bullwaddy, which is listed under the TPWC Act as 'Least Concern', which refers to species that are either widespread or common and cannot be categorised as Critically Endangered, Endangered, Vulnerable, Near Threatened or Data Deficient. However, Bullwaddy is significant in terms of the habitat it provides for the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus leichardti*), which is listed as 'Near Threatened' in the NT. Records surrounding the survey area and a scat collected in the vicinity of the Beetaloo sites during the August 2014 survey confirmed the presence of this species.

Additional species associated with the habitat type include Bush-stone Curlew (*Burhinus grallarius*) and the Northern Nailtail Wallaby (*Onychogalea unguifera*) both listed as Near Threatened by the NT Government.

4.4 Weeds

Database searches identified 17 regional weed species known or likely to occur within the proposed seismic survey area including four Weeds of National Significance (WoNS) and six species declared under the NT *Weeds Management Act,* 2013. The identified weed species are listed below in Table 14 and presented in Figure 12.

Table 14 Regional weeds recorded within the proposed seismic survey area

Scientific Name	Common Name	Status
Alternanthera pungens	Khaki Weed	Class B and C
Andropogon gayanus	Gamba Grass	Class A and C, WoNS
Azadirachta indica	Neem	Class B and C
Calotropis procera	Rubber Bush	Class B and C
Cenchrus echinatus	Mossman River Grass	Class B and C
Datura ferox	Fierce Thornapple	Class A and C
Echium plantagineum	Paterson's Curse	Class A and C
Hyptis suaveolens	Hyptis	Class B and C
Parkinsonia aculeata	Parkinsonia	WoNS / Class B and C
Prosopis spp.	Mesquites	WoNS / Class A and C
Sida cordifolia	Flannel Weed	Class B and C
Sida rhombifolia	Paddy's Lucerne	Class B and C
Tamarix aphylla	Athel Pine	WoNS / Class A, B and C
Themeda quadrivalvis	Grader Grass	Class B and C, WoNS
Tribulus terrestris	Caltrop	Class B and C
Vachellia nilotica (syn. *Acacia nilotica* ssp. *indica*)	Prickly Acacia	WoNS / Class A and C
Xanthium occidentale	Noogoora Burr	Class B and C

*Status: Cwth: WoNS = Weed of National Significance; NT *Weeds Management Act 2013*: Class A = weed is to be eradicated, Class B = weed is to have its growth and spread controlled, Class C = weed is not to be introduced to the NT.

No weeds were encountered in the northern survey area during the November 2019 field survey, although surveys undertaken in 2019 in the surrounding region, including Hayfield Station to the west of the survey area, have identified some weeds in low abundance. Three listed species, *Parkinsonia aculeata* (Parkinsonia), *Hyptis suaveolens* (Hyptis) and *Calotropis procera* (Rubber Bush) were recorded during these surveys.

Parkinsonia is considered a Weed of National Significance (WoNS), which are weed species that are the focus of national management programs for restricting their spread and/or eradicating them from parts of Australia.

During the May 2020 survey, two patches of Hyptis weed (*Hyptis suaveolens*) were recorded at creek crossing NC13 situated on the eastern end of Line 7 in the northern survey area. This creek is located within a different catchment to the majority of EP136 and flows away from to the northern survey area to the east. This creek was found to contain gravelly soils which are preferred by Hyptis.

The remaining creeks within the survey area contain clay soils and no Hyptis was observed at any other of the eight creek sites that underwent ground survey for weeds. Details of the weed patches are provided in Table 15. Hyptis is a declared Class B and Class C weed under the *Weeds Management Act*. Given that Hyptis has been recorded within only one creek on the very eastern end of northern survey area Line 7 the proponent has removed this section of the line from the proposed survey to reduce the risk of weed spread during the seismic line survey. The eastern end of Line 7 has now been updated to terminate at -16.601328 lat, 134.738680 long.

No declared weeds were observed within the southern survey area, however a number of existing weed records, including four records of Rubber bush and two records of Parkinsonia, are located along Line 1 in the southern survey area (refer Table 15). Southern survey area Line 1 is situated along the existing Barkly Stock Route track, which is part of Eva Downs Station. As the proposed seismic survey plans to remain on the existing Barkly Stock Route track at all known weed locations the survey operations are not considered to create a risk of weed spread. A camp site is proposed to be located at the junction of line 1 and line 10 (see Figure 3). An aerial survey of the southern camp area in May 2020, found this area to be Astrebla spp. grassland and did not record the presence of any weeds.

The location of weeds recorded within both the northern and southern survey areas are shown in Figure 12.

Table 15 Weeds recorded within the northern and southern survey areas

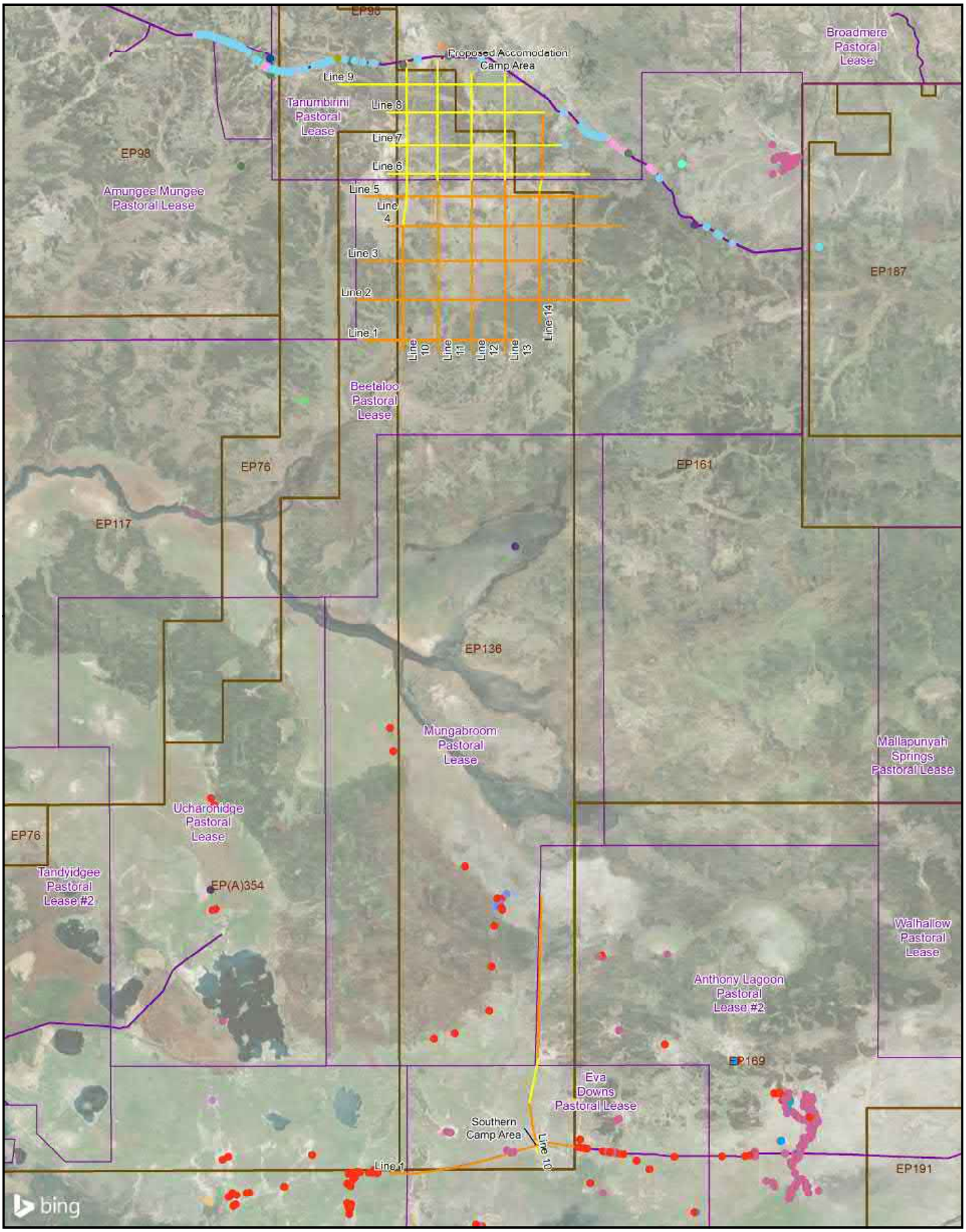
Weed	Survey Area	Location		Patch Size	Density	Weed Survey
		Lat	Long			
Hyptis	Northern Survey Area Line 7	-16.601°	134.739°	20 m^2	11-50%	AECOM May 2020
Hyptis	Northern Survey Area Line 7	-16.601°	134.739°	10 m^2	11-50%	AECOM May 2020
Rubber bush	Southern Survey Area Line 1 – Barkly Stock Route	-17.97°	134.765°	100 m^2	1-10%	NT weed Management Branch 2015
Rubber bush	Southern Survey Area Line 1 – Barkly Stock Route	-17.968°	134.756°	100 m^2	1-10%	NT weed Management Branch 2015
Rubber bush	Southern Survey Area Line 1 – Barkly Stock Route	-17.969°	134.761°	100 m^2	1-10%	NT weed Management Branch 2015
Rubber bush	Southern Survey Area Line 1 – Barkly Stock Route	-17.969°	134.761°	100 m^2	<1%	NT weed Management Branch 2014
Parkinsonia	Southern Survey Area Line 1 – Barkly Stock Route	-17.975°	134.663°	100 m^2	<1%	NT weed Management Branch 2015
Parkinsonia	Southern Survey Area Line 1 – Barkly Stock Route	-17.976°	134.66°	100 m^2	<1%	NT weed Management Branch 2015

4.5 Native Fauna

Previous surveys and database searches indicate that the proposed seismic survey area supports a diverse array of fauna. Database searches of the project area (ALA and NR Maps) provide records for 130 species of birds, 22 species of reptiles, 10 species of mammal and two amphibians (Appendix A).

A limited number of fauna species were recorded as incidental observations during the November 2019 field survey. The survey was undertaken in very hot weather, with temperatures reaching 40°C, therefore wildlife was not particularly active and was difficult to observe.

The most significant fauna sighting was a group of approximately six Australian Bustards observed in the east edge of the survey area. This species was previously listed as Vulnerable under the *TPWC Act* (NT), but has been downgraded to Near Threatened. Threatening processes for Australian Bustard include altered fire regimes, hunting and grazing (Ziembicki, 2003).



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Projection: GDA 1994 MGA Zone 53

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Weed Name

- Unknown
- Barnyard grass - colona
- Buffel grass
- Burr - Noogoora
- Gamba grass
- Hyptis
- Lovegrass - amabilis
- Merrimia - dissecta
- Mesquite
- Mission grass - annual
- Parkinsonia
- Prickly acacia
- Rubber bush
- Sesame
- Sida - Spiny head
- Stylo - caribbean
- Urochloa - Sabi grass

Seismic Lines

- Vegetation Clearing Required
- Existing Track/Gravel Road
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Regional Weed Data for EP136

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LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 12

A3 size

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Table 16 Fauna species recorded during November 2019 survey

Scientific Name	Common name
Birds	
Accipiter fasciatus	Brown Goshawk
Ardeotis australis	Australian Bustard
Artamus minor	Little Woodswallow
Cracticus nigrogularis	Pied Butcherbird
Haliastur sphenurus	Whistling Kite
Malurus lamberti	Variegated Fairy-wren
Pachycephala rufiventris	Rufous Whistler
Pomatostomus temporalis	Grey-crowned Babbler
Rhipidura leucophrys	Willie Wagtail
Smicrornis brevirostris	Weebill
Struthidea cinerea	Apostlebird
Mammals	
Macropus agilis	Agile Wallaby
Reptiles	
Cryptoblepharus sp.	Tree-skink

4.5.1 Threatened fauna species

The PMST, NR Maps and ALA database searches indicate that 21 fauna species listed as threatened under the EPBC Act and/or the TPWC Act may potentially occur in the area. These comprise ten birds, eight mammals and three reptiles. The likelihood of each of these species occurring has been assessed and the outcomes included in Table 17 below.

The likelihood assessment of species occurrence is based on the availability of suitable habitat within the permit area, records in the vicinity and distributional data. Therefore, many of the threatened and migratory fauna species indicated in databases as 'occurring' or 'likely to occur' have been assessed as unlikely to occur within the proposed survey areas. As some areas in the survey sites have not been subject to intensive survey and some species are very cryptic, a conservative approach has been taken to assess species presence. A full description of each species, their distribution and habitat associations are provided in Table 17 below. No core habitat for threatened fauna was identified within the seismic survey area. However, some species may possibly occur and are known to occur in the wider landscape within EP136. Threatened species that may occur include:

- Gouldian Finch *Erythrura gouldiae* (Endangered EPBC Act, Vulnerable TPWC Act)
- Grey Falcon *Falco hypoleucos* (Vulnerable TPWC Act)
- Crested Shrike-tit (northern) *Falcunculus frontatus whitei* (Vulnerable EPBC Act, Near Threatened TPWC Act)
- Painted Honey Eater *Grantiella picta* (Vulnerable EPBC Act, Vulnerable TPWC Act)
- Yellow-spotted Monitor *Varanus panoptes* (Vulnerable TPWC Act)

The region also supports fragmented stands of Bullwaddy, which provides potential habitat for the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus leichardtii*), listed as 'Near Threatened' under the TPWC Act. Records surrounding the survey area and a scat collected during the August 2014 survey confirmed the presence of this species in the area. Additional species associated with the habitat type include Bush-stone Curlew (*Burhinus grallarius*) and the Northern Nailtail Wallaby (*Onychogalea unguifera*) both listed as Near Threatened by the NT Government.

Table 17 EPBC and TPWC Listed Threatened Species and Likelihood of Occurrence

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Birds					
Calidris ferruginea Curlew Sandpiper	Marine Migratory	VU	In the NT this species occurs around Darwin, north to Melville Island and Cobourg Peninsula, and east and south-east to Gove. It has been recorded inland from Victoria River Downs and around Alice Springs (Higgins & Davies 1996).	Coastal habitats, inland it has been found around lakes, dams and ephemeral/permanent waterholes (Higgins & Davies 1996).	Unlikely (suitable habitat not present at survey sites but potential sporadic in wider landscape)
Erythrotriorchis radiatus Red Goshawk	VU	-	Found across most of Northern Australia, in the NT most records are from the Top End but there are records from central Australia (Pizzey & Knight, 2012).	Red Goshawks occupy a range of habitats, often at ecotones, including coastal and sub-coastal tall open forest, tropical savannahs crossed by wooded or forested watercourses. In the NT, it inhabits tall open forest/woodland as well as tall riparian woodland (Aumann & Baker-Gabb, 1991).	Unlikely (no records and core habitat absent)
Erythrura gouldiae Gouldian Finch	E	VU	Formerly widespread across northern Australia. In the NT they are found in the Top End south past Daly Waters (Palmer *et al*., 2012).	Gouldian Finches occupy different habitat types in the breeding and non-breeding season. Breeding habitat consist of hillsides with suitable nesting trees. Outside of the breeding season they are found in lowland drainages to feed on suitable perennial grasses (Dostine & Franklin, 2002).	Possible (sporadic, foraging only, no recent records)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Falcunculus frontatus whitei Crested Shrike-tit (northern)	VU	NT	This species has a very patchy distribution with records from the Victoria River District to Maningrida. Only one record near Borroloola (1930) (Woinarski & Ward, 2012a).	Occupies wet and semi-arid melaleuca and eucalypt open woodlands. May be associated with bloodwoods with flaky bark and ironwood (Ward, 2008).	Possible (no records in vicinity although suitable habitat is present it is very rare)
Falco hypoleucos Grey Falcon	-	VU	This species has a widespread distribution and records for this species exist throughout the NT. However, most records are from arid and semi-arid regions (Pizzey & Knight, 2012).	Grey Falcons inhabit lightly treed inland plains, gibber desserts, sandridges, pastoral lands, timbered watercourses and, occasionally, the driest deserts. Also found also in association with inland drainage systems (Debus, 2012).	Likely (in floodplains across the survey area)
Geophaps smithii Partridge Pigeon	VU	VU	Occurs across the Top End of the NT, declined/disappeared from lower rainfall areas (Woinarski, 2006).	Found predominantly in open eucalypt forest and woodland with grassy understories (Woinarski, 2006).	Unlikely (no records, occurs north of the permit area although some habitat present)
Grantiella picta Painted Honey Eater	VU	VU	This species is found throughout eastern Australia, but breeding is known from south-eastern Australia (Pizzey & Knight, 2012). This species is rare.	This species specialises on the fruit of mistletoes although it may also forage on nectar and insects (Garnett *et al.*, 2011).	Possible (records from Barkly Tablelands but none in close vicinity, habitat present, foraging only)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Pezoporus occidentalis Night Parrot	EN	CE	Not well known. Restricted to arid and semi-arid Australia (Pavey, 2006).	The species is known from Triodia (spinifex) grasslands in stony or sandy areas and chenopod shrublands on floodplains, salt lakes and clay pans (Pavey, 2006b).	Unlikely (records from Tanami Desert in 1980s, suitable habitat unlikely to occur due to cattle)
Polytelis alexandrae Princess Parrot	VU	VU	Occupies arid lands in Australia where it is patchily distributed (Pavey 2006a).	Found in sand dune habitat, spinifex with eucalypts, and shrubs such as acacias, hakeas, and eremophilas (Pizzey & Knight, 2012; Pavey, 2006a).	Unlikely (most records from southern arid region, not primary habitat)
Rostratula australias Australian Painted Snipe	CE	VU	In the NT, probably occurs in central and southern area although it also possible occurs in the northern portion of the area (Woinarski *et al*, 2007).	These birds prefer a habitat of recently flooded temporary vegetated wetlands during the non-breeding period and brackish temporary freshwater wetlands with minimum vegetation during breeding periods. Birds usually forage in thick, low vegetated areas during the day (Curtis *et al*, 2012).	Unlikely* (one record, no suitable habitat at drill sites but may be present in the wider landscape during the wet season)
Tyto novvaehollandiae kimberli Masked Owl (northern)	VU	VU	Distributed in Northern Australia although not well known. In the NT, occurs from Cobourg south to Katherine and the VRD and east to the McArthur River (DEE, 2014b).	This species inhabits tall open eucalypt forest in the NT, especially those associated with *E. Miniata* and *E. tetrodonta (*Woinarski, 2007*)*. Also found in riparian and monsoonal forest and rainforest (DEE, 2014b).	Unlikely (primary habitat absent)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Mammals					
Dasyurus hallucatus Northern Quoll	E	CE	Found throughout most of Northern Australia although now restricted to six main areas (Menkhorst & Knight, 2011). In the NT it is found in the Top End as far southeast as Boroloola (DEE, 2014a). One previous record from Shenandoah Pastoral Lease (unknown date).	Northern Quolls do not have highly specific habitat requirements although the most suitable appear to be rocky habitats. They occur in a variety of habitats across their range, including open forest and woodland. Daytime den sites provide important shelter. Shelter sites include rocky outcrops, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings (Woinarski *et al*, 2007).	Unlikely (no recent records, no core habitat)
Pseudantechinus mimulus Carpentarian Antechinus	–	VU	Found in QLD and the NT. In the NT it has been reported from the Sir Edward Pellew Island group, and Pungalina reserve near Borroloola (Woinarski & Ward, 2012b).	This species is distributed in rocky habitat including sandstone boulders and outcrops with hummock grasses (Woinarski, 2004). In QLD, this species has been recorded on rocky ridges and hill-slopes (Lloyd *et al*., 2013).	Unlikely (one record but no suitable habitat)
Isodon auratus Golden Bandicoot	V	E	This species used to be found across northern, central and western Australia but decline after European settlement (Woinarski, 2007). Now only found on Marchinbar Island in the NT and small area of the NW Kimberley (Fisher & Woinarski, 1994; Woinarski, 2007).	Previously inhabiting a range of arid and semi-arid habitats, in the NT it occupies heathland and shrubland and hummock grasslands on sandstone, vine thickets and grassy woodlands (Menkhorst & Knight, 2011; Woinarski, 2007).	Unlikely (only persists in NE Arnhem Land)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Macroderma gigas Ghost Bat	VU	NT	The species' current range in northern Australia ranges from relatively arid conditions in the Pilbara region of Western Australia to humid rainforests of northern Queensland. A large colony occurs in a series of gold mine workings at Pine Creek, NT. This species has also been recorded throughout the mainland Top End north of approximately 17º latitude (Ward & Milne, 2016).	The distribution of this species is influenced by the availability of suitable caves and mines for roost sites (Ward & Milne, 2016).	Unlikely (no recent records, no suitable cave located near proposed sites)
Macrotis lagotis Greater Bilby	VU	VU	This species occurs in south-western Queensland and in arid north-western Australia (Western Australia and Northern Territory). This species was previously widespread in arid and semi-arid Australia (Pavey, 2006b). The most northern records are from Newcastle Waters and Wave Hill (Southgate & Paltridge, 1998).	In the NT, this species is found on sandy soils dominated by spinifex. Low shrubs such as Acacias and Melaleucas are also common in this habitat. Also hummock grassland associated with low lying drainage systems and alluvial areas (Pavey, 2006b).	Unlikely (no recent records, primary habitat limited in permit area)
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-Tailed Bat	CE	DD	Wide distribution from India through south-eastern Asia to the Solomon Islands, including north-eastern Queensland and the NT. The north-eastern Australian populations are described as the subspecies *S. s. nudicluniatus*, although it is not clear whether this should be applied to the NT population (Duncan *et al*., 1999). There have been very few (<5 confirmed) records since (McKean *et al*. 1981; Thomson 1991). All confirmed records have been from the Kakadu lowlands.	Previous specimens have been collected from Open Pandanus woodland fringing the sedgelands of the South Alligator River in Kakadu National Park (Friend & Braithwaite, 1986). In the NT, it has also been recorded from eucalypt tall open forests (Churchill, 2008)	Unlikely (no records and primary habitat not present)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Trichosurus vulpecula vulpecula Common Brushtail Possum	–	E	Previously widespread in the NT, this species is now found in isolated locations in the southern NT (Woinarski *et al*., 2007).	This species occupies riparian habitat in the vicinity of rocky outcrops or slopes (Kerle *et al*., 1992).	Unlikely (no records in the vicinity of the lease area and no suitable habitat)
Rattus tunneyi Pale Field-rat	–	V	Inhabiting higher rainfall area including the Top End of the NT (Menkhorst & Knight, 2011).	This species favours dense vegetation found along rivers where it occupies burrows in loose colonies (Cole & Woinarski, 2002). However, this species can be found in a variety of habitats including woodlands if a dense understorey of grasses is present (Menkhorst & Knight, 2011).	Unlikely (one record from 1999 in greater area, primary habitat absent)
Reptiles					
Acanthopis hawkei Plains Death Adder	VU	VU	In the NT this species is found in the floodplains of the Adelaide, Mary and Alligator Rivers and the Barkly Tablelands (Ward & Phillips, 2012).	Found on flat cracking soils in treeless floodplains where it forages on frogs, reptiles and rats (Ward & Phillips, 2012).	Unlikely (no records or suitable habitat)
Varanus mertensi Mertens Water Monitor	–	VU	Distributed throughout coastal and inland waters in northern Australia. In the NT found throughout most of the Top End. Decrease in NT population attributed to Cane Toads (Mayes, 2006).	Semi-aquatic species that inhabits vegetation associated with water such as Pandanus and paperbark. Seldom found far away from water (Mayes, 2006).	Unlikely*(was confirmed during previous surveys along Newcastle Creek, habitat unsuitable at proposed survey lease sites)

Species	Conservation Status		Distribution	Habitat	Likelihood of Occurrence
	EPBC	NT			
Varanus panoptes Yellow-spotted Monitor	–	VU	Occurs across a broad geographic range across northern Australia. In the NT most records are from the Top End but occurs as far south as Renner Springs (Ward *et al*., 2012).	Occupies a variety of habitats including coastal beaches, floodplains, grasslands and woodlands (Ward *et al*., 2012).	Possible (records from Barkly Tablelands)

4.5.2 Migratory and Marine Species

The EPBC Protected Matters database (Appendix) indicated the potential presence of 20 Migratory and Marine listed species within the survey area (Table 18). Of these species, four are considered likely to occur, ten possibly occur and six are unlikely to occur within the survey area.

Table 18 Migratory listed species potentially occurring within the survey area

Scientific Name	Common Name	EPBC Act	Likelihood of Occurrence
Actitis hypoleucos	Common Sandpiper	Migratory, Marine	Possible
Anseranas semipalmata	Magpie Goose	Marine	Possible
Apus pacificus	Fork-tailed Swift	Migratory, Marine	Likely
Ardea alba	Great Egret	Marine	Likely
Ardea ibis	Cattle Egret	Marine	Likely
Calidris acuminata	Sharp-tailed Sandpiper	Migratory, Marine	Possible
Calidris ferruginea	Curlew Sandpiper	Migratory, Marine	Possible
Calidris melanotos	Pectoral Sandpiper	Migratory, Marine	Possible
Cecropis daurica	Red-rumped Swallow	Migratory	Unlikely
Charadrius veredus	Oriental Plover	Migratory, Marine	Possible
Chrysococcyx osculans	Black-eared Cuckoo	Marine	Possible
Crocodylus johnstoni	Freshwater Crocodile	Marine	Unlikely
Cuculus optatus	Oriental Cuckoo	Migratory	Possible
Glareola maldivarum	Oriental Pratincole	Migratory, Marine	Possible
Hirundo daurica	Red-rumped Swallow	Marine	Unlikely
Hirundo rustica	Barn Swallow	Migratory, Marine	Unlikely
Merops ornatus	Rainbow Bee-eater	Marine	Likely
Motacilla cinerea	Grey Wagtail	Migratory, Marine	Unlikely
Motacilla flava	Yellow Wagtail	Migratory, Marine	Unlikely
Rostratula benghalensis (*sensu lato*)	Australian Painted Snipe	Migratory, Marine	Possible

4.6 Feral Animals

Feral animals likely to occur within the region include (PWCNT, 2005; ANRA, 2008):

- Domestic Cattle (*Bos Taurus*)
- Water Buffalo (*Bubalus bubalis*)
- Cane Toad (*Bufo marinus*)
- Wild Dog (*Canis lupus familiaris*)
- Donkey (*Equus asinas*)

- Horse (*Equus caballus*)
- Feral Cat (*Felis catus*)
- House Sparrow (*Passer domesticus*)
- Black Rat (*Rattus rattus*)
- Pig (*Sus scrofa*)

During the November 2019 survey evidence of cattle grazing within the past year, or previous 1-2 years was observed at 18 of the 20 sites assessed. The only exceptions were at one very rocky site (NL18) and one *Corymbia* woodland site (NL6). Spinifex grass (*Triodia* sp.) was the dominant grass at both these sites, which is generally not favoured by cattle for food. At sites that were damaged approximately 5-25% of ground cover was impacted by cattle at nine sites, while damage was less than 5% at seven sites. Cattle showed a preference for grazing on *Chrysopogon fallax* (Golden Beard Grass). Cattle grazing and impacts were generally observed within the open woodland communities in the southern survey area. Only minor grazing impacts were observed within grassland communities.

The Cane Toad is known to be present in the permit area and the Commonwealth DEE recognises this species as a 'key threatening process' related to their impacts on biodiversity through predation, competition, land degradation and poisoning. In the Northern Territory, the Cane Toad has been implicated in the decline of several species including several reptiles such as the King Brown Snake and water monitors (Smith & Phillips, 2006).

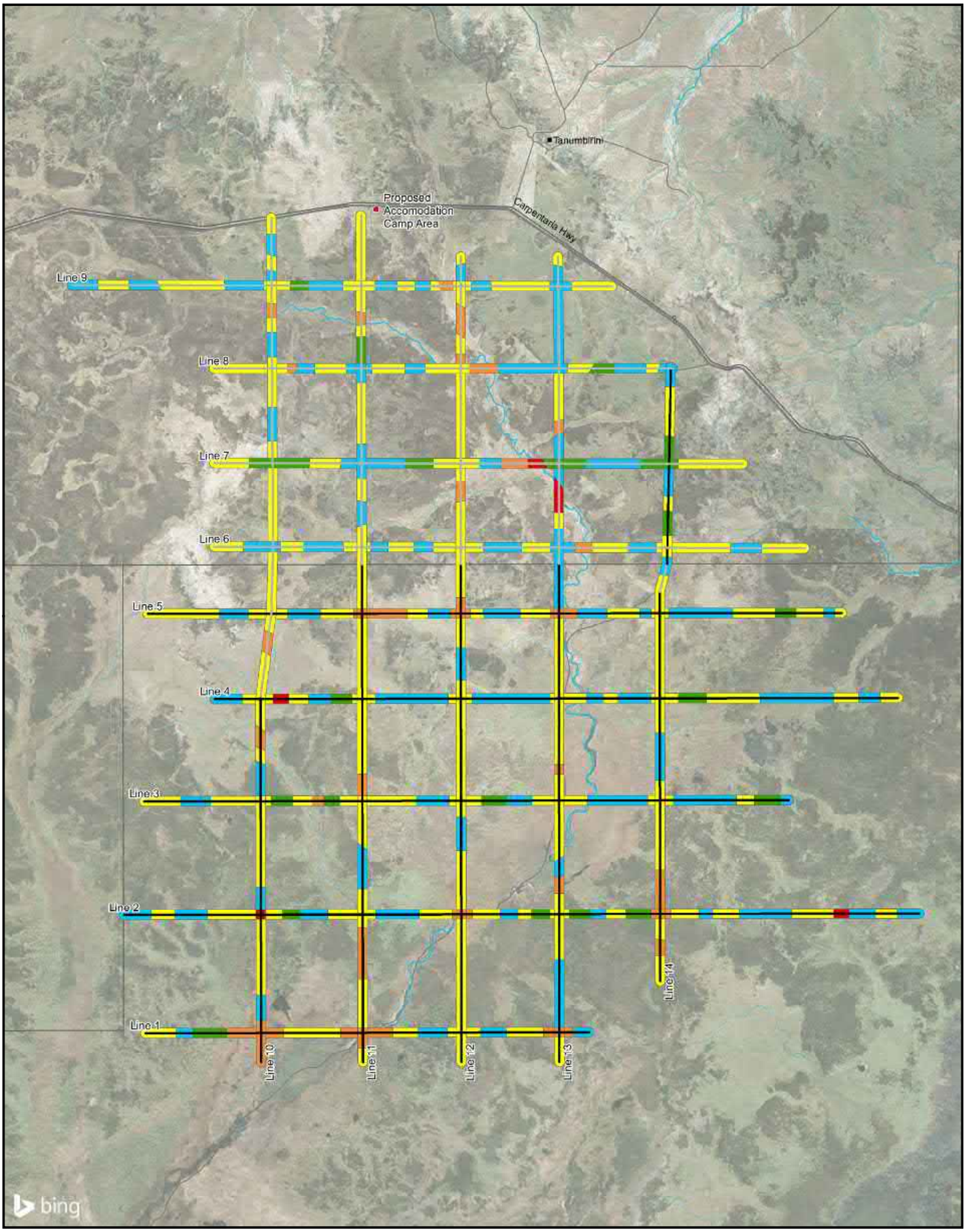
Pest predators such as the Cat are most likely common although their abundance is difficult to assess due to their cryptic nature. Introduced predators such as Cats can impact many vertebrates (e.g. Dickman, 2009 &1996). One of the primary concerns of introduced predators in the site is the impact on EPBC listed species such as reptiles, and ground-dwelling birds. Feral cats are believed to be one of factors that have led to the decline of threatened ground-dwelling bird the Partridge Pigeon (Woinarski, 2006).

4.7 Land Condition

Land Condition Assessments were undertaken for both the northern and southern survey areas. Land condition scores have been mapped for the northern survey area in Figure 13 and for the southern survey area in Figure 14. Detailed definitions for each score are provided in Table 3.

Land condition nearby to creeks and cattle watering points within both the northern and southern survey areas were generally classed as Poor or Disturbed due to evidence of erosion, bare soils and vegetation impacts. Areas displaying obvious fire impacts to vegetation structure and condition were also considered to be Disturbed. Areas of intact land and vegetation were scored either Good or Excellent. Large patches of Lancewood (*Acacia shirleyi*) were classed as Excellent in the northern survey area. Grasslands within the southern survey area were classed as Good. Areas of increased cattle impacts within creeks and patches of open woodland in the southern survey area were described as either Poor or Disturbed.

Land condition assessment sites were also recorded in the field for both the northern and southern survey areas. The location of land assessment sites is shown in Figure 10 and Figure 14. The results of these assessments are presented in Section 6.0.



