AERIAL ARCHAEOLOGICAL SURVEY REPORT: BLUE ENERGY'S EP 205 AND EP207, WISO BASIN, NORTHERN TERRITORY

A report for EcOz Environmental Consultants, Darwin

- DRAFT -

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Cover photo: Anthropomorphic figures at BEAS08. Scale in 1cm.

EXECUTIVE SUMMARY

Blue Energy is proposing a seismic line survey in the Victoria River Downs district, which will cover over 500km. An archaeological survey was conducted to assess the possible impacts the seismic survey may have on archaeological sites. It has been determined in this report that the proposed works will directly impact on several cultural sites of varying significance. Nine archaeological sites were located, mostly comprising of stone artefact scatters, but one site was a spectacular rock art gallery with a large and possibly deep occupation floor, with a high excavation potential. Seismic Lines 03B and 06C are cleared for works on the proviso that the following recommendations are implement to avoid archaeological material. Seismic Line 06A is not cleared for works, as only a sample assessment was made and further on ground survey work is required. Alternatively Line 06A should be cancelled and moved elsewhere. Seismic lines along existing roadways, such as the Buntine Highway and the Buntine-Lajamanu Road are cleared for works as they will be conducted on the existing road easements, which are already highly disturbed.

Summary of recommendations and mitigation schedule:

Site ID	Site Type	Individual site type	GPS Grid Reference (Centroid) Datum: GDA 94, Zone: 52K		Description	Signifi-cance	Recommendation
		Artefacts (n.)	Easting	Northing			
BEAS01	Artefact scatter	11	788686	8078907	Low-density artefact scatter at waterhole. (5,963 m^2)	Low	Option 1. Avoid. Outside of survey area.
BEAS02	Artefact scatter	4	778073	8047171	Low-density artefact scatter associated with gilgai in Cattle Creek. (17,769 m^2)	Low	Option 1. Deviate around the site polygon.
BEAS03	Artefact scatter	3	682647	8015721	Low-density artefact scatter on edge of escarpment. (13,581 m^2)	Low	Option 1. Deviate around the site polygon. Option 2. Stop the line before the site.
BEAS04	Artefact scatter	5	678947	8017567	Low-density artefact scatter on creek bank. (56.8 m^2)	Low	Option 1. Deviate around the site polygon.
BEAS05	Artefact scatter	2	676697	8018796	Low-density artefact scatter on ephemeral creek bank. (1,217 m^2)	Low	Option 1. Deviate around the site polygon.
BEAS06	Artefact scatter	8	596237	8059997	Low-density artefact scatter on Stirling creek bank. (86,986 m^2)	Moderate	Option 1. Cancel the line. Option 2. Systematic pedestrian survey.
BEAS07	Artefact scatter	9	599505	8058302	Low-density artefact scatter on	Moderate	Option 1. Cancel the line. Option 2.

					creek bank. (42.001m^2)		Systematic pedestrian survey.
BEAS08	Rockshelter	>50	615341	8050023	Rockshelter with extensive body of motifs and large occupation floor + additional minor galleries (129.843m^2)	High	Option 1. Cancel the line. Option 2. Systematic pedestrian survey.
BEAS09	Artefact scatter		638795	8037981	Low-density artefact scatter (95.432m^2)	Low	Option 1. Cancel the line. Option 2. Systematic pedestrian survey.

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1.0 INTRODUCTION

1.1 Background and consultancy brief

Blue Energy are proposing to build 284.79 kms of seismic survey lines, divided between three lines, each within a 280 metre to 500 metre corridor, or buffer zone. These three lines are a high priority. Another two low priority lines are also proposed, at a total length of 283.96 km. These low priority lines, however, follow sections of the Buntine Highway and the Buntine Highway-Lajamanu Road. Several proposed seismic worker's campsites are also be located within the buffer zones. These seismic lines on Exploration Permits (EP) 205 and EP207 cover Victoria River Downs, Camfield, Cattle Creek, Wave Hill, Limbunya and Inverway Stations and sections of the Daguragu Aboriginal Land Trust (ALT).

An aerial archaeological survey was required to assess the impact of the proposed works, on archaeological sites, or objects. A three-day aerial survey was conducted from 9 to 11 April 2022 together with ecologist Tom Ewers-Reilly (EcOz Environmental Consultants). Our pilot was Charles Borschmann, NT Heli Muster and our aircraft was a Robinson R44 (VH-KND) helicopter. The consultancy brief was specifically to:

- Identify any prescribed archaeological objects or places as defined under the Northern Territory *Heritage Act (2011)*, and any archaeological sites located within the entire survey area.

- Assess the nature, distribution and significance of these objects or places and discuss possible constraints to the works posed by the presence of archaeological and historic sites and an indication of what sites are likely to be the most sensitive in this respect.

- Present a final report including a summary of survey results, determination of significance of sites and the likely impact of the proposed development, and recommendations regarding management strategies or mitigation procedures as appropriate under the Northern Territory *Heritage Act (2011)*.

The results of the fieldwork identified nine archaeological sites, all of which, except for one, were stone artefact scatters. The exception was a spectacular rock art site with an extensive occupation floor. In addition to the archaeological sites, six background scatters, or isoliths were recorded.

The following describes the archaeological finds and details the mitigation strategy, which is site avoidance and deviation. Seismic lines going straight through them will directly impact some archaeological sites. No archaeological material was recorded on the Buntine and Buntine Highway-Lajamanu Roads, as the seismic lines will be within the existing road corridor.

1.2 Location of the study areas and brief environmental description

The survey area is 125km to the south of Victoria River Downs Station (VRD), on the northern section of the Wiso Basin, 660 km south of Darwin in the Northern Territory (Figure 1). The survey area is broken down per seismic line. These are shown in the list below and mapped in Figure 2:

- Line ID 01A (151.36 km) Buntine Highway
- Line ID 02A (132.60 km) Buntine Highway-Lajamanu Road
- Line ID 03B (117.86 km) Track to be established – high priority

- Line ID 06A (63.22 km) Track to be established – high priority
- Line ID 06C (103.71 km) Track to be established – high priority

The environment is extremely varied throughout the survey area, ranging from flat open woodland and desert, to deeply dissected escarpments. There were no major waterways on two of the three priority lines, only ephemeral creeks, sinkholes and gilgai. These were in the Tanami Desert. Line 06C, however, is just to the east of the Victoria River. Cattle Creek intersects with Line 03B. Line 06A begins just to the east of Swan Creek.

Figures 3, 4 and 5 show the Restricted Work Areas (RWAs) as determined by the Aboriginal Areas Protection Authority who issued Certificate Nos: C2020085, C2020091 and C2021088. Note: all of Line 06A is covered by C2021/088 RWA 2, 3, 4 and 5.

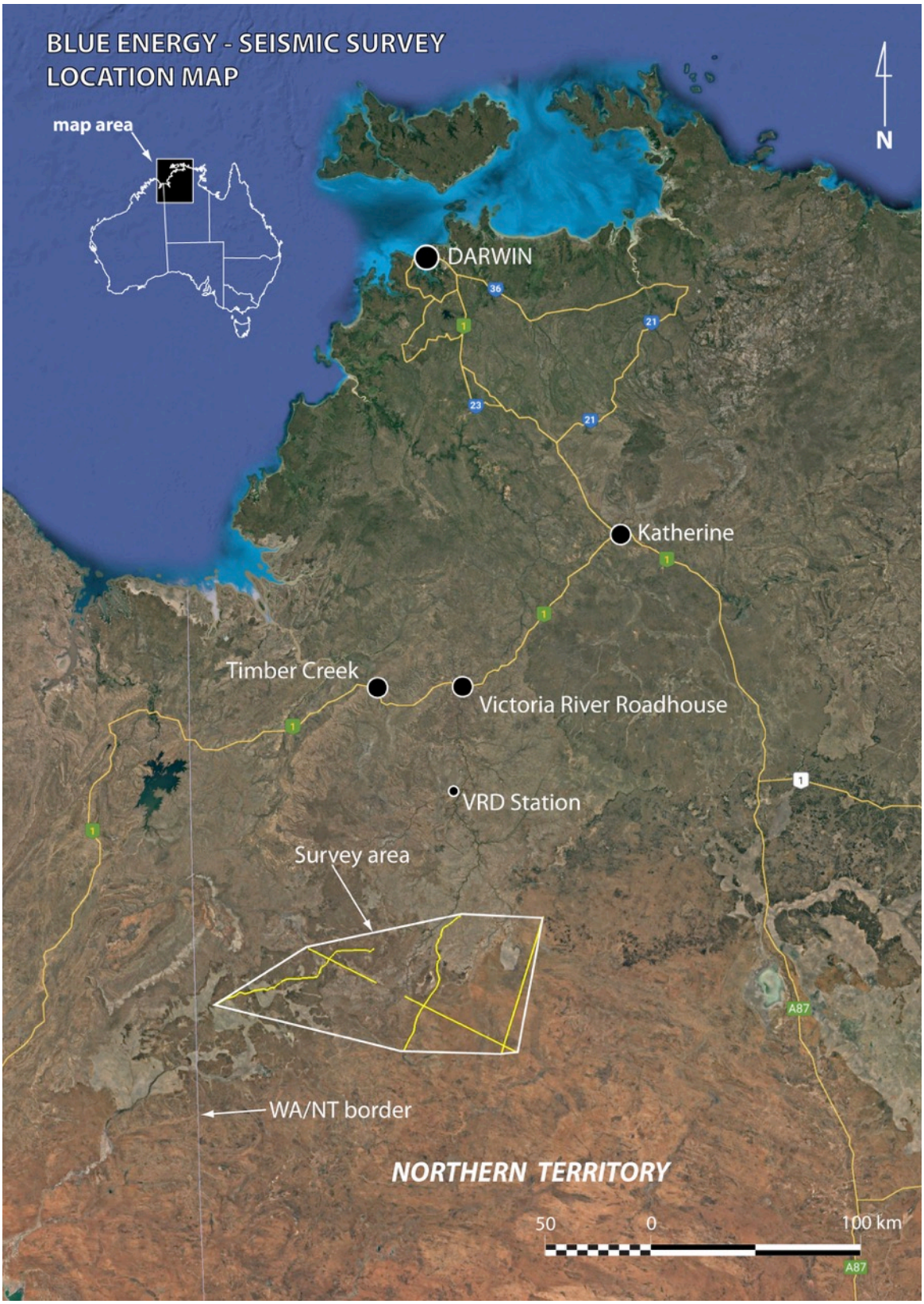

Figure 1. Location map of Blue Energy's study area (After Google Earth).

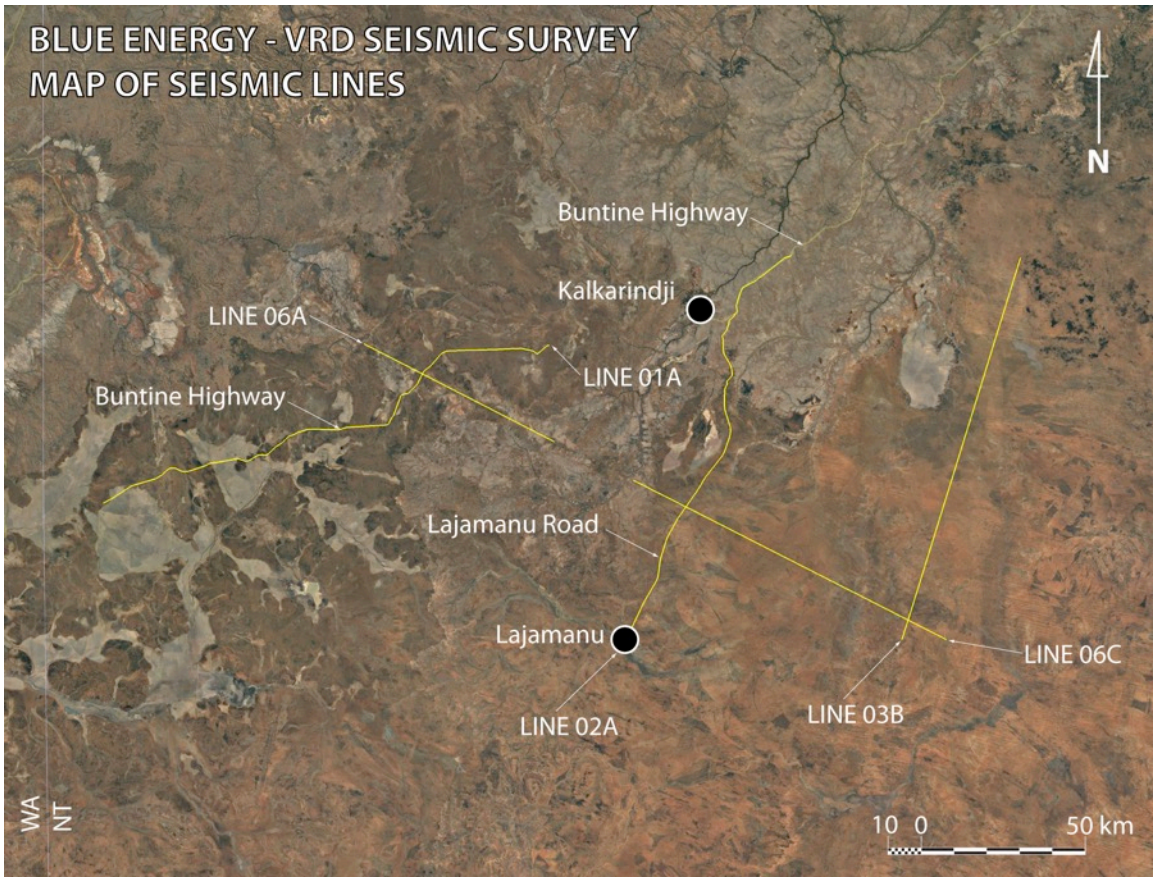

Figure 2. Location of the study area, showing seismic lines, proposed well sites and access tracks (After Google Earth).