N

Projection: GDA 1994 MGA Zone 53

5 2.5 0 5 km

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Seismic Lines

- Vegetation Clearing Required
- Unsealed Road/ Existing Pastoral Track
- Proposed Accomodation Camp Area

Land Condition Assessment

- Very Poor
- Poor
- Disturbed
- Good
- Excellent

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

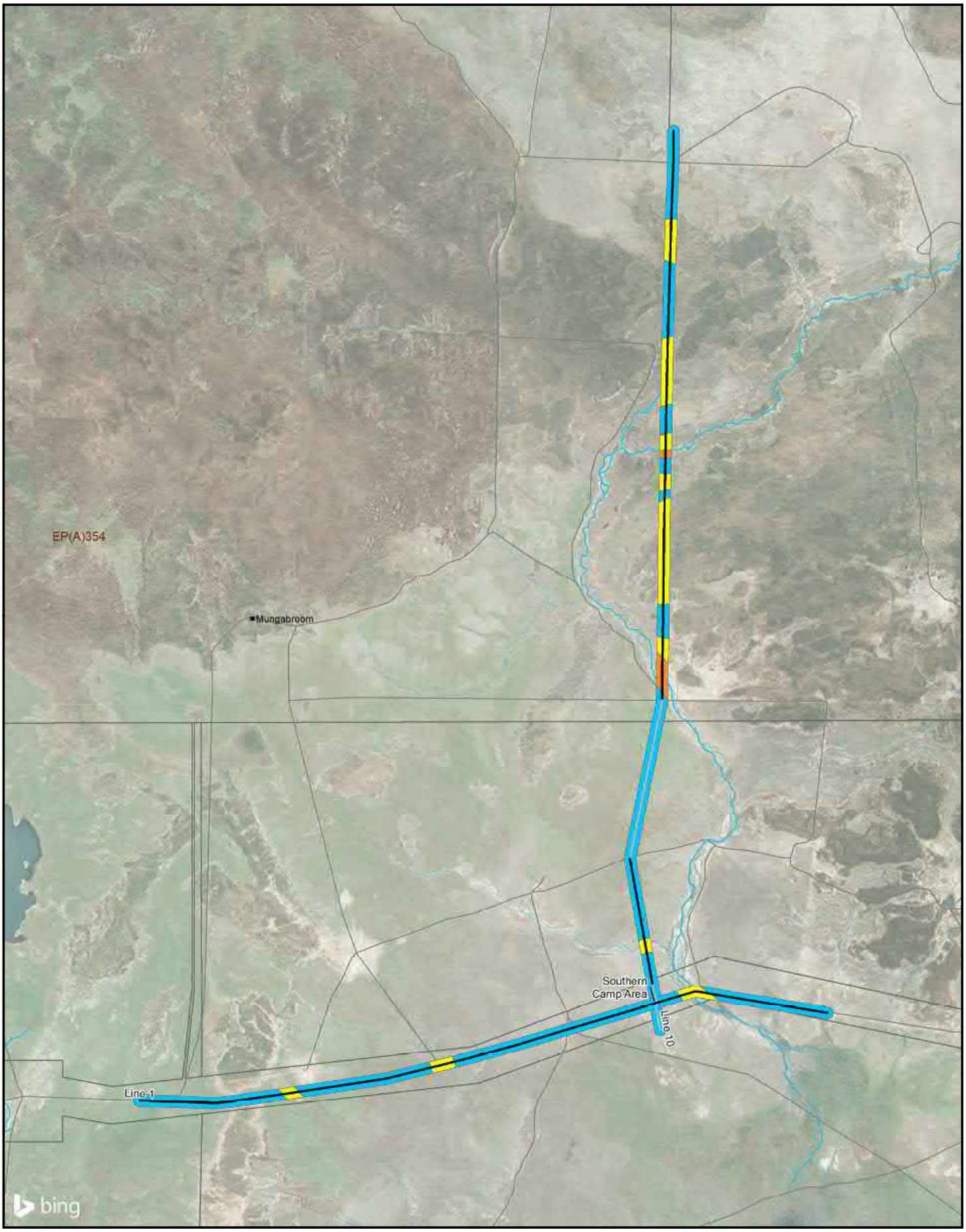
Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Land Condition Assessment for the Northern Seismic Lines

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 13

A3 size



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Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

1:150,000 (when printed at A3)

Seismic Lines
- Vegetation Clearing Required
- Existing Pastoral Track/Road

Land Condition Assessment
- Poor
- Disturbed
- Good

Proposed Accomodation Camp Area

DARWIN
EP136

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

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Land Condition Assessment for the Southern Seismic Lines

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CREATED BY	prachi.kulkarni1
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VERSION	1

Figure 14

A3 size

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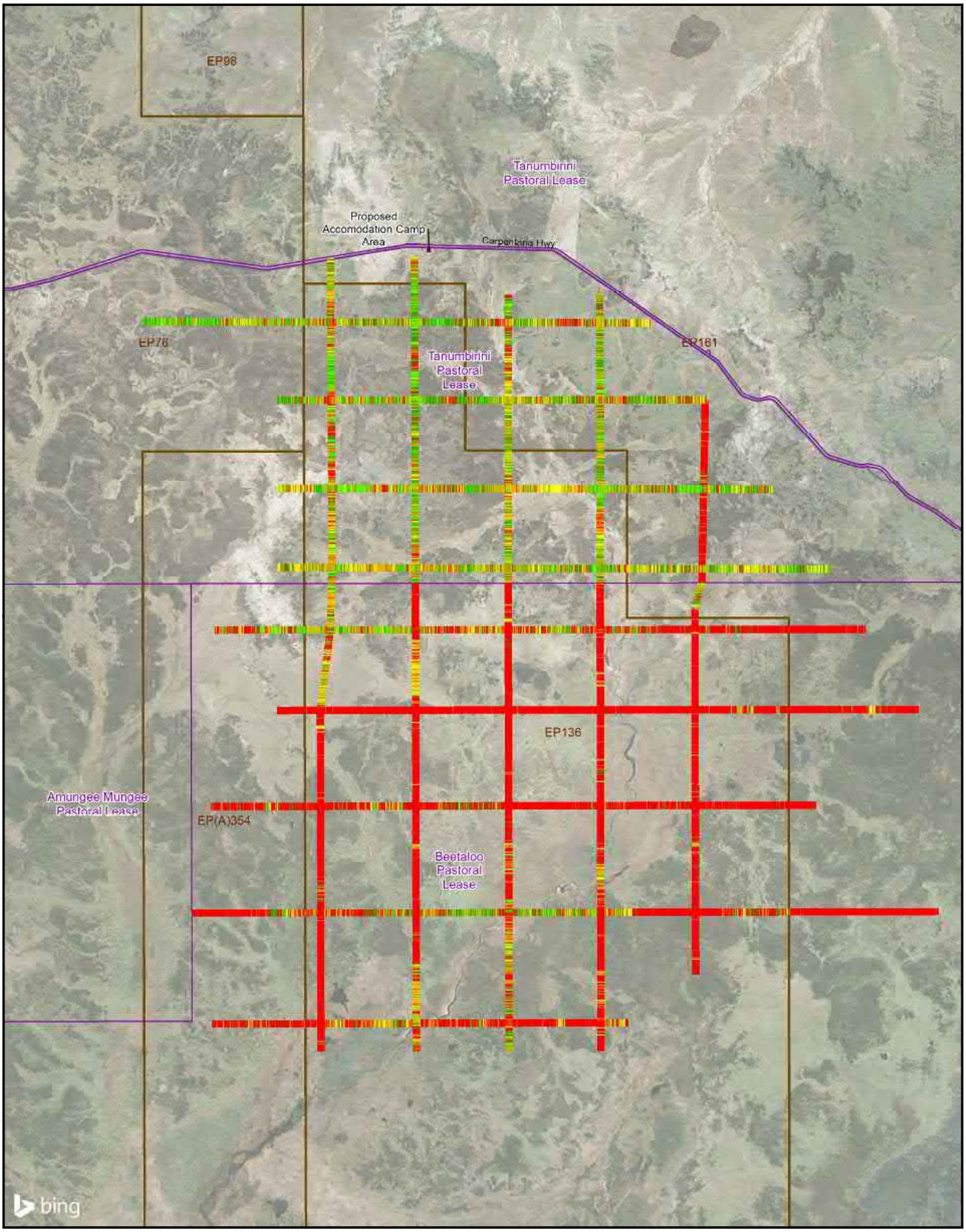
4.7.1 Ground Condition

An interactive supervised classification method was used to assess the seismic line disturbance area. This assigned the ground type (i.e. Bare Earth, Dry Grass, Grass, Shrubs and Trees) that would be encountered along the seismic line alignment from satellite imagery captured on August 2019.

The Satellite imagery was analysed to determine the proportion of bare earth within 1 ha grid squares across the study area. Table 19 shows that the majority of the survey area has a proportion of bare ground cover of 0%-20%, indicating healthy vegetation cover.

Table 19 Ground Condition Description of Seismic Lines

Line	Ground Condition Description (Ha)				
	Bare Earth	Dry Grass	Grass	Shrub	Tree
Northern Seismic Survey Area					
Line 1	7.55	0.67	1.84	0.13	1.26
Line 2	11.98	1.70	1.94	0.65	4.27
Line 3	11.75	0.42	1.15	0.13	3.21
Line 4	14.23	0.12	0.79	0.01	2.51
Line 5	9.33	2.37	2.00	1.58	2.65
Line 6	1.05	3.56	4.28	1.84	4.52
Line 7	1.45	3.37	2.77	2.54	3.53
Line 8	1.78	2.07	2.31	1.26	4.44
Line 9	2.30	2.08	2.72	2.72	4.13
Line 10	10.79	2.56	3.50	1.71	3.26
Line 11	9.98	1.93	3.07	2.15	4.73
Line 12	10.21	2.09	3.80	0.62	4.08
Line 13	10.03	1.86	3.00	1.06	4.82
Line 14	12.93	0.71	0.75	0.28	1.17
Total	**115.36**	**25.51**	**33.92**	**16.68**	**48.58**
Southern Seismic Survey Area					
Line 1	9.68	3.78	0.90	0.74	0.00
Line 10	7.13	10.43	0.82	0.66	0.38
Total	**16.81**	**14.22**	**1.72**	**1.39**	**0.38**



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Projection: GDA 1994 MGA Zone 53

5 2.5 0 5 km

1:192,400 (when printed at A3)

Class Type

- Trees
- Shrubland
- Grassland
- Dry Grassland
- Bare Earth
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Highway

DARWIN
EP136

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

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Bare Earth Overview within the Northern Seismic Exploration Area

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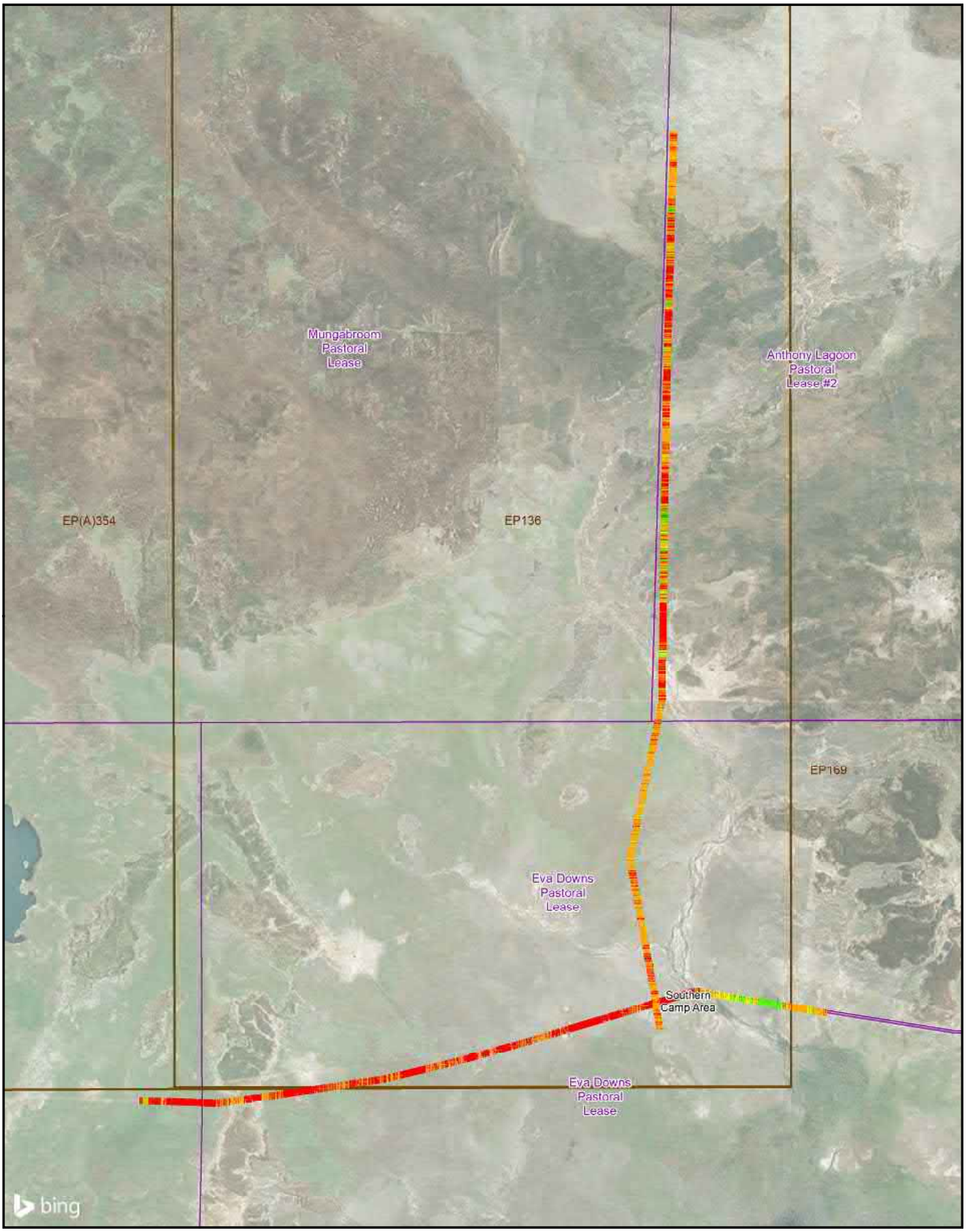
Figure 15

A3 size



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AECOM
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Projection: GDA 1994 MGA Zone 53

4 2 0 4 km

1:150,000 (when printed at A3)

Vegetation classes
- Trees
- Shrubland
- Grassland
- Dry Grassland
- Bare Earth

- Petroleum Exploration Permit
- Proposed Accomodation Camp Area

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

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Bare Earth Overview within the Southern Seismic Exploration Area

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VERSION	1

Figure 16

A3 size

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4.8 Conservation Areas

There are no national or world heritage places, Commonwealth land or heritage places or reserves or critical habitat areas listed under the EPBC Act are located within or adjacent to the survey area.

There is one conservation reserve, the Bullwaddy Conservation Reserve, which lies immediately west of the survey area. The Reserve was declared in 2000 and is approximately 115 km² in area. It represents the only declared conservation area within the Sturt Plateau region to protect the Lancewood/Bullwaddy vegetation community. Less than 3% of this vegetation community is reserved nationally (PWCNT, 2005). The most significant values of the reserve are the flora and the associated fauna for which it provides habitat. This includes the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus leichardtii*), the Northern Nailtail Wallaby (*Onychogalea unguifera*) and the Giant Frog (*Cyclorana australis*). It is also a valuable area for research on the ecology of Bullwaddy, particularly the effects of fire (PWCNT, 2005).

Lake Woods is located approximately 140 km south-east of the seismic survey area on Newcastle Waters Station. This wetland is listed as a Site of Conservation Significance by the Department of Land Resource Management and is listed in the Directory of Important Wetlands in Australia (DIWA: NT013 Lake Woods). The site meets criteria 1, 2, 3, 4, 5 and includes DIWA wetland types: B1, B6, B10, B13 and B14. Although Lake Woods is located outside of the survey area, it is fed principally by surface inflow of Newcastle Creek, itself originating more than 160 km north-east on Amungee Mungee Station. During the period of inundation, Lake Woods supports over 100,000 waterbirds including internationally significant numbers of Plumed Whistling-Duck (*Dendrocygna eytoni*). Numerous bird species nest and feed in the diverse wetland habitat, and the conservation group 'Birdlife International' nominated Lake Woods as an 'Important Bird Area' (IBA). The lake also includes the largest area of lignum swamp in the Northern Territory and in tropical Australia (NRETAS, 2010a).

Tarrabool Lake is a Site of Conservation Significance located approximately 50 km south-east of the southern seismic line. Tarrabool Lake is considered the largest basin-form freshwater wetland and largest wooded swamp in tropical Australia. The lake meets criteria 1, 2, 3, 5 and includes DIWA wetland types: B6, B10, B13 and B14. Lake waters most frequently occupy an inner basin of approximately 400 km^2 but varies greatly depending on wet season rainfall. Tarrabool Lake has been recorded supporting as many as 1,000 Great Egret (*Ardea alba*) and 10,000 Glossy Ibis (*Plegadis falcinellus*). The lake is unique in the region for being dominated by *Eucalyptus microtheca* woodland (NRETAS, 2010b).

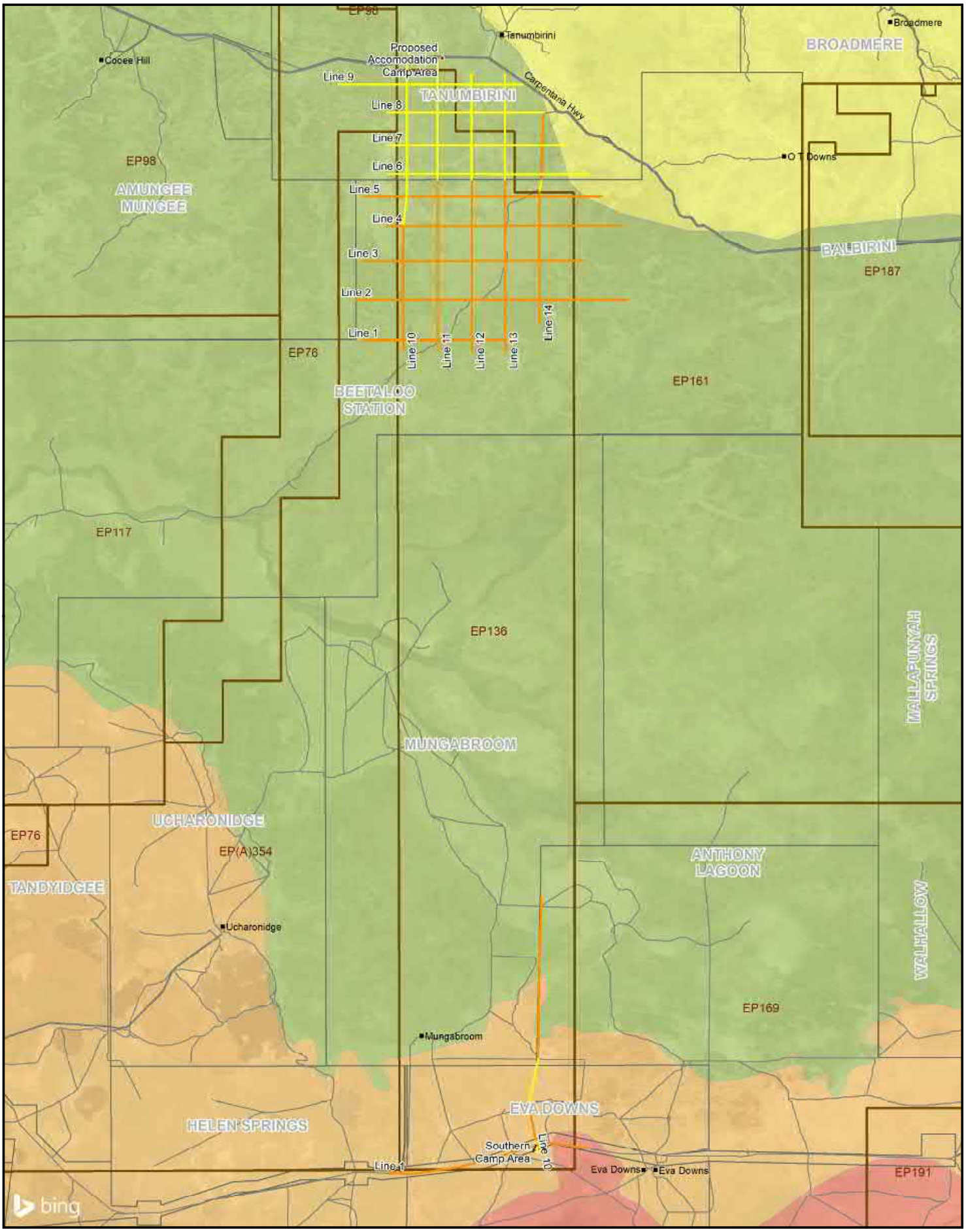
Eva Downs Swamp, located approximately 15 km south of the southern seismic line, is listed in the Directory of Important Wetlands in Australia (DIWA: NT010 Eva Downs Swamp). The area is a large irregular sumpland situated in extensive, gently undulating plains that occasionally connects with Tarrobool Lake. Eva Downs Swamp holds water in most years and therefore serves as a major breeding area for many waterbirds (DAWE, 2020).

4.9 Ecological integrity

A study of Australian landscape health was undertaken by the Commonwealth government (Department of the Environment and Heritage and the National Land and Water Resources Audit, supported by State and Territory agencies), to assess regional landscape health from the perspective of biodiversity and natural ecosystems. As part of this assessment, attributes indicative of landscape condition and trend were analysed. These attributes included:

- Native vegetation extent
- Fragmentation and clearing rates
- Land use
- Current extent and trend of dryland salinity
- Changed hydrological conditions
- Current extent and trend of weeds and feral animals
- The distribution of threatened species and ecosystems.

This resulted in the development of Landscape Health Database 2001, which provides spatial representation of the results. Figure 17 shows an assessment of grazing pressure in the survey area. Most of the survey area has low grazing pressure (70–90% of the area has low grazing pressure).



AECOM

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N

Projection: GDA 1994 MGA Zone 53

10 5 0 10 km

1:528,000 (when printed at A3)

Seismic Lines

- Vegetation Clearing Required
- Existing Track/Gravel Road
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads
- Cadastre

Grazing Pressure

- 70 - 90% of sub-region has low grazing pressure
- 50 - 70% of sub-region has low grazing pressure
- 10 - 30% of sub-region has low grazing pressure
- 0 - 10% of sub-region has low grazing pressure

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Grazing Pressure within EP136

PROJECT ID	60611666
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LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 17

A3 size

4.10 Matters of National Environmental Significance

4.10.1 Potential EPBC Act controlling provisions

When an action is proposed, such as Sweetpea's proposed survey program, approval by the Commonwealth Minister for the Environment under the *EPBC Act* may be required. This will only be the case if the action is likely to result in any significant impacts on Matters of National Environmental Significance (MNES) or if the action will have or is likely to have a significant impact on the environment.

Potential triggers under the EPBC Act include a significant impact on:

- The world heritage values of a declared World Heritage property
- The national heritage values of a listed National Heritage Place
- The ecological character of a declared Ramsar wetland
- A listed Threatened Ecological Community, or its habitat
- The members of a listed threatened species
- The members of a listed migratory species or their habitat
- A water resource, in relation to coal seam gas development and large coal mining development.

4.10.2 Matters of National Environmental Significance

On 11 July 2020 the EPBC Protected Matters Search Tool was used to generate a report for both the northern and southern seismic survey areas (refer to Appendix) to identify whether MNES or other matters protected by the EPBC Act are likely to occur on or in the near vicinity of the 2020 seismic survey area. The results of both searches are provided below in Table 20.

Table 20 Summary of EPBC Aspects for the Sweetpea Survey Area

Aspect	Seismic Survey Area
Matters of National Environmental significance	
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance	None
Great Barrier Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological communities	None
Listed Threatened Species	13
Listed Migratory Species	12
Other Matters Protected by the EPBC Act	
Commonwealth Land	None
Commonwealth Heritage Places	None
Listed Marine Species	19
Whales and other Cetaceans	None
Critical Habitat	None
Commonwealth Reserves Terrestrial	None
Commonwealth Reserves Marine	None

Aspect	Seismic Survey Area
Extra Information (Information that may also be relevant to the Survey sites)	
Places on the Register for National Estate	None
State and Territory Reserves	None
Regional Forest Agreement	None
Invasive Species	16
Nationally Important Wetlands	None
Key Ecological Features (Marine)	None

Sections 4.2, 4.3 and 4.5 provide details on any listed ecological communities, threatened flora, fauna and migratory species that have potential to occur within the seismic survey area. While there are threatened and migratory species that have the potential to occur within the proximity of the survey area, these are unlikely to be significantly impacted by the seismic survey activities.

5.0 Social and Cultural Environment

5.1 Socio economic summary

Sweetpea's seismic survey activities occur within the Barkly Regional Council Area. The Council's area covers 323,500 km^2 and total residential population of over 8,500 (Barkly Regional Council, 2015; ABS, 2016). The major townships in the vicinity of the survey area are Tennant Creek, Elliott, Daly Waters, Newcastle Waters, Mayfield, Dunmarra. The region also contains various pastoral stations and Aboriginal communities.

Analysis of the 2016 Australian Bureau of Statistics (ABS) census suggest that the statistical subdivision of Barkly (extending from Ampilatwatja in the south to Dunmarra in the north) has high unemployment, low levels of income and a very low score on the Index of Relative Socio-Economic Advantage/Disadvantage (refer Table 21 for ABS statistics).

Table 21 Socio economic status of Barkly region compared with the Northern Territory

Characteristics	Barkly	NT
Population (no.)	8,563	228,836
Median age (years)	29	32
Labour Force (no.)	2,965	110,390
Unemployed (no.)	378	7,685
Unemployed as percentage of those in the labour force (%)	12.7	7.0
Median individual income per week ($/week)	1,281	1,983
Median weekly rental payment ($)	75	97
Average household size (no.)	3.3	2.9

Source: ABS 2016 Census

5.2 Land Use

A range of land-uses exists in the proposed seismic survey area. These include the following:

- Pastoral leases, including the Tanumbirini and Beetaloo Stations in the northern survey area and Anthony Lagoon and Eva Downs in the southern survey area (refer Section 5.2.1).
- Road and track networks – the Carpentaria Highway intersect the northern survey area and the Barkly Stock Route track is located within the southern survey area. In addition, there are numerous internal gravel roads, tracks and firebreaks.
- Gas pipeline – the Carpentaria Gas Pipeline runs parallel to the Carpentaria Highway.
- Alice Springs to Darwin Railway - The railway line runs to the west of the Stuart Highway, and does not affect EP136.
- Townships - The townships of Daly Waters and Dunmarra are closest to EP136. Daly Waters is located approximately 123 km west and Dunmarra is approximately 180 km south-west from the permit area access located on the Carpentaria Highway.
- Conservation areas – including the Bullwaddy Conservation Reserve, which lies 20 km to the west of EP136.
- Australian Heritage Database – there are no statutory listed heritage places within the proposed impact area, or within a 125 km x 125 km search area encompassing the proposed seismic survey area.
- NT Heritage Register - A search of the Northern Territory Heritage Register identified 18 Aboriginal archaeological sites and no historic heritage sites within a 50 km x 50 km area that encompasses the proposed seismic survey area.

- Sacred Sites – Engagement with the Aboriginal areas Protection Authority (AAPA) has helped identify a number of Restricted Works Areas (RWA) within the proposed seismic survey area, with the largest RWA occurring along 60 km of Newcastle Creek.

5.2.1 Pastoral Leases

Both the northern and southern survey areas for the seismic exploration activities are located within four perpetual pastoral leases (PPL). The northern survey area is entirely located within the Beetaloo PPL and Tanumbirini PPL. The southern survey area is located within the Anthony Lagoon and Eva Downs PPL (refer Figure 1). All four of these leases have historically been used for pastoral production and continue to support a thriving cattle industry within the region. Pastoralism is a major economic driver in the Northern Territory, and it is estimated the cattle industry generates more than 85% of the NT's primary production value (NTCA 2020).

A section of southern survey area is located within the Barkly Stock Route Road, an authorised stock route for the overland droving of cattle. The stock route also has government maintained unsealed track which provides access for cattle production activities in the area. In October 2015, the Barkly Stock Route was incorporated into Eva Downs PPL lease from the station boundary.

An overview of pastoral lease occurring within the proposed northern and southern survey leases are provide below:

Northern Survey Area

Tanumbirini Station (NT Por 701 Tanumbirini PPL)

Tanumbirini Station is 5,001 km² in size with a carrying capacity of approximately 35,000 cattle. The station was established prior to 1908. The Carpentaria Highway passes through the southern section of the property. It was recently purchased by Rallen Australia along with the nearby Forrest Hill Station.

Beetaloo Station (NT Por 702 Beetaloo PPL)

Beetaloo Station is approximately 7,078 km² in size and has a carrying capacity of 80,000 cattle. The station was established in the 1890's and was acquired by the [redacted] Family in 2002. The station has been developed into a grid of 4 km² paddocks, each containing a cattle watering point to allow for even grazing of the landscape. Paddock boundaries provide access across the entire pastoral lease.

Southern Survey Area

Anthony Lagoon Station (NT Por 3861 Anthony Lagoon PPL) and Eva Downs Station (NT Por 244 Eva Downs PPL)

Anthony Lagoon Station and the neighbouring Eva Downs Station are situated in the Barkly Tablelands and are accessible via the Barkly Stock Route, located just south of Elliot. Eva Downs is run as an outstation of Anthony Lagoon and combined they cover an area of 9,349 km² with a carrying capacity of 60,000 head of cattle. Anthony Lagoon was established in 1895. Both Anthony Lagoon and Eva Downs Stations were purchased by the Australian Agricultural Company (AACO) in 2006.

5.3 Native Title

Four Native Title determinations have been finalised within the proposed seismic survey area:

- NTD33/2012 Tanumbirini PPL – Native Title exists in parts of the determination area which is held by the Kinbininggu and Bamarrngganja groups
- NTD27/2010 Beetaloo PPL – Native Title exists in parts of the determination area which is held by the Karranjini group; the Bamarrnganja group; the Warranangku group; the Pinda (OT Downs) group; and the Lija/Muwartpi group
- NTD7/2013 Anthony Lagoon PPL - Native Title exist in parts of the determination area
- NTD33/2011 Eva Downs PPL – Native Title exists in parts of the determination area.

Figure 18 shows the boundaries of the areas of Native Title in relation to pastoral properties, the permit areas and the proposed 2020 seismic lines.

5.4 Sacred Sites and Restricted Work Areas

Two recorded Aboriginal Area Protection Authority (AAPA) sacred sites are located within close proximity to the Project works:

- AAPA sacred site 5864-18 is located approximately 150 m east of the proposed northern seismic line 10, is described as two large waterholes in a flood out area. Based on the available point data of the sacred site, the seismic line 10 intersects one of the waterholes described in this site, although is an existing pastoral access track.
- Another AAPA recorded sites is known to be located approximately 150 m south of the proposed southern seismic line 1 and is described in the 2012 NLC report as a spring and cave. This site is associated with EP136 RWA6 and is bisected by the Barkly Stock Route.

Additional sacred sites may have been recorded since 2012 that AECOM does not currently possess records for.

In addition, the Northern Land Council (NLC) were engaged by Paltar Petroleum Pyt Ltd (Paltar) to undertake an Ethnographic Site Avoidance Survey for proposed 2012 works program. This survey included drill locations sites within EP136 and provided an overview of Restricted Work Areas (RWA) recommendations for the exploration permit areas. Two of these RWAs intersect with the current proposed impact areas:

- EP136 RWA1, covers over 60 km of Newcastle Creek and intersects all proposed seismic lines for the 2020 seismic exploration program, except Seismic Line 3. The RWA includes a number of recorded sacred sites with AAPA. The NLC proscribed the following conditions for EP136 RWA1:
  - Impacts allowed within a 200 m radius centred on drill site EP136DS1
  - No other works are permitted except access along existing tracks.
- EP136 RWA6 is located on an existing pastoral stock route (Barkly Stock Route) which includes an access track to the Southern Line 1. The NLC proscribed the following condition for EP136 RWA6:
  - No work of any kind is permitted within EP136 RWA6, except access permitted along existing tracks.

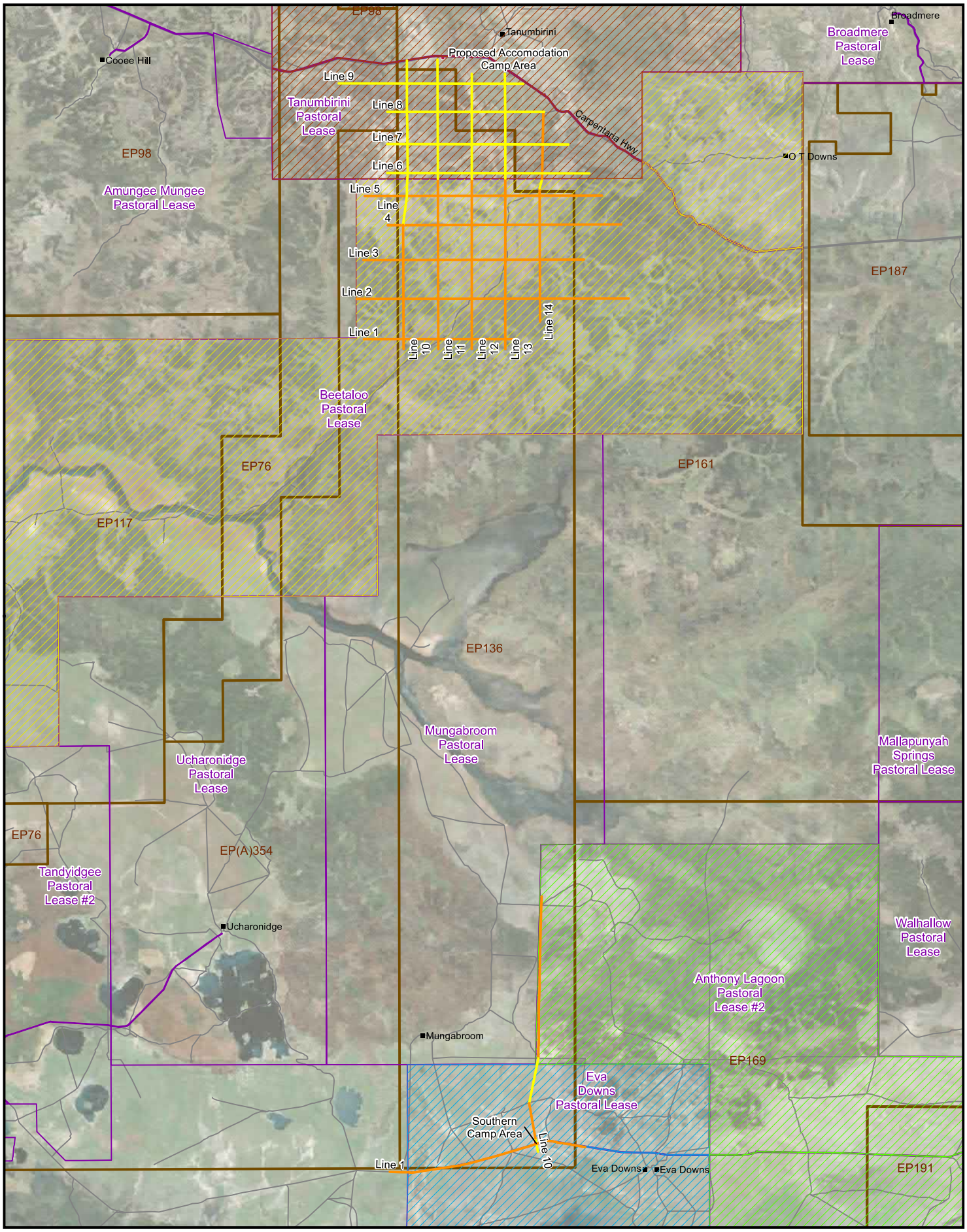
The AAPA application for Sacred Site clearance and determination of RWAs is currently in progress, with on country meetings commencing in mid-July 2020. Further details of the Cultural Heritage Assessment report is provided in *Appendix B of the Seismic Exploration Program EMP*.

5.5 Aboriginal Heritage

5.5.1 Archaeological Heritage Assessment

An archaeological assessment, comprising searches of the NT Heritage Register and Australia Heritage Database, review of archaeological survey reports, and a targeted field inspection using predictive modelling for the area of proposed works, was carried out by AECOM archaeologist, Perri Braithwaite for the 2020 seismic lines.

Most previous archaeological investigations near the study area have been associated with either linear infrastructure in the vicinity of the Carpentaria Highway, or other exploration activities. No assessments have been conducted within the boundaries of the current proposed impact areas. Archaeological finds associated with these investigations are predominantly artefact scatters composed of raw material commonly found in the immediate area (quartz, silcrete and quartzite). One stone arrangement has also been recorded (HLA, 2007b).



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.

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Projection: GDA 1994 MGA Zone 53

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Seismic Lines

- Vegetation Clearing Required
- Unsealed Road/ Existing Pastoral Track
- NTD27/2010
- NTD33/2011
- NTD33/2012
- NTD7/2013
- Native Title Register
- Petroleum Exploration Permit
- Proposed Accomodation Camp Area
- Roads

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Imagery: Bing (c)
Permit Area, Cadastre - NT Gov 2019.

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Native Title within EP136

PROJECT ID	N/A
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 18

A3 size

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Table 22 provides a summary of previous archaeological investigations undertaken in the local area.

Table 22 Previous Archaeological Assessments relevant to the Study Area

Researchers	Assessment Type	Locality	Key Findings
Smith (1986)	Excavation	Lake Woods	*In situ* artefacts dated to 6,000 years
Museum and Art Gallery of the Northern Territory (Hermes, 1986)	Survey	Amadeus Basin to Katherine	Large scale survey for a proposed natural gas pipeline targeting areas of major cultural sensitivity from Daly Waters to Katherine. A total of 32 sites were identified, with the majority being artefact scatters associated with watercourses.
Quaternary Archaeological Surveys (1998)	Survey	Stuart Highway to Mataranka Homestead	Large scale survey for a fibre optic cable corridor. Three isolated artefacts and one historic heritage site identified.
Heritage Surveys (1999)	Survey	Daly Waters to McArthur River	Nine archaeological sites identified including Rock shelters and artefact scatters
HLA Envirosciences (HLA) (2006b. 2006c, 2006d, 2007)	Survey	Beetaloo Basin	Several archaeological sites identified across the exploration permits including artefact scatters, isolated artefacts and a stone cairn. Assessments developed a preliminary predictive model based on random site modelling and landform.
AECOM (2011, 2012a, 2012b)	Survey	Beetaloo Basin	Several archaeological sites identified as part of seismic line clearance and exploratory drill locations including large artefact scatters (>1km), quarry sites and isolated artefacts. Predictive model refined and used in the field to identify 'hot spots' of Indigenous archaeological significance.
AECOM (2015)	Survey	Beetaloo Basin	Large scale survey for four drill hole locations. One large artefact scatter and three smaller artefact scatters identified.

The following sensitive landforms were identified as being likely to contain intact Aboriginal cultural heritage artefacts based on the desktop review:

- Non-flood prone areas adjacent to established watercourses.
- Areas with distinctive vegetation patterning, such as those areas associated with *Macropteranthes kekwickii* (bullwaddy).
- Adjacent to flood plains where a noticeable change in vegetation is identified.
- On the periphery of lagoons and 'chain of ponds' features.

A total of 24 inspection areas were surveyed for the seismic EMP. Of these, 20 target investigation areas associated with sensitive landforms were inspected, with 14 containing evidence of flaked stone artefacts. No expressions of Aboriginal cultural heritage were identified at the additional four inspection areas, surveyed as part of the broader environmental assessment.

Twenty-five Aboriginal archaeological sites (BT-19-AS7 to BT-19-AS19, BT-19-IA1 to BT-19-IA9 and BT-20-AS01 to BT-20-AS03) were identified during the field survey. Of these, 23 were located within the study area, while the remaining two were located adjacent to the study area

The details of these sites are further described in the Cultural Heritage Assessment report included in Appendix B of the *Seismic Exploration Program EMP*.

5.5.2 Areas of cultural significance

The NLC has previously conducted an Ethnographic Site Avoidance Survey within EP136 for a proposed drilling program in 2012 (AECOM, 2015b). The survey provided an overview of then known Restricted Work Areas (RWA) for the exploration permit area. This is the most recent survey available for this assessment. Of the RWAs identified during this survey, two occur within the current seismic survey area (refer Figure 19). The larger RWA covers the headwaters of Newcastle Creek and is intersected by several proposed seismic lines, while a smaller RWA occurs immediately east of seismic line 7, between seismic lines 4 and 5. The current AAPA application will provide further clarity the location and requirements of sacred sites and RWA.

5.6 Historic Heritage

Explorer John McDougall Stuart was the first European to penetrate the NT interior area in 1860. The first written descriptions of the area come from Stuart during his second attempt to cross the continent from south to north (HLA, 2005). Pastoral development began in the area following the completion of the Overland Telegraph Line in 1873, although these early attempts were largely unsuccessful due to the density of the Lancewood-Bullwaddy vegetation and lack of surface water. Daly Waters was recognised as one of the last watering stops on the Murranji Stock Route. It wasn't until the 1930s to 1950s, that the area saw regional economic growth with Daly Waters becoming a significant hub of air and mail services into the Territory. The wartime years saw this role increase with Daly Waters again playing a major role in cross country transport and communication. This role continued until the early 1970s when the airport was closed to commercial traffic. In recent years oil and gas exploration and tourism has supplemented the primarily pastoral economy.

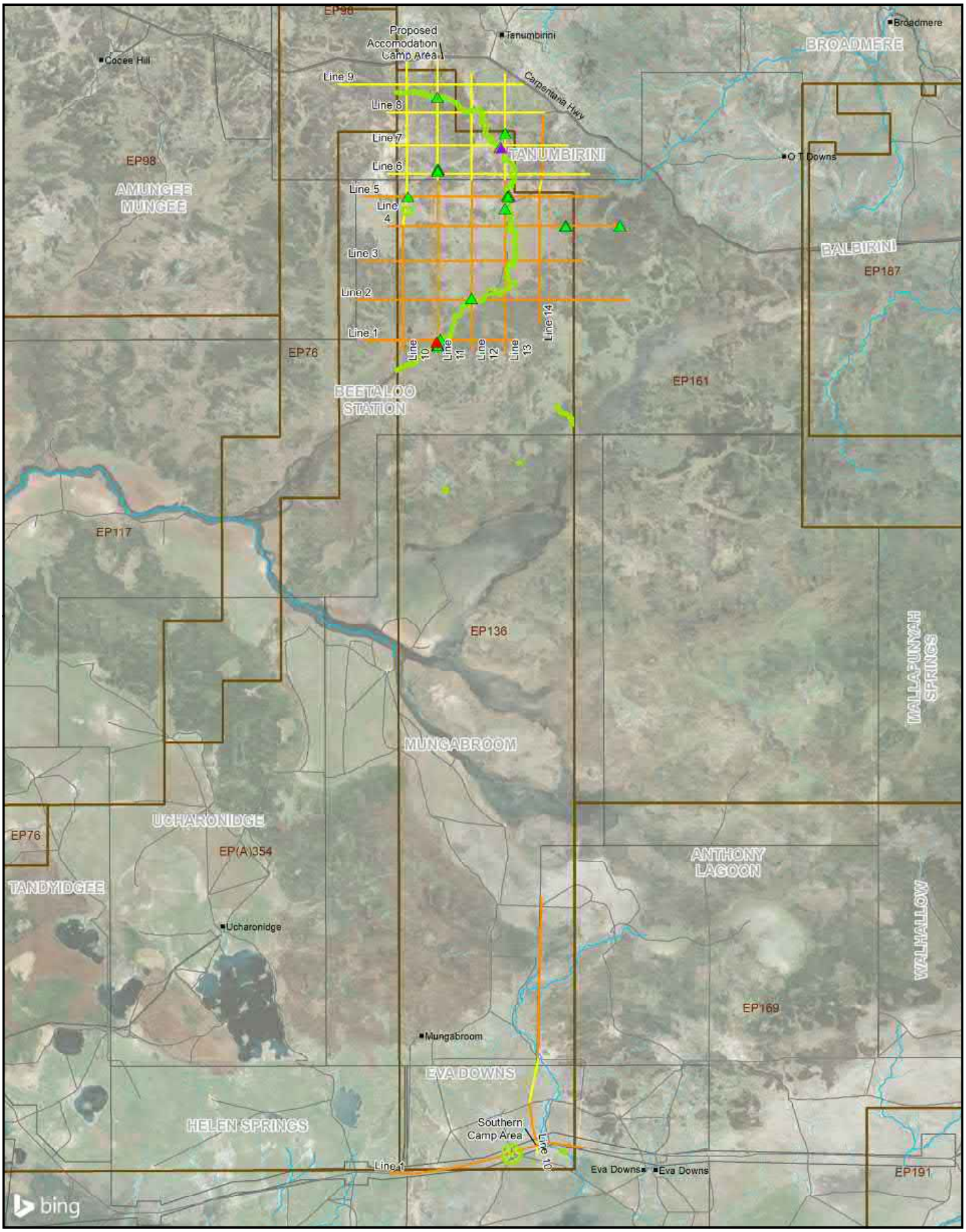
5.6.1 Historic heritage assessment

Australian Heritage Database

A search of the Australia Heritage Database across a 125 km x 125 km search area did not identify any listed heritage places within the survey area. An additional search within a that encompasses the survey area also reveals no statutory listed heritage places.

NT Heritage Register

A search of the Northern Territory (NT) Heritage Register identified 18 Aboriginal archaeological sites and no historic heritage sites within a 50 km x 50 km area that encompasses the Project Area. The proposed seismic line alignment will not impact previously identified heritage sites, with the closest recorded Aboriginal archaeological site (Yaroo Site 3b) being located approximately 250 m to the west of Seismic Line 9 (refer *to Appendix B of the Heritage Assessment Report*).



N

AECOM
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Projection: GDA 1994 MGA Zone 53

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1:528,000 (when printed at A3)

Aboriginal Archaeological Sites
- High Significance
- Moderate Significance
- Low Significance
- Restricted Work Areas

Seismic Lines
- Vegetation Clearing Required
- Existing Pastoral Track/Road

- Petroleum Exploration Permit
- Proposed Accomodation Camp

Drainage
- Major
- Minor
- Roads
- Cadastre

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd, Environmental Management Plan

Areas of Cultural Heritage Significance within EP136

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	15-Jul-2020
VERSION	1

Figure 19

A3 size

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6.0 Land Condition Summary

6.1 Northern and Southern Survey Area Land Condition Assessment

A land condition assessment was undertaken for the northern survey area in November 2019 and for the additional northern and southern survey area in May 2020. Detailed land condition description and photographs are provided below. The location of the northern survey area sites are shown in Figure 10 and southern survey sites are shown in Figure 11. Table 23 presents the distance in kilometres from the land condition classification of the individual seismic lines.

A clear difference can be observed for land condition scores recorded on Tanumbirini Station in the north compared to those recorded at Beetaloo Station in the south. This is due to the cleared tracks present on Beetaloo Station. Sweetpea is preferentially undertaking seismic exploration along these tracks to avoid the requirement to clear vegetation. Land condition nearby to creeks and cattle watering points were generally classed as poor or disturbed due to evidence of erosion, bare soils and vegetation impacts. Areas displaying obvious fire impacts to vegetation structure and condition were also considered to be disturbed. Areas of intact land and vegetation were scored either good or excellent. Large patches of Lancewood (*Acacia shirleyi*) were classed as excellent in the northern survey area. Grasslands within the southern survey area were classed as good.

Table 23 Seismic Line Land Condition Classification in Kilometres

Line #	Total (km)	Very Poor (km)	Poor (km)	Disturbed (km)	Good (km)	Excellent (km)	Existing Track (km)
Northern Survey Area							
Line 1	22.93	-	-	-	-	-	22.93
Line 2	41.09	-	-	-	-	-	41.09
Line 3	33.32	-	-	-	-	-	33.32
Line 4	35.31	-	-	-	-	-	35.31
Line 5	35.86	-	-	-	-	-	35.86
Line 6	30.5	-	0.88	17.32	12.3	-	-
Line 7	27.31	0.92	1.4	9.15	7.28	8.56	-
Line 8	23.71	-	1.92	11.4	9.21	1.18	-
Line 9	27.89	-	0.66	15.52	10.79	0.92	-
Line 10	43.87	-	1.82	17.59	5.16	0.5	18.8
Line 11	43.73	-	0.65	11.99	3.95	1.4	25.74
Line 12	41.6	-	3.08	11.9	-	-	26.62
Line 13	41.6	1.55	0.75	3.78	9.25	0.5	25.77
Line 14	31.77	-	-	0.93	0.6	0	30.24
Total (km)	**480.49**	**2.47**	**11.16**	**99.58**	**58.54**	**13.06**	**295.68**
	% of Line	**1%**	**2%**	**21%**	**12%**	**3%**	**62%**
Southern Survey Area							
Line 1	30.21	-	-	-	-	-	30.21
Line 2	38.83	-	-	-	8.97	-	29.86
Total (km)	**69.04**	**-**	**-**	**-**	**8.97**	**-**	**60.07**
	% of Line	**0%**	**0%**	**0%**	**13%**	**0%**	**87%**

Northern Site 1 (NL1)			
Location	-16.865807°, 134.562257°	**Veg. community**	*Eucalyptus pruinosa* open woodland
Landform	Alluvial Plain	**Soil**	Poorly drained clays (Vertosol)




Obstruction cover	Insignificant (<1%)	**Crust broken-ness**	Moderately broken
Perennial basal cover	Low (1-10%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	<10%	**Microtopography**	Deep formations, with visible base (25-100mm)
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Brittle, breaking into amorphous fragments or powder

Soil	A1:	0-0.05m, Sandy clay loam, colour: 2.5Y 3/1 Very dark grey, pH 6.5
	B1:	0.05-0.1m, Medium clay, colour: 10YR 5/1 Grey, pH 6.5
Vegetation description	**Upper storey:**	*Eucalyptus pruinosa* (3-5m)
	Mid-storey:	*Eucalyptus pruinosa*
	Understorey:	*Dichanthium* sp.
Disturbance	Grazing in current season: approximately 25% of area, 25-50% vegetation impacted. No fire damage. Sheet water erosion across 50-75% of area. Minor rill erosion.	
Habitat	Scattered hollows, scattered small and large fallen branches, surface rocks absent, mistletoe common. Poor habitat for hollow and log dependant fauna, average habitat for small birds	
Fauna	Potential habitat for threatened species such as Plains Death Adder and Grey Falcon.	

Northern Site 2 (NL2)			
Location	-16.67126°, 134.693178°	**Veg. community**	Corymbia (mixed) open woodland
Landform	Plain	**Soil**	Gravelly brown earths (Kandosol)




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	NA
Perennial basal cover	Low (1-10%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	10-25%, local, slight	**Microtopography**	Smooth, insignificant retention
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.05m, Sandy clay loam, colour: 7.5 YR 3/2 dark brown, 50% sub-rounded, 3mm ironstone gravels, slake score 4, pH 6.5
	B1:	0.05-0.1m, Sandy clay loam, colour: 7.5 YR 4/3 Brown, 50% sub-rounded 3-10mm ironstone gravels, slake score 4, pH 6.5
Vegetation description	**Upper storey:**	*Corymbia dichromophloia* (dominant), *Corymbia terminalis, Eucalyptus chlorophylla* and *Erythrophleum chlorostachys* (scattered). (5-10m)
	Mid-storey:	*Erythrophleum chlorostachys* (dominant), *Terminalia canescens* and *Grevillea striata*
	Understorey:	*Acacia wickhamii, Carissa lanceolata, Triodia bitextura* (scattered)
Disturbance	Grazing in current season: approximately 5% of area, 5-25% ground vegetation impacted. Fire damage 2-3 years previous, minor scars of 1-4m on some trees/shrubs	
Habitat	Abundant hollows, common small branches and sparse large branches, small surface rocks common, large rocks absent, mistletoe absent. Excellent habitat for hollow dependant fauna, good habitat for log dependent fauna, good habitat for small birds.	
Fauna	Observed fauna included Rufous Whistler (*Pachycephala rufiventris*) and Little Woodswallow (*Artamus minor*). Potential habitat for threatened species such as Yellow-spotted Monitor and Grey Falcon.	

Northern Site 3 (NL3)			
Location	-16.669343°, 134.659452°	**Veg. community**	*Eucalyptus chlorophylla* open woodland
Landform	Alluvial Plain	**Soil**	Poorly drained clays (Vertosol)




Obstruction cover	Low (1-15%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Slight (5-20%), sand
Litter cover	10-25%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.05m, Sandy clay loam, colour: 7.5YR 4/3 brown, 50% 1mm orange mottles, slake score 3, pH 6
	B1:	0.05-0.1m, Light clay, colour: 7.5YR 5/3 brown, 50% sub-rounded 3-10mm ironstone gravels, slake score 1, pH 6.
Vegetation description	**Upper storey:**	*Eucalyptus chlorophylla* (3-5m)
	Mid-storey:	*Eucalyptus chlorophylla*
	Understorey:	*Dichanthium* sp., *Eragrostis* sp., *Chrysopogon fallax* (sparse), *Carissa lanceolata*
Disturbance	Grazing in current season: approximately 30% of area, 5-25% ground vegetation impacted. Fire damage 2-3 years previous, minor scars of 1-4m on some trees/shrubs. Sheet water erosion across 5-25% of area.	
Habitat	Common hollows (small), scattered small and large fallen branches, surface rocks absent, mistletoe scattered. Average habitat for hollow and log dependant fauna, average habitat for small birds	
Fauna	Observed fauna included Whistling Kite (*Haliastur sphenurus*). Potential habitat for threatened species such as Plains Death Adder and Grey Falcon.	

Northern Site 4 (NL4)			
Location	-16.671529°, 134.516323°	**Veg. community**	*Eucalyptus pruinosa* open woodland
Landform	Alluvial Plain	**Soil**	Poorly drained clays (Vertosol)




Obstruction cover	Low (1-15%)	**Crust broken-ness**	Moderately broken
Perennial basal cover	Insignificant (<1%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	<10%, local, slight	**Microtopography**	Deep formations with visible base (25-100mm)
Cryptogram cover	Extensive (>50%)	**Surface nature**	Self-mulching clay

Soil	A1:	0-0.05m, Sandy clay loam, colour: 10YR 3/2, very dark greyish brown, 10% 3-5mm sub-angular ironstone fragments, slickensides, pH 6.
	B1:	0.05-0.1m, Light clay, colour: 10YR 3/2 very dark greyish brown, 10% sub-angular 3-5mm ironstone fragments, slickensides, slake score 2, pH 6.
Vegetation description	**Upper storey:**	*Eucalyptus pruinosa* (3-5m)
	Mid-storey:	*Eucalyptus pruinosa*
	Understorey:	*Eriachne* sp., *Carissa lanceolata*
Disturbance	Grazing in current season: approximately 25% of area, 5-25% ground vegetation impacted. No fire damage evident. Sheet and gully water erosion across >75% of area.	
Habitat	Hollows absent, scattered small fallen branches, small rocks common, mistletoe absent. Poor habitat for hollow and log dependant fauna, average habitat for small birds.	
Fauna	Potential habitat for threatened species such as Plains Death Adder and Grey Falcon.	

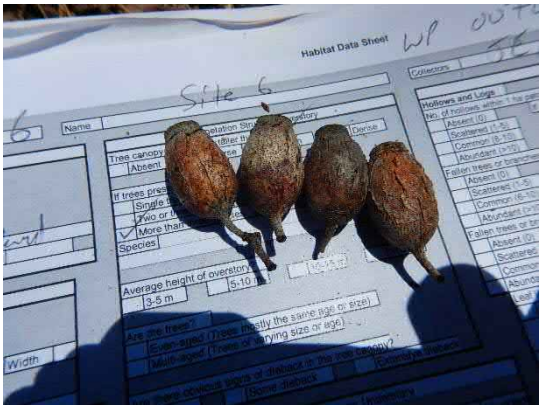
Northern Site 5 (NL5)			
Location	-16.671879°, 134.5153°	**Veg. community**	*Eucalyptus leucophloia* woodland
Landform	Plain	**Soil**	Gravelly brown earths




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	NA
Perennial basal cover	High (>20%)	**Deposited material**	Slight (5-20%), sand
Litter cover	<10%, local, slight	**Microtopography**	Smooth, insignificant retention
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.05m, Silty clay loam, colour: 7.5YR 4/3 brown, 10% 10-50mm sub-angular fragments, slake score 2, pH 5.
	A3:	0.05-0.1m, Light clay, colour: 7.5YR 5/3 brown, 80% sub-angular 10-100mm fragments, slake score 2, pH 6.5.
Vegetation description	**Upper storey:**	*Eucalyptus leucophloia* subsp. *euroa* (dominant), *Macropteranthes kekwickii* (5-10m)
	Mid-storey:	*Acacia sp., Macropteranthes kekwickii, Eucalyptus leucophloia* subsp. *euroa*
	Understorey:	*Triodia bitextura, Dichanthium* sp., *Dodonea coriacea*
Disturbance	Grazing in current season: approximately 5% of area, <5% ground vegetation impacted. No fire damage evident.	
Habitat	Hollows abundant, small and large fallen branches common, small rocks abundant, mistletoe absent. Excellent habitat for hollow dependant fauna, good habitat for log dependent fauna and small birds.	
Fauna	Observed fauna included Variegated Fairy-wren (*Malurus lamberti*). Potential habitat for threatened species such as Gouldian Finch, Yellow-spotted Monitor and Grey Falcon.	

Northern Site 6 (NL6)			
Location	-16.56115°, 134.420524°	**Veg. community**	*Corymbia terminalis* open woodland
Landform	Foot slope	**Soil**	Poorly drained mottled earths



Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Moderate (20-50%), sand
Litter cover	50-75%, local, slight	**Microtopography**	Smooth, insignificant retention
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Surface loose-sandy

Soil	A1:	0-0.03m, Sandy loam, colour: 7.5YR 3/2 dark brown, 10-20mm sub-rounded ironstone fragments, slake score 3, pH 6.
	B1:	0.03-0.3m, Sandy loam, colour: 7.5YR 4/1 dark grey, 10% sub-angular and sub-rounded ironstone fragments, 10% orange 1mm mottles, slake score 2, pH 6.5.
Vegetation description	**Upper storey:**	*Corymbia terminalis* (dominant) *and Erythrophleum chlorostachys* (sparse) (5-10m)
	Mid-storey:	*Macropteranthes kekwickii, Melaleuca viridiflora, Erythrophleum chlorostachys, Acacia sp, Petalostigma banksii, Petalostigma pubescens*
	Understorey:	*Triodia bitextura* (dominant), *Aristida* sp., *Acacia* sp. and *Melaleuca viridiflora*
Disturbance	Grazing disturbance not evident. Fire damage in previous 1-2 years, minor scars <1m on some trees/shrubs	
Habitat	Hollows common, small fallen branches common, large fallen logs scattered, small rocks scattered, mistletoe absent. Average habitat for hollow and log dependent fauna. Good habitat for small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor, Northern (Crested) Shrike-tit and Grey Falcon.	

Northern Site 7 (NL7)			
Location	-16.605035°, 134.649864°	**Veg. community**	*Macropteranthes kekwickii* open shrubland
Landform	Plain	**Soil**	Brown earths




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	Slightly broken
Perennial basal cover	High (>20%)	**Deposited material**	Slight (5-20%), sand
Litter cover	75-100%	**Microtopography**	Smooth, insignificant retention
Cryptogram cover	Moderate (10-50%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.03m, Sandy loam, colour: 2.5YR 4/4 reddish brown, slake score 1, pH 7.
	B1:	0.03-0.05m, Sandy clay loam, colour: 10YR 5/4 yellowish brown, slake score 3, pH 6.5.
Vegetation description	**Upper storey:**	*Macropteranthes kekwickii* (dominant), *Eucalyptus microtheca* (sparse) (3-5m)
	Mid-storey:	*Macropteranthes kekwickii, Acacia* sp.
	Understorey:	*Dichanthium fecundum* (dominant), *Chrysopogon fallax* (sparse)
Disturbance	Grazing in current season: approximately 2% of area, <5% ground vegetation impacted. Fire damage in previous 1-2 years, minor scars 1-4m on most trees/shrubs	
Habitat	Small hollows scattered, small and large fallen branches scattered, surface rocks and mistletoe absent. Poor habitat hollow and log dependent fauna, and small birds.	
Fauna	Potential habitat for threatened species such as Grey Falcon.	

Northern Site 8 (NL8)			
Location	-16.585808°, 134.656187°	**Veg. community**	*Acacia shirleyi* open-forest
Landform	Plain	**Soil**	Gravelly brown earths




Obstruction cover	Very high (>50%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	75-100%	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	NA	**Surface nature**	Crust very hard and brittle

Soil	A1:	0-0.05m, Sandy loam (heavy), colour: 5YR 3/3 dark reddish brown, 75% sub-rounded and sub-angular 10-30mm ironstone fragments
Vegetation description	**Upper storey:**	*Acacia shirleyi* (dominant) and *Macropteranthes kekwickii* (8-10m)
	Mid-storey:	*Acacia shirleyi* (dominant) and *Macropteranthes kekwickii*
	Understorey:	*Chrysopogon fallax, Eriachne* sp.*, Carissa lanceolata* (all sparse)
Disturbance	Grazing in current season: approximately 5% of area, <5% ground vegetation impacted. Fire damage in previous 1-2 years, minor scars 1-4m on most trees/shrubs	
Habitat	Small hollows scattered, small fallen branches abundant, large logs common, small surface rocks common, scattered mistletoe. Poor habitat for hollow dependent fauna, excellent habitat for log dependent fauna, good habitat for small birds.	
Fauna	Unsuitable habitat for threatened species.	

Northern Site 9 (NL9)			
Location	-16.585091°, 134.655744°	**Veg. community**	*Eucalyptus chlorophylla* open-woodland
Landform	Alluvial Plain		




Obstruction cover	Low (1-15%)	**Crust broken-ness**	NA
Perennial basal cover	Low (1-10%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	75-100%	**Microtopography**	Smooth, insignificant retention
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust very hard

Vegetation description	**Upper storey:**	*Eucalyptus chlorophylla, Eucalyptus camaldulensis* var. *obtusa* (5-6)
	Mid-storey:	*Melaleuca nervosa, Melaleuca citrolens, Macropteranthes kekwickii*
	Understorey:	*Dichanthium* sp., *Chrysopogon fallax* (sparse), *Melaleuca citrolens*
Disturbance	Grazing in current season: approximately 5% of area, <5% ground vegetation impacted. No evident fire damage. Sheet water erosion across 25-50% of area.	
Habitat	Hollows common, small and large fallen branches scattered, small surface rocks scattered, mistletoe absent. Good habitat for hollow dependent fauna, average habitat for log dependent fauna, good habitat for small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor, Northern (Crested) Shrike-tit and Grey Falcon.	

Northern Site 10 (NL10)			
Location	-16.692367°, 134.654356°	**Veg. community**	Corymbia (mixed) open woodland
Landform	Plain	**Soil**	Gravelly brown earths




Obstruction cover	Very high (>50%)	**Crust broken-ness**	NA
Perennial basal cover	High (>20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	75-100%	**Microtopography**	
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.03m, Sandy loam (heavy), colour: 2.5Y3/3, dark olive brown, 10% sub-rounded 3mm ironstone fragments, pH 6
	A3:	0.03-0.1m, Sandy clay loam, 2.5 Y 4/3 olive brown, 20% sub-rounded 3mm ironstone fragments, pH 5.5
Vegetation description	**Upper storey:**	*Corymbia terminalis, Corymbia dichromophloia, Erythrophleum chlorostachys, Eucalyptus tectifica* and *Macropteranthes kekwickii* (5-10m)
	Mid-storey:	*Acacia lysiphloia* (dominant), *Macropteranthes kekwickii, Erythrophleum chlorostachys, Dodonaea coriacea*
	Understorey:	*Dichanthium fecundum, Chrysopogon fallax*
Disturbance	Grazing in previous 1-2 years: approximately 10% of area, <5% ground vegetation impacted. Fire damage in previous 1-2 years, some trees/shrubs killed	
Habitat	Hollows scattered, small and large fallen branches scattered, surface rocks and mistletoes absent. Good habitat for hollow and log dependent fauna, and small birds.	
Fauna	Observed fauna included Apostlebird (*Struthidea cinereal*) Potential habitat for threatened species such as Yellow-spotted Monitor, Northern (Crested) Shrike-tit and Grey Falcon.	

Northern Site 11 (NL11)			
Location	-16.809622°, 134.606852°	**Veg. community**	*Eucalyptus microtheca* woodland
Landform	Alluvial plain	**Soil**	Brown earths




Obstruction cover	Low (1-15%)	**Crust broken-ness**	Intact
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Slight (5-20%), sand
Litter cover	25-50%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	Slight (1-10%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.03m, Sandy loam (heavy), colour: 7.5YR 3/4 dark brown, slaking score 2, pH 5
	A3:	0.03-0.1m, Sandy loam (heavy), 7.5YR 3/4 dark brown, slaking score 2, pH 4.5
Vegetation description	**Upper storey:**	*Eucalyptus microtheca (dominant), Eucalyptus camaldulensis* var. *obtusa* (near creek, sparse), *Corymbia terminalis* (sparse) (3-5m)
	Mid-storey:	*Eucalyptus microtheca* and *Acacia holosericea*
	Understorey:	*Chrysopogon fallax* and other burnt tussock grasses
Disturbance	Grazing in current season: approximately 40% of area, 25-50% ground vegetation impacted. Fire damage in previous 2-3 years, minor 1-4m scars on some trees/shrubs	
Habitat	Small hollows common, small fallen branches common, large logs scattered, small surface rocks and mistletoe scattered. Average habitat for hollow dependent fauna. Good habitat for log dependent fauna and small birds.	
Fauna	Observed fauna included Brown Goshawk (*Accipiter fasciatus*) and tree skink (*Cryptoblepharus* sp.) Potential habitat for threatened species such as Plains Death Adder, Yellow-spotted Monitor and Grey Falcon.	

Northern Site 12 (NL12)			
Location	-16.535686 °, 134.558292°	**Veg. community**	*Eucalyptus microtheca* open woodland
Landform	Alluvial plain		




Obstruction cover	Low (1-15%)	**Litter cover**	25-50%, local, slight
Perennial basal cover	Low (1-10%)	**Cryptogram cover**	Slight (1-10%)
Surface nature	Crust moderately hard		
Vegetation description	**Upper storey:**	*Eucalyptus microtheca, Eucalyptus camaldulensis* var. *obtusa* (dominant), *Macropteranthes kekwickii* (sparse) (3-5m)	
	Mid-storey:	*Eucalyptus microtheca* and *Acacia holosericea*	
	Understorey:	*Dichanthium fecundum, Eragrostis* sp., *Eriachne* sp.	
Disturbance	Grazing in current season: approximately 25% of area, 5-25% ground vegetation impacted. Fire damage in previous 2-3 years, minor <1m scars on some trees/shrubs. Sheet and gully erosion, ~20% area eroded.		
Habitat	Hollows abundant, scattered small and large fallen branches, small surface rocks and mistletoe scattered. Good habitat for hollow and log dependent fauna, and small birds.		
Fauna	Potential habitat for threatened species such as Plains Death Adder, Yellow-spotted Monitor and Grey Falcon.		

Northern Site 13 (NL13)			
Location	-16.630433°, 134.559263 °	**Veg. community**	*Macropteranthes kekwickii* shrubland
Landform	Gently undulating plain	**Soil**	Gravelly brown earths




Obstruction cover	High (30-50%)	**Crust broken-ness**	Intact
Perennial basal cover	High (>20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	25-50%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	NA	**Surface nature**	Crust easily broken with finger pressure

Soil	A1:	0-0.03m, Sandy loam (heavy), colour: 7.5YR 3/3 dark brown, 75% sub-rounded to sub-angular 30mm ironstone gravels, slaking score 4, pH 6.5
	B1:	0.03-0.15m, Sandy clay loam, 7.5YR 4/2 brown, 75% sub-rounded & sub-angular 5-30mm ironstone gravels, slaking score 4, pH 6.5
Vegetation description	**Upper storey:**	*Macropteranthes kekwickii* (dominant), *Acacia shirleyi, Corymbia terminalis, Erythrophleum chlorostachys* (sparse)
	Mid-storey:	*Macropteranthes kekwickii* (dominant), *Acacia shirleyi*
	Understorey:	*Chrysopogon fallax, Grewia retusifolia, Dodonaea coriacea, Terminalia canescens*
Disturbance	Grazing in previous 1-2 years: approximately 15% of area, 5-25% ground vegetation impacted. Fire damage in previous 1-2 years, minor <1m scars on some trees/shrubs	
Habitat	Hollows scattered, small fallen branches abundant and large logs common, small surface rocks common, mistletoe scattered. Average habitat for hollow dependent fauna. Excellent habitat for log dependent fauna and good habitat for small birds.	
Fauna	Observed fauna included Apostlebird (*Struthidea cinereal*). Potential habitat for threatened species such as Crested (Northern) Shrike-tit and Grey Falcon.	

Northern Site 14 (NL14)			
Location	-16.629052°, 134.55792°	**Veg. community**	Corymbia (mixed) open woodland
Landform	Gently undulating plain	**Soil**	Brown earths




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	Intact
Perennial basal cover	High (>20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	25-50%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust easily broken with finger pressure

Soil	A1:	0-0.05m, Sandy loam (heavy), colour: 7.5YR 3/4 dark brown, well graded uniform fines, slaking score 4, pH 5.5
	B1:	0.05-0.15m, Sandy clay loam, 7.5YR 4/3 brown, well graded uniform fines, organics, slaking score 4, pH 6.5
Vegetation description	**Upper storey:**	*Corymbia dichromophloia* (dominant), *Petalostigma pubescens, Terminalia canescens, Erythrophleum chlorostachys, Corymbia ferruginea*
	Mid-storey:	*Terminalia canescens* (dominant), *Corymbia dichromophloia, Erythrophleum chlorostachys*
	Ground storey:	*Triodia bitextura* (dominant), *Chrysopogon fallax* (sparse), *Eriachne sp., Terminalia canescens, Grewia retusifolia*
Disturbance	Grazing in previous 1-2 years: approximately 2% of area, <5% ground vegetation impacted. Fire damage in previous 1-2 years, some trees/shrubs killed.	
Habitat	Hollows scattered, small fallen branches common and large logs scattered, small surface rocks and mistletoe scattered. Average habitat for hollow and log dependent fauna. Good habitat for small birds.	
Fauna	Observed fauna included Weebill (*Smicrornis brevirostris*), Grey-crowned Babbler (*Pomatostomus temporalis*) and Apostlebird. Potential habitat for threatened species such as Yellow-spotted Monitor, Crested (Northern) Shrike-tit and Grey Falcon.	

Northern Site 15 (NL15)			
Location	-16.856204°, 134.558891°	**Veg. community**	*Eucalyptus microtheca* isolated trees
Landform	Alluvial plain	**Soil**	Mottled brown earths




Obstruction cover	Low (1-15%)	**Crust broken-ness**	Intact	**Cryptogram cover**	Insignificant (<1%)
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Extensive (>50%), sand		
Litter cover	50-75%, local, slight	**Microtopography**	Deep formations with visible base (25-100mm)		

Soil	A1:	0-0.05m, Sandy loam, colour: 7.5YR 3/4 dark brown, 30% sub-rounded 3-5mm ironstone gravels, slaking score 4, pH 4.5
	B1:	0.05-0.10m, Sandy loam, 10YR 4/4 dark yellowish brown, orange 1mm mottles, slaking score 3, pH 5
	B2	0.1-0.35, sandy clay loam, 10YR 3/6, dark yellowish brown, orange 1mm mottles, slaking score 2, pH 6.5
Vegetation description	**Upper storey:**	*Eucalyptus microtheca* (dominant) and *Acacia holosericea*
	Mid-storey:	*Eucalyptus microtheca* (dominant) and *Acacia holosericea*
	Understorey:	*Dichanthium fecundum* (dominant), *Chrysopogon fallax* (sparse)
Disturbance	Grazing in previous 1-2 years: approximately 15% of area, 5-25% ground vegetation impacted. Fire damage in previous 2-3 years, minor <1m scars on some trees/shrubs	
Habitat	Scattered hollows and fallen branches, small surface rocks and mistletoe scattered. Poor habitat for hollow and log dependent fauna. Average habitat for small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor, Plains Death Adder and Grey Falcon.	

Northern Site 16 (NL16)			
Location	-16.875478°, 134.558842°	**Veg. community**	*Acacia shirleyi* forest
Landform	Plain	**Soil**	Brown earths




Obstruction cover	Very high (>50%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	10-25%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust moderately hard

Soil	A1:	0-0.03m, Sandy loam, colour: 5YR 2.5/2 dark reddish brown, 10% sub-rounded 3mm ironstone gravels, slaking score 3, pH 6
	B1:	0.03-0.10m, Sandy loam (heavy), 7.5YR 3/3 dark brown, slaking score 4, pH 6.5
	B2	0.10-0.15m, sandy clay loam, 7.5YR 4/4 dark brown, slaking score 4, pH 5
Vegetation description	**Upper storey:**	*Acacia shirleyi* (5-10m)
	Understorey:	*Aristida* sp.*, Chrysopogon fallax, Acacia lysiphloia*
Disturbance	Grazing in present season: approximately 40% of area, 25-50% ground vegetation impacted. Fire damage in previous 1-2 years, scars 1-4m on most trees/shrubs	
Habitat	Hollows absent. Small and large fallen branches abundant. Small surface rocks common. Mistletoe scattered. Excellent habitat for log dependent fauna. Average habitat for small birds. Habitat for hollow and rock dependent fauna absent.	
Fauna	Observed fauna included tree skink (*Cryptoblepharus* sp.). Unsuitable habitat for threatened species.	

Northern Site 17 (NL17)			
Location	-16.828662°, 134.508695°	**Veg. community**	*Corymbia dichromophloia* open woodland
Landform	Plain	**Soil**	Gravelly red earths (Kandosol)




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Slight (5-20%), sand
Litter cover	25-50%, local, slight	**Microtopography**	Shallow depressions, low retention (3-8mm)
Cryptogram cover	Insignificant (<1%)	**Surface nature**	Crust is easily broken with finger pressure

Soil	A1:	0-0.03m, Sandy loam, colour: 2.5YR 3/3 dark reddish brown, 20% sub-rounded 3-5mm ironstone gravels, pH 6.5
	B1:	0.03-0.10m, Sandy loam (heavy), 2.5YR 5/3 reddish brown, 5% sub-rounded 3-5mm ironstone gravels slaking score 4, pH 7
	B2	0.10-0.15m, sandy clay loam, 2.5YR 3/6 dark red, 5% sub-rounded 3-5mm ironstone gravels, slaking score 4
Vegetation description	**Upper storey:**	*Corymbia dichromophloia* (5-10m)
	Mid-storey	*Petalostigma pubescens, Erythrophleum chlorostachys*
	Understorey:	*Triodia bitextura, Chrysopogon fallax, Acacia wickhamii, Carissa lanceolata*
Disturbance	Grazing in present season: approximately 20% of area, 5-25% ground vegetation impacted. Fire damage in present season, several trees/shrubs killed in mid-storey	
Habitat	Hollows common. Small and large fallen branches scattered. Small surface rocks scattered. Mistletoe absent. Good habitat for hollow dependent fauna. Average habitat for log dependent fauna and small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor and Grey Falcon.	

Northern Site 18 (NL18)			
Location	-16.667105°, 134.509016°	**Veg. community**	*Eucalyptus leucophloia* open woodland
Landform	Plain	**Soil**	Rudosol




Obstruction cover	Low (1-15%)	**Crust broken-ness**	NA
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Insignificant (0-5%)
Litter cover	10-25%, local, slight	**Cryptogram cover**	Insignificant (<1%)

Soil	A1:	0-0.05m, Loamy sand, 95% gravel cover on surface - Rudosol
Vegetation description	**Upper storey:**	*Eucalyptus leucophloia* subsp. *euroa* (3-5m)
	Mid-storey	*Acacia wickhamii, Acacia sp.*
	Understorey:	*Triodia bitextura, Dichanthium fecundum*
Disturbance	No evidence of grazing impacts. Fire damage 2-3 years previous, minor scars <1m on some trees/shrubs. Gully erosion across 10% of area.	
Habitat	Hollows common. Small and large fallen branches scattered. Small surface rocks abundant and large rocks common. Mistletoe absent. Good habitat for hollow dependent fauna. Average habitat for log and rock dependent fauna, and small birds.	
Fauna	Potential habitat for threatened species such as Gouldian Finch and Grey Falcon.	