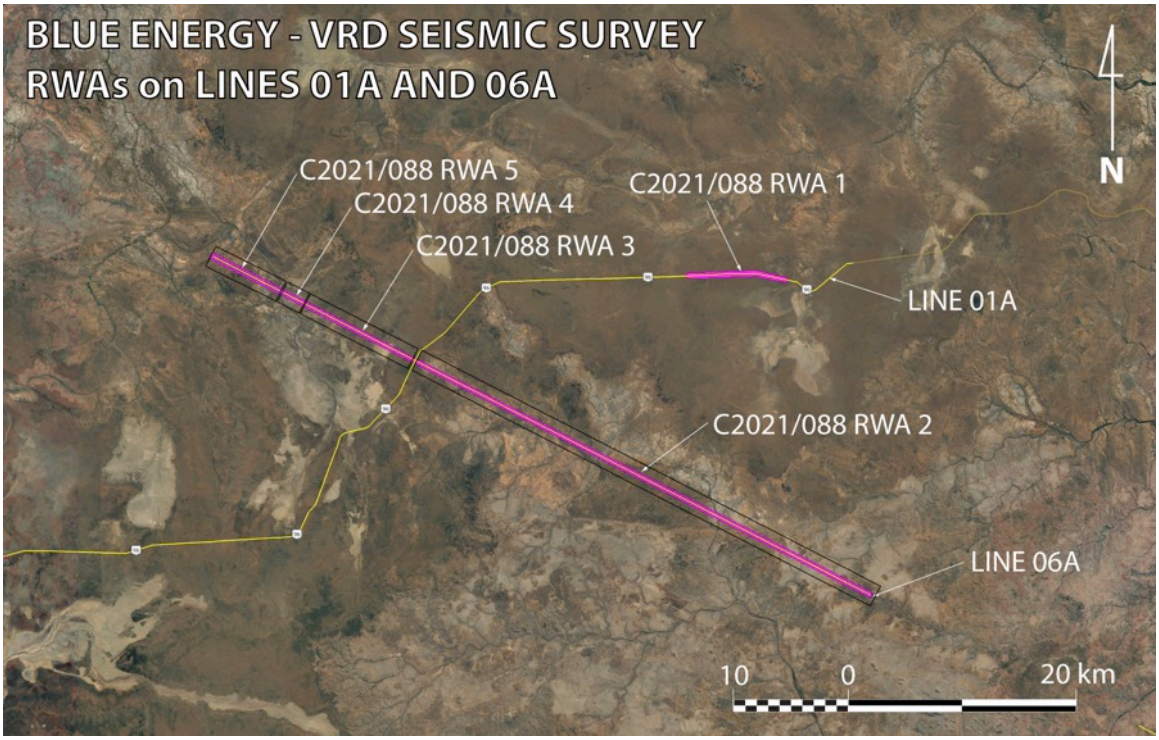

Figure 3. Map of Restricted Work Areas on Lines 01A and 06A (After Google Earth).

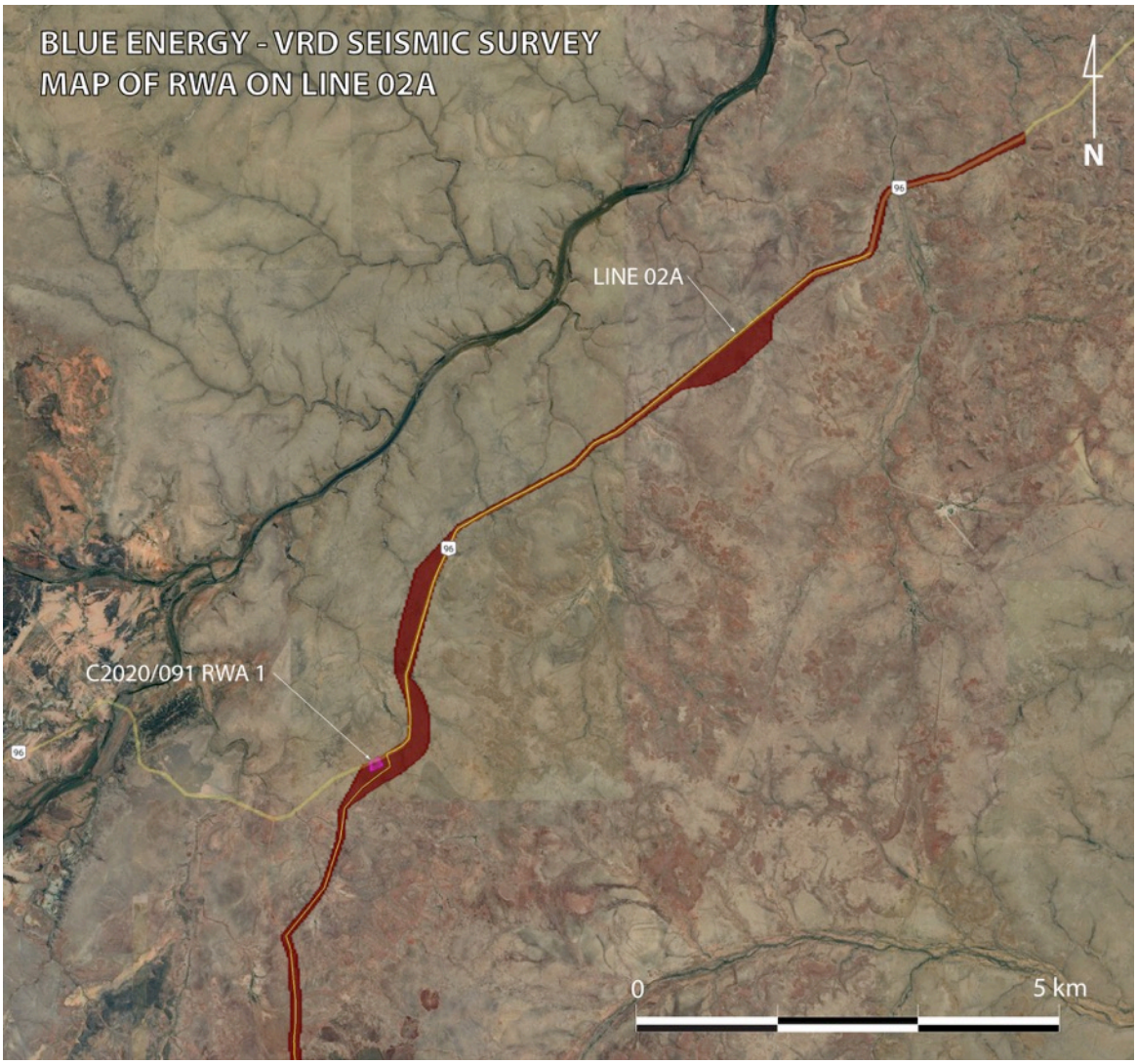

Figure 4. Map of restricted work areas on Line 02A (After Google Earth).

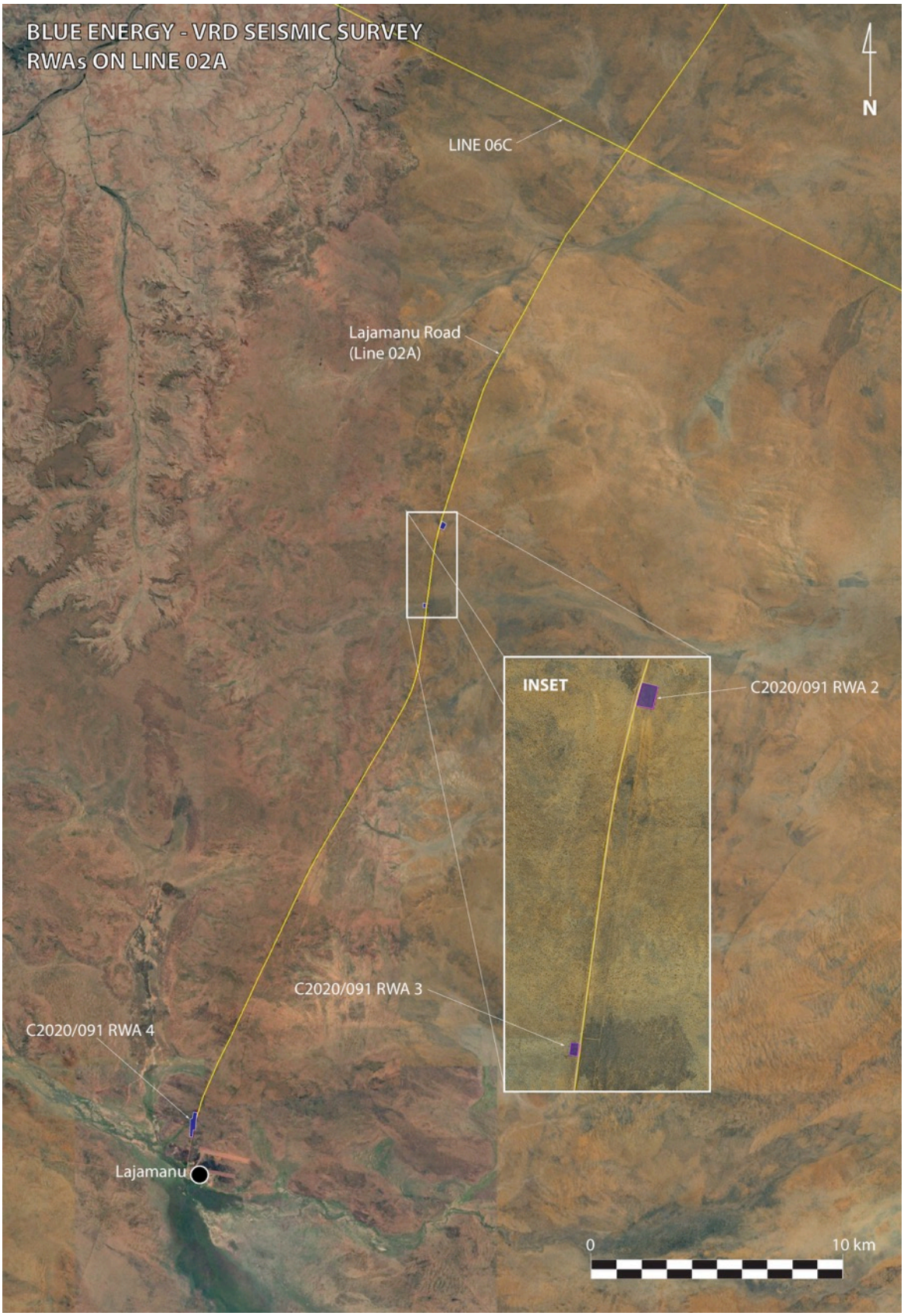

Figure 5. Map of restricted work areas on Line 02A (After Google Earth).