Northern Site 19 (NL19)			
Location	-16.711383°, 134.813592°	**Veg. community**	*Corymbia dichromophloia* open woodland
Landform	Plain	**Soil**	Brown earths




Obstruction cover	Moderate (15-30%)	**Crust broken-ness**	Slightly broken
Perennial basal cover	Moderate (10-20%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	50-75%, local, slight	**Surface nature**	Crust is easily broken with finger pressure
Cryptogram cover	Moderate (10-50%)		

Soil	A1:	0-0.05m, sandy loam, colour: 10YR 2/2 very dark brown, fine grained, uniformed, slaking score 4, pH 7
	A3	0.05-0.1, sandy loam (heavy), colour: 10YR 3/2 very dark greyish brown, slaking score 4, pH 7
Vegetation description	**Upper storey:**	*Corymbia dichromophloia* (dominant), *Erythrophleum chlorostachys (sparse)* and *Macropteranthes kekwickii* (sparse) (5-10m)
	Mid-storey	Dead shrubs (unidentifiable), *Terminalia canescens*
	Understorey:	*Dichanthium fecundum, Chrysopogon fallax, Terminalia canescens* and *Petalostigma pubescens*
Disturbance	Grazing impacts in present season, approximately 30% of area, 5-25% of ground vegetation impacted. Fire damage 1-2 years previous, some trees/shrubs killed	
Habitat	Hollows scattered. Small fallen branches common, large logs absent. Small surface rocks and mistletoe scattered. Average habitat for log and hollow dependent fauna, and small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor and Grey Falcon.	

Northern Site 20 (NL20)			
Location	-16.710284°, 134.739562°	**Veg. community**	*Eucalyptus camaldulensis* isolated trees
Landform	Gently Undulating Plain	**Soil**	Poorly drained clays (Vertosol)

Obstruction cover	Low (1-15%)	**Crust broken-ness**	Slightly broken
Perennial basal cover	Low (1-10%)	**Deposited material**	Insignificant (0-5%), sand
Litter cover	10-25%, local, slight	**Surface nature**	Crust is easily broken with finger pressure
Cryptogram cover	Insignificant (<1%)	**Erosion**	Pedastal erosion, >30cm, moderate

Soil	A1:	0-0.03m, sandy clay loam (heavy), colour: 7.5YR 3/1 very dark grey, slaking score 2, pH 6
	B1:	0.03-0.35, light clay, colour: 7.5YR 4/4 brown, slaking score 4, pH 7
Vegetation description	**Upper storey:**	*Eucalyptus camaldulensis* var. *obtusa* (dominant), *Macropteranthes kekwickii* (sparse)
	Mid-storey	*Atalaya hemiglauca*
	Understorey:	*Dichanthium fecundum*
Disturbance	Grazing impacts in present season, approximately 30% of area, 5-25% of ground vegetation impacted. Fire damage 2-3 years previous, minor scars <1m on some trees/shrubs. Sheet and gully erosion, >75% of area eroded	
Habitat	Hollows scattered. Small fallen branches common, large logs scattered. Surface rocks and mistletoe absent. Average habitat for log and hollow dependent fauna, and small birds.	
Fauna	Potential habitat for threatened species such as Yellow-spotted Monitor, Plains Death Adder and Grey Falcon.	

Southern Site 1 (SL1)			
Location	-17.630595°, 134.704395°	**Veg. community**	*Sorghum timorense* open tussock grassland
Landform	Alluvial Plain		




Slope	<1%		
Soil drainage	Very poorly drained (seasonal waterlogging and inundation)		
Soil texture	Light clay		
Soil colour	Black		
Termite mounds	Absent		
Ground cover	Vegetation 30%, litter cover 10%, bare soil 60%		
Surface rocks	Siltstone		
Vegetation description	**Ground storey: 0-1 m**	*Sorghum timorense* (22%), *Iseilema vaginiflorum* (3%), *Sesbania muelleri* (3%)	
Disturbance	No fire, weeds or feral animal disturbance evident.		
Habitat	Poor fauna habitat. Fallen logs, tree hollows, mistletoe, flowering plants and leaf litter all absent.		

Southern Site 2 (SL2)			
Location	-17.670137°, 134.703712°	**Veg. community**	*Eucalyptus leucophloia* open woodland
Landform	Alluvial Plain		




Slope	<1%
Soil drainage	Poorly drained (seasonally waterlogged)
Soil texture	Sandy loam
Soil colour	Greyish
Termite mounds	Abundant
Ground cover	Vegetation 15%, litter cover 5%, bare soil 75%, rock cover 5%

Vegetation description	**Upper storey: 4-6 m**	*Eucalyptus leucophloia* (8%)
	Mid-storey: 1-4 m	*Eucalyptus pruinosa* (10%), *Carissa lanceolata* (4%)
	Understorey: 0-1 m	*Eulalia aurea* (6%), *Triodia bitextura* (5%), *Cullen plumosum* (2%)
Disturbance	No fire, weeds or feral animal disturbance evident.	
Habitat	Scattered fallen logs and tree hollows. Mistletoe, flowering plants and leaf litter absent.	

Southern Site 3 (SL3)			
Location	-17.692947°, 134.702798°	**Veg. community**	*Eucalyptus microtheca* open woodland
Landform	Floodplain		




Slope	<1%
Soil drainage	Very poorly drained (seasonal waterlogging and inundation)
Soil texture	Sandy loam
Soil colour	Yellowish brown
Termite mounds	Common
Ground cover	Vegetation 15%, litter cover 5%, bare soil 75%, gravel 5%

Vegetation description	**Upper storey: 4-7 m**	*Eucalyptus microtheca* (10%),
	Mid-storey: 1-4 m	*Ventilago viminalis* (4%), *Carissa lanceolata* (3%), *Ehretia saligna* (1%)
	Understorey: 0-1 m	*Eulalia aurea* (8%), *Chrysopogon pallidus* (3%), *Eriachne armitii* (2%)
Disturbance	No fire, weeds or feral animal disturbance evident.	
Habitat	Scattered fallen logs and tree hollows. Mistletoe, flowering plants and leaf litter absent.	

Southern Site 4 (SL4)			
Location	-17.727650°, 134.702120°	**Veg. community**	*Eucalyptus pruinosa* open woodland
Landform	Alluvial Plain		




Slope	<1%
Soil drainage	Very poorly drained (seasonal waterlogging and inundation)
Soil texture	Sandy clay loam
Soil colour	Yellowish brown
Termite mounds	Common
Ground cover	Vegetation 30%, bare soil 68%, gravel 2%

Vegetation description	**Upper storey: 4-6 m**	*Eucalyptus pruinosa* (7%)
	Mid-storey: 1-4 m	*Eucalyptus pruinosa* (2%), *Carissa lanceolata* (2%)
	Understorey: 0-1 m	*Eulalia aurea* (20%), *Chrysopogon pallidus* (5%), *Eriachne armitii* (5%)
Disturbance	No fire, weeds or feral animal disturbance evident.	
Habitat	Poor fauna habitat. Fallen logs, tree hollows, mistletoe, flowering plants and leaf litter all absent.	

Southern Site 5 (SL5)			
Location	-17.750727°, 134.701108°	**Veg. community**	*Eucalyptus microtheca* open woodland
Landform	Floodplain		




Slope	<1%		
Soil drainage	Very poorly drained (seasonal waterlogging and inundation)		
Soil texture	Clay loam		
Soil colour	Brown		
Termite mounds	Absent		
Ground Cover	Vegetation 50%, litter cover 10%, bare soil 40%		
Vegetation description	**Upper storey: 3-5 m**	*Eucalyptus microtheca* (6%)	
	Mid-storey: 1-4 m	*Eucalyptus microtheca* (10%)	
	Understorey: 0-1 m	*Aristida inaequiglumis* (30%), *Eriachne armitii* (5%)	
Disturbance	No fire, weeds or feral animal disturbance evident.		
Habitat	Poor fauna habitat. Fallen logs, tree hollows, mistletoe, flowering plants and leaf litter all absent.		

Southern Site 6 (SL6)			
Location	-17.762897°, 134.701820°	**Veg. community**	*Corymbia dichromophloia* open woodland
Landform	Alluvial Plain		




Slope	<1%
Soil drainage	Moderately well drained (occasional waterlogging)
Soil texture	Loamy sand
Soil colour	Reddish brown
Termite mounds	Common
Ground cover	Vegetation 20%, litter cover 5%, bare soil 55%, gravel 20%
Surface rocks	Laterite, 60% <0.6cm, 40% 0.6-2cm

Vegetation description	**Upper storey: 7-10 m**	*Corymbia dichromophloia* (8%)
	Mid-storey: 1-5 m	*Hakea arborescens* (5%), *Terminalia canescens* (1%)
	Understorey: 0-0.5 m	*Triodia bitextura* (20%)
Disturbance	Major scars on trees/shrubs. Fire impacts more than 2 years ago.	
Habitat	Scattered fallen logs. Tree hollows, mistletoe, flowering plants and leaf litter absent.	

Southern Site 7 (SL7)			
Location	-17.789008°, 134.700470°	**Veg. community**	*Corymbia terminalis* and *Eucalyptus chlorophylla* open woodland
Landform	Alluvial Plain		




Slope	<1%
Soil drainage	Rapidly drained
Soil texture	Sandy loam
Soil colour	Reddish
Termite mounds	Common
Ground cover	Vegetation 15%, litter cover 5%, bare soil 75%, gravel 5%
Surface rocks	Laterite, <0.6-2 cm

Vegetation description	**Upper storey: 5-7 m**	*Corymbia terminalis* (4%), *Eucalyptus chlorophylla* (3%)
	Mid-storey: 1-4 m	*Hakea arborescens* (1%), *Eucalyptus pruinosa* (2%)
	Understorey: 0-0.5 m	*Triodia bitextura* (10%), *Acacia lysiphloia* (3%)
Disturbance	Major scars on trees/shrubs. Fire impacts more than 2 years ago.	
Habitat	Poor fauna habitat. Fallen logs, tree hollows, mistletoe, flowering plants and leaf litter all absent.	

7.0 Summary

During November 2019 and May 2020 surveys, AECOM undertook land condition assessments (LCA) and heritage assessments (HA) across 580.29 km of proposed seismic lines in the northern survey area on Tanumbirini and Beetaloo Stations and 68.99 km of proposed seismic lines in the southern survey area on Anthony Lagoon and Eva Downs Stations.

The aim of the LCA was identify and document site condition prior to the proposed activities occurring in the footprint of the proposed seismic program and inform the preparation of the Environmental Management Plan (EMP). The proposed northern survey program will have a total disturbance area of approximately 242.15 ha, which includes a 2 ha field camp and will utilise 293.29 km (91%) of existing access tracks. The southern survey program will have a total disturbance area of approximately 36.50 ha, including the 2 ha field camp and will utilise 59.99 km of existing access track including 30.20 km along the Barkly Stock Route Road.

The LCA has identified the ecological conditions and documented the site condition prior to Sweetpea commencing exploration activities. Information obtained during field surveys will set a benchmark of land condition to aim for when undertaking rehabilitation of the site once exploration activities have been completed. The desktop review of the northern seismic alignments confirms similar conditions are likely to be expected from what already has been captured in the November 2019 and May 2020 surveys.

The desktop review and field survey assisted in identifying the potential environmental risks and impacts to the environment based on the conditions identified on site and has allowed the development of mitigation measures to minimise Sweetpea and its contractors impacts on the environment and heritage.

During the field survey proposed seismic lines were assessed to be in generally good condition with no to low evidence of weeds and erosion. Disturbance from cattle was evident across the area; however, the level of disturbance to ground vegetation was less than 25% at the majority of sites assessed.

No EPBC listed threatened ecological communities or threatened species are likely to be significantly impacted from the proposed exploration program activities.

Overall, the impacts of the vegetation clearing for the proposed seismic lines and access tracks are considered minor from a landscape perspective. This will be facilitated by using existing pastoral access tracks that have already been cleared of vegetation. The surrounding habitat is extensive and most species are mobile and will be able to access surrounding habitat during the short duration of the seismic acquisition program.

Specific controls will be implemented for the ephemeral creek crossings and drainage lines to minimise disturbance. The seismic program is scheduled for October/November 2020 dry season when the creeks and drainage lines will be dry.

Mitigation measures are presented in the seismic exploration program EMP and will assist in minimising the impacts from Sweetpea's activities on the natural environment and EPBC listed species that may occur within the survey area.

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Appendix A1

Geographical Coordinates of Sweetpea Seismic Program

Appendix A1 Geographical Coordinates of Sweetpea Seismic Program

Activity Area	Station	Coordinates of Seismic Line				Total Length (km)	Total Area (Ha)*	Total Area of Vegetation Clearing (Ha)^
		Start of Line		End of Line				
		Lat	Long	Lat	Long			
Northern Exploration Area								
Line 1	Beetaloo	-16.86660	134.45300	-16.86660	134.66800	22.92	11.46	1.39
Line 2	Beetaloo	-16.81160	134.44300	-16.81160	134.82900	41.10	20.55	4.92
Line 3	Beetaloo	-16.75830	134.45300	-16.75830	134.76500	33.32	16.66	3.34
Line 4	Beetaloo	-16.71090	134.48700	-16.71070	134.81800	35.31	17.66	2.51
Line 5	Beetaloo	-16.67080	134.45500	-16.67100	134.79100	35.88	17.94	4.23
Line 6	Tanumbirini	-16.63940	134.48700	-16.64070	134.77300	30.50	15.25	6.36
Line 7	Tanumbirini	-16.60040	134.48700	-16.60130	134.74300	27.31	13.66	6.08
Line 8	Tanumbirini	-16.55620	134.48700	-16.55660	134.70900	23.72	11.86	5.70
Line 9	Tanumbirini	-16.51710	134.41900	-16.51820	134.68000	27.89	13.95	6.85
Line 10	Beetaloo & Tanumbirini	-16.48600	134.51500	-16.88040	134.50900	43.66	21.83	4.97
Line 11	Beetaloo & Tanumbirini	-16.48510	134.55800	-16.88040	134.55900	43.75	21.88	6.88
Line 12	Beetaloo & Tanumbirini	-16.50440	134.60700	-16.88050	134.60600	41.61	20.81	4.69
Line 13	Beetaloo & Tanumbirini	-16.50440	134.65400	-16.88070	134.65400	41.61	20.81	5.88
Line 14	Beetaloo & Tanumbirini	-16.55610	134.70800	-16.84290	134.70300	31.71	15.86	1.45
Field Camp	Tanumbirini	-16.48601	134.56757	-	-	-	2.00	0.2
					Northern Footprint Total	**480.29**	**242.15**	**65.45**
Southern Exploration Area								
Line 1	Anthony Lagoon	-18.00350	134.48700	-17.97020	134.76600	30.19	15.10	0.74
Line 10	Eva Downs	-17.62810	134.70400	-17.97660	134.69800	38.80	19.40	1.03
Field Camp	Eva Downs	-17.96507	134.69708	-	-	-	2.00	-
					Southern Footprint Total	**68.99**	**36.50**	**1.77**
					Total Footprint	**549.28**	**278.65**	**67.22**

* Total area based on 5 m wide seismic lines.

^ Total area of vegetation clearing required has been calculated off GIS modelling of shrub and tree vegetation types only (Refer to Appendix D of the Seismic EMP).

Total Length km does not include the two field camps.

Appendix A2

Flora Species Within the Exploration Area (ALA, NR Maps, 2020)

Appendix A2 Flora Species Within the Exploration Area (ALA, NR Maps, 2020)

Table 1B Flora species within Exploration Area (ALA, NRM Maps, NT)

Family	Genus	Species
ACANTHACEAE	*Brunoniella*	*australis*
	Hypoestes	*floribunda*
AMARANTHACEAE	*Alternanthera*	*denticulata*
	Alternanthera	*nodiflora*
	Gomphrena	*breviflora*
	Gomphrena	*flaccida*
	Gomphrena	*leptophylla*
	Ptilotus	*calostachyus*
	Ptilotus	*fusiformis*
	Ptilotus	*nobilis*
APOCYNACEAE	*Calotropis*	*procera*
	Carissa	*spinarum*
	Cynanchum	*viminale*
	Marsdenia	*australis*
	Marsdenia	*geminata*
	Secamone	*elliptica*
	Tylophora	*flexuosa*
ASTERACEAE	*Blumea*	*saxatilis*
	Blumea	*tenella*
	Calotis	*breviseta*
	Pterocaulon	*serrulatum*
	Streptoglossa	*adscendens*
	Streptoglossa	*bubakii*
BORAGINACEAE	*Ehretia*	*saligna*
CAMPANULACEAE	*Isotoma*	sp. tanumbirini
	Lobelia	*dioica*
CAPPARACEAE	*Capparis*	*lasiantha*
	Capparis	*umbonata*
CARYOPHYLLACEAE	*Polycarpaea*	*breviflora*
CELASTRACEAE	*Denhamia*	*obscura*
CHENOPODIACEAE	*Chenopodium*	*auricomum*
COMBRETACEAE	*Macropteranthes*	*kekwickii*
	Terminalia	*canescens*

Family	Genus	Species
COMBRETACEAE	*Terminalia*	*Oblongata* subsp. *volucris*
	Terminalia	*volucris*
COMMELINACEAE	*Commelina*	*agrostophylla*
	Murdannia	*graminea*
	Murdannia	*vaginata*
CONVOLVULACEAE	*Bonamia*	*brevifolia*
	Evolvulus	*alsinoides*
	Ipomoea	*plebeia*
	Ipomoea	*polymorpha*
	Jacquemontia	*paniculata*
	Merremia	*incisa*
	Operculina	*aequisepala*
	Polymeria	*longifolia*
CUCURBITACEAE	*Cucumis*	*melo*
	Cucumis	*picrocarpus*
CYPERACEAE	*Bulbostylis*	*barbata*
	Cyperus	*bifax*
	Cyperus	*concinnus*
	Cyperus	*cristulatus*
	Cyperus	*oxycarpus*
	Cyperus	*polystachyos*
	Fimbristylis	*dichotoma*
	Fimbristylis	*microcarya*
	Rhynchospora	*longisetis*
DROSERACEAE	*Drosera*	*indica*
EBENACEAE	*Diospyros*	*humilis*
	Diospyros	*rugosula*
ERIOCAULACEAE	*Eriocaulon*	*cinereum*
ERYTHROXYLACEAE	*Erythroxylum*	*ellipticum*
EUPHORBIACEAE	*Eriocaulon*	*cinereum*
	Euphorbia	*schultzii*
	Euphorbia	*thelephora*
FABACEAE	*Acacia*	*argyraea*
	Acacia	*calligera*
	Acacia	*elachantha*
	Acacia	*galioides*
	Acacia	*gonoclada*

Family	Genus	Species
FABACEAE	*Acacia*	*hammondii*
	Acacia	*plectocarpa*
	Acacia	*shirleyi*
	Acacia	*thomsonii*
	Acacia	*torulosa*
	Acacia	*Wickhamii* subsp. *wickhamii*
	Alysicarpus	*muelleri*
	Bauhinia	*cunninghamii*
	Chamaecrista	*absus* var. *absus*
	Crotalaria	*dissitiflora*
	Crotalaria	*medicaginea* var. *neglecta*
	Crotalaria	*montana*
	Desmodium	*muelleri*
	Erythrophleum	*chlorostachys*
	Flemingia	*pauciflora*
	Galactia	sp.
	Glycine	*tomentella*
	Indigofera	*colutea*
	Indigofera	*ewartiana*
	Indigofera	*trita*
	Neptunia	*dimorphantha*
	Neptunia	*gracilis*
	Neptunia	*monosperma*
	Parkinsonia	*aculeata*
	Rhynchosia	*minima*
	Senna	*obtusifolia*
	Sesbania	*brachycarpa*
	Tephrosia	*remotiflora*
	Uraria	*lagopodioides*
	Vigna	*Lanceolata* var. *lanceolata*
	Zornia	*muriculata*
GOODENIACEAE	*Goodenia*	*armitiana*
	Goodenia	*gracilis*
	Goodenia	*leiosperma*
	Goodenia	*nigrescens*
	Goodenia	*strangfordii*
HYDROLEACEAE	*Hydrolea*	*zeylanica*

Family	Genus	Species
LAMIACEAE	*Basilicum*	*polystachyon*
	Mesosphaerum	*suaveolens*
	Premna	*acuminata*
LAURACEAE	*Cassytha*	*capillaris*
	Cassytha	*filiformis*
LINDERNIACEAE	*Striga*	*curviflora*
LORANTHACEAE	*Amyema*	*maidenii* subsp. *maidenii*
	Lysiana	*spathulata* subsp. *spathulata*
LYTHRACEAE	*Ammannia*	*multiflora*
MALVACEAE	*Abutilon*	*hannii*
	Corchorus	*sidoides*
	Gossypium	*australe*
	Grewia	*mesomischa*
	Grewia	*retusifolia*
	Herissantia	*crispa*
	Hibiscus	*meraukensis*
	Hibiscus	*sturtii*
	Hibiscus	*verdcourtii*
	Melhania	*oblongifolia*
	Melochia	*corchorifolia*
	Sida	*brachypoda*
	Sida	*fibulifera*
	Sida	*rohlenae* subsp. *rohlenae*
	Sida	*spinosa*
	Triumfetta	*plumigera*
	Waltheria	*indica*
MENISPERMACEAE	*Tinospora*	*smilacina*
MENYANTHACEAE	*Nymphoides*	*crenata*
MOLLUGINACEAE	*Glinus*	*lotoides*
MYRTACEAE	*Corymbia*	*dichromophloia*
	Corymbia	*grandifolia* subsp. *grandifolia*
	Corymbia	*polycarpa*
	Eucalyptus	*camaldulensis* subsp. *obtusa*
	Eucalyptus	*chlorophylla* subsp. *chlorophylla*
	Eucalyptus	*leucophloia* subsp. *euroa*
	Eucalyptus	*microtheca*
	Eucalyptus	*pruinosa* subsp. *pruinosa*

Family	Genus	Species
MYRTACEAE	*Eucalyptus*	*tectifica*
	Lophostemon	*grandiflorus*
	Melaleuca	*acacioides*
	Melaleuca	*citrolens*
	Melaleuca	*viridiflora*
NYCTAGINACEAE	*Boerhavia*	*paludosa*
OLEACEAE	*Jasminum*	*molle*
ONAGRACEAE	*Ludwigia*	*perennis*
OPILIACEAE	*Opilia*	*amentacea*
PEDALIACEAE	*Sesamum*	*indicum*
PHYLLANTHACEAE	*Flueggea*	*Virosa* subsp. *melanthesoides*
	Phyllanthus	*exilis*
	Phyllanthus	*lacerosus*
	Phyllanthus	*minutiflorus*
	Sauropus	*rigidulus*
	Synostemon	*rhytidospermus*
	Synostemon	*rigidulus*
PICRODENDRACEAE	*Petalostigma*	*pubescens*
PLANTAGINACEAE	*Stemodia*	*glabella*
POACEAE	*Acrachne*	*racemosa*
	Aristida	*latifolia*
	Aristida	*queenslandica*
	Astrebla	*elymoides*
	Astrebla	*pectinata*
	Astrebla	*squarrosa*
	Brachyachne	*convergens*
	Chrysopogon	*fallax*
	Chrysopogon	*pallidus*
	Dactyloctenium	*radulans*
	Dichanthium	*sericeum* subsp. *humilius*
	Digitaria	*brownii*
	Digitaria	*gibbosa*
	Ectrosia	*agrostoides*
	Ectrosia	*leporina*
	Enneapogon	*lindleyanus*
	Eragrostis	*amabilis* var. *amabilis*
	Eragrostis	*cumingii*

Family	Genus	Species
POACEAE	*Eragrostis*	*fallax*
	Eragrostis	*kennedyae*
	Eragrostis	*tenellula*
	Eriachne	*armittii*
	Eriachne	*nervosa*
	Eriachne	*obtusa*
	Eulalia	*aurea*
	Iseilema	*calvum*
	Iseilema	*fragile*
	Iseilema	*vaginiflorum*
	Mnesithea	*formosa*
	Panicum	*decompositum*
	Panicum	*effusum*
	Panicum	*laevinode*
	Panicum	*mindanaense*
	Paspalidium	*rarum*
	Paspalidium	*retiglume*
	Perotis	*rara*
	Pseudopogonatherum	*contortum*
	Schizachyrium	*fragile*
	Sehima	*nervosum*
	Setaria	*surgens*
	Sorghum	*plumosum*
	Sorghum	*timorense*
	Triodia	*bitextura*
	Tripogonella	*loliiformis*
	Urochloa	*holosericea*
POLYGALACEAE	*Polygala*	*difficilis*
	Polygala	*orbicularis*
PONTEDERIACEAE	*Monochoria*	*cyanea*
	Pontederia	*cyanea*
PORTULACACEAE	*Calandrinia*	*quadrivalvis*
PROTEACEAE	*Grevillea*	*pteridifolia*
PTERIDACEAE	*Cheilanthes*	*tenuifolia*
RHAMNACEAE	*Alphitonia*	*excelsa*
RUBIACEAE	*Oldenlandia*	*Mitrasacmoides* subsp. *mitrasacmoides*
	Spermacoce	*argillacea*

Family	Genus	Species
RUBIACEAE	*Spermacoce*	*pogostoma*
	Spermacoce	*stenophylla*
SANTALACEAE	*Santalum*	*lanceolatum*
SAPINDACEAE	*Atalaya*	*hemiglauca*
	Dodonaea	*physocarpa*
	Dodonaea	*stenophylla*
SCROPHULARIACEAE	*Eremophila*	*bignoniiflora*
SOLANACEAE	*Solanum*	*lucani*
VIOLACEAE	*Hybanthus*	*enneaspermus*
VITACEAE	*Cayratia*	*trifolia*

Table 2B Fauna species within Exploration Area (ALA, NRM Maps, NT)

Common Name	Scientific Name
Amphibians	
Knife-footed Frog	*Cyclorana cultripes*
Green Tree Frog	*Litoria caerulea*
Birds	
Brown Goshawk	*Accipiter fasciatus*
Australian Owlet-nightjar	*Aegotheles cristatus*
Grey teal	*Anas gracilis*
Grey duck	*Anas superciliosa*
Australasian Darter	*Anhinga novaehollandiae*
Australasian Pipit	*Anthus novaeseelandiae*
Brolga	*Antigone rubicunda*
Red-winged Parrot	*Aprosmictus erythropterus*
Wedge-tailed Eagle	*Aquila audax*
Intermediate Egret	*Ardea intermedia*
Eastern Great Egret	*Ardea modesta*
White-necked Heron	*Ardea pacifica*
Australian Bustard	*Ardeotis australis*
Black-faced Woodswallow	*Artamus cinereus*
White-breasted Woodswallow	*Artamus leucorynchus*
Little Woodswallow	*Artamus minor*
Masked Woodswallow	*Artamus personatus*
White-browed Woodswallow	*Artamus superciliosus*
Hardhead	*Aythya australis*
Bush Stone-curlew	*Burhinus grallarius*

Common Name	Scientific Name
Sulphur-crested Cockatoo	*Cacatua galerita*
Little Corella	*Cacatua sanguinea*
Red-tailed Black Cockatoo	*Calyptorhynchus banksii*
Pheasant Coucal	*Centropus phasianinus*
Horsfield's Bronze-Cuckoo	*Chalcites basalis*
Maned Duck	*Chenonetta jubata*
Brown Songlark	*Cincloramphus cruralis*
Rufous Songlark	*Cincloramphus mathewsi*
Swamp Harrier	*Circus approximans*
Spotted Harrier	*Circus assimilis*
Golden-headed Cisticola	*Cisticola exilis*
Black-tailed Treecreeper	*Climacteris melanura*
Grey Shrike-thrush	*Colluricincla harmonica*
Rufous-throated Honeyeater	*Conopophila rufogularis*
Ground Cuckoo-shrike	*Coracina maxima*
Black-faced cuckoo-shrike	*Coracina novaehollandiae*
White-bellied Cuckoo-shrike	*Coracina papuensis*
Little Crow	*Corvus bennetti*
Torresian Crow	*Corvus orru*
Grey Quail	*Coturnix pectoralis*
Swamp Quail	*Coturnix ypsilophora*
Pied Butcherbird	*Cracticus nigrogularis*
Black-soil Ctenotus	*Ctenotus joanae*
Varied Sittella	*Daphoenositta chrysoptera*
Plumed Whistling-Duck	*Dendrocygna eytoni*
Mistletoebird	*Dicaeum hirundinaceum*
White-faced Heron	*Egretta novaehollandiae*
Black-fronted Dotterel	*Elseyornis melanops*
Galah	*Eolophus roseicapilla*
Crimson Chat	*Epthianura tricolor*
Spinifexbird	*Eremiornis carteri*
Red-kneed Dotterel	*Erythrogonys cinctus*
Spotted Nightjar	*Eurostopodus argus*
Brown Falcon	*Falco berigora*
Nankeen Kestrel	*Falco cenchroides*
Australian Hobby	*Falco longipennis*
Black Falcon	*Falco subniger*

Common Name	Scientific Name
Eurasian Coot	*Fulica atra*
Singing Honeyeater	*Gavicalis virescens*
Gull-billed Tern	*Gelochelidon nilotica*
Diamond Dove	*Geopelia cuneata*
Bar-shouldered Dove	*Geopelia humeralis*
Peaceful Dove	*Geopelia striata*
White-throated gerygone	*Gerygone olivacea*
Magpie-lark	*Grallina cyanoleuca*
Brolga	*Grus rubicunda*
Australian Magpie	*Gymnorhina tibicen*
Whistling Kite	*Haliastur sphenurus*
Pictorella Mannikin	*Heteromunia pectoralis*
Little Eagle	*Hieraaetus morphnoides*
Pied Stilt	*Himantopus himantopus*
White-winged Triller	*Lalage sueurii*
Brown Honeyeater	*Lichmera indistincta*
Pink-ear	*Malacorhynchus membranaceus*
Variegated Fairy-wren	*Malurus lamberti*
Red-backed Fairy-wren	*Malurus melanocephalus*
Yellow-throated Miner	*Manorina flavigula*
White-throated Honeyeater	*Melithreptus albogularis*
Black-chinned Honeyeater	*Melithreptus gularis*
Budgerigar	*Melopsittacus undulatus*
Grey's Menetia	*Menetia greyii*
Rainbow Bee-eater	*Merops ornatus*
Little Pied Cormorant	*Microcarbo melanoleucos*
Jacky Winter	*Microeca fascinans*
Black Kite	*Milvus migrans*
Horsfield's Bushlark	*Mirafra javanica*
Restless Flycatcher	*Myiagra inquieta*
Southern Boobook	*Ninox novaeseelandiae*
Nankeen night heron	*Nycticorax caledonicus*
Cockatiel	*Nymphicus hollandicus*
Crested Pigeon	*Ocyphaps lophotes*
Crested Bellbird	*Oreoica gutturalis*
Rufous Whistler	*Pachycephala rufiventris*
Red-browed Pardalote	*Pardalotus rubricatus*

Common Name	Scientific Name
Striated Pardalote	*Pardalotus striatus*
Australian pelican	*Pelecanus conspicillatus*
Fairy Martin	*Petrochelidon ariel*
Tree Martin	*Petrochelidon nigricans*
Great Cormorant	*Phalacrocorax carbo*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Common Bronzewing	*Phaps chalcoptera*
Flock Bronzewing	*Phaps histrionica*
Little Friarbird	*Philemon citreogularis*
Long-tailed Planigale	*Planigale ingrami*
Yellow-billed Spoonbill	*Platalea flavipes*
Royal Spoonbill	*Platalea regia*
Glossy Ibis	*Plegadis falcinellus*
Tawny Frogmouth	*Podargus strigoides*
Long-tailed Finch	*Poephila acuticauda*
Grey-crowned Babbler	*Pomatostomus temporalis*
Hooded Parrot	*Psephotus dissimilis*
Varied Lorikeet	*Psitteuteles versicolor*
Great Bowerbird	*Ptilonorhynchus nuchalis*
Grey-headed Honeyeater	*Ptilotula keartlandi*
Grey-fronted Honeyeater	*Ptilotula plumula*
Long-haired Rat	*Rattus villosissimus*
Willie Wagtail	*Rhipidura leucophrys*
Weebill	*Smicrornis brevirostris*
Australian Pratincole	*Stiltia isabella*
Double-barred Finch	*Stizoptera bichenovii*
Apostlebird	*Struthidea cinerea*
Australasian Little Grebe	*Tachybaptus novaehollandiae*
Zebra Finch	*Taeniopygia guttata*
Australian White Ibis	*Threskiornis moluccus*
Straw-necked Ibis	*Threskiornis spinicollis*
Red-backed Kingfisher	*Todiramphus pyrrhopygius*
Sacred Kingfisher	*Todiramphus sanctus*
Red-chested Button-quail	*Turnix pyrrhothorax*
Eastern Barn Owl	*Tyto javanica*
Masked Lapwing	*Vanellus miles*
Mammals	

Common Name	Scientific Name
Dingo	*Canis familiaris*
Cat	*Felis catus*
Agile Wallaby	*Macropus agilis*
Common Wallaroo	*Macropus robustus*
Red Kangaroo	*Macropus rufus*
Northern Nailtail Wallaby	*Onychogalea unguifera*
Western Chestnut Mouse	*Pseudomys nanus*
Little Red Flying-fox	*Pteropus scapulatus*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*
Stripe-faced Dunnart	*Sminthopsis macroura*
Reptiles	
Children's Python	*Antaresia childreni*
Stimson's Python	*Antaresia stimsoni*
Red-tailed Soil-crevice Skink	*Austroablepharus kinghorni*
Metallic Snake-eyed Skink	*Cryptoblepharus metallicus*
Central Netted Dragon	*Ctenophorus nuchalis*
Leopard Ctenotus	*Ctenotus pantherinus*
Red-sided Ctenotus	*Ctenotus pulchellus*
Excitable Delma	*Delma tincta*
Soil-crack whip snake	*Demansia rimicola*
Burton's Snake-lizard	*Lialis burtonis*
Gilbert's Dragon	*Lophognathus gilberti*
Crowned Gecko	*Lucasium stenodactylum*
King Brown Snake	*Pseudechis australis*
Northern Hooded Scaly-foot	*Pygopus steelescotti*
Northern Spiny-tailed Gecko	*Strophurus ciliaris*
Little Spotted Snake	*Suta punctata*
Centralian Blue-tongue	*Tiliqua multifasciata*
Eastern Blue-tongue	*Tiliqua scincoides*
Eyrean Earless Dragon	*Tympanocryptis tetraporophora*
Mertens' Water Monitor	*Varanus mertensi*
Yellow-spotted Monitor	*Varanus panoptes*
Spencer's Monitor	*Varanus spenceri*

Appendix A3

EPBC Protected Matters Search Tool Results

Appendix A3 EPBC Protected Matters Search Tool Results

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.