2.0 HERITAGE LEGISLATIVE FRAMEWORK

2.1. Northern Territory legislation

There are two kinds of heritage sites protected under the Northern Territory *Heritage Act* (2011), hereafter referred to as the Act, declared and prescribed places and objects. The Act places legal constraints on owners of private property, local government and the Crown:

- Places or objects listed on the Northern Territory Heritage Register are declared heritage places and objects that are protected under section 33 of the Act, and

- Prescribed archaeological places and objects, which may or may not be declared, are protected under sections 29 and 39 of the Act.

It is an offence under the Act to damage, destroy, alter or carry out work of any sort on declared or prescribed sites without the written consent of the Minister or Minister's delegate. If considered appropriate, the Heritage Branch may on occasion utilise the discretion available in the Act to give permission for small-scale disturbance (such as the relocation of isolated stone artefacts) without the need for a formal application. The discretion is allowed under s148 of the Act, which in effect says that a heritage officer (such as an archaeologist) may undertake actions (or authorize actions), not construed as an offence.

2.1.1 Declared heritage places and objects

Categories, which describe the status of each site on the Northern Territory Heritage Register database, are listed in Table 1.

Table 1. Site status on the Northern Territory Heritage Register database

Status	Description
D	Declared heritage place.
NR	Not recommended. HC* determined that the place did not meet heritage assessment criteria and did not hold sufficient value to warrant declaration under the *Act*.
RF	Refused by the Minister. HC* recommended for declaration and Minister refused to do so.
P	Proposed. HC* has determined that the place warrants declaration under the *Act* but has not yet made its recommendations to the minister.
RV	Revoked. Declaration as a heritage place pursuant to Section 26(1) of the *Act* is revoked.
N	Nominated. HC* has yet to complete its assessment of the heritage value of the place.

*Heritage Council

The Northern Territory Heritage Register contains places that possess special significance for the Northern Territory and have been recognized for a wide range of natural and cultural values. As a result it includes places that have been deemed significant because of their environmental and/or cultural characteristics. For the purposes of the current report, only places of historic or archaeological significance have been included. A search of the register indicates that the proposed works programme for Blue Energy's EP205 and EP207, will not impact on any sites listed in the Heritage Register.

2.1.2 Prescribed archaeological places and objects

Most archaeological places and objects are listed in the *Heritage Conservation Regulations* (1999) as prescribed places and objects. The Heritage Branch, Community Participation and Inclusion, Department of Territory Families, Housing and Communities, hold the Archaeological Sites Register. Included in this register are the protected prescribed sites that consist of all archaeological sites and objects pertaining to the past occupation by Aboriginal people. Any historic sites listed on this register do not indicate that these sites are protected or hold legal significance under the Northern Territory *Heritage Act 2011*.

2.2. Constraints

2.2.1 Ground Integrity (GI)

Assessing ground surface integrity provides an indicator of whether or not the landscape under study has been modified, and if so the degree of disturbance encountered. It then becomes possible to gauge the degree to which modification has influenced the environmental context within which artefacts and/or places of cultural and/or scientific interest are located. Ground surface integrity must also be assessed from the perspective of the current legislation.

The *Aboriginal Cultural Heritage Act 2003* (in Queensland, but equally applicable to the Northern Territory) provides a definition for GI that includes the removal of native vegetation as inferring the ground has been subjected to 'significant ground disturbance'. Under these criteria of modification, therefore, the *Act* assumes that archaeological integrity and significance is greatly reduced, is negligible, or even extinguished completely.

Contrary to this however, archaeologists are continually finding evidence that important cultural heritage material and/or places regularly survive not only land clearing activities but also invasive farming techniques such as ploughing.

Combined with this is the fact that, regardless of levels of GI, significant Aboriginal objects and/or significant Aboriginal areas can be defined on entirely cultural grounds, by Traditional Owners, not requiring any assessment of ground surface integrity.

Levels of GI are determined using a percentage range between 0-100% where 0% indicates all GI is gone, and 100% represents excellent preservation of the original context. Zero – 0%; Poor – 1-25%; Moderate- 26-50 %; Fair – 51-75 %; Good – 76-85%; Excellent 86-100%.

2.2.2 Ground Surface Visibility (GSV)

Assessments of ground surface visibility provide an indication of how much of the ground surface can actually be seen.

Ground surface visibility (GSV) is most commonly inhibited by vegetation but other inhibitors may include concrete, gravel and bitumen. Levels are determined using a percentage scale similar to that used for the calculation of Ground Integrity (GI), in that 0% represents zero visibility and 100% represents maximum visibility (bare ground). Zero – 0%; Poor – 1-25%; Moderate – 26-50 %; Fair – 51-75 %; Good – 76-85%; Excellent – 86-100%. The better the visibility, the more potential there is for locating cultural/archaeological material.

3.0 PREVIOUS RESEARCH

3.1 Literature review

The study area occurs within the traditional lands of the Gurindji, Mudburra and Warlmanpa people (Fig. 6). Previous archaeological studies in the study area relate mainly to three sites along the Buntine-Lajamanu Road. The majority of sites in the area are in Gregory National Park. The sites are listed in Table 2 (only those along the Buntine-Lajamanu Road) and mapped in Figure 7. There have been extensive studies of the rockart sites in the VRD and for further information, see Lewis (1990).

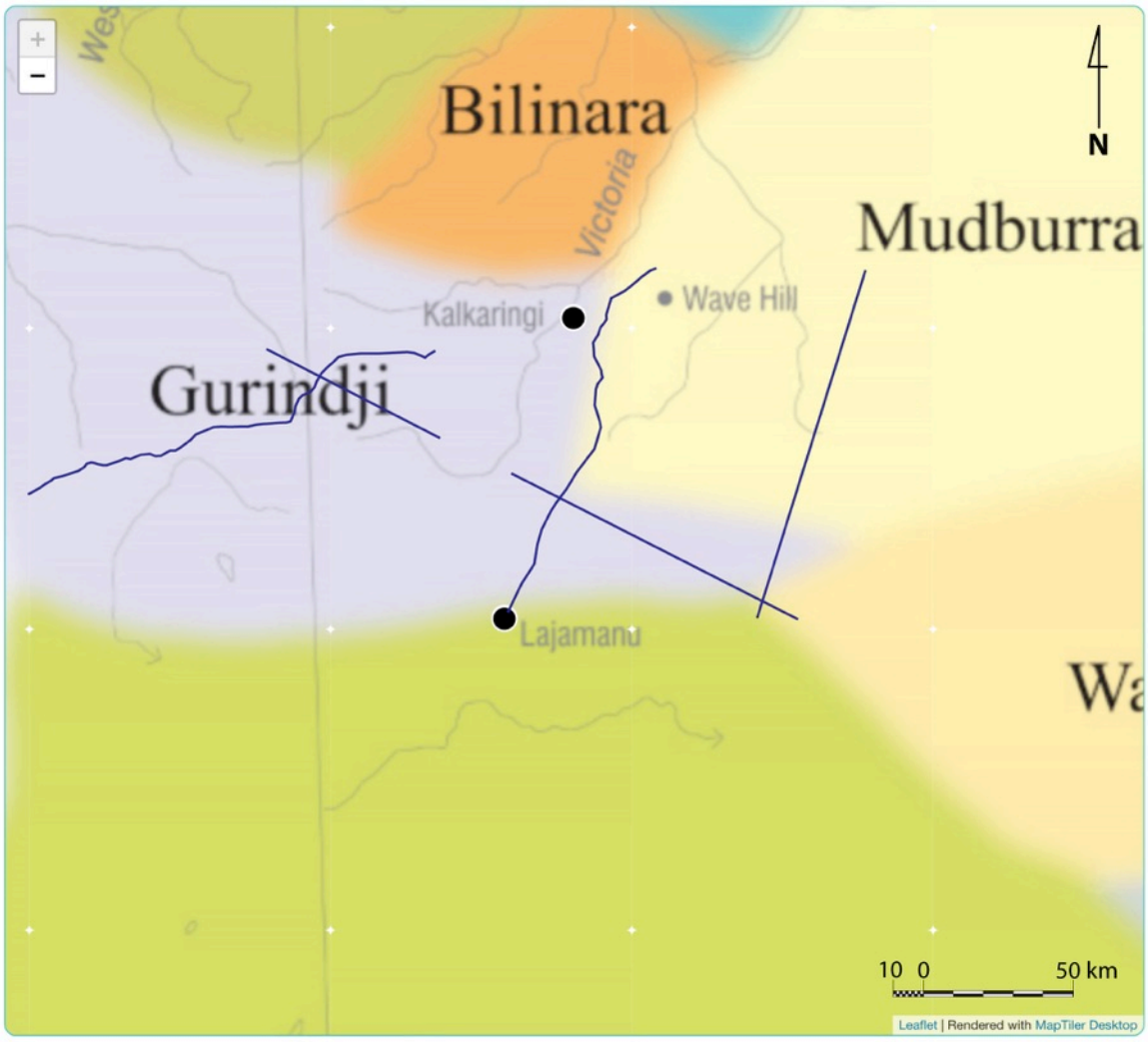

Figure 6. Tindale map with the seismic lines superimposed showing tribal distributions (After AIATSIS. URL: https://aiatsis.gov.au/explore/map-indigenous-australia. Accessed 2 May 2022).

Table 2. Previously recorded archaeological sites specifically on Line 02A – Buntine-Lajamanu Road (After Heritage Branch, NTG)

Site_ Name	Site_ Status	Site_ Context	Site_ condi-tion	Site_ signifi-cance	Exists	Work_Carried_out_on_Site	Easting	Northing	Zone	Map_ Sheet	Con-tent
Bowen site 14	Unknown	loamy surface with deep cracks	Good	High	Unknown	Recorded	707911	8076786	52	5063	Wave Hill
Bowen site 15	Unknown	cracked surface amongst cobble outcrops	Good	High	Unknown	Recorded	702252	8060382	52	5062	Watson
Bowen site 16	Unknown	cracked surface amongst cobble outcrops	Good	High	Unknown	Recorded	702243	8059468	52	5062	Watson

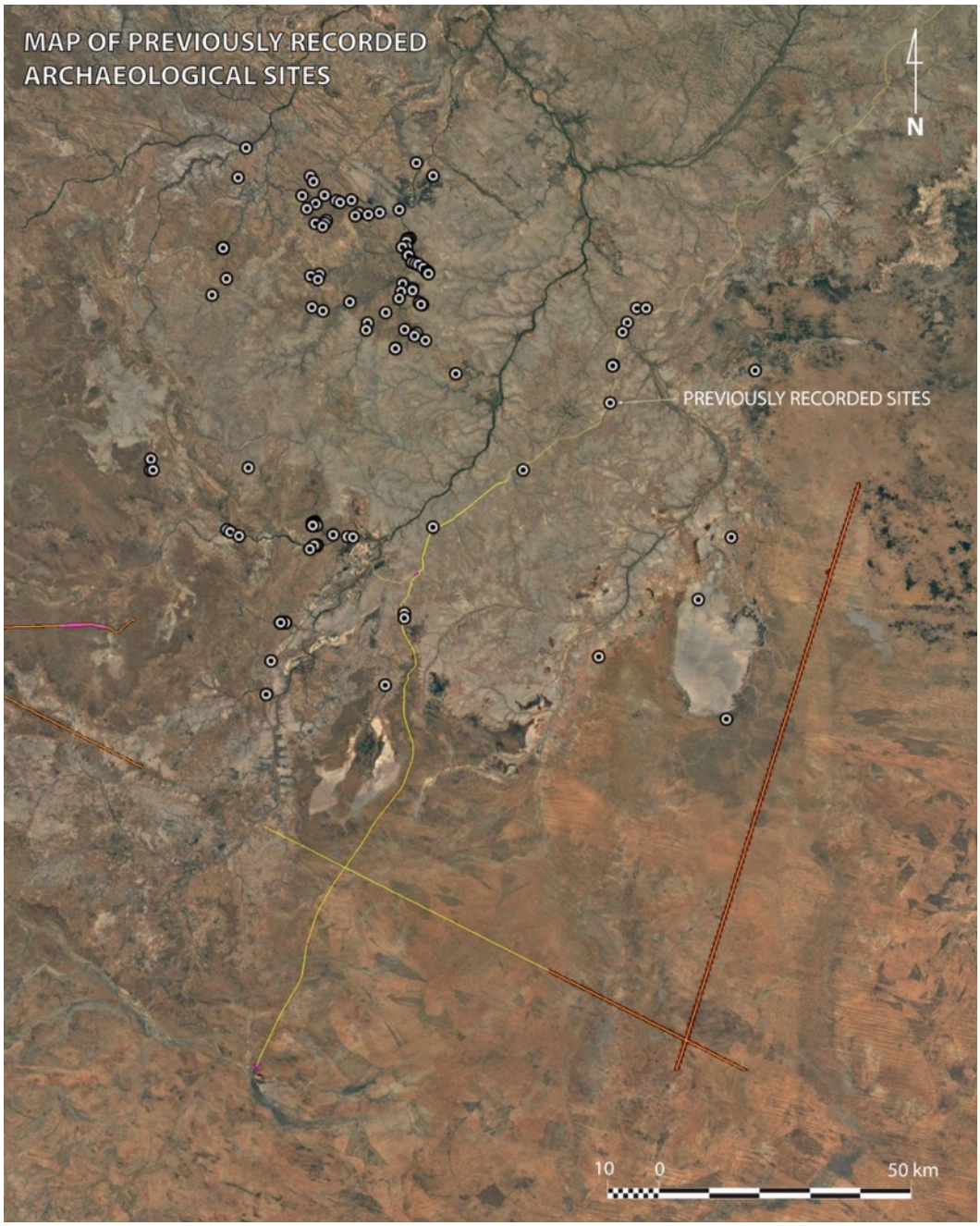

Figure 7. Map of previously recorded archaeological sites in the survey area (After Google Earth).

4.0 METHODS

4.1 Survey method

Archaeological survey methods are often based on sampling strategies. These strategies can be 'purposive', where specific areas are targeted, or 'probabilistic', where decisions are made to survey without any prior knowledge or predictive model of what heritage resources might exist in the landscape to be surveyed. Cultural heritage survey strategies generally involve transects across project areas chosen at random (probabilistic) to avoid possible bias in the results, or transects within particular areas (purposive) known to potentially contain Aboriginal cultural heritage or contain sites that were identified in previous research or surveys.

The purposive survey method was used in this survey utilised aerial resources to assay likely habitation areas. Water is a key determinate as to where people were in the environment. Waterways were, hence, targeted in the aerial survey, as well as stoney laterite ridges on the edges of swamps and drainage channels. Rock outcrops were also investigated. A short pedestrian survey was conducted along each of the survey lines from the helicopter landing zones (LZs). Some were brief to quickly assess sites, while other pedestrian transects were longer at sites of high probability to contain archaeological material. Formal tool types were photographed and some unique flakes and a GPS grid reference was recorded. Knapping floors were defined by polygons to delineate their boundaries, although site polygons may be extended to include entire waterholes, including areas that were archaeologically sterile. Previously recorded sites were relocated to confirm their locations with current GPS accuracy, as the GPS coordinates for sites recorded pre-2000 were still being dithered. Boundaries were also determined for them to identify their extent and density.

The aircraft was to fly along the centre of seismic lines at a height of approximately 200 ft (60.96 m) at a speed of approximately 50 - 70 knots (92.6 km/h to 129.64 km/h). The height afforded good views to either side of the centre line up to 500 m. Landings were also made outside of the target sites as a control to test the survey method. Landing Zones were also determined by the needs of the ecological survey, mainly to determine the location of endangered Bilby holes.

4.1.1 Identification of archaeological material

Stone artefacts, including tools and debitage, the by-product of manufacture, are identified on the following criteria after McCarthy (1976), Holdaway and Stern (2004):

- Bulb of percussion
- Erailure scar (on the ventral surface)
- Point of force application (PFA) and associated ring crack
- Termination types (e.g. feathered, stepped, hinged, plunge)
- Flake scars (dorsal scars and ridges)
- Cores (identified by the presence of negative flake scars)
- Hammer stones (identified by the presence of end-crushing on pebble stones)
- Retouch (reworking of flake margins)
- Raw material type
- Grinding stones (very smooth wear on upper surface)

List of artefact type abbreviations:

- Ad – Adze
- An – Anvil
- Bl – Blade
- Co – core
- Cf – Core fragment

- Ct – Core tool
- F – flake
- Fp – flake piece
- Gs – Grindstone/Grinding plate
- Gh – Grinding hollow
- Hs – Hammer stone
- M – Manuport
- Mp – Multi platform core
- Rtf – retouched flake
- S – Scraper
- Sp – Single platform core
- Ts – Top stone
- X – Axe/wasted cobble
- Z – Other e.g., ceremonial

List of artefact raw material abbreviations:

- B – Basalt
- C – Chert
- Ch – Chalcedony
- G – Greywacke
- Gr – Granite
- Hs – Hornsfel
- Im – Indurated mudstone
- J – Jasper
- SS – Sandstone
- S – Silcrete
- Q – Quartz
- Qz – Quartzite

4.1.2 Definition of archaeological sites

4.1.2.1 Historical Sites

Historical sites in north Australia are those that have physical evidence of European and non-European activities. These range from Macassan sites to military sites of WWII. These sites may overlap with Aboriginal heritage sites.

4.1.2.2 Aboriginal Heritage Sites

Aboriginal archaeological sites can be classified by six main types: 1) stone knapping sites, including quarries, 2) background scatters, including isoliths, 3) stone arrangements, such as mounds, walls, fish traps or stone motifs, 4) shell middens, 5) burials, 6) scarred trees and 7) rock art sites.

Burke and Smith (2004:63) define an archaeological site as 'any place that contains the physical evidence of past human activity. Australia, however, has what has been referred to as a background scatter of stone artefacts, which refers to low-density artefact scatters that either represent singular knapping events ('dinner-time' camps or 'hunting camps'), or larger sites that have been buried or disturbed. To differentiate this site type from larger sites that may contain thousands of artefacts, the term Archaeological Site (AS) is used to describe home-camps or quarries i.e., places where people have been returning to for millennia, as opposed to sites that have very low artefact densities that represent sporadic visits i.e., background scatters (BS). Others have called these sites persistent occupation sites, whereby people have return to frequently, or visit sporadically over a long period of time (Schlanger, 1992).

4.2 Assessment of archaeological significance

From personal observations, Aboriginal people regard all material cultural heritages as significant. They are, after all, the tangible reminders of their culture and represent a finite resource. It is a western construct to assess sites and objects as a hierarchy. Significance assessment in archaeology, therefore, is complex, dependent on a range of factors. These can be classified as low, moderate or high significance, following the International Council on Sites and Monuments (ICOMOS) Charter for the Conservation of Places of Cultural Significance, or the Burra Charter (Maquis-Kyle and Walker, 1992).

Archaeological significance, however, very much depends on the research questions being posed (see Sullivan and Bowdler, 1984; Moratto and Kelly, 1981). Generally low significance finds have poor diversity of artefact types and in very low densities. Sites that are likely to be particularly valuable in answering archaeological research questions are given moderate archaeological significance. High archaeological significance sites have very high artefact densities per metre squared, with rare and unique finds that is well preserved and has high ground integrity (see below). The concept of significance in cultural heritage assessments is often irrelevant, whereby the client merely seeks to determine absence or presence of cultural material on their proposed works area and how best to mitigate their impact on those finds to comply with the Act.

5.0 RESULTS

5.1 Archaeology

Thirty-five landings were made (Fig. 8). Nine archaeological sites were recorded and all were stone artefact scatters of various significance (Fig. 9). Six isolated stone artefacts were recorded, some of which occurred at the control landing sites, which were not expected to contain archaeological material. For instance, BEBS01 and BEBS02 were found in what appeared to be open terrain with no apparent local water sources. The finds, however, were later discovered to be in association with a melaleuca stand that suggested wetter conditions might have prevailed at the time of the artefact deposition. The majority of archaeological sites were low-density artefact scatters. They may have been much larger, as they were only sampled and not mapped entirely. The aim of the survey was to determine the location of sites, rather than to record them in detail. Many of the sites located on Line 06A were recorded to indicate that the majority of watercourses transected by the line will highly likely contain archaeological material. It was not feasible to assess all the watercourses transected by the line and this will be discussed further below.

Table 2 lists the archaeological finds, descriptions and locations. Artefacts were made mostly on cherts, silcretes and quartzite with some quartz. The artefacts ranged from formal tool types such as retouched flakes incorporating points, burrens and blades. One site, BEAS06 was found to have a Kimberley Point, which was bi-facially retouched. Another spectacular found was a hammer stone in BEAS02, in Cattle Creek, which is rare. One site with high significance was found on Line 06A, a rockart site with large occupation floor and in association with several other smaller galleries. The site, BEAS08, has numerous painted motifs and engravings depicting animals and anthropomorphic figures. Appendix 1 lists the Landing Zones (LZs), descriptions and locations. Appendix 2 provides the site polygon grid references. Appendix 3 shows artefacts photographs and Appendix 4 is of the art at BEAS08. The following headings briefly describe the sites.

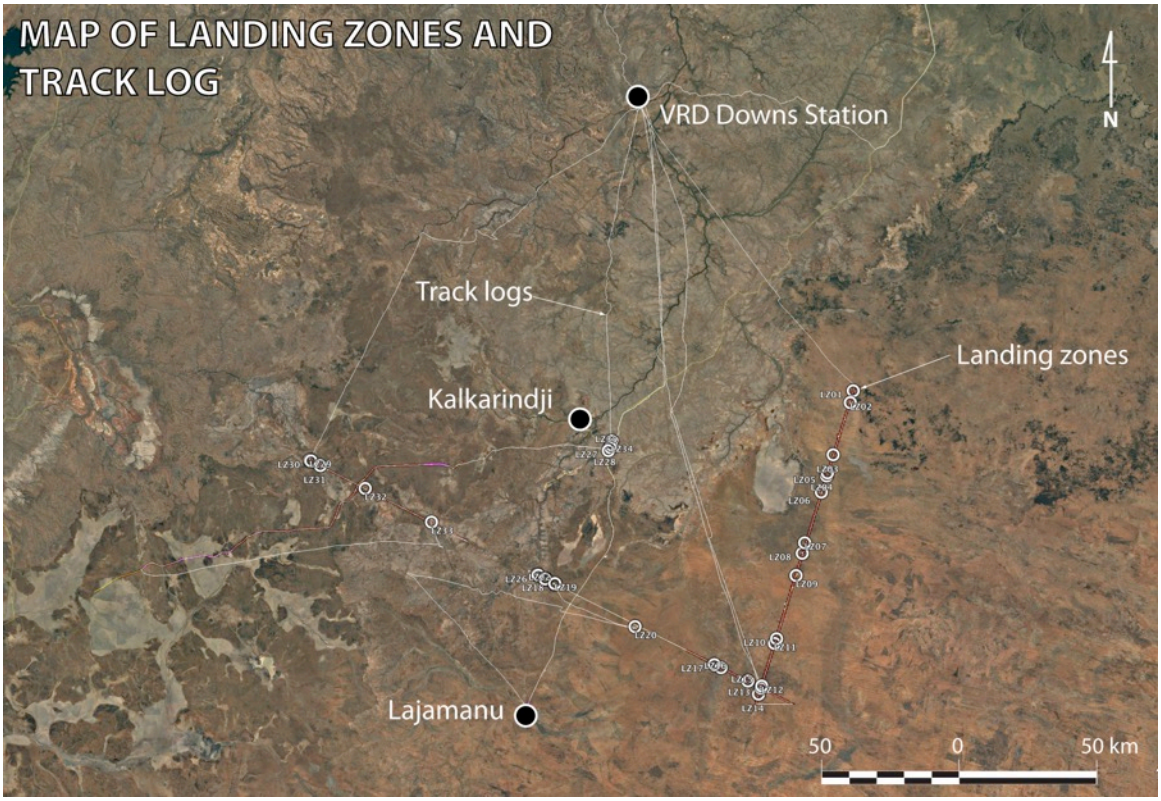

Figure 8. Map of Landing Zones (LZs) and survey tracklog (After Google Earth).