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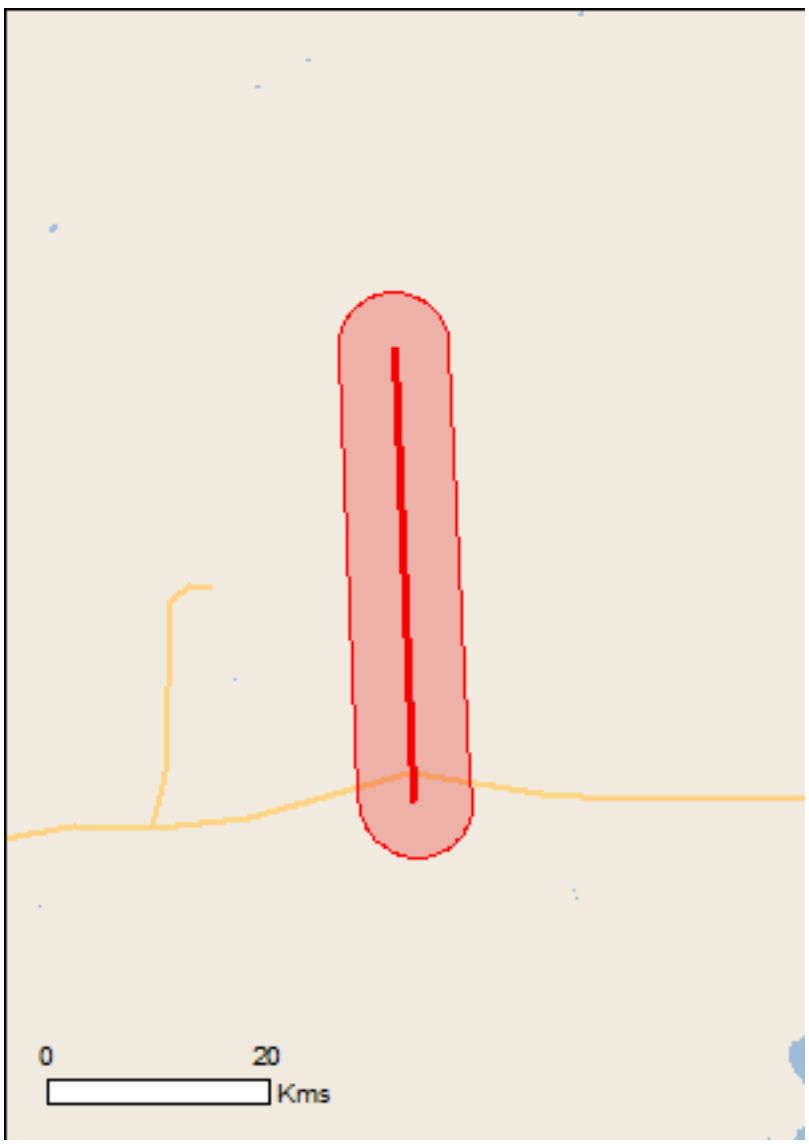

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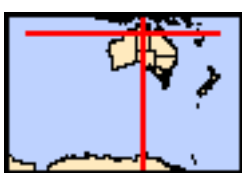

Summary

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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	10
Listed Migratory Species:	10

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
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:	None
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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 may occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	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 may occur within area
Reptiles		
Acanthophis hawkei Plains Death Adder [83821]	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

Name	Threatened	Type of Presence
		habitat likely to occur within area
Migratory Terrestrial Species		
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 may 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

Other Matters Protected by the EPBC Act

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
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely 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 may occur within area

Name	Threatened	Type of Presence
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 may 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 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
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

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
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
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

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may 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

Nationally Important Wetlands	[Resource Information]
Name	State
Eva Downs Swamp	NT

Caveat

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- 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

-17.633487 134.698058,-17.981281 134.714537,-17.983893 134.717284,-17.983893 134.717284

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-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
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-Australian Government National Environmental Science Program
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-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

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

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Australian Government
Department of the Environment and Energy

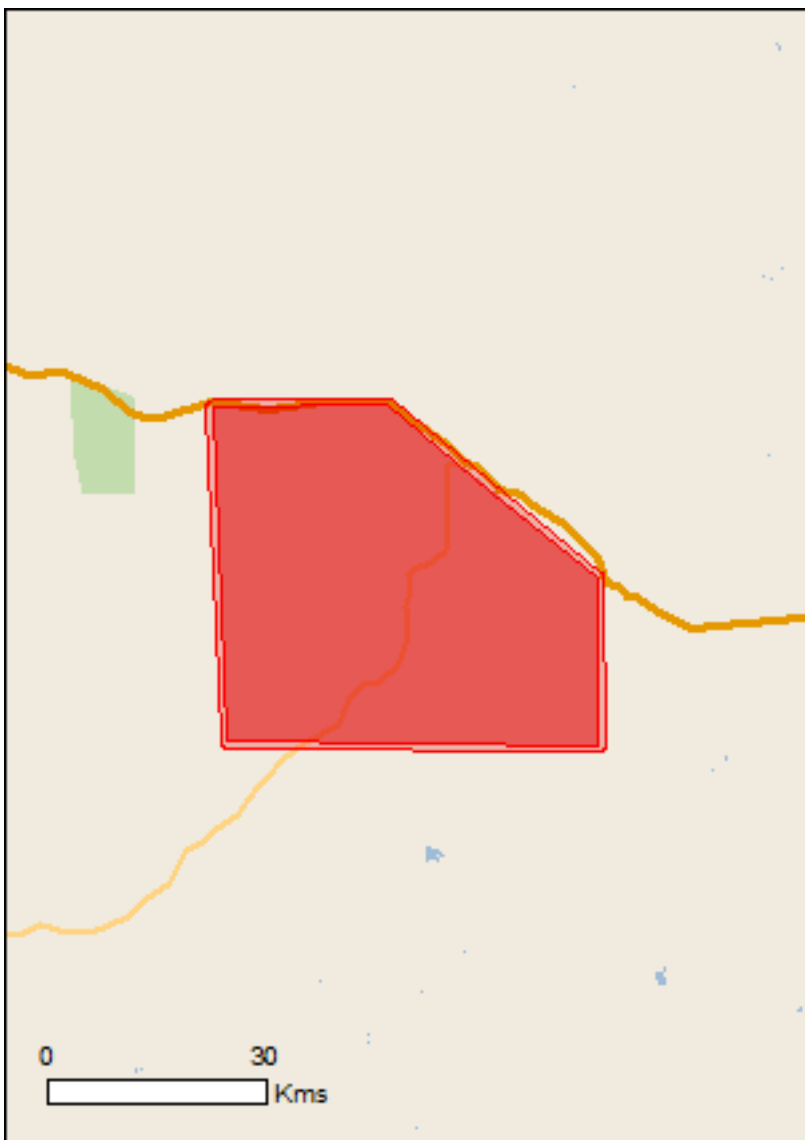
EPBC Act Protected Matters Report

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.

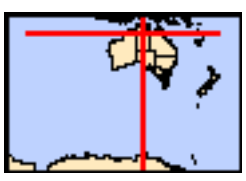
Report created: 05/06/20 14:10:03



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 1.0Km



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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	10
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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
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:	None
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Elseya lavarackorum Gulf Snapping Turtle [67197]	Endangered	Species or species habitat may 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

Name	Threatened	Type of Presence
		habitat likely to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within 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 may 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

Other Matters Protected by the EPBC Act

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 likely 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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
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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 may 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
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

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		
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Bubalus bubalis Water Buffalo, Swamp Buffalo [1]		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
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		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

Caveat

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Coordinates

-16.488041 134.41722,-16.485408 134.631453,-16.68941 134.891005,-16.886624 134.893065,-16.882681 134.435759,-16.488039 134.417217,-16.488039 134.417217,-16.488041 134.41722

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Appendix B

EP136 Cultural Heritage Assessment

Appendix B EP136 Cultural Heritage Assessment

AECOM Imagine it. Delivered.

Seismic Exploration Program 2020
Sweetpea Petroleum Pty Ltd
01-Sep-2020

Unique Reference No. SWP1-04

Cultural Heritage Assessment

EP136 - Beetaloo Sub-Basin, NT

Cultural Heritage Assessment

EP136 - Beetaloo Sub-Basin, NT

Client: Sweetpea Petroleum Pty Ltd

ABN: 20 093 864 925

Prepared by

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ABN 20 093 846 925

01-Sep-2020

Job No.: 60611666

DENR Unique Reference No. SWP1-04

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

Quality Information

Document	Cultural Heritage Assessment
Ref	60611666 DENR Unique Reference No.: SWP1-04
Date	01-Sep-2020
Prepared by	Perri Braithwaite
Reviewed by	Alana Court & Luke Kirkwood

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	21-Jan-2020	Draft	Luke Kirkwood Principal Heritage Specialist	
1	19-Feb-2020	EMP Pre-approval Submission	Alana Court Association Director - Environment	
2	22-Jul-2020	May 2020 Update for Seismic Exploration EMP submission	Alana Court Association Director - Environment	
3	01-Sep-2020	Appendix B for Final Seismic Exploration EMP	Alana Court Association Director - Environment	

Table of Contents

List of Tables

List of Figures

List of Plates

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by Sweetpea Petroleum (Sweetpea) to prepare an Environmental Management Plan (EMP) to support Sweetpea's proposed 2020 2D seismic exploration program in Exploration Permit 136 (EP136) in the Beetaloo Sub-Basin, Northern Territory (NT).

The heritage assessment involved a desktop review of existing heritage data from the Australian Heritage database, the NT Heritage Branch and archaeological survey reports, and a targeted field inspection using predictive modelling for the proposed seismic lines. For the purpose of this assessment, a 500 m buffer was placed on the seismic line (250 m either side of the seismic line). This EMP covers the area within the buffer, hereafter referred to as the study area.

It is noted that the field survey initially covered a preliminary seismic line design which consisted of 410 km of seismic lines. In early February 2020, the survey design was modified for the northern survey area and included an additional two lines in the southern survey area. This report describes the conditions encountered during the November 2019 for the preliminary seismic line design and May 2020 supplementary survey for the modified survey design.

2.0 Project Location and Proposed Activities

The northern survey area is located within the Beetaloo and Tanumbirini pastoral leases and lies predominantly within the northern section of EP136 exploration permit area, extending in places into EP76, EP161 and EP(A)354 exploration permit areas (Figure 1). The southern survey area comprises two seismic lines located along the boundary of Anthony Lagoon and Eva Downs pastoral leases, which includes a section of the Barkly Stock Route (Figure 2).

The primary activities subject to this heritage assessment are:

- Access track construction, use and maintenance
- Seismic survey activities
- Field camp construction and operation
- Routine access, maintenance and monitoring of all activity areas subject to the Seismic EMP.

The proposed seismic activities comprise 16 seismic lines, covering approximately 549.28 km in total and a 2-ha northern field camp and southern field camp. The total footprint for the activity is provided below in Table 1.

Table 1 Seismic Line and Field Camp Footprint

Line	Length by Permit Area (km) / Area of Field Camp (km^2)						Total Length (km)*	Total Area (Ha)#	Total Area of Vegetation Clearing (Ha)^
	EP136	EP161	EP76	EP(A)354	EP169	none			
Northern Exploration Area									
Line 1	17.79	-	-	5.13	-	-	22.92	11.46	1.39
Line 2	26.64	8.24	-	6.22	-	-	41.10	20.55	4.92
Line 3	26.64	1.51	-	5.17	-	-	33.32	16.66	3.34
Line 4	26.65	7.16	-	1.50	-	-	35.31	17.66	2.51
Line 5	26.66	4.26	-	4.96	-	-	35.88	17.94	4.23
Line 6	17.77	11.23	-	1.50	-	-	30.50	15.25	6.36
Line 7	17.78	8.04	-	1.49	-	-	27.31	13.66	6.08
Line 8	8.89	13.33	1.50	-	-	-	23.72	11.86	5.70

Line	Length by Permit Area (km) / Area of Field Camp (km²)						Total Length (km)*	Total Area (Ha)#	Total Area of Vegetation Clearing (Ha)^
	EP136	EP161	EP76	EP(A)354	EP169	none			
Line 9	8.89	10.18	8.82	-	-	-	27.89	13.95	6.85
Line 10	42.28	1.38	-	-	-	-	43.66	21.83	4.97
Line 11	42.26	1.49	-	-	-	-	43.75	21.88	6.88
Line 12	33.03	8.58	-	-	-	-	41.61	20.81	4.69
Line 13	33.04	8.57	-	-	-	-	41.61	20.81	5.88
Line 14	19.65	12.06	-	-	-	-	31.71	15.86	1.45
Field Camp	0.02*	-	-	-	-	-	-	2.00	0.20
Northern Total	**347.99**	**96.03**	**10.32**	**25.97**	**0.00**	**0.00**	**480.29**	**242.15**	**65.45**
Southern Exploration Area									
Line 1	20.45	-	-	-	9.44	0.30	30.19	15.10	0.74
Line 10	38.80	-	-	-	-	-	38.80	19.40	1.03
Field Camp	0.02*	-	-	-	-	-	-	2.00	0.00
Southern Total	**59.25**	**0.00**	**0.00**	**0.00**	**9.44**	**0.30**	**68.99**	**36.50**	**1.77**
Coverage Total	**407.22**	**96.03**	**10.32**	**25.97**	**9.44**	**0.30**	**549.28**	**278.65**	**67.22**

*Area km² - not included in total length.

Footprint area based on maximum width of seismic line being 5 m.

^ Total area of clearing required has been calculated from GIS modelling of shrub and tree vegetation types only (Refer to Appendix D of the EMP).

435000 440000 445000 450000 455000 460000 465000 470000 475000 480000

8185000 8180000 8175000 8170000 8165000 8160000 8155000 8150000 8145000 8140000 8135000 8130000 8125000

Seismic Line 9
Seismic Line 8
TANUMBIRINI
Seismic Line 7
Seismic Line 6
Seismic Line 5
AMUNGEE
MUNGEE
Seismic Line 4
Seismic Line 3
Seismic Line 2
Seismic Line 1
Seismic Line 10
Seismic Line 11
Seismic Line 12
Seismic Line 13
Seismic Line 14
BEETALOO
STATION

LEGEND

- Project Area Buffer
- Pastoral Cadastre
- EP136

AECOM
www.aecom.com

0 1 2 3 4 5 km

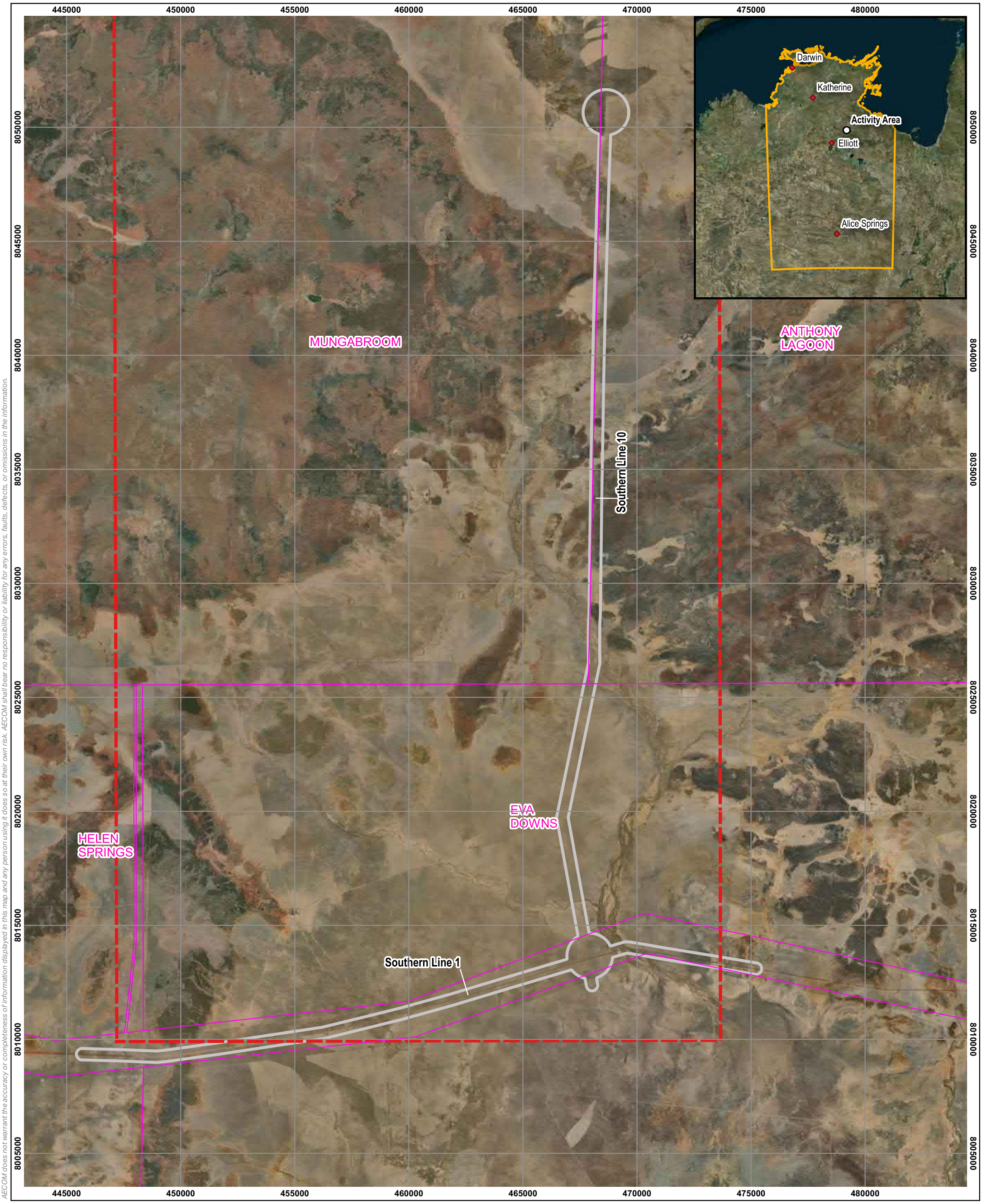
1:180000 (when printed at A3)

Data Sources:
Sweetpea

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Northern Exploration Area
Heritage Assessment
Project Area

PROJECT ID	60611666
CREATED BY	IB
LAST MODIFIED	31-8-2020
VERSION	2

Figure 1



LEGEND

- Project Area Buffer
- Pastoral Cadastre
- EP136

AECOM
www.aecom.com

0 1 2 3 4 5 km

1:150000 (when printed at A3)

Data Sources:
Sweetpea

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Southern Exploration Area
Heritage Assessment
Project Area

PROJECT ID	60611666
CREATED BY	IB
LAST MODIFIED	31-8-2020
VERSION	2

Figure 2

3.0 Existing Data Sources

Information on the location of heritage sites within the study area was obtained from:

- a review of Native Title claims and Indigenous Land Use Agreements over the proposed Project Area
- a review of Federal heritage registers (Australian Heritage Database) managed by the Department of Agriculture, Water and the Environment
- a review of registered archaeological sites Northern Territory Heritage Register managed by the NT Heritage Branch
- a review of known sacred sites managed by the Aboriginal Areas Protection Authority (AAPA)
- a review of past archaeological survey reports and assessments undertaken within the local area.

3.1 Native Title

There are five Native Title determinations that have been finalised within the Project Area proposed for the 2020 seismic program (see Table 2, Figure 3 and Figure 4).

Table 2 Native Title Current for the Permit Areas

Name	Tribunal No	Fed Court Number	Outcome
Beetaloo Pastoral Lease	DCD2012/012	NTD27/2010	Native Title exists in parts of the determination area
Tanumbirini Pastoral Lease	DCD2013/019	NTD33/2012	Native Title exists in parts of the determination area
Anthony Lagoon Pastoral Lease #2	DCD2014/006	NTD7/2013	Native Title exist in parts of the determination area.
Mungabroom Pastoral Lease	DCD2012/006	NTD20/2010	Native Title exists in parts of the determination area
Eva Downs Pastoral Lease	DCD2014/001	NTD33/2011	Native Title exists in parts of the determination area

3.2 Australian Heritage Database

A search of the Australia Heritage Database identified that no statutory and non-statutory listed heritage places are listed within the proposed impact areas.

3.3 Northern Territory Heritage Register

A search of the Northern Territory (NT) Heritage Register identified 18 Aboriginal archaeological sites and no historic heritage sites within a 50 km x 50 km area that encompasses the Project Area. The proposed seismic line alignment will not impact previously identified heritage sites, with the closest recorded Aboriginal archaeological site (Yaroo Site 3b) being located approximately 250 m to the west of Seismic Line 9 (Figure 5 and Figure 6).

435000 440000 445000 450000 455000 460000 465000 470000 475000 480000

8185000 8180000 8175000 8170000 8165000 8160000 8155000 8150000 8145000 8140000 8135000 8130000

Seismic Line 9

Seismic Line 8

Native Title DCD2013/019
Tanumbirini Pastoral Lease

Seismic Line 7

Seismic Line 6

Seismic Line 5

Seismic Line 4

Seismic Line 3

Native Title DCD2012/012
Beetaloo Pastoral Lease

Seismic Line 2

Seismic Line 1

Seismic Line 10

Seismic Line 11

Seismic Line 12

Seismic Line 13

Seismic Line 14

LEGEND

- Project Area Buffer

Native Title

- Amungee Mungee Pastoral Lease
- Beetaloo Pastoral Lease
- Tanumbirini Pastoral Lease

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Data Sources:
Sweetpea
Native Title

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Northern Exploration Area
Heritage Assessment
Native Title

PROJECT ID	60611666
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LAST MODIFIED	31-8-2020
VERSION	2

Figure 3

445000 450000 455000 460000 465000 470000 475000 480000

8050000 8045000 8040000 8035000 8030000 8025000 8020000 8015000 8010000 8005000

Native Title DCD2012/006
Mungabroom Pastoral Lease

Native Title DCD2014/006
Anthony Lagoon Pastoral Lease #2

Southern Line 10

Native Title DCD2014/001
Eva Downs Pastoral Lease

Southern Line 1

LEGEND

Project Area Buffer

Native Title

- Anthony Lagoon Pastoral Lease #2
- Eva Downs Pastoral Lease
- Mungabroom Pastoral Lease

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0 1 2 3 4 5 km

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Data Sources:
Sweetpea
Native Title

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Southern Exploration Area
Heritage Assessment
Native Title

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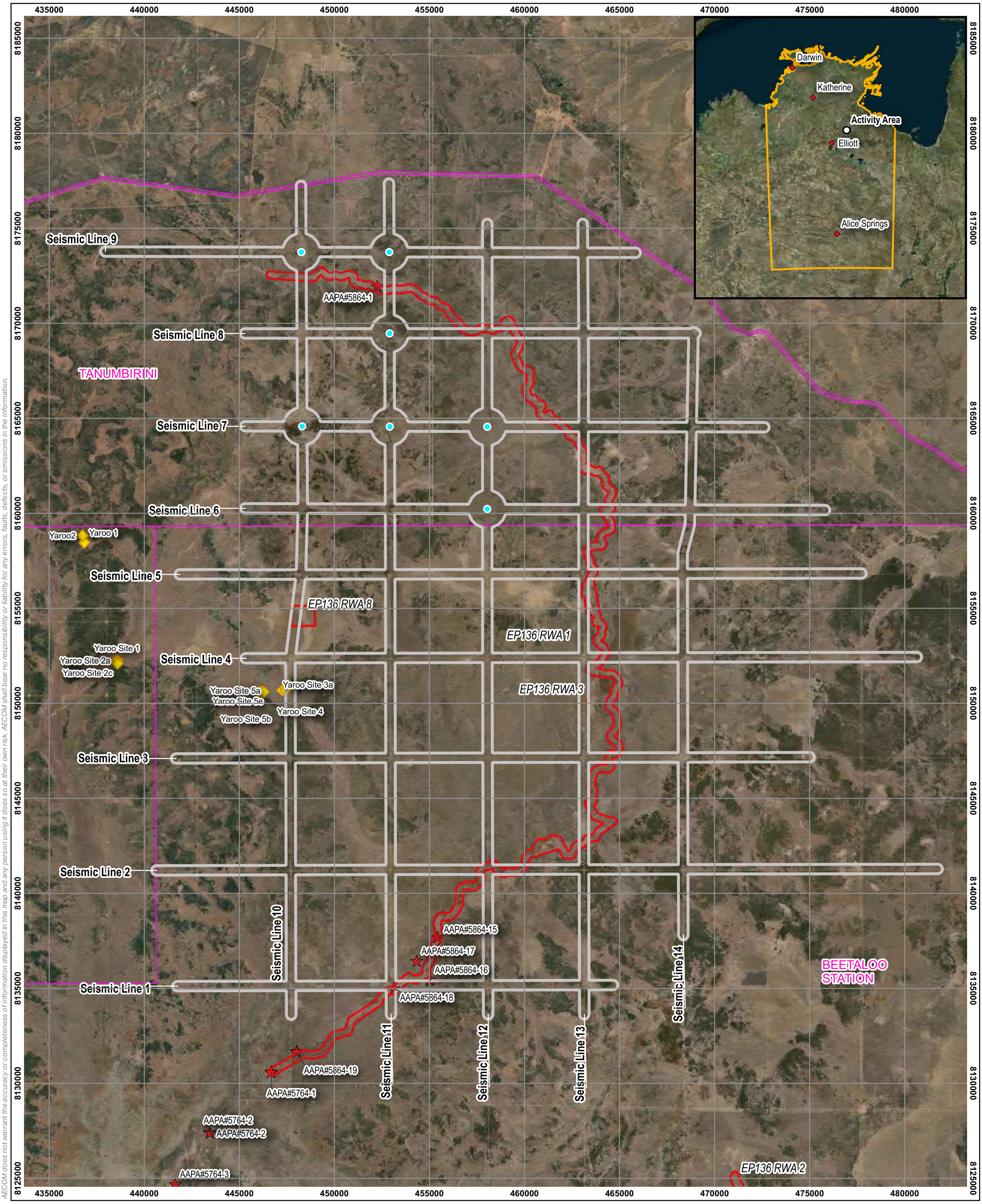
LAST MODIFIED	31-8-2020
VERSION	2

Figure 4



LEGEND

- Project Area Buffer
- AAPA Sacred Sites
- NT - Aboriginal Heritage Register
- AAPA Restricted Works Area
- Proposed Water Monitoring Bore
- Pastoral Cadastre

AECOM
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0 1 2 3 4 5 km

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Data Sources:
Sweetpea
NT Government (Heritage Branch)
NT Government (AAPA)

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Northern Exploration Area
Heritage Assessment
Previously Identified Heritage

PROJECT ID	60611666
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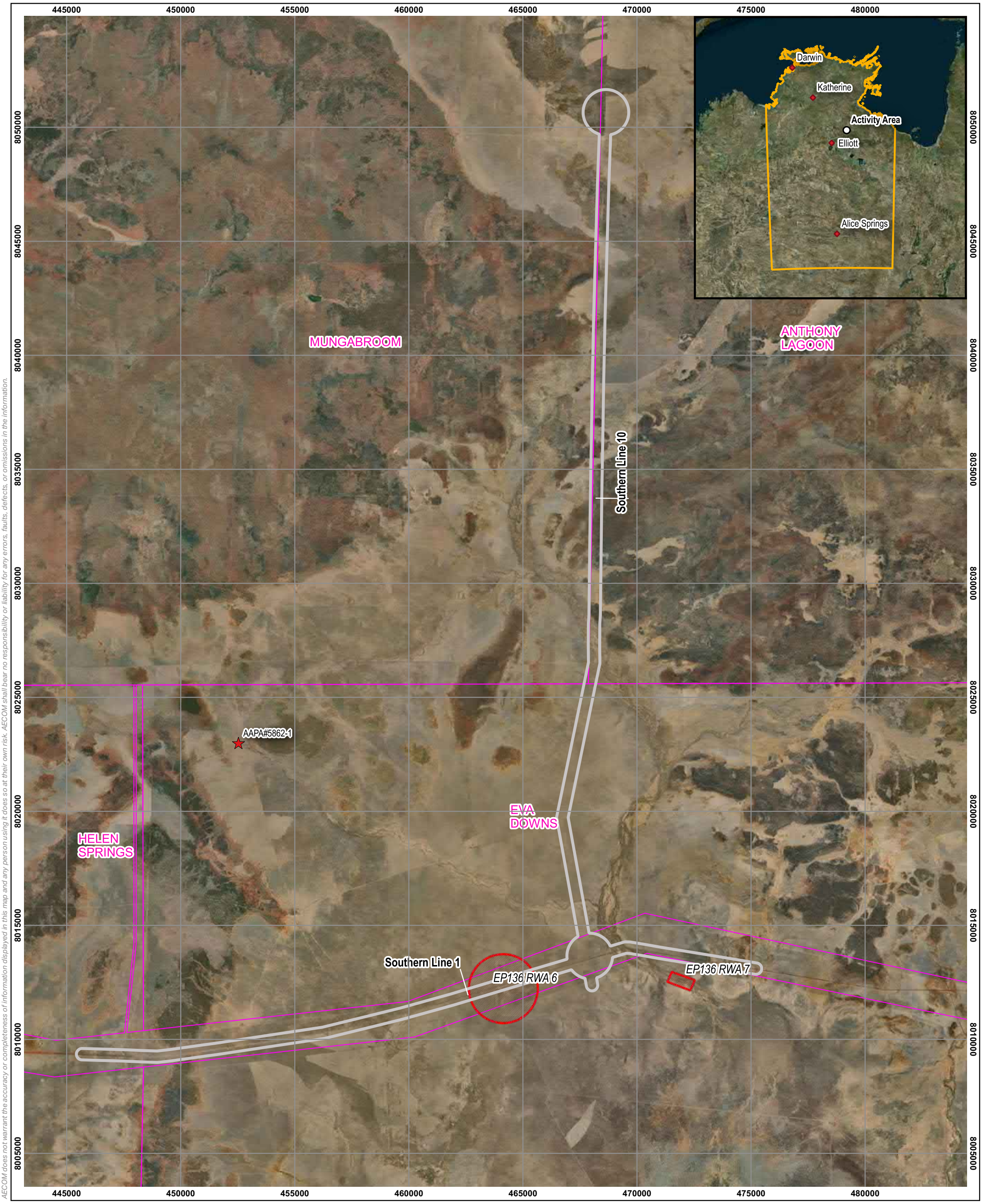
LAST MODIFIED	31-8-2020
VERSION	2

Figure 5



LEGEND

- Project Area Buffer
- AAPA Sacred Sites
- AAPA Restricted Works Area
- Pastoral Cadastre

AECOM
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0 1 2 3 4 5 km

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Data Sources:
Sweetpea
NT Government (Heritage Branch)
NT Government (AAPA)

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EP136 Beetaloo Sub-Basin, NT
Southern Exploration Area
Heritage Assessment
Previously Identified Heritage

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Figure 6

3.4 Sacred Sites

Two recorded AAPA sacred sites are located within close proximity to the Project works (Figure 5 and Figure 6):

- AAPA sacred site 5864-18 is located approximately 150 m east of the proposed northern seismic line 10, is described as two large waterholes in a flood out area (see Figure 7). Based on the available point data of the sacred site, the seismic line 10 intersects one of the waterholes described in this site, although is an existing pastoral access track.
- Another AAPA recorded sites is known to be located approximately 150 m south of the proposed southern seismic line 1, and is described in the 2012 NLC report as a spring and cave. This site is associated with EP136 RWA6 and is bisected by the Barkly Stock Route (Figure 8).

Additional sacred sites may have been recorded since 2012 that AECOM does not currently possess records for. The AAPA application for Sacred Site clearance is currently in progress, with on country meetings commencing in mid-July 2020.

3.4.1 Restricted Works Areas

In 2012, Paltar Petroleum Pty Ltd (Paltar), engaged the Northern Land Council (NLC) directly to undertake an Ethnographic Site Avoidance Survey for proposed 2012 works program. This survey included drill locations sites within EP136 and EP143 and provided an overview of Restricted Work Areas (RWA) recommendations for the exploration permit areas. Two of these RWAs intersect with the current proposed impact areas:

- EP136 RWA1, covers over 60 km of Newcastle Creek and intersects all proposed seismic lines for the 2020 seismic exploration program, except Seismic Line 3 (Figure 5). The RWA includes a number of recorded sacred sites with AAPA. The NLC proscribed the following conditions for EP136 RWA1:
  - Impacts allowed within a 200 m radius centred on drill site EP136DS1
  - No other works are permitted except access along existing tracks.
- EP136 RWA6 is located on an existing pastoral stock route (Barkly Stock Route) which includes an access track to the Southern Line 1 (Figure 6). The NLC proscribed the following condition for EP136 RWA6:
  - No work of any kind is permitted within EP136 RWA6, except access permitted along existing tracks.

Figure 7 Seismic line study area intersecting waterhole associated with AAPA recorded sacred site 5864-18 (red star) within EP136 RWA1 (red hatching)

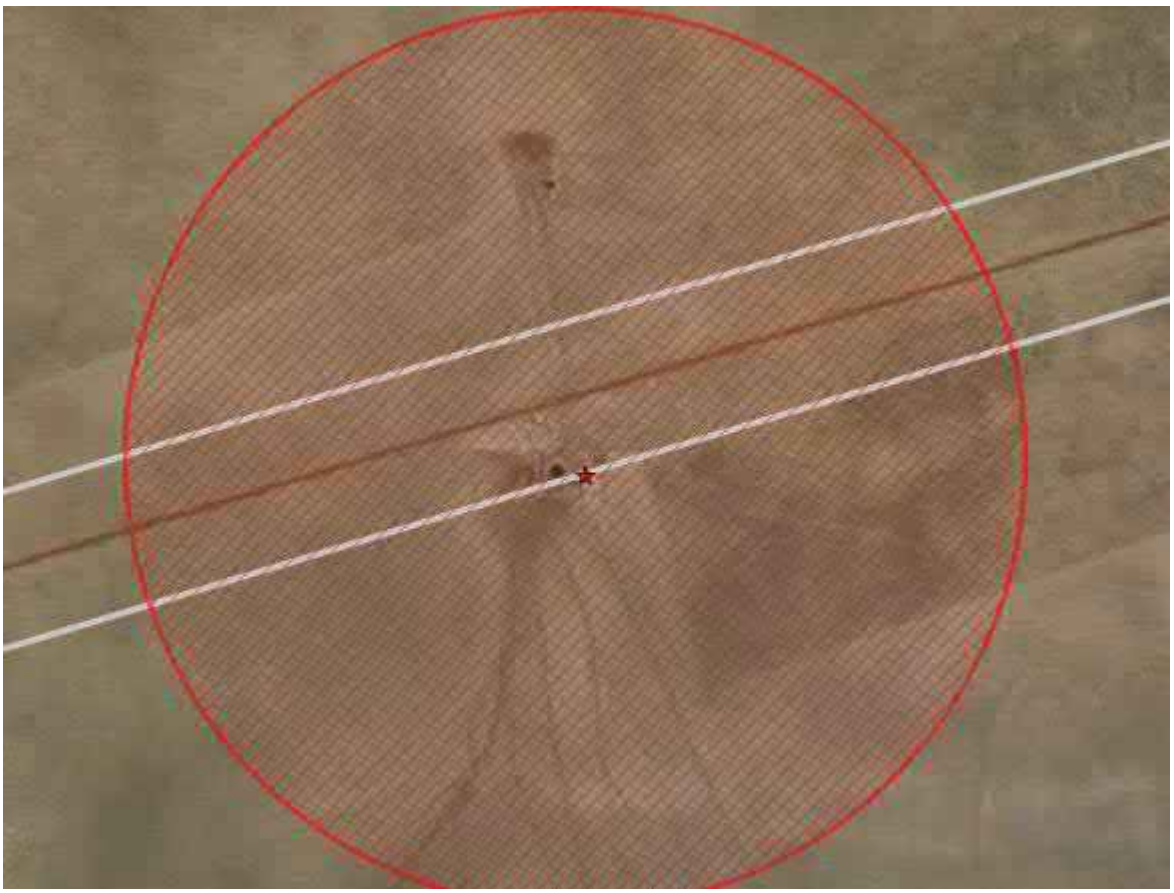


Figure 8 Southern line 1 study area and adjacent to AAPA recorded site (red star) within EP136 RWA6 (red hatching)

3.5 Previous Archaeological Investigations

The majority of archaeological investigations near the study area have been predominately associated with either linear infrastructure in an alignment parallel to the Stuart Highway or natural gas exploration activities associated with the Beetaloo Basin. Of the assessments relevant to the study area, the majority of sites identified are artefact scatters composed of raw material commonly found in the immediate area (quartz, silcrete and quartzite). One stone arrangement has also been recorded. No assessments have been conducted within the boundaries of the current study area. Table 3 provides a summary of previous archaeological investigations undertaken in the local area.

Table 3 Previous Archaeological Assessments relevant to the Study Area

Researchers	Assessment Type	Locality	Key Findings
Smith (1986)	Excavation	Lake Woods	*In situ* artefacts dated to 6,000 years.
Museum and Art Galleries of the Northern Territory (1986)	Survey	Amadeus Basin to Katherine	Large scale survey for a proposed natural gas pipeline targeting areas of major cultural sensitivity from Daly Waters to Katherine. 32 sites were identified with the majority being artefact scatters associated with watercourses.
Quaternary Archaeological Surveys (1998)	Survey	Stuart Highway to Mataranka Homestead	Large scale survey for a fibre optic cable corridor. Three isolated artefacts and one historic heritage site identified.
Heritage Surveys (1999)	Survey	Daly Waters to McArthur River	Nine archaeological sites identified including rockshelters and artefact scatters.