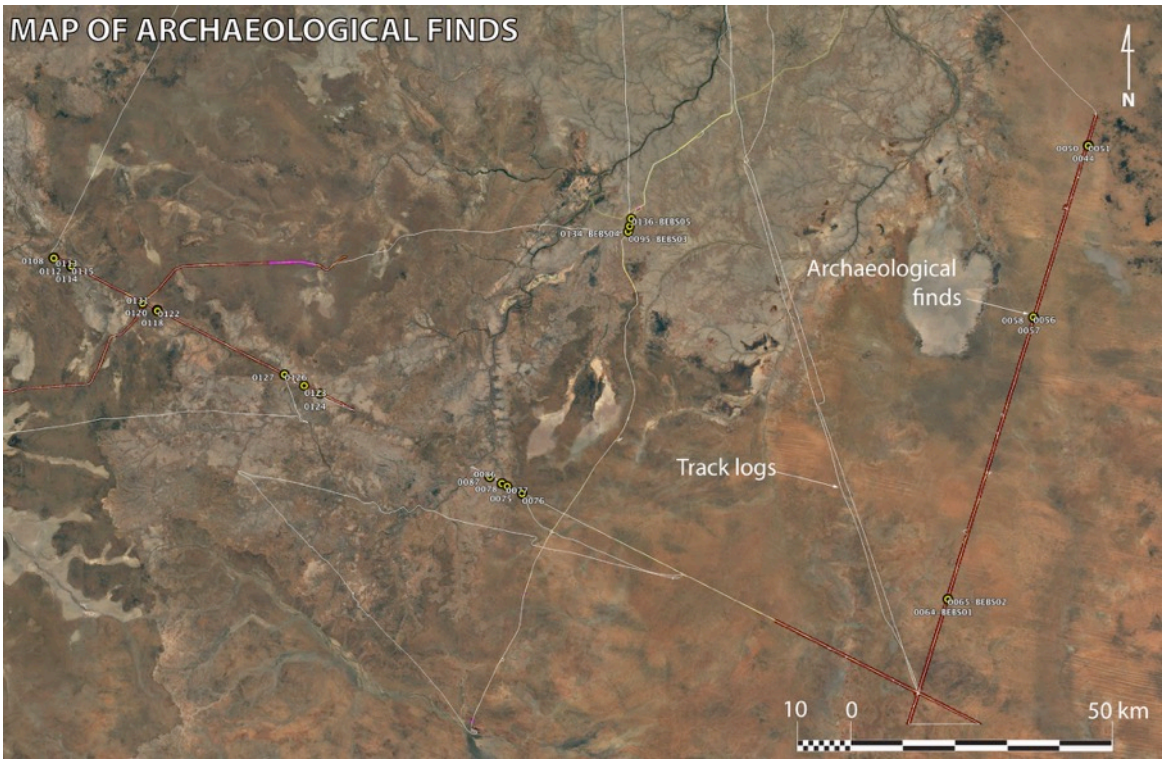

Figure 9. Map of all archaeological sites – yellow dots, showing their distribution (After Google Earth).

Table 3. Archaeological Sites (AS) and Background Scatters (BS)

Format: UTM M/D/Y H:M:S 9.50 hrs Datum[037]: GDA						
ID	**Wpt Name**	**Comment**	**Zone**	**Zone**	**Easting**	**Northing**
BEAS01						
W	44	F(S), RTF(S) POINT	52	K	788662	8078921
W	45	F(S)	52	K	788663	8078922
W	46	F(S)X2	52	K	788666	8078926
W	47	F(S)	52	K	788669	8078931
W	48	F(S)	52	K	788671	8078930
W	49	F(C)	52	K	788706	8078929
W	50	BU(S)	52	K	788714	8078894
W	51	F(S), FP(S)	52	K	788666	8078880
BEA02						
W	56	RTF(S)	52	K	778018	8047268
W	57	F(C)	52	K	778127	8047192
W	58	HS(B)	52	K	778129	8047186
W	59	F(C)	52	K	778090	8047149
BEBS01						
W	64	RTF(Q)	52	K	761614	7995357
BEBS02						
W	65	GS(SS)	52	K	761516	7995374

BEAS03						
W	75	F(S)	52	K	682664	8015708
W	76	F(S)	52	K	682658	8015736
W	77	F(S)	52	K	682643	8015766
BEBS03						
W	78	GS(SS)	52	K	679935	8017053
BEAS04						
W	80	RTF(S) UNIFACIAL, SINGLE MARGIN, F(S)	52	K	678948	8017568
W	81	F(C), FP(S), FP(QZ)	52	K	678946	8017568
BEAS05						
W	86	F(Q)	52	K	676700	8018799
W	87	RTF(S) BADE	52	K	676691	8018806
BEBS04						
W	95	F(S)	52	K	702798	8063695
BEAS06						
W	108	F(C)X3, F(QZ)	52	K	596163	8059855
W	109	RTF(C) KIMBERLY POINT. FP(S), F(C)X5	52	K	596168	8059915
W	110	B(S)	52	K	596176	8059934
BEAS07						
W	112	F(Q)	52	K	599467	8058330
W	113	GS(SS), F(Q)X3	52	K	599486	8058350
W	114	GS(SS)	52	K	599473	8058351
W	115	TS(SS)	52	K	599466	8058350
W	116	GS(SS)	52	K	599468	8058348
W	117	GS(SS)	52	K	599464	8058352
BEAS08						
W	118	F(S)	52	K	615396	8050112
W	120	RTF(C), RTF(QZ), UNIFACIAL BOTH MARGINS	52	K	615382	8050072
W	121	MAIN ROCK ART SITE	52	K	615347	8050052
W	122	MINOR ROCK ART GALLERIES	52	K	615442	8049917
BEAS09						
W	126	F(C), F(Q)	52	K	638885	8037995
W	127	RTF(C)x2, RTF(S)x2, RTF(B)	52	K	638860	8037988
BEBS05						
W	134	F(C)	52	K	703083	8064687
BEBS06						
W	136	C(C)	52	K	703408	8066073

5.2 Archaeological sites (AS)

5.2.1 Blue Energy Archaeological Site 1 (BEAS01)

A low-density artefact scatter found in association with a waterhole, consisting of 11+ artefacts with formal tool types. The site occurs 290m to the east of the buffer zone for C2020/085 on Line 03B. It is outside of the works area. Figure 10 shows the site, predominately just to the right of the waterhole. Figures 11 and 12 show site context and orthographic view respectively. Figure 13 maps the site.

Figure 10. BEAS01 site photo.

Figure 11. BEAS01 oblique aerial context view.

Figure 12. BEAS01 orthographic view.

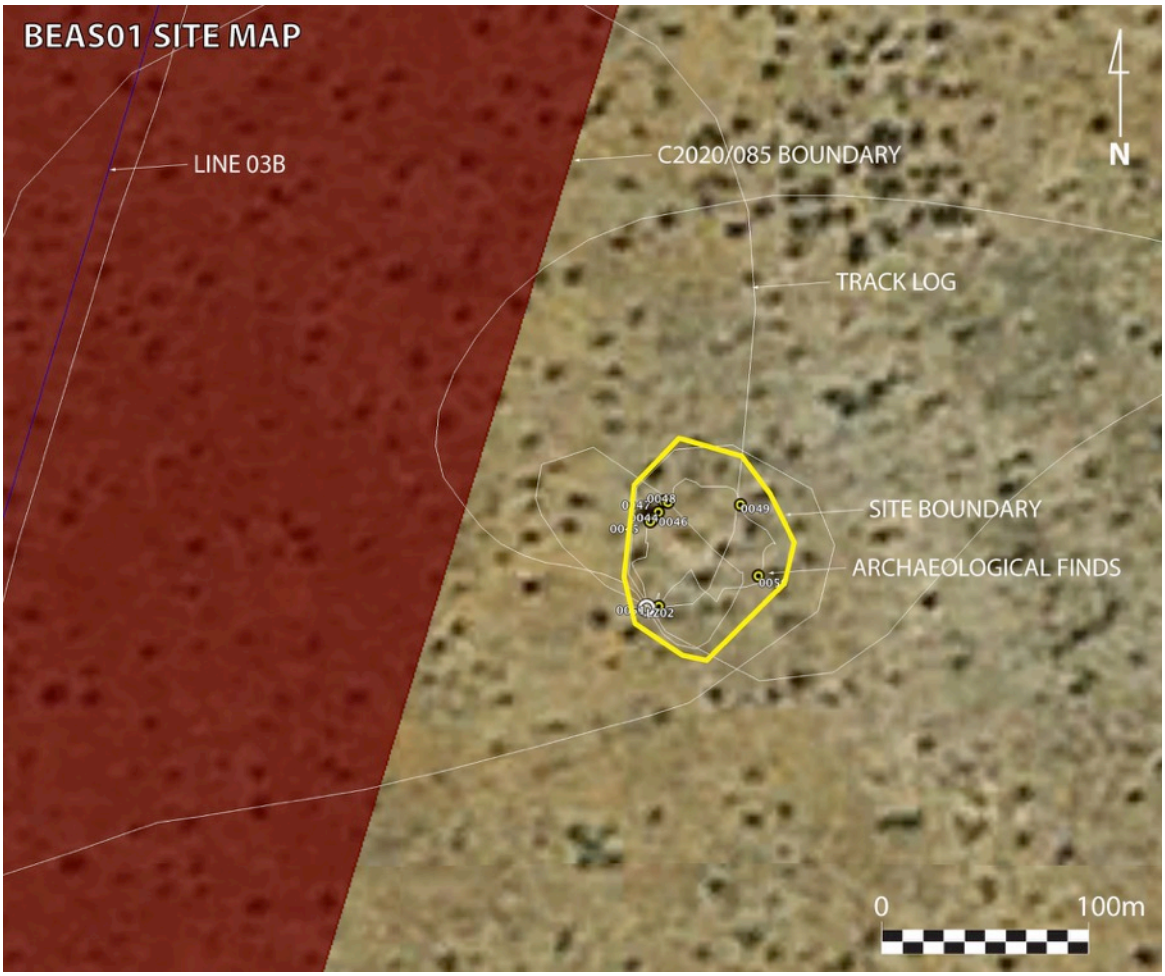

Figure 13. BEAS01 site map near the eastern edge of C2020/085 (After Google Earth).

5.2.2 Blue Energy Archaeological Site 2 (BEAS02)

A landing was made on Cattle Creek for an examination of its banks, but no archaeology was found there. The archaeology was instead to have been found in association with gilgai in the creek's bed. Low GSV was encountered, which limited site visibility to <5%. The site consists of four artefacts, including a hammer stone and retouched flake. It quite likely is much larger. Line 03B intersects the site and will have a direct impact. Figure 14 shows site context views of the gilgai and aerial perspectives (Fig. 15). Figure 16 maps the site.

Figure 14. BEAS02 terrestrial site photo.

Figure 15. BEAS02 oblique aerial site photo. Note: finds are approximately in the middle of the Cattle Creek.

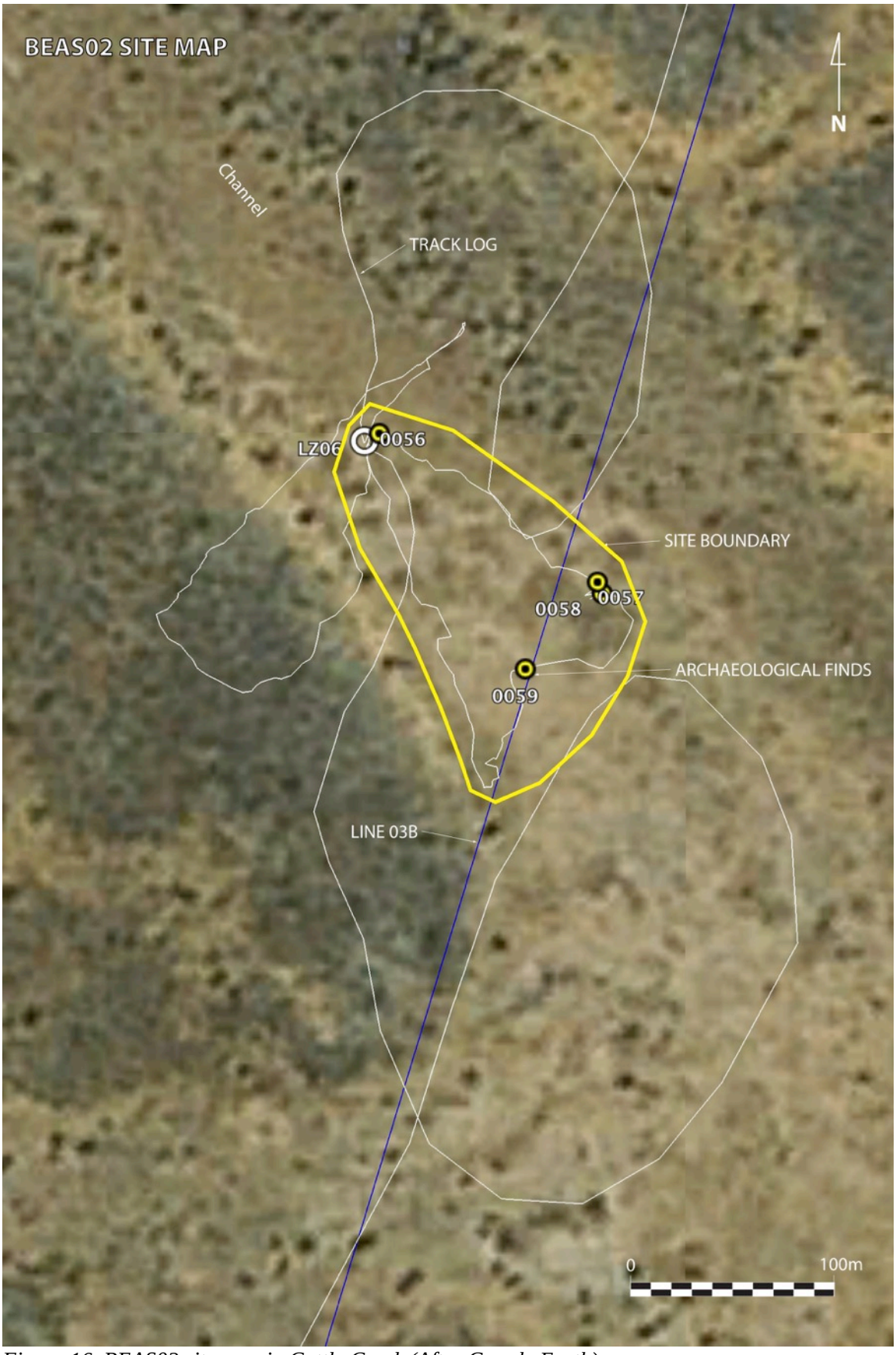

Figure 16. BEAS02 site map in Cattle Creek (After Google Earth).

5.2.3 Blue Energy Archaeological Site 3 (BEAS03)

On top of escarpment overlooking a series of overhangs underneath conglomerated laterite. Low-density artefact scatter, dominated by flakes on silcrete on red, laterite soils, Line 06C. Figure 17 shows the site from the ground and Figure 18 shows an aerial perspective. Figure 19 maps the site. Possible single deposition event and/or hunting camp?

Figure 17. BEBAS03 terrestrial site photo.

Figure 18. BEAS03 aerial oblique photo. Site is on top of the breakaway formation in middle of frame.

Figure 19. BEAS03 site map (After Google Earth).

5.2.4 Blue Energy Archaeological Site 4 (BEAS04)

Low-density artefact scatter on the western bank of Sambo Creek, with massive retouched flake and primary flakes on silcrete and chert. Figure 20 shows a ground context view and Figure 21 shows the aerial perspective. Figure 22 maps the site. The entire access corridor was not surveyed, neither were drainage channels leading up to and after the main waterway. Pedestrian transect from LZ22 to LZ23.

Figure 20. BEAS04 terrestrial site photo.

Figure 21. BEAS04 oblique aerial site photo.

Figure 22. BEAS04 site map (After Google Earth).

5.2.5 Blue Energy Archaeological Site 5 (BEAS05)

Low-density artefact scatter with formal tool type – blade on silcrete. On eastern bank of small ephemeral creek, tributary of Sambo Creek. Figure 23 shows the site context photo and Figure 24 maps the site. Last LZ on Line 06C.

Figure 23. BEAS05 terrestrial site photo.

Figure 24. BEAS05 site map (After Google Earth).

5.2.6 Blue Energy Archaeological Site 6 (BEAS06)

Medium-density artefact scatter on eastern bank of Stirling Creek. Numerous formal tool types including bi-facially retouched Kimberly Point. The site most likely extends to and beyond the boundary of C2021/088 RWA 5 on Line 06A. Figure 25 shows the terrestrial context view and Figure 26 is an aerial perspective. Figure 27 maps the site.

Figure 25. BEAS06 terrestrial site context photo.

Figure 26. BEAS06 aerial oblique site photo. Site is located on the creek bank to the left of frame.

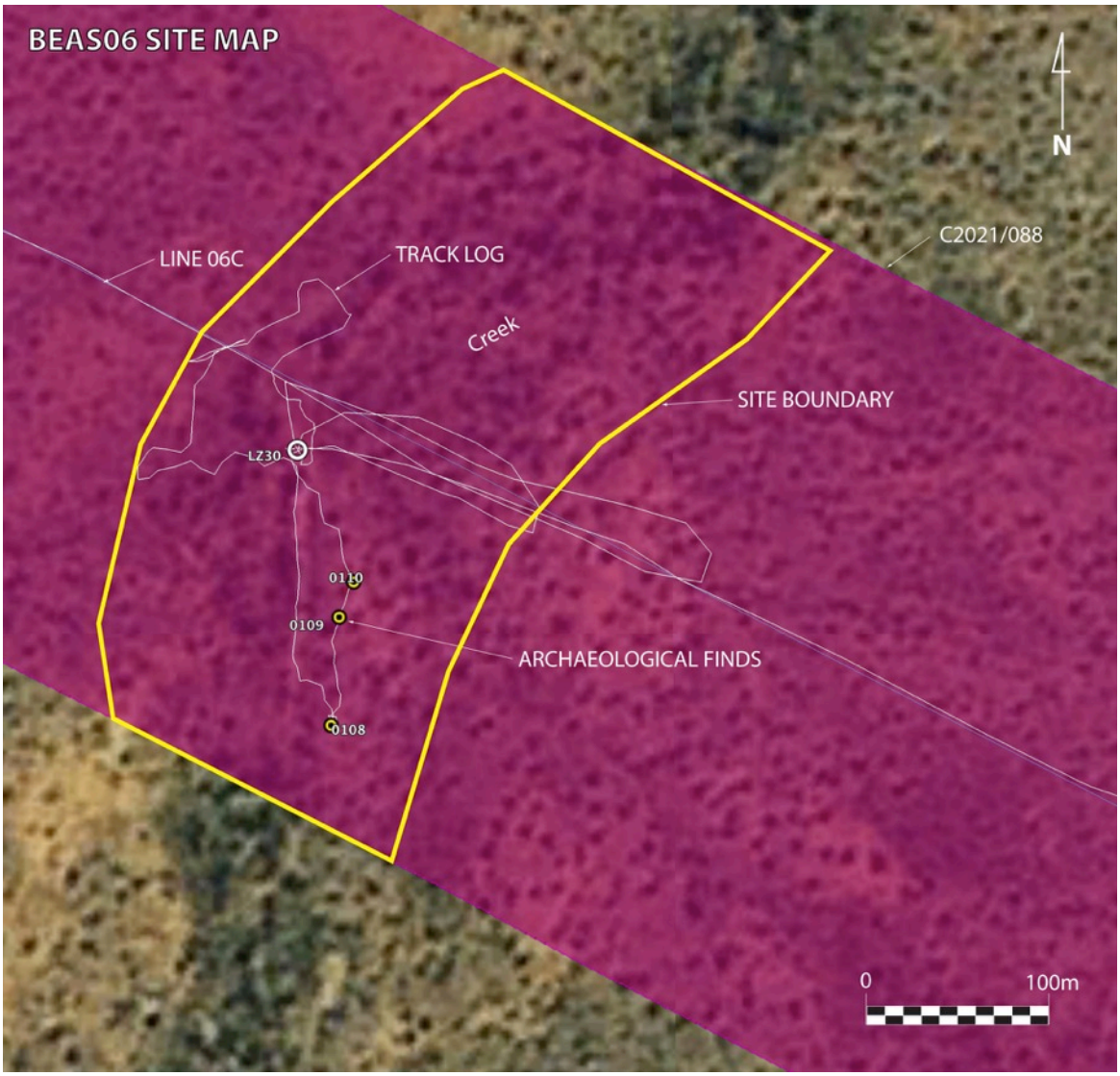

Figure 27. BEAS06 site map in C2021/088 RWA 5 (After Google Earth).

5.2.7 Blue Energy Archaeological Site 7 (BEAS07)

Medium-density artefact scatter on a low laterite rise next to creek and gilgai. High incidence of grinding stone fragments including one conjoin and topstone. The site is highly likely to extend to and beyond the boundary of C2021/088 RWA 5. Figure 28 is of a terrestrial view. Figure 29 shows an aerial perspective and with nearby gilgai (Fig. 30). Significant habitation site on a Stirling Creek tributary. Figure 31 maps the site. A recorded Sacred Site (White Rock Hill) was encountered while heading east from BEAS07, just south of the buffer zone for Line 06A (Fig. 32).

Figure 28. Terrestrial context view of BEAS07.

Figure 29. Aerial oblique context view of BEAS07. The helicopter's rotor blade points to the site.

Figure 30. Aerial oblique context view of BEAS07 in association with gilgai.

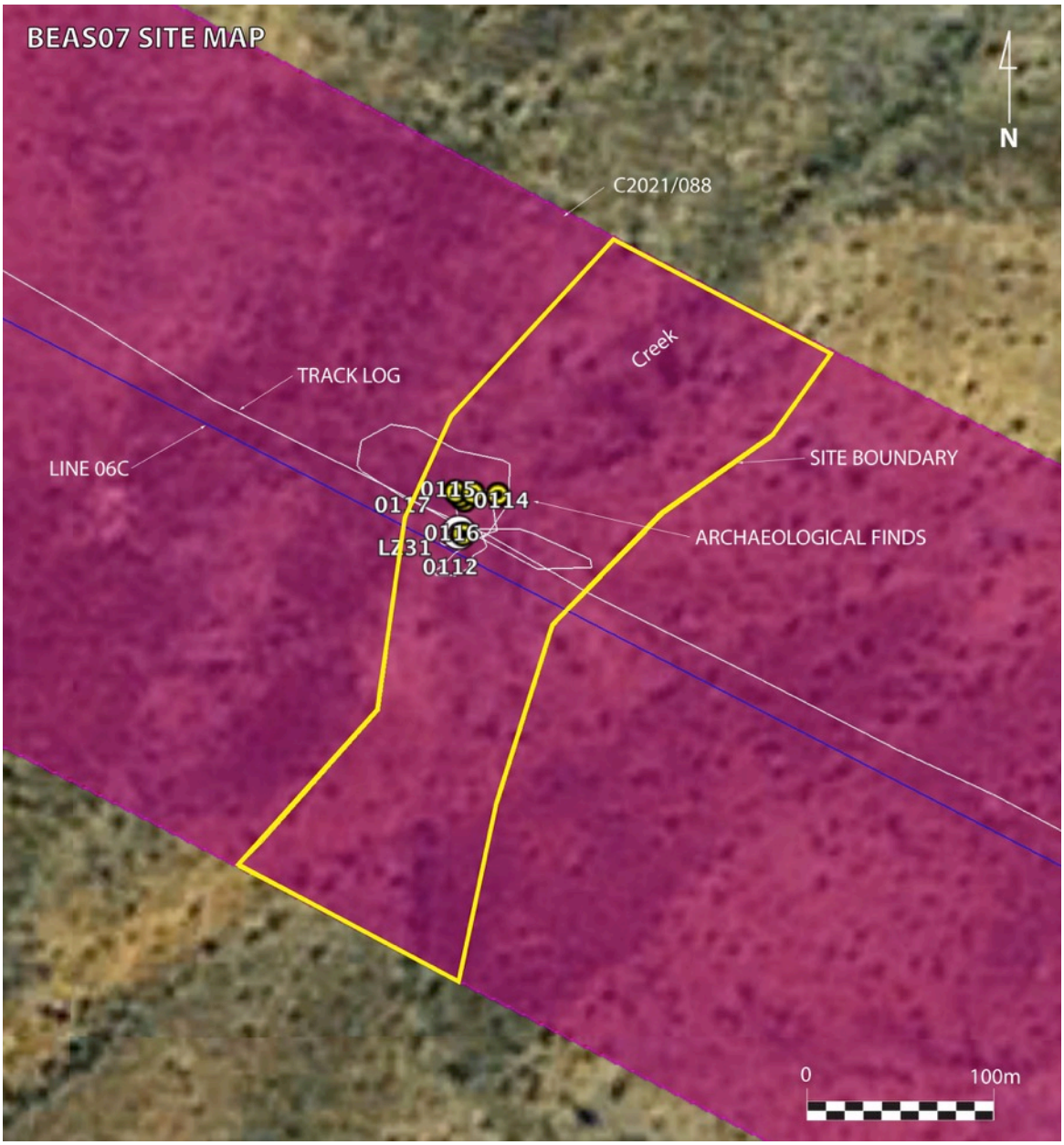

Figure 31. BEAS07 site map in C2021/088 RWA 5 (After Google Earth).