Researchers	Assessment Type	Locality	Key Findings
HLA Envirosciences (HLA) (2006b, 2006d, 2006c, 2007)	Survey	Beetaloo Basin	Several archaeological sites identified across the exploration permits including artefact scatters, isolated artefacts and stone cairns. Assessments developed a preliminary predictive model based on random site modelling and landform.
AECOM (2011b, 2012a, 2012b)	Survey	Beetaloo Basin	Several archaeological sites identified as part of seismic line clearance and exploratory drill locations including large artefact scatters (>1km), quarry sites and isolated artefacts. Predictive model refined and used in the field to identify 'hot spots' of Indigenous archaeological significance.
AECOM (2015)	Survey	Beetaloo Basin	Large scale survey for four drill hole locations. One large artefact scatter and three smaller artefact scatters identified.

4.0 Site Inspection

4.1 Aims and Objectives

The aim of the inspection was to identify any surface expressions of Aboriginal archaeological and potential cultural heritage values within the proposed study area.

4.2 Methodology

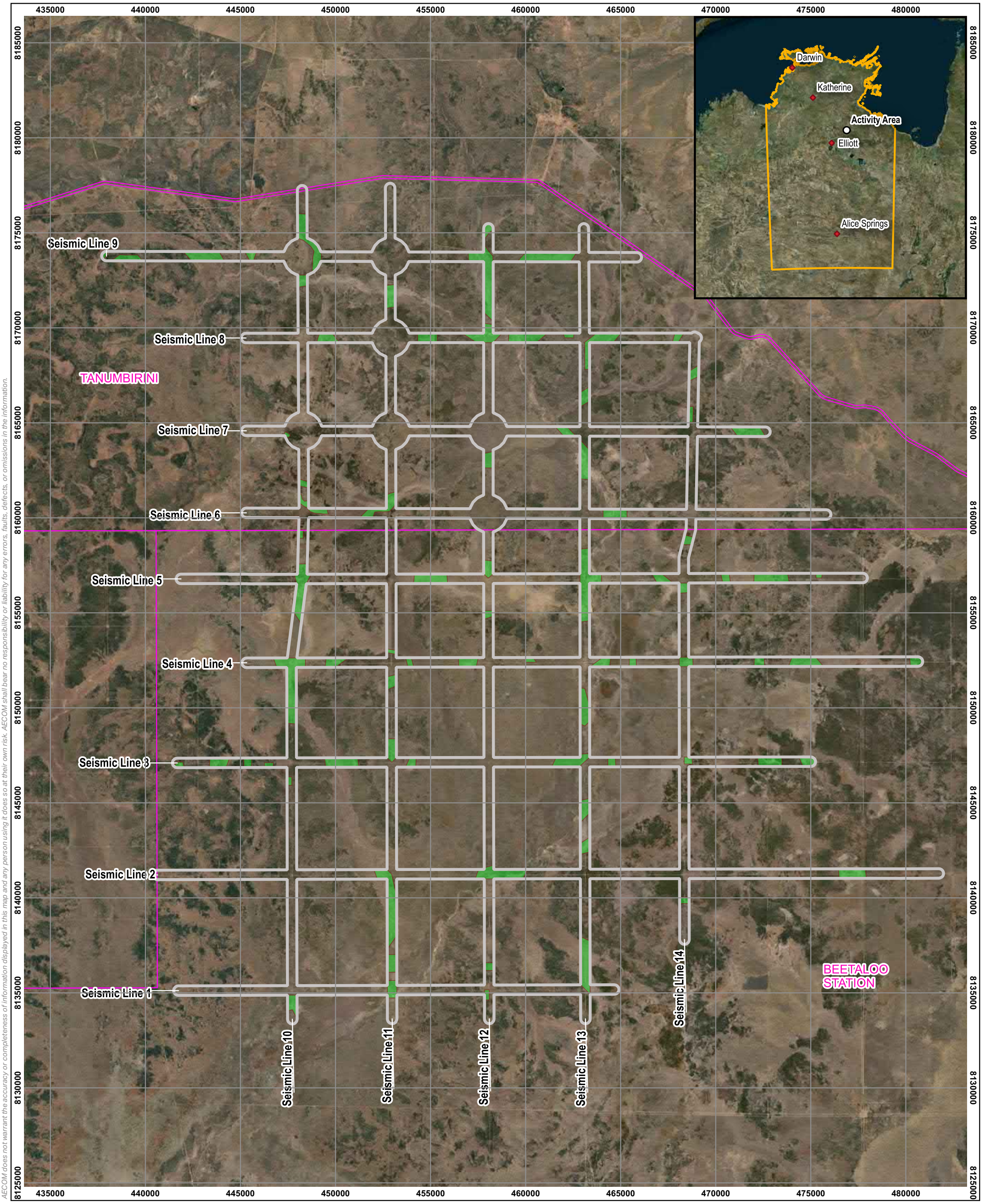
A heritage assessment was undertaken for the Project Area by AECOM heritage specialist, Perri Braithwaite between 5 and 7 November 2019. A supplementary survey was conducted by Dr.Silvano Jung between 26 and 30 May 2020. The assessment involved inspection of targeted investigation areas identified from predictive modelling developed by AECOM (2011a, 2012a, 2015, 2016). This AECOM modelling builds on an initial low resolution predictive model developed by HLA (2006a, 2006c). The AECOM model improves upon this by importing known distribution of archaeological sites on both a regional and local scale, in addition to the presence of semi and permanent water resources and suitable raw materials (Figure 9 and Figure 10).

AECOM have identified the following sensitive landforms that are expected to contain Aboriginal cultural heritage:

- Non-flood prone areas adjacent to established watercourses.
- Areas with distinctive vegetation patterning, such as those areas associated with *Macropteranthes kekwickii* (bullwaddy).
- Adjacent to flood plains where a noticeable change in vegetation is identified.
- On the periphery of lagoons and ‘chain of ponds’ features.

Using satellite imagery, all of the above sensitive landforms that intersected the proposed impact area were identified as target investigation areas (n=71). Of these, simple random sampling identified 20 target investigation areas for ground truthing as part of the three-day and four-day rapid site assessment in November 2019 and May 2020, respectively (Figure 11 and Figure 12) . As part of the broader environmental survey additional areas, that were not associated with culturally sensitive landforms, were also surveyed to assess the efficacy of the predictive model.

During the inspection, notes were taken on landform, ground surface visibility and areas of exposure. Photographic records were taken at each surveyed target area. Attribute data for all identified flaked stone artefacts were entered directly into a GPS unit (Section 4.3).



LEGEND

- Project Area Buffer
- Aboriginal Cultural Heritage Sensitivity
- Pastoral Cadastre

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0 1 2 3 4 5 km

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Data Sources:
Sweetpea
NT Government (Heritage Branch)
NT Government (AAPA)

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Aboriginal Cultural Heritage Sensitivity

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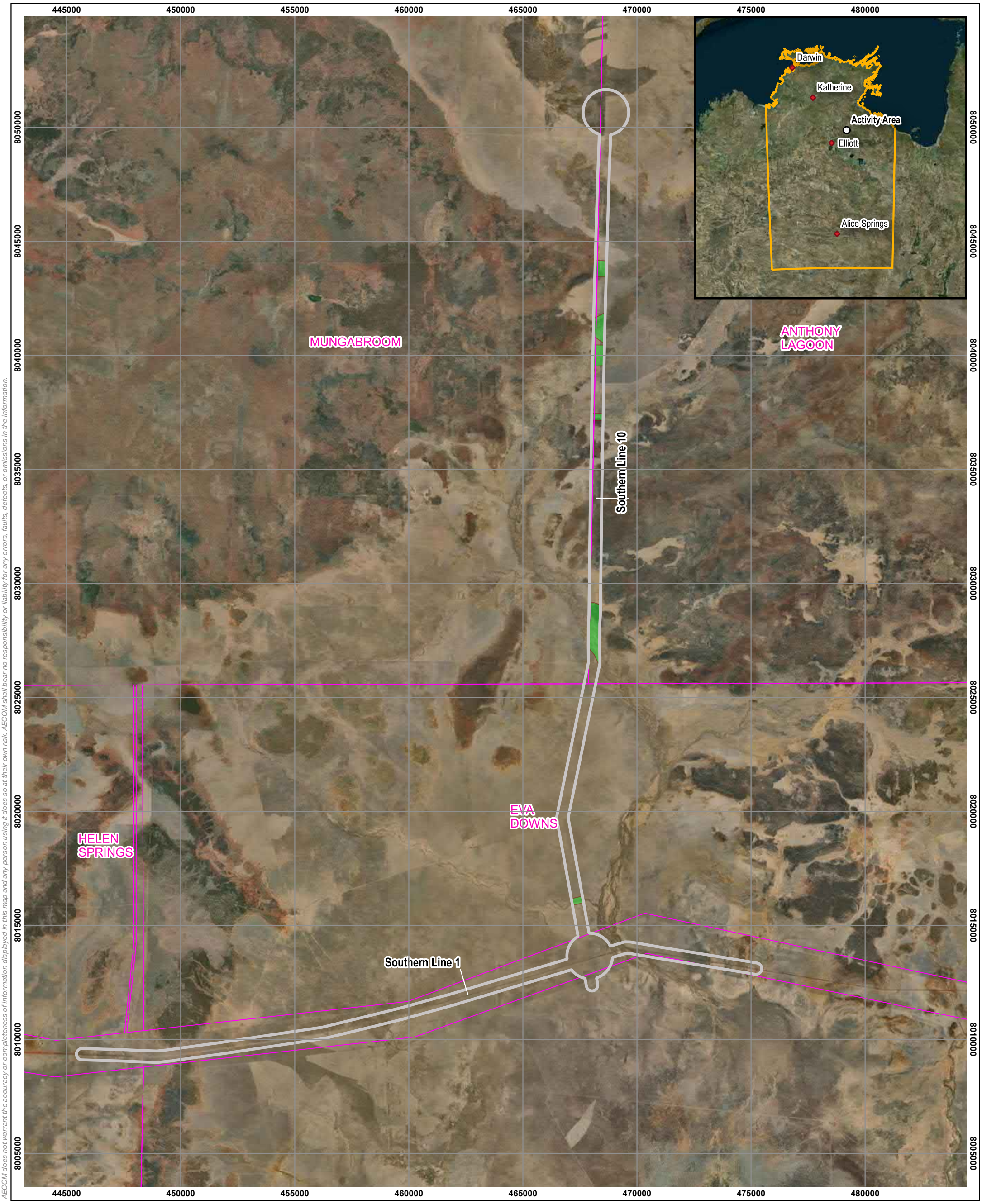
Figure 9



LEGEND

- Project Area Buffer
- Aboriginal Cultural Heritage Sensitivity
- Pastoral Cadastre

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Data Sources:
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NT Government (AAPA)

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Aboriginal Cultural Heritage Sensitivity

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Figure 10

4.3 Results

A total of 24 inspection areas were surveyed for the Seismic EMP (Figure 11 and Figure 12). Of these, 20 target investigation areas associated with sensitive landforms were inspected, with 14 containing evidence of flaked stone artefacts (Figure 13 and Figure 14). No expressions of Aboriginal cultural heritage were identified at the additional four inspection areas, surveyed as part of the broader environmental assessment.

Ground surface visibility (GSV) was varied across the site ranging from 0-100%. Ground Surface Integrity (GSI) within the previously cleared tracks was identified at 0-25% (low) and outside the cleared track varied between 75-100% (high).

Results of the inspection are provided in Table 4 and Plate 1 - Plate 48. Appendix B2 provides details on ground surface visibility classes, subsurface archaeological potential assessment and impact potential.

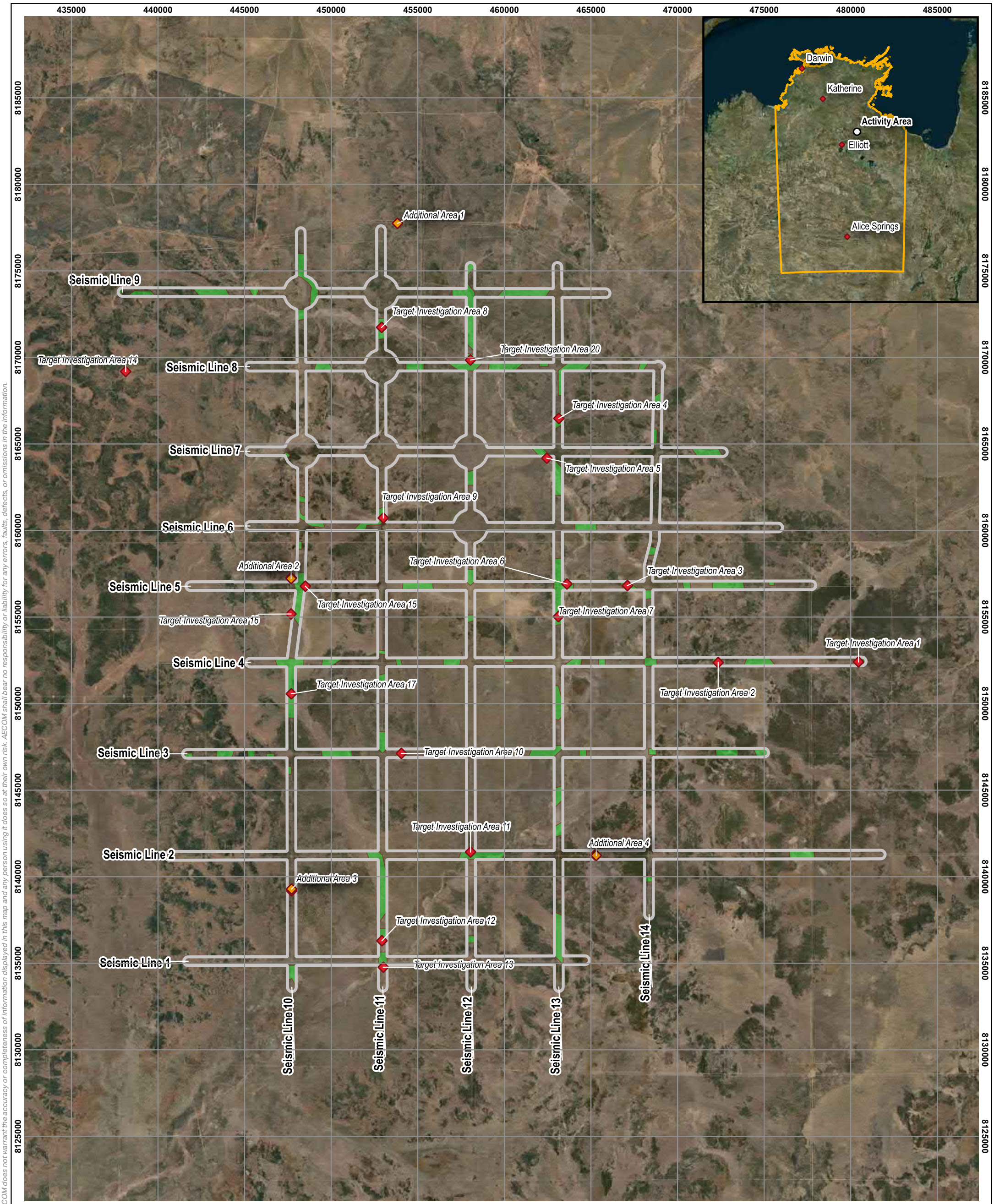
Table 4 Inspection Results

Target Area	Easting*	Northing*	GSV%	GSI%	Surface Archaeology
1	[redacted]	[redacted]	75-100	75-100	BT-19-AS11
2	[redacted]	[redacted]	75-100	75-100	BT-19-IA4 BT-19-IA5
3	[redacted]	[redacted]	75-100	75-100	No
4	[redacted]	[redacted]	75-100	75-100	BT-19-AS18
5	[redacted]	[redacted]	0-25	75-100	BT-19-AS16 BT-19-AS17
6	[redacted]	[redacted]	0-100	75-100	BT-19-AS12 BT-19-AS13 BT-19-IA7
7	[redacted]	[redacted]	75-100	75-100	BT-19-IA6
8	[redacted]	[redacted]	75-100	75-100	BT-19-AS19
9	[redacted]	[redacted]	25-50	75-100	BT-19-IA8 BT-19-IA9 BT-19-AS15
10	[redacted]	[redacted]	75-100	75-100	No
11	[redacted]	[redacted]	75-100	75-100	BT-19-AS10
12	[redacted]	[redacted]	0-50	75-100	No
13	[redacted]	[redacted]	75-100	75-100	BT-19-AS7 BT-19-AS8 BT-19-AS9 BT-19-IA1 BT-19-IA2 BT-19-IA3
14[a]	[redacted]	[redacted]	25-50	75-100	No
15	[redacted]	[redacted]	75-100	75-100	BT-19-AS14
16[a]	[redacted]	[redacted]	50-75	75-100	No
17	[redacted]	[redacted]	50-75	75-100	No
18	[redacted]	[redacted]	50-75	75-100	BT-20-AS01
19	[redacted]	[redacted]	50-75	50-75	BT-20-AS02

Target Area	Easting*	Northing*	GSV%	GSI%	Surface Archaeology
20	[redacted]	[redacted]	75-100	75-100	BT-20-AS03
Additional Area #1	[redacted]	[redacted]	75-100	0-25	No
Additional Area #2[a]	[redacted]	[redacted]	25-100	75-100	No
Additional Area #3	[redacted]	[redacted]	25-100	75-100	No
Additional Area #4	[redacted]	[redacted]	0-25	75-100	No

* - Datum: GDA94 Z53

a – Note that these areas now are located outside of the revised 2020 program



LEGEND

- Project Area Buffer
- Traget Investigation Areas
- Additional Inspection Areas
- Aboriginal Cultural Heritage Sensitivity

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EP136 Beetaloo Sub-Basin, NT
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Heritage Assessment
Inspection Areas

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Figure 11

LEGEND

- Project Area Buffer
- Target Investigation Areas
- Aboriginal Cultural Heritage Sensitivity

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Southern Exploration Area
Heritage Assessment
Inspection Areas

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Figure 12

Plate 1 **Target Area #1 general context shot looking north**

Plate 2 **Target Area #1 ground cover context shot showing surface visibility.**

Plate 3 **Target Area #2 general context shot looking north**

Plate 4 **Target Area #2 ground cover context shot showing surface visibility**

Plate 5 **Target Area #3 general context shot looking west**

Plate 6 **Target Area #3 ground cover context shot showing surface visibility**

Plate 7 Target Area #4 general context shot looking west

Plate 8 Target Area #4 ground cover context shot showing surface visibility

Plate 9 Target Area #5 general context shot looking north

Plate 10 Target Area #5 general context shot showing surface visibility

Plate 11 Target Area #6 general context shot looking north

Plate 12 Target Area #6 general context shot showing surface visibility

Plate 13 Target Area #7 general context shot looking north

Plate 14 Target Area #7 general context shot showing surface visibility

Plate 15 Target Area #8 general context shot looking north

Plate 16 Target Area #8 general context shot showing surface visibility

Plate 17 Target Area #9 general context shot looking north

Plate 18 Target Area #9 general context shot showing surface visibility

Plate 19 **Target Area #10 general context shot looking north**

Plate 20 **Target Area #10 general context shot showing surface visibility**

Plate 21 **Target Area #11 general context shot looking north**

Plate 22 **Target Area #11 general context shot showing surface visibility**

Plate 23 Target Area #12 general context shot looking north

Plate 24 Target Area #12 general context shot showing surface visibility

Plate 25 Target Area #13 general context shot looking north

Plate 26 Target Area #13 general context shot showing surface visibility

Plate 27 Target Area #14 general context shot looking north

Plate 28 Target Area #14 general context shot showing surface visibility

Plate 29 **Target Area #15 general context shot looking north**

Plate 30 **Target Area #15 general context shot showing surface visibility**

Plate 31 **Target Area #16 general context shot looking north**

Plate 32 **Target Area #16 general context shot showing surface visibility**

Plate 33 **Target Area #17 general context shot looking north**

Plate 34 **Target Area #17 general context shot showing surface visibility. Note, large poor quality non-artefactual gravel and rock.**

Plate 35 **Target Area #17 general context shot** (Jung, 2020)

Plate 36 **Target Area Target Area #17showing surface visibility** (Jung, 2020)

Plate 37 **Target Area #19 general context shot looking east** (Jung, 2020)

Plate 38 **Target Area #19 general context shot looking northwest showing surface visibility** (Jung, 2020)

Plate 39 **Target Area #20 general context shot** (Jung, 2020)

Plate 40 **Target Area #20 general context shot showing surface visibility shot** (Jung, 2020)

Plate 41 **Additional Area #1 (location of camp site) general context shot looking north**

Plate 42 **Additional Area #1 (location of camp site) general context shot showing surface visibility.**

Plate 43 **Additional Area #2 general context shot looking north**

Plate 44 **Additional Area #2 general context shot showing surface visibility.**

Plate 45 **Additional Area #3 general context shot looking south**

Plate 46 **Additional Area #3 general context shot looking east**

Plate 47 **Additional Area #4 general context shot looking north**

Plate 48 **Additional Area #4 general context shot showing surface visibility.**

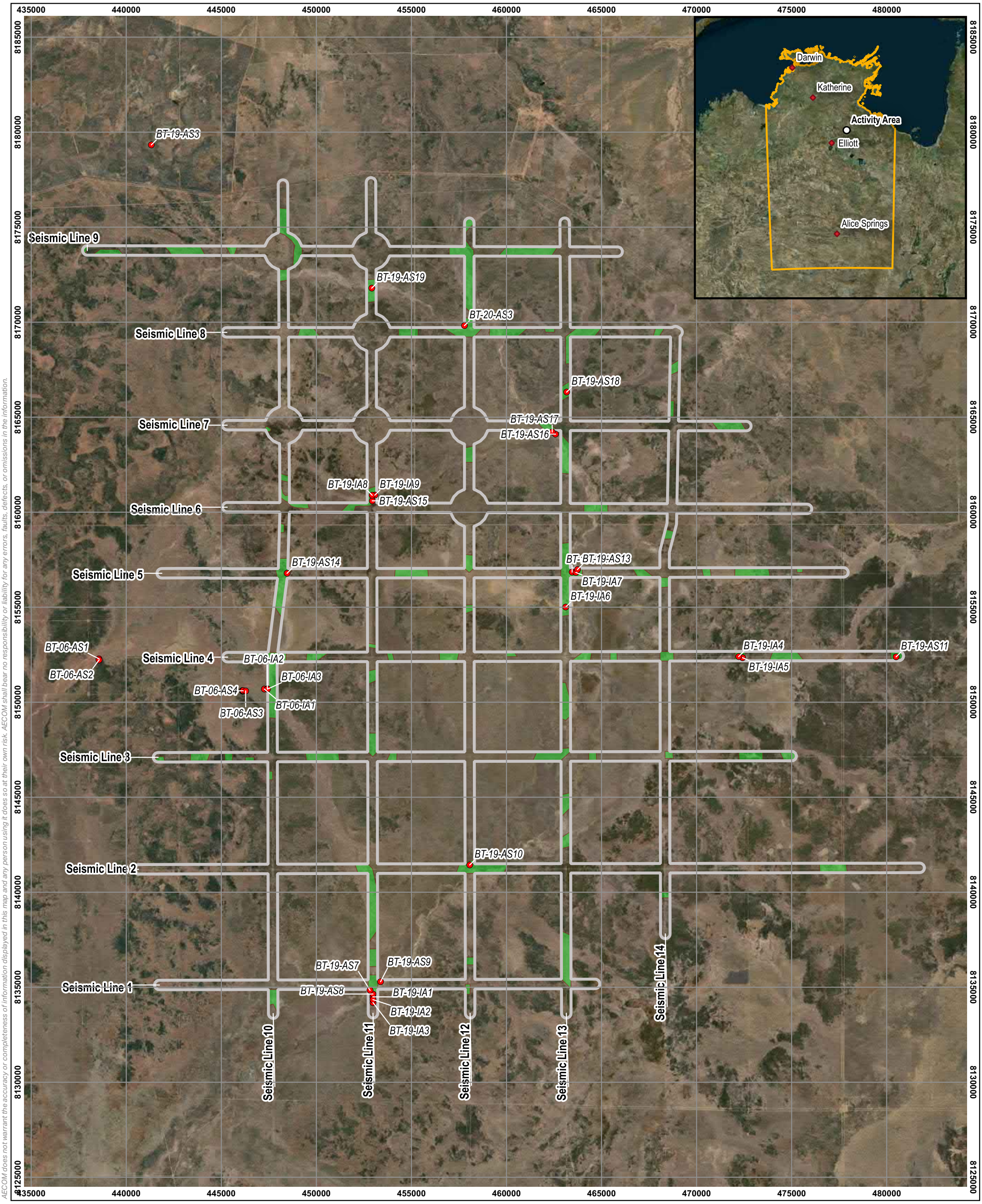
Twenty-five Aboriginal archaeological sites (BT-19-AS7 to BT-19-AS19, BT-19-IA1 to BT-19-IA9 and BT-20-AS01 to BT-20-AS03) were identified during the field survey. Of these, 23 were located within the study area, while the remaining two were located adjacent to the study area (Table 5 and Figure 13 and Figure 14).

Table 5 **Summary of Aboriginal archaeological site**

Site ID	Site Type	Seismic Line	Location	Easting*	Northing*
BT-19-AS7	Artefact Scatter	10	Target Area 13	[redacted]	[redacted]
BT-19-AS8	Artefact Scatter	10	Target Area 13	[redacted]	[redacted]
BT-19-AS9	Artefact Scatter	NA	Target Area 13	[redacted]	[redacted]
BT-19-AS10	Artefact Scatter	11	Target Area 11	[redacted]	[redacted]
BT-19-AS11	Artefact Scatter	6	Target Area 1	[redacted]	[redacted]
BT-19-AS12	Artefact Scatter	7	Target Area 6	[redacted]	[redacted]
BT-19-AS13	Artefact Scatter	NA	Target Area 6	[redacted]	[redacted]
BT-19-AS14	Artefact Scatter	7	Target Area 15	[redacted]	[redacted]
BT-19-AS15	Artefact Scatter	10	Target Area 9	[redacted]	[redacted]
BT-19-AS16	Artefact Scatter	8	Target Area 5	[redacted]	[redacted]
BT-19-AS17	Artefact Scatter	8	Target Area 5	[redacted]	[redacted]
BT-19-AS18	Artefact Scatter	2	Target Area 4	[redacted]	[redacted]
BT-19-AS19	Artefact Scatter	10	Target Area 8	[redacted]	[redacted]

Site ID	Site Type	Seismic Line	Location	Easting*	Northing*
BT-19-IA1	Isolated Artefact	10	Target Area 13	[redacted]	[redacted]
BT-19-IA2	Isolated Artefact	10	Target Area 13	[redacted]	[redacted]
BT-19-IA3	Isolated artefact	10	Target Area 13	[redacted]	[redacted]
BT-19-IA4	Isolated artefact	6	Target Area 2	[redacted]	[redacted]
BT-19-IA5	Isolated artefact	NA	Target Area 2	[redacted]	[redacted]
BT-19-IA6	Isolated artefact	2	Target Area 7	[redacted]	[redacted]
BT-19-IA7	Isolated artefact	7	Target Area 6	[redacted]	[redacted]
BT-19-IA8	Isolated artefact	10	Target Area 9	[redacted]	[redacted]
BT-19-IA9	Isolated artefact	NA	Target Area 9	[redacted]	[redacted]
BT-20-AS01	Artefact Scatter	Southern Line10	Target Area 18	[redacted]	[redacted]
BT-20-AS02	Artefact Scatter	Southern Line10	Target Area 19	[redacted]	[redacted]
BT-20-AS03	Artefact Scatter	11	Target Area 20	[redacted]	[redacted]

* Datum: GDA94 Z53



LEGEND

- Project Area Buffer
- Aboriginal Cultural Heritage Sensitivity
- Surface Archaeology Sites

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2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Northern Exploration Area
Heritage Assessment
Identified Heritage Sites

Data Sources:
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NT Government (Heritage Branch)
NT Government (AAPA)

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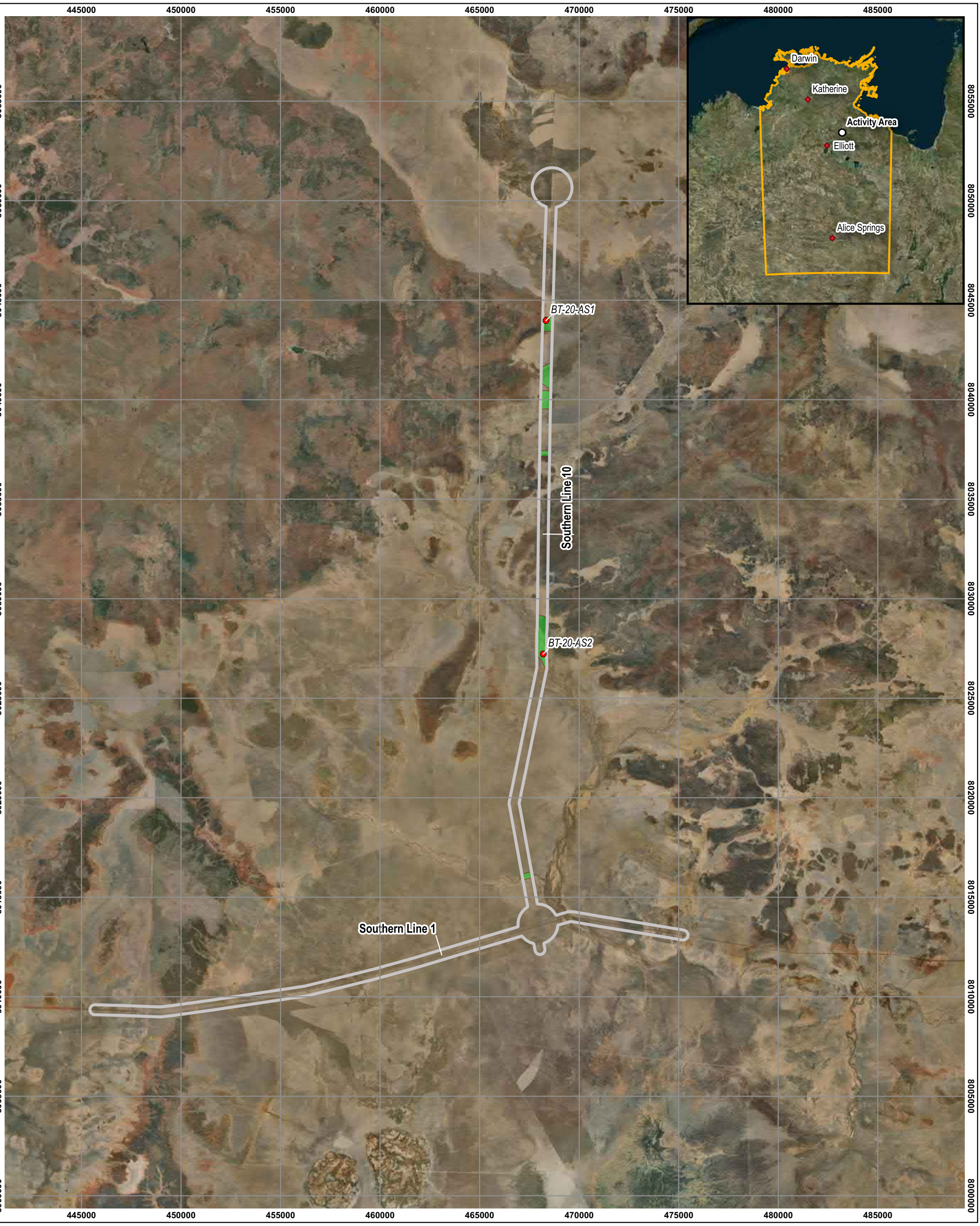
Figure 13



LEGEND

- Project Area Buffer
- Surface Archaeology Sites
- Aboriginal Cultural Heritage Sensitivity

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0 1 2 3 4 5 km

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2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Southern Exploration Area
Heritage Assessment
Identified Heritage Sites

Data Sources:
Sweetpea
NT Government (Heritage Branch)
NT Government (AAPA)

PROJECT ID	60611666
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VERSION	2

Figure 14

4.3.1 BT-19-AS7 – Artefact Scatter

BT-19-AS7 (GDA94 Zone 53 [redacted]) is a high-density artefact scatter located on the southern extent of seismic line 10 study area, adjacent to a large lagoon within Newcastle Creek associated with sacred site 5864-18 (Figure D13, Appendix B4). The site was initially identified by lithic material exposed along the creek bed of Newcastle Creek. While many of the artefacts were identified within the creek bed, the main concentration of artefacts were located around the periphery of the lagoon east of the bulldozed track.

The artefacts scatter comprises several hundred artefacts, 77 of which were recorded in detail. Lithic types include 54 flakes, 22 tools and one core. Of the tools, seven are pirri points, six are bifacial points, and three are retouched flakes. Raw materials include silcrete, chert and quartzite. Collectively, the character of the flaked stone artefact assemblages adjacent to this watercourse/lagoon is suggestive of what Schlanger (1992), has described as a 'persistent place'. Persistent places, as articulated by Schlanger (1992), are created through two basic mechanisms, the first being when a particular landscape segment possesses a quality that attracts repeated human activity over time, for example, a watercourse or knappable stone source, the second, being the structuring of future landscape use through human creations and/or environmental modifications. Such places may be functionally dynamic through time and need not attract permanent settlement, the alternative being long-term episodic use.

Ground surface visibility was consistently 100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track and around the lagoon was moderate to high with minor pastoral activities evident (Plate 49 - Plate 54). The artefacts met strict criteria for lithic identification and were not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material. Furthermore, the presence of identifiable lithic material located in areas unaffected by earthworks confirms the validity of the site.

Plate 49 **BT-19-AS7 - context shot looking north.**

Plate 50 **BT-19-AS7 - context shot showing surface visibility.**

Plate 51 **BT-19-AS7 - 2x Pirri points and 2x bifacial points**

Plate 52 **BT-19-AS7 – proximal flake (ventral)**

Plate 53 **BT-19-AS7 – silcrete bifacial point**

Plate 54 **BT-19-AS7 – silcrete Pirri point (dorsal)**

4.3.2 BT-19-AS8 – Artefact Scatter

BT-19-AS8 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter comprising two silcrete flakes, located on the seismic line 10 study area (Figure D13, Appendix B4). The artefact was exposed on a heavily disturbed bulldozed track.

Ground surface visibility was consistently 100%. GSI was severally degraded from the bulldozed track. Evidence of impact from creation of the track was evident with cobbles showing impact from

bulldozers and soil pushed in mounds to the side. The artefacts met strict criteria for lithic identification and were not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material.

4.3.3 BT-19-AS9 – Artefact Scatter

BT-19-AS9 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter comprising two complete chert flakes located 150m north of the central extent of seismic line 1 study area (Figure D13, Appendix B4). The site was initially identified by lithic material exposed along the creek bed of Newcastle Creek.

Ground surface visibility was consistently 100%. GSI was moderate to high with minor pastoral activities evident (Plate 55 - Plate 58).

Plate 55 BT-19-AS9 - context shot of looking south.

Plate 56 BT-19-AS9 - context shot showing surface visibility.

Plate 57 BT-19-AS9 – complete flake (ventral)

Plate 58 BT-19-AS9 – complete flake (dorsal)

4.3.4 BT-19-AS10 – Artefact Scatter

BT-19-AS10 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located on the southern extent of seismic line 11 study area, adjacent to and within Newcastle Creek (Figure D11, Appendix B4). The site was initially identified by lithic material exposed on the access track, with additional artefactual material located off the track during subsequent inspection.

The artefact scatter comprises six artefacts, including four flakes and two cores. Raw material includes chert and silcrete.

Ground surface visibility was variable across the site ranging from 50-75%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the isolated artefact was identified, was moderate to high with minor pastoral activities evident (Plate 59 - Plate 62). The artefacts met strict criteria for lithic identification and were not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material.

Plate 59 BT-19-AS10 - context shot of looking west

Plate 60 BT-19-AS10 - context shot showing surface visibility.

Plate 61 BT-19-AS10 - complete flake (dorsal)

Plate 62 BT-19-AS10 – complete flake (ventral)

4.3.5 BT-19-AS11 – Artefact Scatter

BT-19-AS11 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located on the eastern extent of seismic line 6 study area, adjacent to a lagoon 30 m south of a heavily disturbed access track (Figure D1, Appendix B4). The artefact scatter comprises two silcrete flakes and one silcrete retouched flake.

Ground surface visibility was variable across the site from 50-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track was moderate to high with minor pastoral activities evident (Plate 63 - Plate 66). The artefacts met strict criteria for lithic identification and were not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material.

Plate 63 BT-19-AS11 – context shot looking east.

Plate 64 BT-19-AS11 - context shot showing surface visibility.

Plate 65 BT-19-AS11 -complete flake (ventral)

Plate 66 BT-19-AS11 –complete flake (dorsal)

4.3.6 BT-19-AS12 – Artefact Scatter

BT-19-AS12 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located 75 m north of the seismic line 7 study area, adjacent to a Newcastle Creek (Figure D6, Appendix B4). The artefact scatter comprises two silcrete flakes and one multidirectional silcrete core.

Ground surface visibility was consistently 100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the site was identified, was moderate to high with minor pastoral activities evident (Plate 67 - Plate 70). The artefacts met strict criteria for lithic identification and were not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material. Furthermore, the presence of identifiable lithic material located in areas unaffected by earthworks confirms the validity of the site.

Plate 67 BT-19-AS12 - context shot looking east.

Plate 68 BT-19-AS12 - context shot showing surface visibility.

Plate 69 BT-19-AS12 - proximal flake (dorsal)

Plate 70 BT-19-AS12 – proximal flake (ventral)

4.3.7 BT-19-AS13 – Artefact Scatter

BT-19-AS13 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located 165m north of seismic line 7 study area, adjacent to and within Newcastle Creek (Figure D6, Appendix B4). The artefact scatter comprises six artefacts, included three silcrete flakes, two chert flakes and one silcrete core.

Ground surface visibility was consistently 100%. GSI was moderate to high with minor pastoral activities evident (Plate 71 - Plate 74).

Plate 71 BT-19-AS13 - context shot looking south.

Plate 72 BT-19-AS13 - context shot showing surface visibility.

Plate 73 BT-19-AS13 - complete flake (ventral)

Plate 74 BT-19-AS13 - complete flake (dorsal)

4.3.8 BT-19-AS14 – Artefact Scatter

BT-19-AS14 (GDA94 Zone 53 [redacted] is a low-density artefact scatter located on the seismic line 7 study area, adjacent to a depression, inundated during the wet season (Figure D15, Appendix B4). The site was initially identified by lithic material exposed on the access track. The artefact scatter comprises on silcrete flake and one chert flake.

Ground surface visibility varies between 75-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side (Plate 75 - Plate 78). The artefacts met strict criteria for lithic identification and were not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

Plate 75 BT-19-AS14 - context shot looking east

Plate 76 BT-19-AS14 - context shot showing surface visibility.

Plate 77 BT-19-AS14 – complete artefact (dorsal)

Plate 78 BT-19-AS14 – complete artefact (ventral)

4.3.9 BT-19-AS15 – Artefact Scatter

BT-19-AS15 (GDA94 Zone 53 [redacted] is a low-density artefact scatter located on seismic line 10 study area adjacent to a flood plain where a small creek line runs 30 m west of the scatter (Figure D9, Appendix B4). The artefact scatter comprises five silcrete flakes and one silcrete retouched flake.

Ground surface visibility was variable across the site ranging from 25-75%. GSI was moderate to high, with minor pastoral activities evident (Plate 79 - Plate 82).

Plate 79 BT-19-AS15 - context shot looking north.

Plate 80 BT-19-AS15 - context shot showing surface visibility.

Plate 81 BT-19-AS15 – complete flake (dorsal)

Plate 82 BT-19-AS15 – complete flake (dorsal)

4.3.10 BT-19-AS16 – Artefact Scatter

BT-19-AS16 (GDA94 Zone 53 [redacted]) is a high-density artefact scatter located on seismic line 8 study area, adjacent to Newcastle Creek (Figure D5, Appendix B4). The site was initially identified by lithic material exposed on the creek bed of Newcastle creek.

The artefact scatter comprises 31 artefacts including 28 flakes and three cores. Raw materials include silcrete and chert. Collectively, the character of the flaked stone artefact assemblages adjacent to this watercourse/lagoon is suggestive of a persistent place (Schlanger 1992).

Ground surface visibility ranged between 75-100%. GSI was moderate to high, with minor pastoral activities evident (Plate 83 - Plate 86).

Plate 83 BT-19-AS16 - context shot looking north.

Plate 84 BT-19-AS16 - context shot showing surface visibility.

Plate 85 BT-19-AS16 – proximal flake (ventral)

Plate 86 BT-19-AS16 – 5x chert flakes

4.3.11 BT-19-AS17 – Artefact Scatter

BT-19-AS17 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located on seismic line 8 study area, adjacent to and within Newcastle Creek (Figure D5, Appendix B4). The site was initially identified by lithic material exposed on the creek bed of Newcastle creek.

The artefact scatter is comprised of three artefacts, including one silcrete flake, one chert retouched flake and one silcrete multidirectional core. Due to its proximity to BT-19-AS16, this site is likely an expression of the persistent pattern along Newcastle Creek.

Ground surface visibility was consistently 100%. GSI was moderate to high with minor pastoral activities evident (Plate 87 - Plate 90).

Plate 87 BT-19-AS17 - context shot looking north.

Plate 88 BT-19-AS17 - context shot showing surface visibility

Plate 89 BT-19-AS17 – proximal flake (dorsal)

Plate 90 BT-19-AS17 – complete flake (ventral)

4.3.12 BT-19-AS18 – Artefact Scatter

BT-19-AS18 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located on seismic line 2 adjacent to and within a tributary of Newcastle Creek (Figure D4, Appendix B4). The site was initially identified by lithic material exposed on the creek bed of the waterway. The artefact scatter is comprised of four silcrete flakes.

Ground surface visibility varies across the site with 75-100%. GSI was moderate to high with minor pastoral activities evident (Plate 91 - Plate 94).

Plate 91 BT-19-AS18 - context shot looking north.

Plate 92 BT-19-AS18 - context shot showing surface visibility.

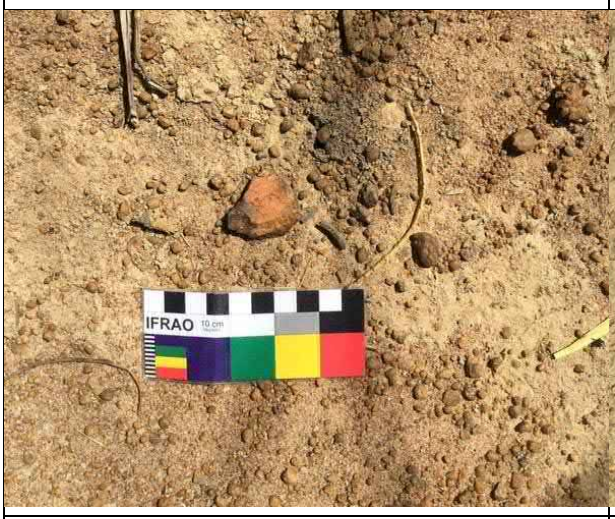

Plate 93 BT-19-AS18 - complete flake (ventral)

Plate 94 BT-19-AS18 – complete flakes (dorsal)

4.3.13 BT-19-AS19 – Artefact Scatter

BT-19-AS19 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter located on the northern extent of seismic line 10 adjacent to Newcastle Creek (Figure D8, Appendix B4). The site was initially identified by lithic material exposed on the creek bed extending to the banks.

The artefact scatter comprises six flakes and one unidirectional core. Raw material includes chert and silcrete.

Ground surface visibility varies across the site ranging from 50-75%. GSI was moderate to high with minor pastoral activities evident (Plate 95 - Plate 98).

Plate 95 BT-19-AS19 - context shot of looking north.

Plate 96 BT-19-AS19 - context shot showing surface visibility.

Plate 97 BT-19-AS19 – quartzite core

Plate 98 BT-19-AS19 – 2x quartzite flakes

4.3.14 BT-19-IA1 – Isolated Artefact

BT-19-IA1 (GDA94 Zone 53 [redacted]) is an isolated retouched quartzite flake, located on the southern extent of the seismic line 10 study area (Figure D13, Appendix B4). The artefact was exposed on a heavily disturbed bulldozed track 200 m south of Newcastle Creek.

Ground surface visibility was consistently 100%, however ground surface integrity (GSI) was severally degraded from the bulldozed access track (Plate 99). Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. The artefact met strict criteria for lithic identification and was not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

4.3.15 BT-19-IA2 – Isolated Artefact

BT-19-IA2 (GDA94 Zone 53 [redacted]) is an isolated retouched chert flake, located on the southern extent of seismic line 10 study area (Figure D13, Appendix B4). The artefact was exposed on a heavily disturbed bulldozed track 480 m south of Newcastle Creek.

Ground surface visibility was consistently 100%, however GSI was severally degraded due to the bulldozed track (Plate 99). Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. The artefact met strict criteria for lithic identification and was not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

4.3.16 BT-19-IA3 – Isolated Artefact

BT-19-IA3 (GDA94 Zone 53 [redacted]) is an isolated grindstone located on the southern extent of seismic line 10 study area (Figure D13, Appendix B4). The artefact was exposed on a heavily disturbed bulldozed track 680 m south of Newcastle Creek.

Ground surface visibility was consistently 100%, however GSI was severally degraded from the bulldozed track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side (Plate 99 - Plate 102). The artefact met strict criteria for lithic identification and was not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material.

Plate 99 BT-19-IA3 - context shot looking north.

Plate 100 BT-19-IA3 - context shot showing surface visibility.

Plate 101 BT-19-IA3 - sandstone grindstone

Plate 102 BT-19-IA3 - context shot showing surface visibility and context of the artefact.

4.3.17 BT-19-IA4 – Isolated Artefact

BT-19-IA4 (GDA94 Zone 53 [redacted]) is an isolated silcrete medial flake, located on the eastern extent of seismic line 6 study area, adjacent to a bulldozed access track (Figure D2, Appendix B4).

Ground surface visibility was variable across the site ranging from 50-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the isolated artefact was identified, was moderate to high with minor pastoral activities evident (Plate 103 - Plate 106). The artefact met strict criteria for lithic identification and was not considered a 'dozer-facts' – sharp rocks created by a bulldozer that imitate lithic material.

Plate 103 BT-19-IA4 - context shot looking east.

Plate 104 BT-19-IA4 - context shot showing surface visibility.

Plate 105 BT-19-IA4 - proximal flake (dorsal)

Plate 106 BT-19- IA4 - proximal flake (ventral)

4.3.18 BT-19-IA5 – Isolated Artefact

BT-19-IA5 (GDA94 Zone 53 [redacted]) is an isolated silcrete split flake located 80 m south of the eastern extent of seismic line 6 study area, adjacent to a bulldozed access track (Figure D2, Appendix B4).

Ground surface visibility was variable across the site ranging from 75-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the isolated artefact was identified, was moderate to high with minor pastoral activities evident (Plate 107 - Plate 110). The artefact met strict criteria for lithic identification and was not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

Plate 107 BT-19-IA5 - context shot looking east.

Plate 108 BT-19-IA5 - context shot showing surface visibility.

Plate 109 BT-19-IA5 - complete flake (dorsal)

Plate 110 BT-19- IA5 - complete flake (dorsal)

4.3.19 BT-19-IA6 – Isolated Artefact

BT-19-IA6 (GDA94 Zone 53 [redacted]) is an isolated silcrete flake, located on the seismic line 2 study area adjacent to the bulldozed track, approximately 350 m west of Newcastle Creek (Figure D7, Appendix B4).

Ground surface visibility was variable across the site from 75-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the isolated artefact was identified, was moderate to high with minor pastoral activities evident (Plate 111 - Plate 114). The artefact met strict criteria for lithic identification and was not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

Plate 111 BT-19-IA6 - context shot looking west.

Plate 112 BT-19-IA6 - context shot showing surface visibility.

Plate 113 BT-19-IA6 - proximal flake (dorsal)

Plate 114 BT-19- IA6 – proximal flake (ventral)

4.3.20 BT-19-IA7 – Isolated Artefact

BT-19-IA7 (GDA94 Zone 53 [redacted]) is an isolated complete silcrete flake, located on the eastern extent of seismic line 7 study area, adjacent to Newcastle Creek (Figure D6, Appendix B4).

Ground surface visibility was varied across the site ranging from 75-100%. GSI was severally degraded within the bulldozed access track. Evidence of impact from creation of the track was evident with cobbles showing impact from bulldozers and soil pushed in mounds to the side. GSI adjacent to the track, where the isolated artefact was identified, was moderate to high with minor pastoral activities evident (Plate 115 - Plate 118). The artefact met strict criteria for lithic identification and was not considered a ‘dozer-facts’ – sharp rocks created by a bulldozer that imitate lithic material.

Plate 115 BT-19-IA7 - context shot looking north.

Plate 116 BT-19-IA7 - context shot showing surface visibility.

Plate 117 BT-19-IA7 – complete flake (dorsal)

Plate 118 BT-19- IA7 – complete flake (ventral)

4.3.21 BT-19-IA8 – Isolated Artefact

BT-19-IA8 (GDA94 Zone 53 [redacted]) is an isolated silcrete flake, located on the northern extent of seismic line 10 study area, adjacent to a tributary of Newcastle Creek (Figure D9, Appendix B4).

Ground surface visibility was variable across the site ranging from 50-75%. GSI was moderate to high showing signs of minor pastoral activity (Plate 119 and Plate 120).

Plate 119 BT-19-IA8 - context shot of looking north.

Plate 120 BT-19-IA8 - context shot showing surface visibility.

4.3.22 BT-19-IA9 – Isolated Artefact

BT-19-IA9 (GDA94 Zone 53 [redacted]) is an isolated silcrete proximal flake located 160m east of the northern extent of seismic line 10 study area, within the creek bed of a tributary of Newcastle Creek (Figure D9, Appendix B4).

Ground surface visibility was variable across the site ranging from 25-75%. GSI was moderate to high showing signs of minor pastoral activity (Plate 121 - Plate 124).

Plate 121 BT-19-IA9 - context shot looking east.

Plate 122 BT-19-IA9 - context shot showing surface visibility.

Plate 123 BT-19-IA9 - proximal flake (ventral)

Plate 124 BT-19- IA9 – proximal flake (dorsal)

4.3.23 BT-20-AS01 – Artefact Scatter

BT-20-AS01 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter comprising two chert flakes (Plate 125 and Plate 126). The artefact scatter is located on southern line 10 study area, on the edge of a flood plain in sparse mid-height vegetation (Figure D18, Appendix B4).

Ground surface visibility was consistently 100%. GSI was moderate to high with minor pastoral activities evident (Jung, 2020).

Plate 125 BT-20-AS01 - chert flake (ventral) (Jung, 2020, p. 6)

Plate 126 BT-20-AS01 - chert flake (proximal) (Jung, 2020, p. 7)

4.3.24 BT-20-AS02 – Artefact Scatter

BT-20-AS02 (GDA94 Zone 53 [redacted]) is a moderate-density artefact scatter located towards the southern extent of southern line 10 study area, adjacent to an unnamed creekline (Figure D19, Appendix B4). The site was identified approximately 30 m east of a fence line on flat sandy laterite soils (Plate 127 and Plate 128).

The artefacts scatter comprises more than 12 artefacts, including a number of flakes and one chert pirri point. Raw material types included cherts silcrete and crystal quartz (Plate 129 - Plate 134). Collectively, the character of the flaked stone artefact assemblages adjacent to this watercourse is suggestive of what Schlanger (1992), has described as a 'persistent place'.

Ground surface visibility was variable across the site ranging 50-75%. GSI was moderate to high, with minor pastoral activities evident (Jung, 2020).

Plate 127 **BT-20-AS02 - context shot look northwest** (Jung, 2020, p. 9)

Plate 128 **BT-20-AS02 - context shot look north across creek** (Jung, 2020, p. 9)

Plate 129 **BT-20-AS02 - chert flake (ventral), quartzite flake (distal ventral), chert flake (ventral)** (Jung, 2020, p. 10)

Plate 130 **BT-20-AS02 - chert flake (ventral)** (Jung, 2020, p. 10)

Plate 131 BT-20-AS02 - chert pirri point (ventral) (Jung, 2020, p. 11)

Plate 132 BT-20-AS02 – complete crystal quartz flake (ventral) (Jung, 2020, p. 11)

Plate 133 BT-20-AS02 – complete chert flake (ventral) (Jung, 2020, p. 12)

Plate 134 BT-20-AS02 – broken silcrete flake (dorsal) (Jung, 2020, p. 12)

4.3.25 BT-20-AS03 – Artefact Scatter

BT-20-AS03 (GDA94 Zone 53 [redacted]) is a low-density artefact scatter comprising two quartzite flakes (Plate 135 and Plate 136). The artefact scatter is located on seismic line 11 study area, adjacent to Newcastle Creek (Figure D20, Appendix B4).

Ground surface visibility was variable across the site ranging from 75-100%. GSI was high showing signs of minor pastoral activity (Jung, 2020).

Plate 135 BT-20-AS03 - quartzite flake (ventral) (Jung, 2020, p. 14)

Plate 136 BT-20-AS03 – quartzite flake (ventral) (Jung, 2020, p. 14)

4.4 Scientific Significance Assessment

In the absence of formal State/Territory significance assessment guidelines, AECOM utilises a standard scientific approach, using set criteria developed for Australian contexts. These criteria involve the principal factors involved in determining a site's significance and as a consequence the level of mitigation management measures required. For the current assessment, information on the scientific values of the Activity Area has been obtained through a review of existing environmental and archaeological data for the Activity Area. An assessment of the scientific significance of all sites within the Activity Area is presented in Table 6 below. The significance rating of "scientific significance" is offered on the basis of an assessment of the place's complexity, rarity, representativeness, integrity/place condition and assigned low (n=0-2), moderate (n=3-5) and high (n=6-8) values. The criteria are explained in Appendix B2. Table 6 applies the criteria to each of the identified sites. Of the 28 archaeological sites, one site was determined to be of high scientific significance, two sites were determined to be of medium scientific significance, with the remaining sites being of low scientific significance

Table 6 Scientific Significance Assessment

Site Name	Site Contents	Site Integrity	Rarity	Overall Scientific Significance
BT-19-AS7	High. The site contains a large number of artefacts and diverse range of cultural material and artefact type.	Moderate-high	High. An artefact scatter containing several hundred artefacts with over 22 tools, seven of which were pirri points and six bifacial points, is a rare occurrence within the geographical region.	High
BT-19-AS8	Low	Low	Low	Low
BT-19-AS9	Low	Moderate-high	Low	Low
BT-19-AS10	Low	Low	Low	Low
BT-19-AS11	Low	Moderate-high	Low	Low
BT-19-AS12	Low	Moderate-high	Low	Low
BT-19-AS13	Low	Moderate-high	Low	Low

Site Name	Site Contents	Site Integrity	Rarity	Overall Scientific Significance
BT-19-AS14	Low	Low	Low	Low
BT-19-AS15	Low	Low	Low	Low
BT-19-AS16	Moderate. The site contains a large number of artefacts but limited range or cultural heritage material and artefact type.	Moderate-high	Low	Moderate
BT-19-AS17	Low	Moderate-high	Low	Low
BT-19-AS18	Low	Moderate-high	Low	Low
BT-19-AS19	Low	Moderate-high	Low	Low
BT-19-IA1	Low	Low	Low	Low
BT-19-IA2	Low	Low	Low	Low
BT-19-IA3	Low	Low	Low	Low
BT-19-IA4	Low	Moderate-high	Low	Low
BT-19-IA5	Low	Moderate-high	Low	Low
BT-19-IA6	Low	Moderate-high	Low	Low
BT-19-IA7	Low	Moderate-high	Low	Low
BT-19-IA8	Low	Moderate–high	Low	Low
BT-19-IA9	Low	Moderate–high	Low	Low
BT-20-AS01	Low	Moderate-high	Low	Low
BT-20-AS02	Low	Moderate-high	Moderate. An artefact scatter containing a pirri point is an irregular occurrence within the geographical region.	Moderate
BT-20-AS03	Low	Moderate-high	Low	Low

4.5 Cultural Significance

Cultural value refers to the spiritual, traditional, historic and contemporary associations and attachments a place or area has for Aboriginal people and can only be identified through consultation with Aboriginal people. AAPA intend to consult with Aboriginal stakeholders to ascertain cultural significance of Aboriginal heritage values within the Project impact footprint.

4.6 Impact Assessment

The degree of impact an activity will have on a cultural heritage place is assessed in terms of the magnitude of change to the acknowledged heritage values of a place as summarised in Appendix B2 Table 14. The final assessment of the significance of impact on a cultural heritage place is a factor of the cultural heritage sensitivity of the place, combined with the predicted magnitude of change. A prediction of impact significance can be made both before and after the implementation of identified mitigation measures, allowing the efficacy of the measures to be assessed and revealing residual impacts that need to be taken into account (see Appendix B2 Table 15 for estimating impact significance).

The significance of predicted impacts to each of the sites is assessed in Table 7 using the rankings established in the previous sections. The proposed works will have a neutral impact on majority of the sites and only a neutral/slight impact on four sites.

Table 7 Assessment of significance of mitigated impacts

Site	Site type	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
BT-19-AS7	Artefact Scatter	High	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS8	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS9	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS10	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS11	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS12	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS13	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS14	Artefact Scatter	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-AS15	Artefact Scatter	Low	Vegetation clearance to create track	Partial	Partial loss of value	Low	Neutral/slight
BT-19-AS16	Artefact Scatter	Moderate	Outside of Study Area. No impacts anticipated.	None	No loss of value	No change	Neutral
BT-19-AS17	Artefact Scatter	Low	Outside of Study Area. No impacts anticipated.	Partial	No loss of value	No change	Neutral
BT-19-AS18	Artefact Scatter	Low	Vegetation clearance to create track	Partial	Partial loss of value	Low	Neutral/slight

Site	Site type	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Magnitude of change prior to mitigation	Significance of impact
BT-19-AS19	Artefact Scatter	Low	Vegetation clearance to create track	Partial	Partial loss of value	Low	Neutral/slight
BT-19-IA1	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA2	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA3	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA4	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA5	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA6	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA7	Isolated artefact	Low	Use of existing track	None	No loss of value	No change	Neutral
BT-19-IA8	Isolated artefact	Low	Vegetation clearance to create track	Partial	Partial loss of value	Low	Neutral/slight
BT-19-IA9	Isolated artefact	Low	Vegetation clearance to west. No impacts anticipated.	None	No loss of value	No Change	Neutral
BT-20-AS01	Artefact scatter	Low	Use of existing track	None	No loss of value	No Change	Neutral
BT-20-AS02	Artefact scatter	Moderate	Use of existing track	None	No loss of value	No Change	Neutral
BT-20-AS03	Artefact scatter	Low	Vegetation clearance to the east. No impacts anticipated to site	None	No loss of value	No change	Neutral

5.0 Key Findings

The key findings of this heritage assessment are:

- A review of existing heritage data and reports for the study area indicate that the proposed works will impact landforms and archaeology (BT-19-AS7 – artefact scatter) associated with the AAPA recorded sacred site 5864-18.
- At least two RWAs (EP136 RWA1 and EP136 RWA6) previously identified through engagement of the NLC and traditional owners as part of the 2012 works are intersected by the proposed works. Most of the proposed works will be conducted on existing cleared tracks.
- A total of 25 areas were inspected during the field program. Of these, 20 target areas associated with culturally sensitive landforms were inspected, with 14 containing evidence of Aboriginal archaeological sites (80%). No expressions of Aboriginal cultural heritage was identified at the additional four inspection areas that were not associated with any form of sensitive landforms. AECOM's predictive archaeological model confirms that evidence of Aboriginal archaeological cultural heritage is typically associated with the identified sensitive landforms including:
  - Non-flood prone areas adjacent to established watercourses.
  - Areas with distinctive vegetation patterning, such as those areas associated with *Macropteranthes kekwickii* (bullwaddy).
  - Adjacent to flood plains where a noticeable change in vegetation is identified.
  - On the periphery of lagoons and 'chain of ponds' features.
- Twenty-five Aboriginal archaeological sites were located during the 2019 and 2020 AECOM targeted inspection within or immediately adjacent to the proposed seismic lines. Of these, one site was determined to be of high significance (BT-19-AS7 – artefact scatter), two sites were determined to be of moderate significance (BT-19-AS16 – artefact scatter and BT-20-AS02 – artefact scatter), with the remaining sites determined to be of low significance.
- Based on the significance assessment and the proposed magnitude of change, the works will have neutral impacts on 21 sites and Neutral/slight impacts on four sites.
- An updated AAPA Authority Certificate is currently being developed and will further inform requirements for the project.

6.0 Recommendations

On the basis of the above findings, the following recommendations and mitigations are made:

- All identified archaeological and cultural sites should be avoided wherever possible, minimise as far as practical and then mitigate where avoidance and minimisation is not possible.
- Works should remain on the previously disturbed access tracks where they exist.
- Where uncleared sensitive landforms intersect the proposed seismic lines, a clearance protocol should be implemented to determine if Aboriginal cultural heritage exists.
- All heritage sites recorded as part of this survey, should be reported to the NT Heritage Branch. Should these heritage items be declared a heritage object by the NT Heritage Council, a work order may be required for future impacts to the object.
- An unexpected heritage finds stop works procedure is to be implemented for the duration of the project:
  - Collection of artefacts and relocation to a nearby area away from the proposed disturbance.
  - A record of relocated artefacts must be provided to the NT Heritage Branch.

- A clearance form signed by traditional owner field representatives is to be provided to Sweetpea for internal documentation stating that the clearance has been undertaken according to the above conditions.
- The proposed relocation protocol must be agreed to by the Northern Territory Heritage Branch.
- Induction of staff on site is to include reference to the wider area having Aboriginal heritage values and the stop works procedure.

Table 8 outlines the recommendations for all Aboriginal sites identified during this assessment.

Table 8 Summary of recommendations for each site

Site Name	Impact	Recommendation
BT-19-AS8	Neutral	• In accordance with the current proposed works, no further actions are required.
BT-19-IA1		
BT-19-IA2		
BT-19-IA3		
BT-19-IA6		
BT-19-AS7	Neutral	• In accordance with the current proposed works, no further actions are required • If proposed works are anticipated beyond the existing tracks further assessment will be required.
BT-19-AS9		
BT-19-AS10		
BT-19-AS11		
BT-19-AS12		
BT-19-AS13		
BT-19-AS14		
BT-19-AS16		
BT-19-AS17		
BT-19-IA4		
BT-19-IA5		
BT-19-IA7		
BT-19-IA9		
BT-20-AS01		
BT-20-AS02		
BT-20-AS03		
BT-19-AS15	Neutral/slight	• If the proposed works impact the site, artefact collection and relocation should be undertaken in consultation with the Traditional Owners.
BT-19-AS18		
BT-19-AS19		
BT-19-IA8		

7.0 References

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Appendix B1

Legislation

Appendix B1 Legislation

Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on the 16 July 2000 (NSW Department of Urban Affairs and Planning, 2000). Under section 26 of the EPBC Act it is stated that:

> *A person must not take on Commonwealth land an action that has, will have or is likely to have a significant impact on the environment.*

Under section 28 of the EPBC Act it is stated that:

> *The Commonwealth or a Commonwealth agency must not take inside or outside the Australian jurisdiction an action that has, will have or is likely to have a significant impact on the environment inside or outside the Australian jurisdiction.*

An action is defined as a project, development, undertaking, activity, series of activities, or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact;
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines ‘environment’ as both natural and cultural environments and therefore includes Aboriginal and historic heritage items. Under the Act, protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE) which is no longer a statutory list.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (the ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the 'preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition' (section 4).

Under the Act, ‘Aboriginal tradition’ is defined as “the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships” (Section 3). A ‘significant Aboriginal area’ is an area of land or water in Australia that is of ‘particular significance to Aboriginals in accordance with Aboriginal tradition’ (Section 3). A ‘significant Aboriginal object’, on the other hand, refers to an object (including Aboriginal remains) of like significance.

For the purposes of the Act, an area or object is considered to be injured or desecrated if:

- In the case of an area:
  - it is used or treated in a manner inconsistent with Aboriginal tradition;
  - the use or significance of the area in accordance with Aboriginal tradition is adversely affected;
  - passage through, or over, or entry upon, the area by any person occurs in a manner inconsistent with Aboriginal tradition;
- in the case of an object:
  - it is used or treated in a manner inconsistent with Aboriginal tradition.

The ATSIHP Act can override state and territory laws in situations where a state or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object. However, the Minister can only make a decision after receiving a legally valid application under the ATSIHP Act and, in the case of long term protection, after considering a report on the matter. Before making a declaration to protect an area or object in a state or territory, the Commonwealth Minister must consult the appropriate Minister of that state or territory (section 13).

Territory Legislation

Heritage Act 2011

The *Heritage Act 2011* provides for the protection of both natural and cultural heritage (Aboriginal, historical and Macassan heritage) within the Northern Territory. The Act establishes the Heritage Council (consisting of eleven members) and the NT Heritage Register. It sets the process by which places become heritage places and allows for interim protection of places.

It is an offence to remove or damage heritage places or objects or to mislead or obstruct heritage officers regarding the provision of requested information or entry to works, vehicles or premises that are likely to have been involved in an offence against the Heritage Act. Compliance with the requirements of the Act must be adhered to at all times.

Northern Territory Aboriginal Sacred Sites Act 1989

The *Northern Territory Aboriginal Sacred Sites Act* 1989 was established to provide a system that protects sacred sites whilst providing for the development of land.

The Aboriginal Areas Protection Authority (AAPA) is a statutory authority established under the Sacred Sites Act and is responsible for overseeing the protection of sacred sites on land and sea across the whole of Australia's Northern Territory.

The Act establishes the protection of Aboriginal sacred sites through:

- Sacred site avoidance surveys and issuing authority certificates for any development proposals.
- Giving the public information about existing sacred sites through abstracts of Authority records and access to the registers the Authority maintains.
- Establishing and maintaining a Register of Sacred Sites
- Manages the rights of traditional custodians to access Sacred Sites.

The Act also establishes a range of offences and associated penalties that are aimed at protecting sacred sites. It is an offence to desecrate or disturb a site without the approval of the relevant custodians. A register of known sites exists to assist in identifying the likelihood of disturbance and potential need to obtain approval. The Act also establishes a duty-of-care to notify the AAPA of any potential disturbance to Aboriginal sacred sites.

Appendix B2

Archaeological Assessment Criteria

Appendix B2 Archaeological Assessment Criteria

Table 9 Ground Surface Visibility (GSV) Scheme

GSV rating	Percentage GSV
No ground surface visible	0%
Very poor	1-10%
Poor	11-30%
Fair	31-50%
Good	51-70%
Very good	71-90%
Excellent	91-100%

Table 10 Ground Surface Integrity (GSI) Scheme

GSI rating	Definition
Low	Ground surface has been subjected to significant disturbance (e.g. earthworks, excavation). Little to no integrity remains.
Moderate	Ground surface has been subject to moderate disturbance (e.g. native vegetation clearance) but retains a reasonable degree of integrity.
High	An unmodified or minimally modified ground surface.

Significance Assessment

Scientific Value

Scientific value refers to the importance of a place in terms of its rarity, representativeness and the extent to which it may contribute further information (i.e., its research potential).

Research Potential

Research potential can be defined as the potential of an archaeological site to address what Bowdler (1981: 129) has referred to as “timely and specific research questions”. These questions may relate to any number of issues concerning past human lifeways and environments and, as suggested by Bowdler’s quote, will inevitably reflect current trends or problems in academic research (Burke & Smith 2004: 249). For their part, Bickford and Sullivan (1984: 23-4) suggest that the research potential of an archaeological site can be determined by answering the following series of questions:

1. Can the site contribute knowledge which no other resource can?
2. Can the site contribute knowledge which no other such site can?
3. Is this knowledge relevant to general questions about human history or other substantiative subjects?

Several criteria can be used to assess the research potential of an archaeological site. Particularly important in the context of Aboriginal archaeology are the intactness or integrity of the site in question, its complexity (place contents) and its representativeness.

Complexity (Place Contents)

The *complexity* of a site refers primarily to the nature or character of the artefactual materials or features that constitute it but also includes site structure (e.g., the physical size of the site, spatial patterning in observed cultural materials). In the case of open artefact sites, for example, the principal criteria used to assess complexity are the site’s size (i.e., number of artefacts and/or spatial extent), the presence, range and frequency of artefact and raw material types, and the presence of features such as hearths. Table 11 provides the assessment criteria for the complexity of the site.

Table 11 Place complexity criteria

Criteria	Value
Place contains 0-10 artefacts	Low - 0
Place contains large number of artefacts but limited range of cultural heritage materials	Medium - 1
Place contains large number of artefacts and diverse range of cultural heritage material	High - 2

Rarity and Representativeness

Rarity and r*epresentativeness* are related concepts. Rarity refers to the relative uniqueness of a site within its local and regional context. The scientific significance of a site is assessed as higher if it is unique or rare within either context. Conversely, it is considered to be of lower significance if it is common in one or both. The concept of representativeness, meanwhile, refers to the question of whether or not a site is "a good example of its type, illustrating clearly the attributes of its significance" (Burke & Smith 2004: 247). Representativeness is an important criterion as one of the primary goals of cultural heritage management is to preserve for future generations a representative sample of all archaeological site types in their full range of environmental contexts.

In common with rarity, assessments of representativeness within a region are dependent on the state of current knowledge concerning the number and type of archaeological sites present within that region. This is a critical point, for as suggested by Kuskie (2000) and others (e.g., Bowdler 1981; Godwin 2011; Pearson & Sullivan 1995), the absence across most of Australia of regional-scale quantitative data for Aboriginal sites and places represents a major constraint in assessments of representativeness and rarity. As stressed by Bowdler (1981) some 30 years ago, detailed regional-scale assessments of the Aboriginal archaeological record of Australia are required to address this issue. Table 12 provides the assessment criteria for the place's rarity.

Table 12 Rarity criteria

Criteria	Value
Common occurrence within the geographical region	Low - 0
Irregular occurrence within the geographical region	Medium - 1
Rare occurrence within the geographical region	High - 2

Integrity/Place Condition

Integrity refers to the extent to which a site has been disturbed by natural and/or anthropogenic phenomena and includes both the state of preservation of particular remains (e.g., animal bones, plant remains) and, where applicable, stratigraphic integrity. Assessments of archaeological integrity are predicated on the notion that undisturbed or minimally disturbed sites are likely to yield higher quality archaeological and/or environmental data than those whose integrity has been significantly compromised by natural and/or anthropogenic phenomena. Establishing levels of preservation or integrity in the context of a surface survey is difficult. Nonetheless, useful rating schemes are available for 'open' sites (Coutts & Witter 1977: 34) and modified trees (Long 2003). Table 13 provide the assessment criteria for the place's integrity.

Table 13 Integrity criteria for place's integrity

Criteria	Values
Place demonstrates high degree of disturbance with some cultural materials remaining	Low – 0
Place in good condition with little disturbance	Medium - 1
Place in excellent condition with minimum or no disturbance	High - 2

Impact Assessment

The degree of impact an activity will have on a cultural heritage place is assessed in terms of the magnitude of change to the acknowledged heritage values of a place as summarised in Table 14. These impacts may be direct, such as the demolition of heritage buildings, or indirect, such as changes to the views or setting of a cultural heritage place. In some cases, indirect impacts might also cause physical damage to a cultural heritage place, such as excessive vibration causing structural damage, or excessive pollution causing damage to surfaces.

Table 14 Determining magnitude of change

Magnitude	Example criteria
Major	Change to all or most significant aspects of the place, such that its heritage values are substantially reduced or destroyed.
Medium	Change to some significant aspects of the place, such that some of its heritage values are partially reduced.
Low	Minor change to significant aspects of the place, such that some of its heritage values are slightly reduced.
Negligible	Changes to insignificant aspects of the places, such that its heritage values are not reduced.
No Change	No change.

The final assessment of the significance of impact on a cultural heritage place is a factor of the cultural heritage sensitivity of the place, combined with the predicted magnitude of change, as outlined in Table 15. A prediction of impact significance can be made both before and after the implementation of identified mitigation measures, allowing the efficacy of the measures to be assessed and revealing residual impacts that need to be taken into account.