Figure 32. Aerial view of sacred site White Rock Hill, approximately 2.6km east of BEAS07 on the seismic line, with extensive creek system in the background.

5.2.8 Blue Energy Archaeological Site 8 (BEAS08)

Highly significant rockart gallery with high-density artefact scatter at base. Nearby water source. extensive. Main gallery features painted motifs of animals and anthropomorphic figures. Engravings of emu feet and linear features (unknown). The occupation floor is of dark grey friable soil with numerous stone artefacts on the surface. The floor measures about 7x4 metres. The site has a high excavation potential with possible deep stratified deposits, which may be used for dating the region. Line 06A runs through the site (within a few metres) and will need to deviate significantly outside of the buffer zone. An alternative mitigation programme may be able to clear a path through the stone artefact scatter at the base of the rockshelter. Figure 33 shows a context view from the landing zone. Figure 34 is of the site's aspect looking north, with a commanding view of the small valley. Figures 35 and 36 are of the occupation floor. Aerial context views are shown in Figures 37 and 38. Figure 39 is an aerial view of an associated smaller gallery just to the east of the main gallery and Figure 40 shows the context view of the escarpment from a higher altitude. Figure 41 maps the site area.

Figure 33. View of BEAS08 rock art shelter from the landing zone, looking south.

Figure 34. View from rockshelter looking north.

Figure 35. View of occupation floor.

Figure 36. View of entire occupation floor.

Figure 37. BEAS aerial view - closeup.

Figure 38. BEAS aerial context view showing erosion sheet in front of the shelter.

Figure 39. Aerial view of adjacent minor galleries.

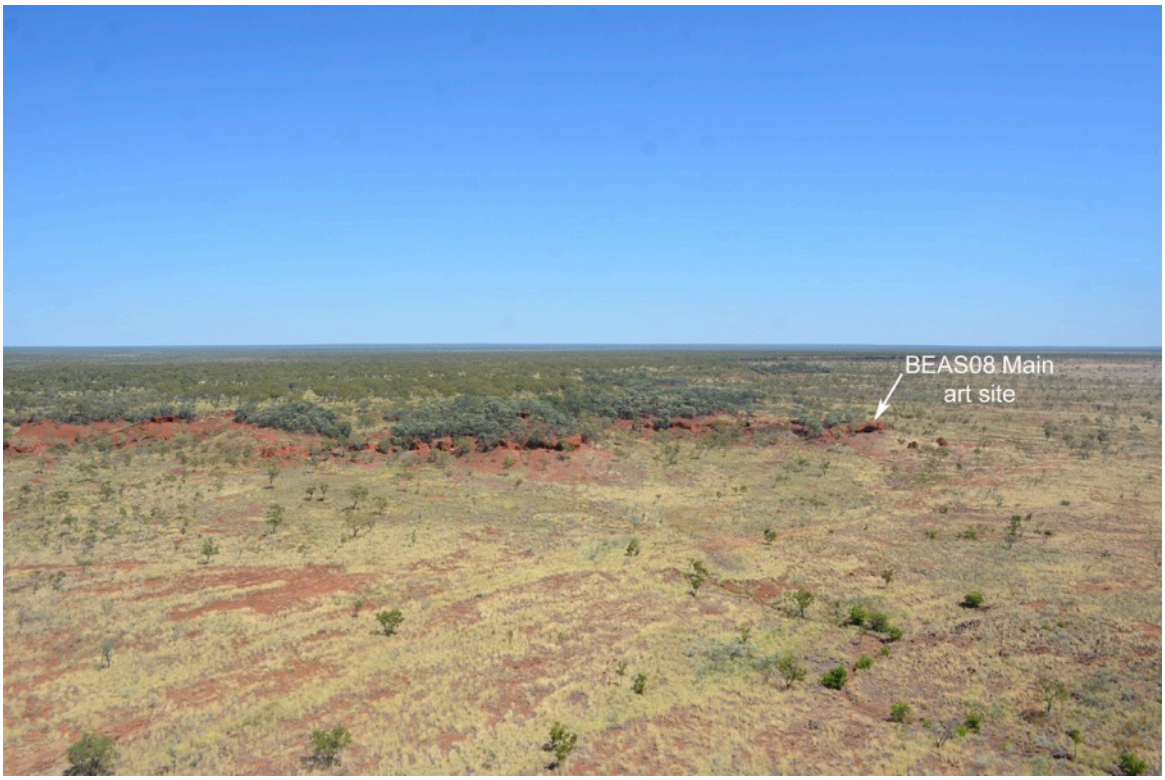

Figure 40. Aerial view of the overall site complex. Minor galleries are just to the left of the main rockshelter.

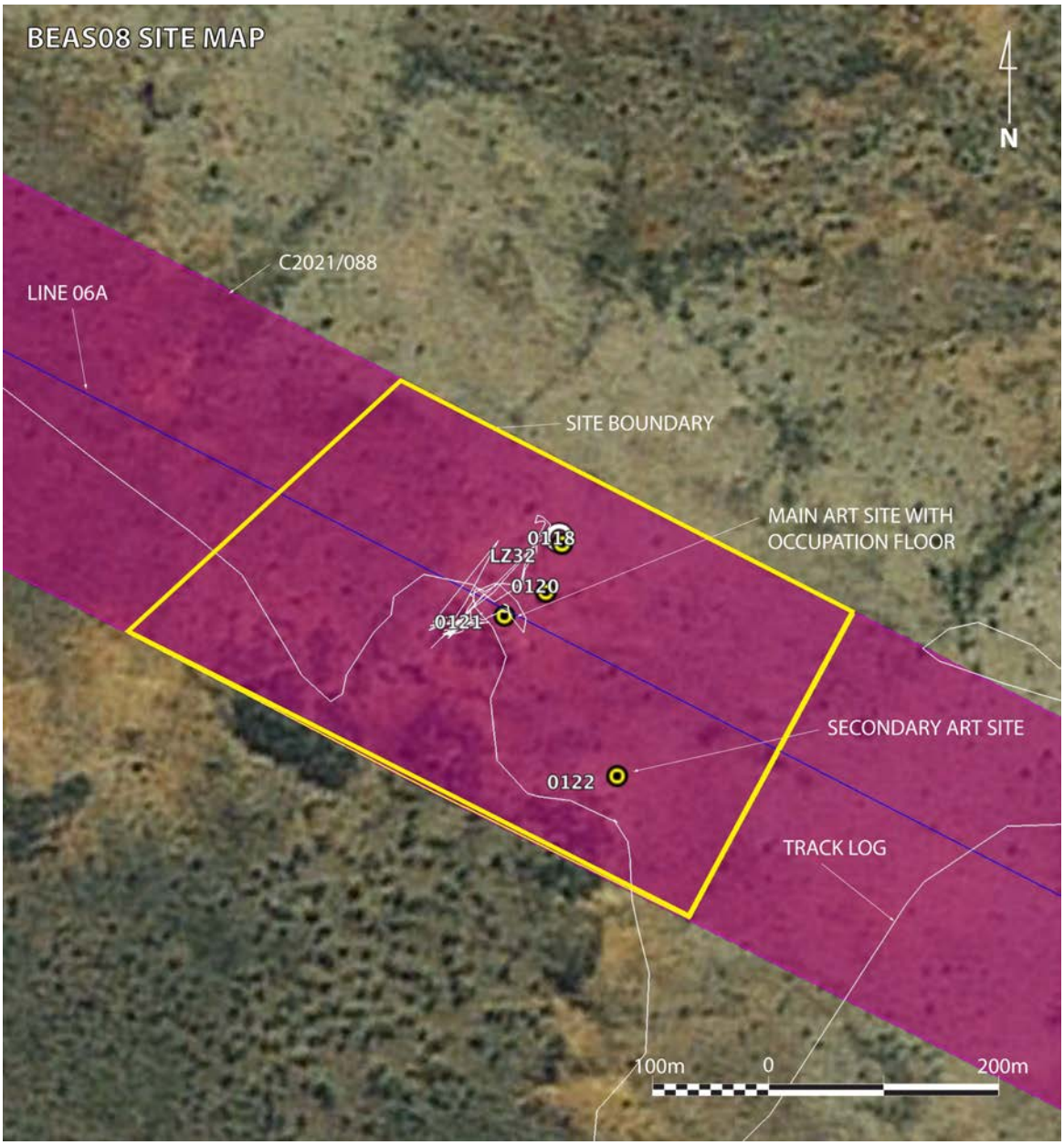

Figure 41. BEAS08 site map in C2021/088 RWA 2 (After Google Earth).

5.2.9 Blue Energy Archaeological Site 9 (BEAS09)

Low-density artefact scatter on the eastern bank of a tributary of the Victoria River. Red soils and gentle undulating ground with open woodland. The site is characterised by large flakes and formal tool types such as a blade and retouched flakes on silcrete and chert. Site is likely to extend to and beyond the buffer zone. Figure 42 shows the site context and Figure 43 shows an aerial perspective. Figure 44 maps the site.

Figure 42. BEAS09 terrestrial context view.

Figure 43. BEAS09 aerial context view, adjacent to major creek.

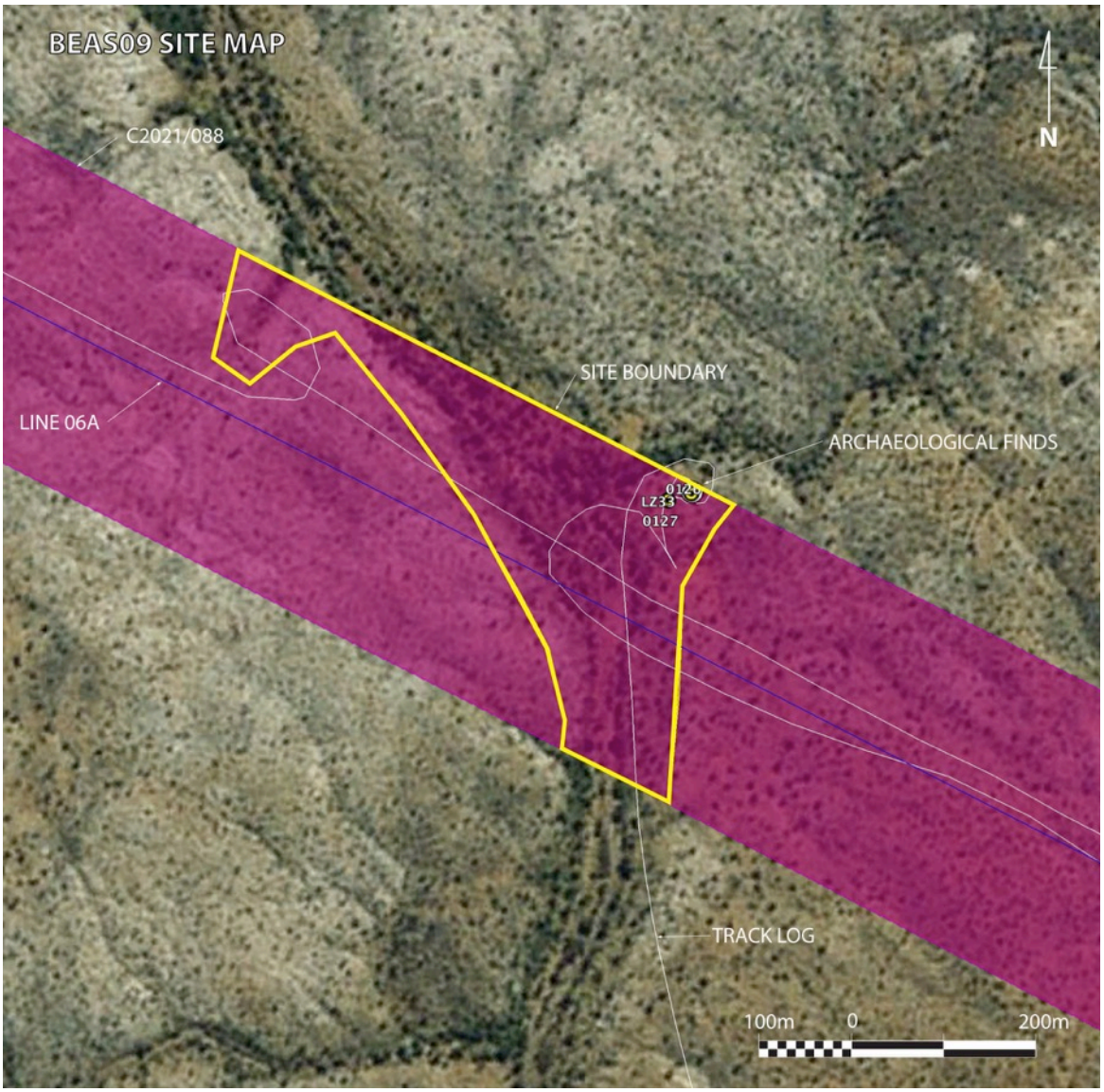

Figure 44. BEAS09 site map in C2021/088 RWA 2 (After Google Earth). Note: crosses upper reaches of the Victoria River.