Table 15 Estimating impact significance

Significance of impact		Magnitude of change				
		Major	**Medium**	**Low**	**Negligible**	**No change**
Cultural heritage sensitivity	**Extreme**	Very large	Large/very large	Moderate/large	Slight	Neutral
	Very high	Very large	Large/very large	Moderate/large	Slight	Neutral
	High	Large/very large	Moderate/large	Slight/moderate	Slight	Neutral
	Moderate	Moderate/large	Moderate	Slight	Neutral/slight	Neutral
	Low	Slight/moderate	Slight	Neutral/slight	Neutral/slight	Neutral
	Negligible	Slight	Neutral/slight	Neutral/slight	Neutral	Neutral

Appendix B3

Listed Heritage Sites

Appendix B3 Listed Heritage Sites

Table 16 Northern Territory Aboriginal Heritage Register

Place Name	Easting	Northing
Yaroo Site 2b	[redacted]	[redacted]
Yaroo2	[redacted]	[redacted]
Yaroo Site 5c	[redacted]	[redacted]
Yaroo Site 5d	[redacted]	[redacted]
Yaroo Site 5e	[redacted]	[redacted]
Yaroo Site 5f	[redacted]	[redacted]
Yaroo 1	[redacted]	[redacted]
Yaroo Site 2c	[redacted]	[redacted]
Yaroo Site 3	[redacted]	[redacted]
Yaroo Site 3a	[redacted]	[redacted]
Yaroo Site 3b	[redacted]	[redacted]
Yaroo Site 4	[redacted]	[redacted]
Yaroo Site 5	[redacted]	[redacted]
Yaroo Site 5a	[redacted]	[redacted]
Yaroo Site 5b	[redacted]	[redacted]
Yaroo Site 1	[redacted]	[redacted]
Yaroo Site 2	[redacted]	[redacted]
Yaroo Site 2a	[redacted]	[redacted]

Appendix B4

Archaeological Sites Mapbook

Appendix B4 Archaeological Sites Mapbook

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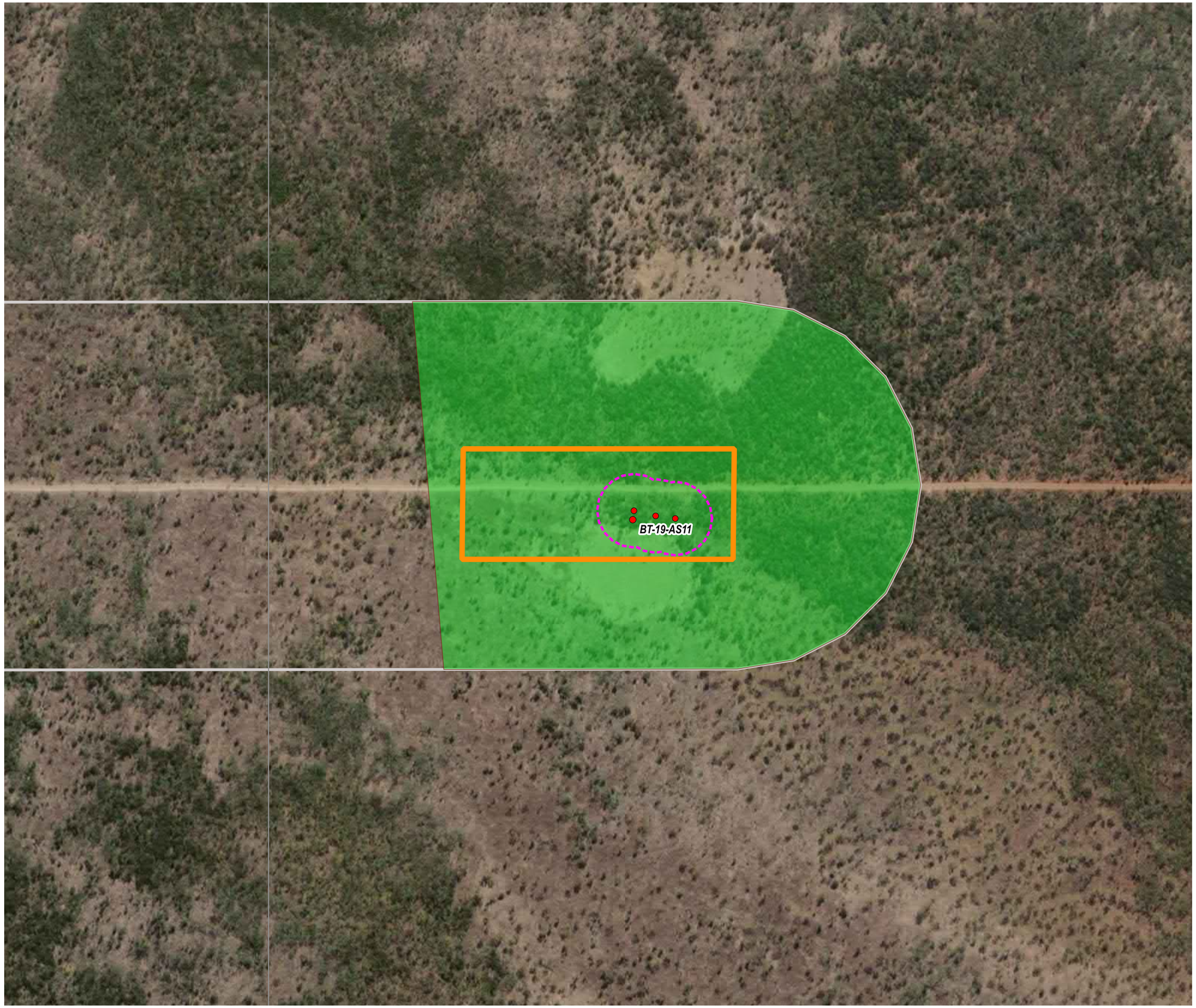

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 1

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D1

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 2

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D2

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 3

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

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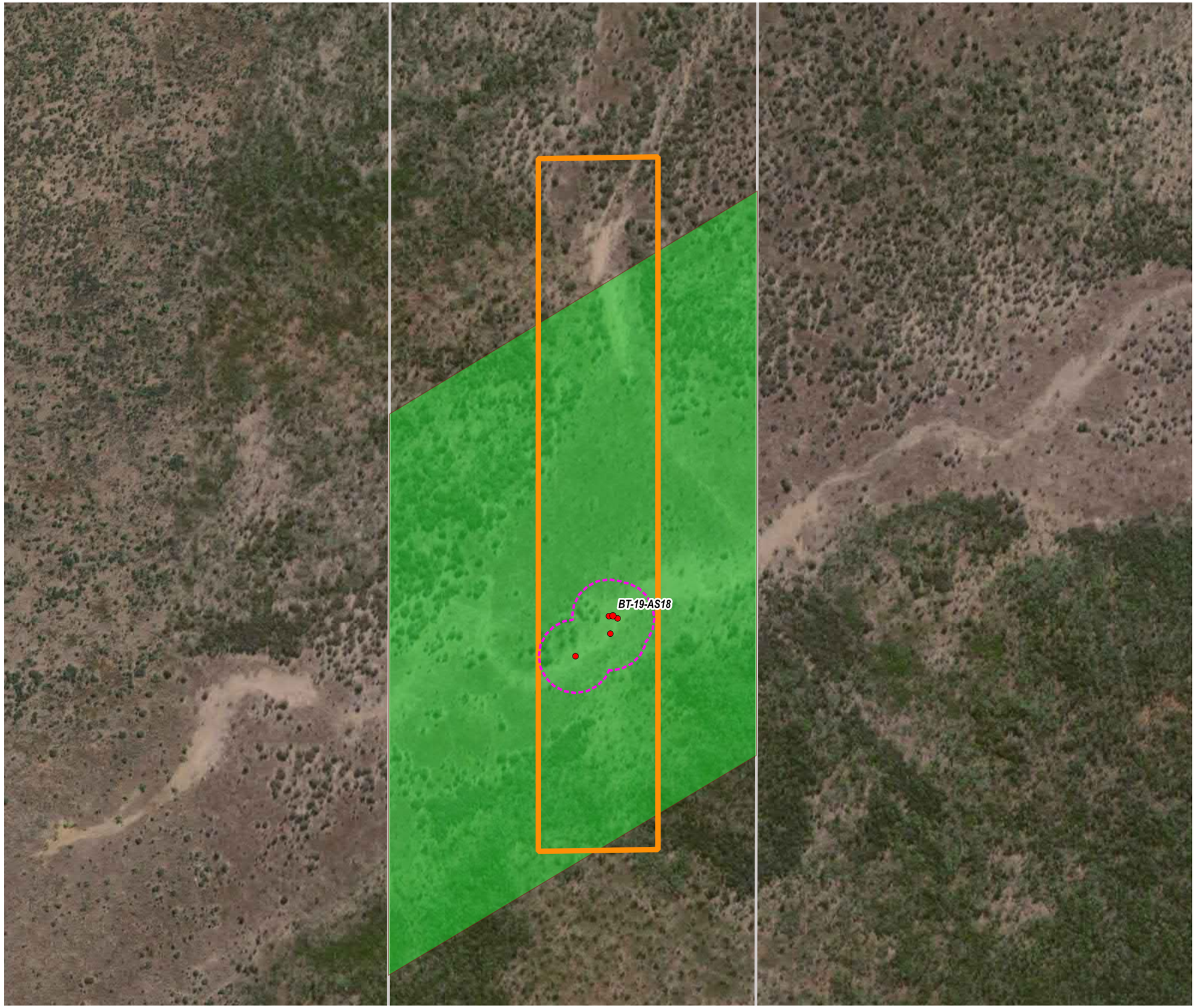

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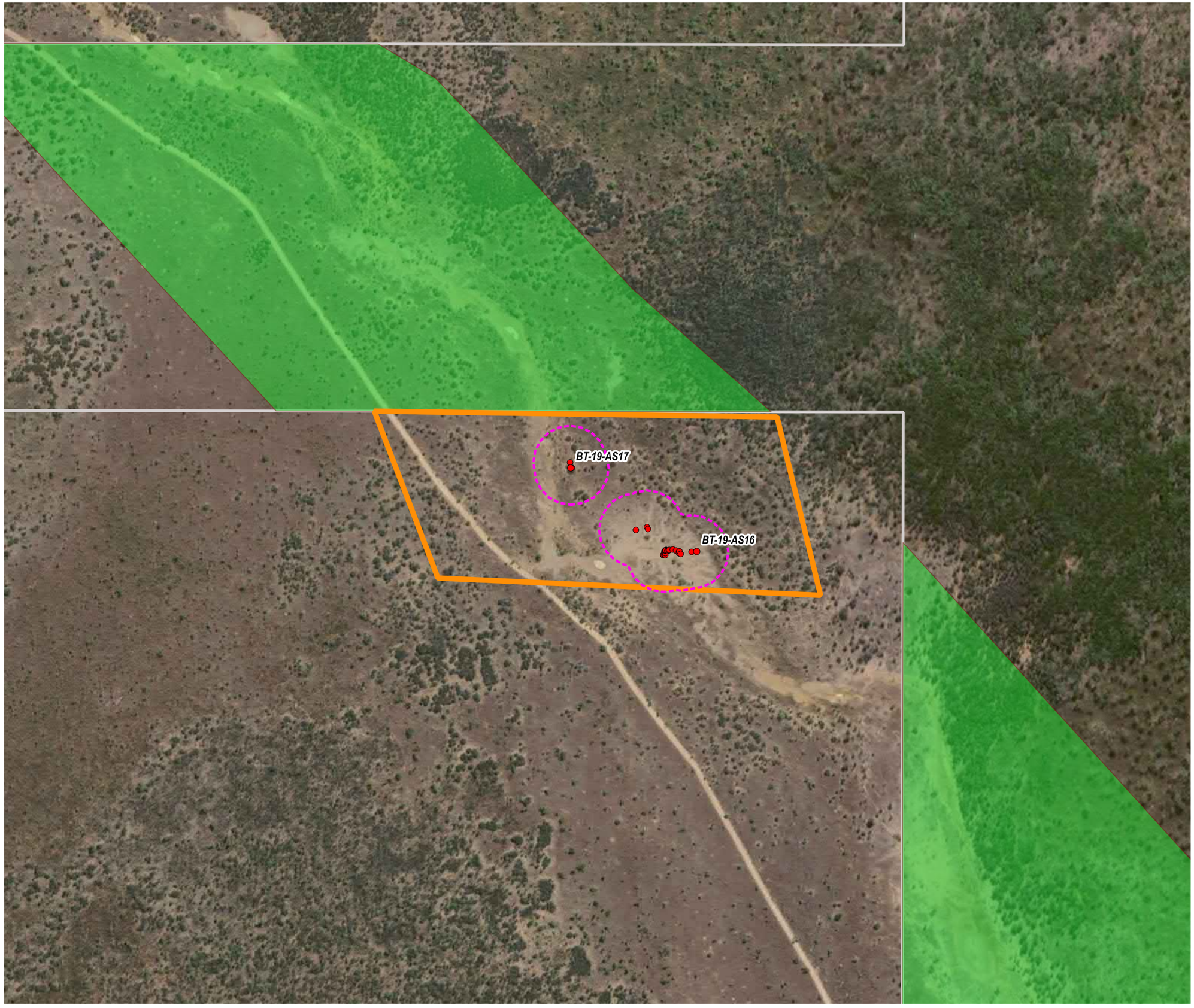
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 4

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D4



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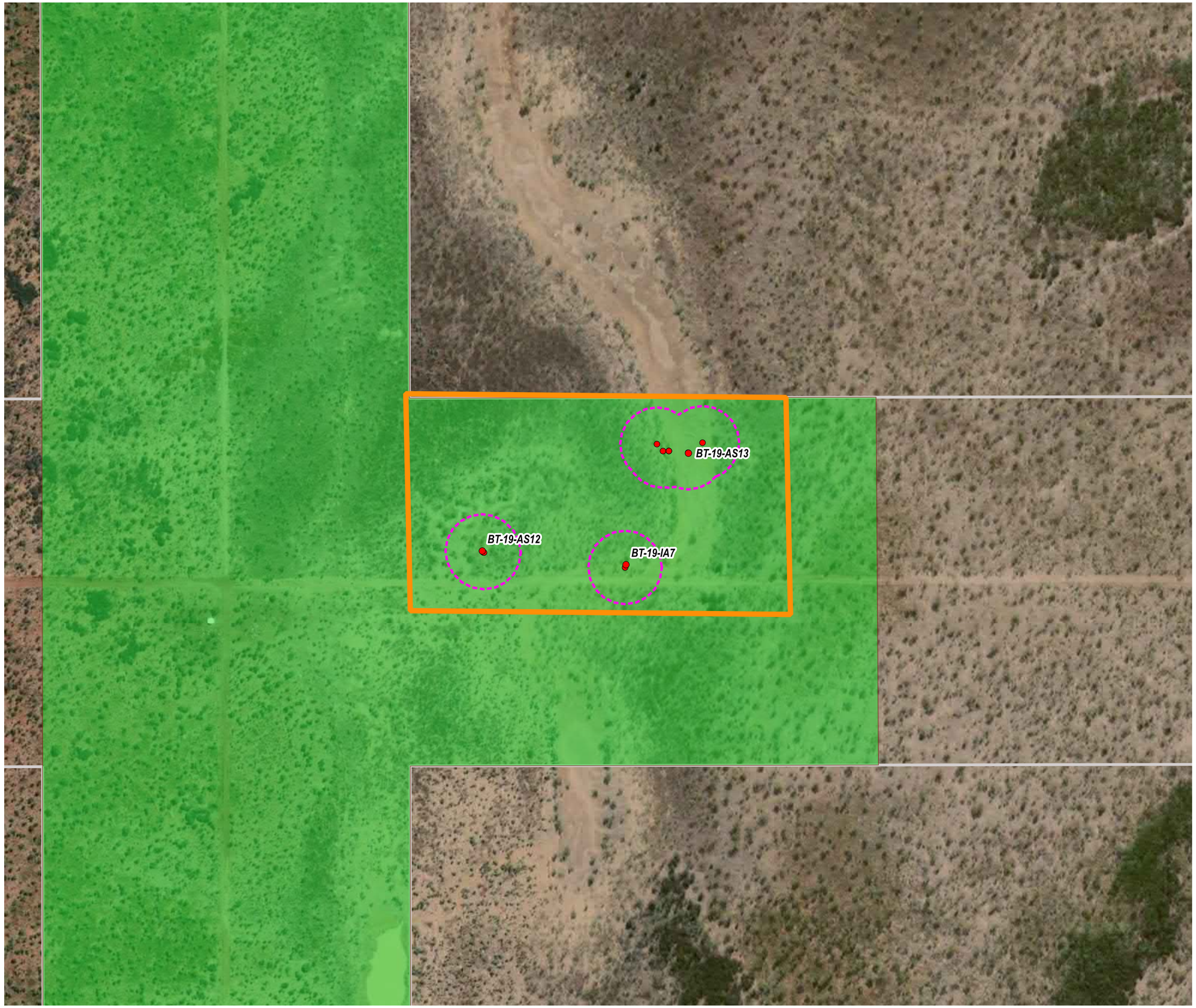
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 5

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D5



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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 6

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D6

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 7

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D7

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 8

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D8

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 9

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D9

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 10

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D10

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 11

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D11

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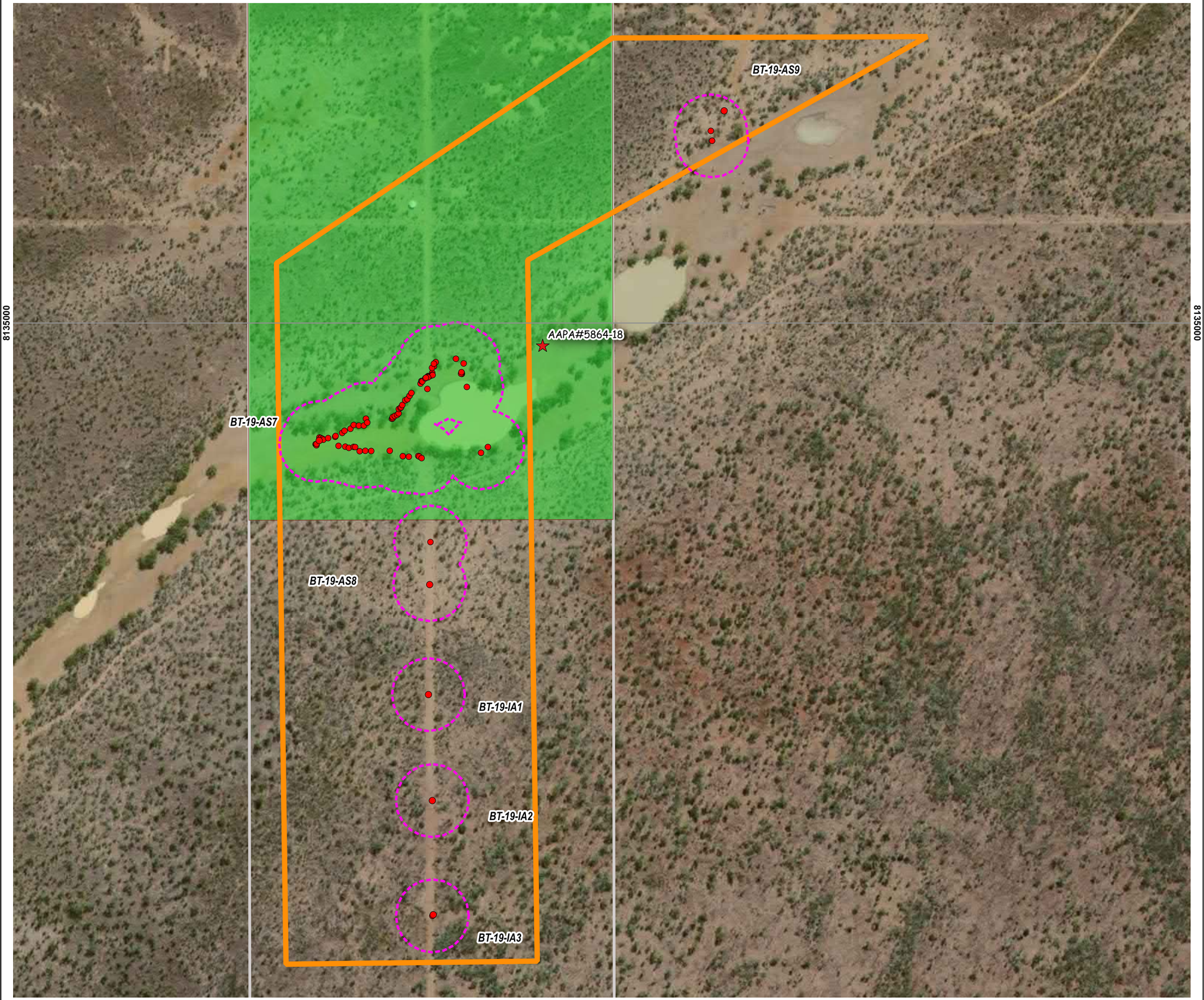
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 12

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D12



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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 13

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D13

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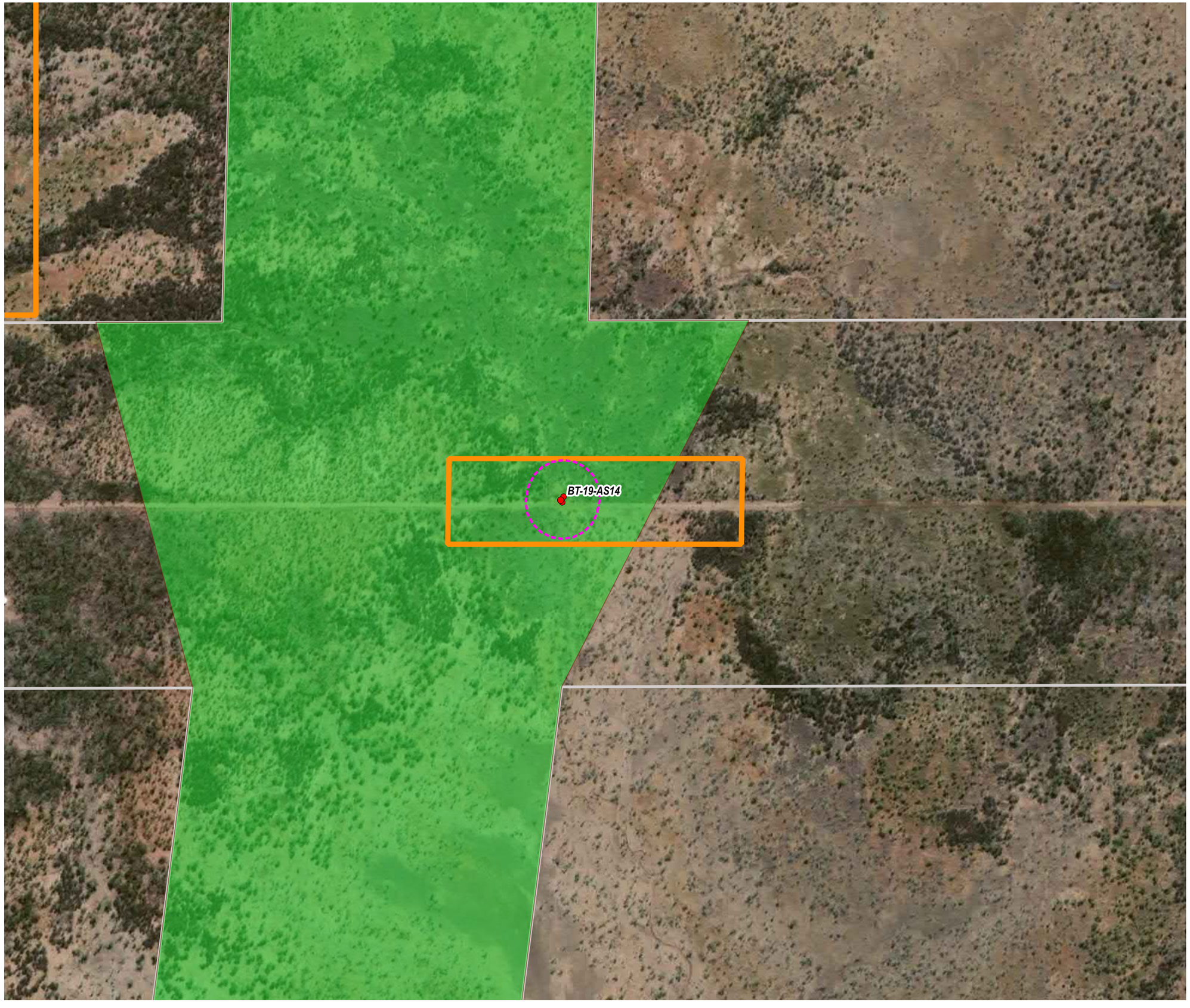
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 14

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D14



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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 15

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D15

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 16

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D16

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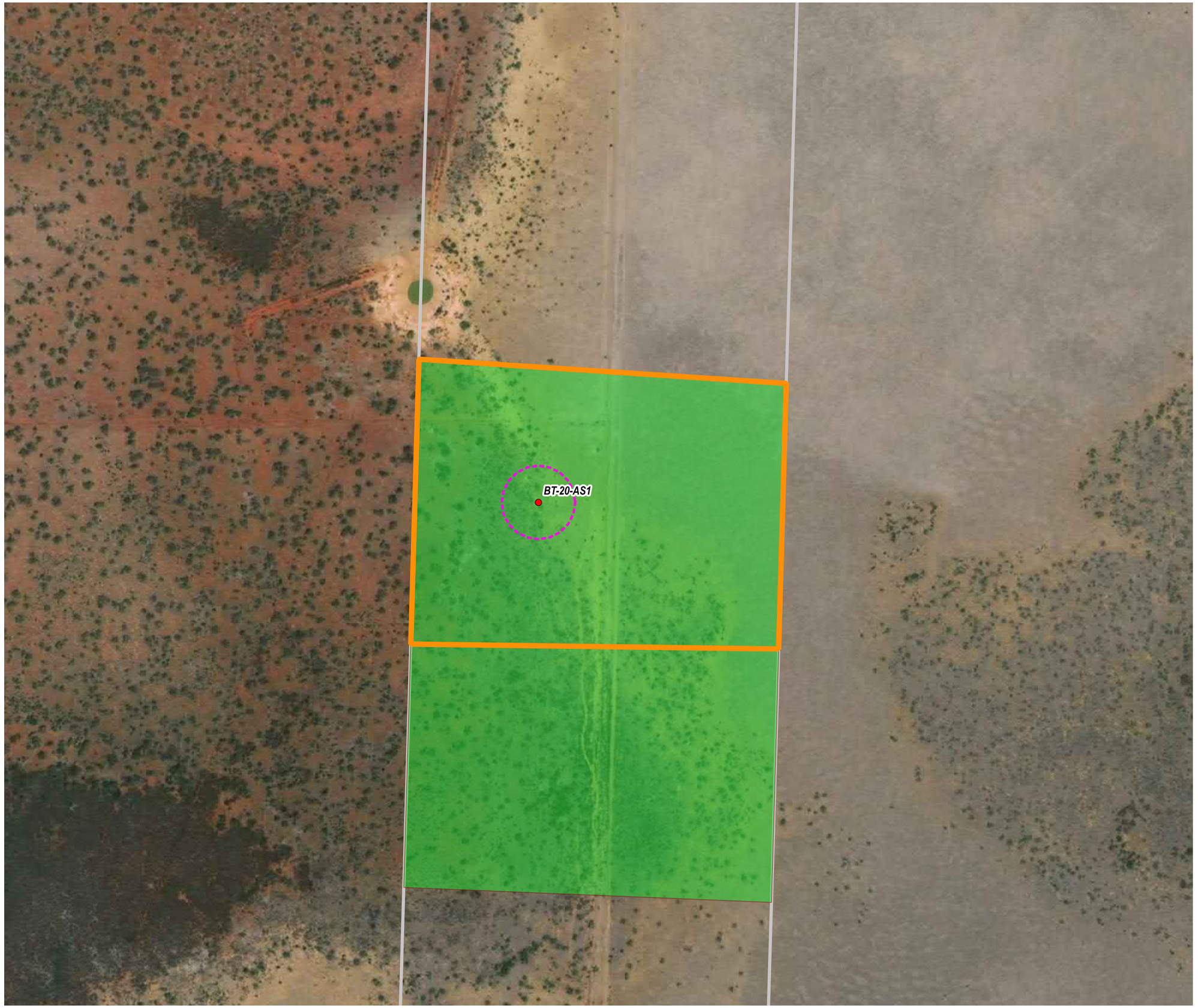
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 17

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D17



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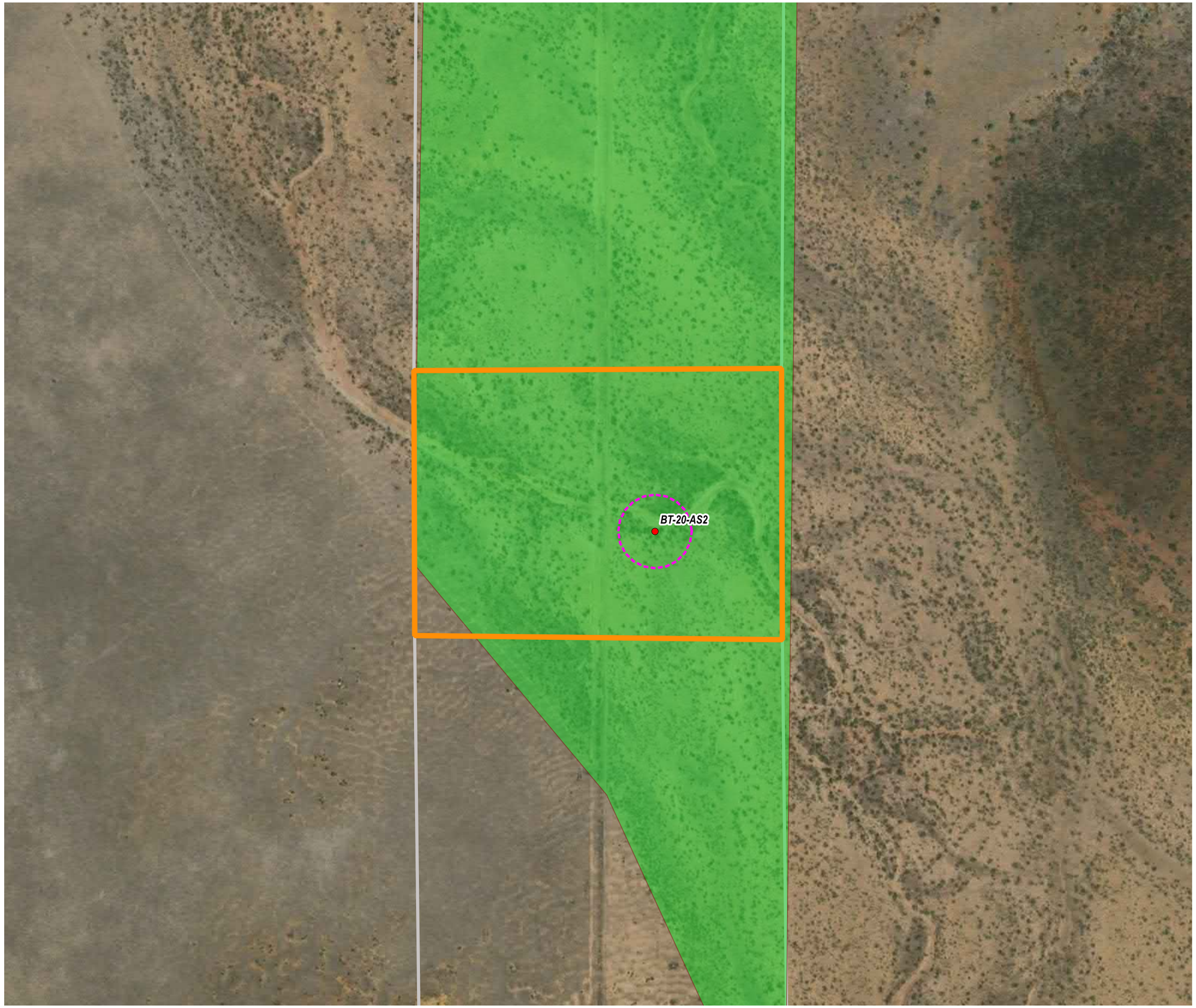
LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 18

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D18



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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 19

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D19

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Target Area 20

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D20

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Additional Target Area 1

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D21

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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Additional Target Area 2

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D22

AECOM
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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Additional Target Area 3

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D23

AECOM
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LEGEND

- Archaeological Lithics
- AAPA Sacred Sites
- NT Aboriginal Heritage Register
- Archaeological Site Extent
- Inspected Areas
- Aboriginal Cultural Heritage Sensitivity
- Seismic Line Buffer

2D Seismic Exploration Program
EP136 Beetaloo Sub-Basin, NT
Heritage Assessment
Additional Target Area 4

PROJECT ID	60611666
CREATED BY	PB
LAST MODIFIED	30-6-2020
VERSION	1

Figure D24

Appendix B5

Unexpected Finds Procedure

Appendix B5 Unexpected Finds Procedure

Unexpected Finds Procedure

The following management measures are recommended for unexpected Aboriginal heritage finds and to be included as part of daily toolbox discussions.

Aboriginal Cultural Heritage

Aboriginal finds can include the following:

- **Stone artefacts** (sharp edged rocks that have identifiable features demonstrating evidence of human modification. See attached information sheet)
- **Scarred Trees** (trees with symmetrical scars that might demonstrate evidence of removal of bark for use in coolamons, shields and huts. See attached information sheet)
- **Grindstones** (Large sandstone items (either fixed in bedrock or mobile) that have manmade grooves in them demonstrating use. See attached information sheet)
- **Stone Axes** (heavy hatchet head like stone items, typically with the leading edge sharpened. See attached information sheet)
- **Bone, Shell and Charcoal** (potential historical food waste dumps (also known as Middens). See attached information sheet)

Geotechnical subsurface works are typically likely to encounter shell, charcoal and bone which will appear as lens from a centimetre to several metres in depth.

Prior to surface works, geotechnical team should also be aware of potential for surface finds of artefacts and avoid impacts to scarred trees.

Aboriginal Cultural Heritage Procedure

If an object of potential Aboriginal cultural heritage value is uncovered:

1. All work to cease within 10 metres of the suspected find, and the area to be cordoned off using temporary fencing.
2. Site Supervisor is to be immediately notified who will then engage a qualified Heritage Advisor to assess the find and recommend any necessary management measures.
3. If the find is determined to be Aboriginal heritage, the Site Supervisor or Heritage Advisor to notify the relevant Heritage Department
4. Work is not to recommence in the vicinity of the find until direction is provided by the Heritage Department.

Historical Cultural Heritage

Historic finds can include the following:

- **Glass** (Coloured glass, bottles (complete or fragmentary etc.)
- **Metal** (identifiable metallic objects such as cutlery, buckles, farming equipment, woodworking and metal equipment etc.)
- **Ceramic** (Plates, cups, ink wells, pipes, etc.)
- **Wood** (identifiable human manufactured wooden items)
- **Stone** (identifiable human manufactured stone items)
- **Bone, Shell and Charcoal** (potential historical food waste dumps)

Historical Heritage Procedure

The following management measures are recommended for unexpected historic finds.

1. All work to cease within 10 metres of the suspected find, and the area to be cordoned off using temporary fencing.
2. Site Supervisor to be notified who will then engage with a qualified Heritage Advisor to assess the find and recommend any necessary management measures.
3. If the find is determined to be of heritage importance, work is not to recommence in the vicinity of the find until direction is provided from the relevant Heritage Department
4. If the find is determined to be historical heritage, the Site Supervisor or Heritage Advisor to notify Heritage Department
5. Work is not to recommence in the vicinity of the find until direction is provided by the Heritage Department.

Discovery of Human Remains

If any suspected human remains are discovered during any activity works, they must be initially assumed under the provisions of the relevant Coroners Act to be a crime scene and treated accordingly. The following procedure is to be applied:

1. All activity in the vicinity must cease and the Site Supervisor to be notified immediately.
2. The Police **must be notified immediately** of the discovery by the Site Supervisor or appointed supervisor in charge of the works area.
3. The remains must be **left in place** and protected from harm or damage with a minimum of at least a 50m buffer. It is important to use best judgement and restrict all movement in the immediate vicinity around the discovery until directed otherwise by the Police as this could contaminate a potential crime scene. Likewise do not set up temporary fencing unless directed by the Police.
4. If the appointed expert investigating the find under the relevant Coroners Act believes that there is reasonable grounds to believe the remains to be:
    - **a crime scene**, the Police will provide direction on the management of the discovery
    - **Aboriginal ancestral remains**, the relevant Aboriginal Heritage Department is to be contacted
    - **historical remains**, the relevant Historic Heritage Department is to be contacted