5.3 Significance assessment of finds

- **High significance**
  BEAS08 is of high significance due to its high density of artefacts, the range of painted and engraved motifs in the art assemblage and that it is of a high excavation potential.

- **Moderate significance**
  BEAS07 and BEAS06 are of moderate significance due to their artefact densities and range of formal tool types.

- **Low significance**
  BEAS01 to BEAS05 are of low significance. Low artefact density and limited range of artefact types.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Blue Energy required an archaeological assessment to comply with the *Northern Territory Heritage Act (2011)* in the northern sector of the Wiso Basin, Northern Territory. A total of 568.75km of seismic lines is proposed, divided into five lines in the VRD area. Three seismic lines are a priority; two of these, Line 03B and Line 06C, predominately traverse the Tanami Desert, while the third, Line 06A, traverses the Daguragu Aboriginal Land Trust in semi-arid environments. The two low-priority lines are along existing major roadways. The proposed works will unlikely impact archaeological sites in the already heavily disturbed road easements.

The survey recorded nine archaeological sites, most of which were stone artefact scatters, but one was a rockshelter with an extensive assemblage of painted and engraved motifs. The assemblages at the sites are characterised by formal tool types such as stone points, burrens and grinding stones, which provide an insight into the toolkit range utilised by Aboriginal people. The site offers an excavation opportunity to determine a date sequence for the VRD. In addition to the sites, six isolated artefacts were recorded. Blue Energy's seismic line survey proposal, determined by this report, will impact on Indigenous Cultural Heritage. The following recommendations arise from this report, to best mitigate the impacts of the proposed works on the archaeology.

6.2 Recommendations

6.2.1 Recommendation 1: Site Avoidance

- BEAS01 on Line 03B is outside of the survey area and will not be impacted by the proposed development.
- BEAS04 on Line 06C is approximately 40m north of the line. The line should not deviate from its current plan.

6.2.2 Recommendation 2: Deviation of the seismic lines

- BEAS02 on Line 03B will need to be avoided by staying outside of the recorded site polygon.
- BEAS03 on Line 06C will need to be avoided by moving the line south of the site polygon. Alternatively the line could be stopped prior to reaching the polygon, as the site is at the edge of a cliff and is not trafficable.
- BEAS05 is on Line 06C. The line will need to be deviated to the south to avoid the site polygon.

6.2.3 Recommendation 3: Line cancellation

- Line 06A runs through numerous streams and watercourses. The line should be re-surveyed with systematic pedestrian methods. It was not possible to assess the entire line in the time frame of this survey. BEAS06, BEAS07 and BEAS09 on Line 06A were sample sites only, to determine if archaeological material was deposited along creek edges, which, as determined in this survey, they were. As a result, it is highly likely that similar finds will be made at all of the waterways traversed by Line 06A. Alternatively the entire line should be cancelled, or moved to higher ground to avoid water sources. Furthermore, the line traverses a highly significant rockshelter site, BEAS08 and will need to be moved to avoid the area.

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APPENDIX 1: Landing zone locations and descriptions

Format: UTM M/D/Y H:M:S 9.50 hrs Datum[037]: GDA 94							
ID	Name	Comment	Date	Zone	Zone	Easting	Northing
W	LZ01	Bullwaddy	09/04/22	52	K	789734	8083047
W	LZ02	Water Hole (BEAS01), some limestone outcropping	09/04/22	52	K	788659	8078879
W	LZ03	Limestone outcrop	09/04/22	52	K	782363	8060474
W	LZ04	Drop off – pedestrian transect. Limestone outcrop, exfoliation, deflated surface. Spinifex, acacia, some quartz outcropping, Pretty Poly Grevillea, some laterite	09/04/22	52	K	780278	8054049
W	LZ05	Pickup	09/04/22	52	K	779960	8052974
W	LZ06	Creek bed, no banks. Limestone, low outcrops on southern bank. Some gilgai in middle of creek.	09/04/22	52	K	778010	8047263
W	LZ07	Small dry soak	09/04/22	52	K	771929	8029344
W	LZ08	Palaeo drainage channel	09/04/22	52	K	771003	8025604
W	LZ09	Control	09/04/22	52	K	768758	8017741
W	LZ10	Laterite low rise, melaleuca low rise (signifies presence of water), club leaf acacia, wet country, grevillea refracta (Silverleaf grevillea), Ghost gums (Corymbia), Brachychiton (curry plant), Silver box	09/04/22	52	K	761608	7995356
W	LZ11	Pickup	09/04/22	52	K	760845	7993704
W	LZ12	Laterite ridge	09/04/22	52	K	756173	7978612
W	LZ13	Bilby habitat, laterite rise, spinifex	09/04/22	52	K	755938	7977806
W	LZ14	Laterites and bilbies	09/04/22	52	K	755025	7975711
W	LZ15	Spinifex, snappy gum, hakea, bilby holes, some laterite, pretty poly grevillea	10/04/22	52	K	751247	7980400
W	LZ16	Bilby habitat, no laterite, low woodland, clay pans	10/04/22	52	K	741645	7985303
W	LZ17	On edge of shallow creek, no banks, redgums, no stone	10/04/22	52	K	739262	7986427
W	LZ18	Drop off – pedestrian transect. On top of escarpment, breakaway	10/04/22	52	K	682607	8015631
W	LZ19	Pickup. Base of escarpment	10/04/22	52	K	682587	8015853
W	LZ20	Base of escarpment. Crystal quartz field	10/04/22	52	K	679942	8017067
W	LZ21	Drop off – pedestrian transect. Small creek with stone and sand	10/04/22	52	K	679377	8017394
W	LZ22	NW of major creek, mangrove ficus. Flood area	10/04/22	52	K	679176	8017475
W	LZ23	Pickup – Sambo Creek	10/04/22	52	K	678920	8017563
W	LZ24	Creek	10/04/22	52	K	675513	8019386
W	LZ25	Laterite rise near creek	10/04/22	52	K	676371	8018977
W	LZ26	Near creek, lots of crystal quartz	10/04/22	52	K	676696	8018791
W	LZ27	On bore track, stoney, black soil	10/04/22	52	K	702069	8062674
W	LZ28	On diversion line, on creek line,	10/04/22	52	K	702773	8063711

		stoney, quartz nodules					
W	LZ29	Laterite Creek, no banks	11/04/22	52	K	595727	8060252
W	LZ30	In creek bed, thick grass on banks	11/04/22	52	K	596145	8060006
W	LZ31	Creek	11/04/22	52	K	599464	8058329
W	LZ32	Art site	11/04/22	52	K	615393	8050116
W	LZ33	Archaeological site	11/04/22	52	K	638885	8037995
W	LZ34	Drainage line	11/04/22	52	K	703119	8064672
W	LZ35	Main creek, buffel grass	11/04/22	52	K	703393	8066059

APPENDIX 2: Polygon waypoints for archaeological sites within the works areas

Format: UTM M/D/Y H:M:S 9.50 hrs Datum[037]: GDA 94				
Name	Zone	Zone	Easting	Northing
BEAS01	52	K	788673	8078960
	52	K	788651	8078938
	52	K	788646	8078895
	52	K	788651	8078873
	52	K	788673	8078858
	52	K	788684	8078855
	52	K	788706	8078874
	52	K	788722	8078893
	52	K	788727	8078910
	52	K	788716	8078933
	52	K	788702	8078951
	52	K	788673	8078960
BEAS02	52	K	778001	8047270
	52	K	777994	8047248
	52	K	778007	8047209
	52	K	778028	8047171
	52	K	778043	8047138
	52	K	778061	8047087
	52	K	778073	8047081
	52	K	778095	8047090
	52	K	778122	8047114
	52	K	778142	8047145
	52	K	778150	8047172
	52	K	778139	8047201
	52	K	778104	8047233
	52	K	778054	8047269
	52	K	778012	8047282
	52	K	778001	8047270
BEAS03	52	K	682577	8015787
	52	K	682586	8015719
	52	K	682649	8015660
	52	K	682708	8015652
	52	K	682719	8015706
	52	K	682699	8015754
	52	K	682661	8015779
	52	K	682624	8015791
	52	K	682577	8015787
BEAS04	52	K	678946	8017572
	52	K	678944	8017569
	52	K	678944	8017565
	52	K	678948	8017564

	52	K	678951	8017564
	52	K	678952	8017568
	52	K	678951	8017571
	52	K	678946	8017572
BEAS05	52	K	676686	8018814
	52	K	676680	8018807
	52	K	676678	8018798
	52	K	676680	8018788
	52	K	676690	8018779
	52	K	676704	8018776
	52	K	676713	8018780
	52	K	676717	8018792
	52	K	676713	8018809
	52	K	676698	8018817
	52	K	676686	8018814
BEAS06	52	K	596261	8060216
	52	K	596237	8060205
	52	K	596175	8060154
	52	K	596089	8060069
	52	K	596057	8060010
	52	K	596034	8059910
	52	K	596042	8059859
	52	K	596197	8059779
	52	K	596228	8059882
	52	K	596262	8059953
	52	K	596313	8060009
	52	K	596395	8060066
	52	K	596442	8060114
	52	K	596261	8060216
BEAS07	52	K	599547	8058484
	52	K	599461	8058391
	52	K	599436	8058337
	52	K	599422	8058236
	52	K	599359	8058167
	52	K	599347	8058155
	52	K	599464	8058094
	52	K	599482	8058181
	52	K	599514	8058280
	52	K	599573	8058339
	52	K	599631	8058379
	52	K	599663	8058423
	52	K	599547	8058484
BEAS08	52	K	615267	8050241
	52	K	615048	8050039
	52	K	615499	8049806

			615636	8050051
			615267	8050241
BEAS09			638393	8038259
			638366	8038142
			638405	8038114
			638455	8038154
			638497	8038170
			638570	8038078
			638651	8037967
			638696	8037887
			638727	8037827
			638744	8037747
			638740	8037718
			638858	8037659
			638869	8037779
			638875	8037895
			638910	8037956
			638931	8037981
			638393	8038259

APPENDIX 3: Artefact photographs

Figure 45. Wpt No. #44 RTF(S)x2. Scale in 1cm.

Figure 46. #50 BU(S). Scale in 1 cms.

Figure 47. Wpt No. 56 RTF(S). Scale in 1cm.

Figure 48. Wpt No. 58 HS(B). Scale in 1cm.

Figure 49. Wpt No. 64 RTF(Q). Scale in 1cm.

Figure 50. Wpt No. 65 GS(SS). Scale in 1cm.

Figure 51. Wpt No. 78 GS(SS). Scale in 1cm.

Figure 52. Wpt No. 80 F(S) left, RTF(S) right. Scale in 1cm.

Figure 53. Wpt No. 87 RTF(S) Blade. Scale in 1cm.

Figure 54. Wpt No. 95 F(S). Scale in 1cm.

Figure 55. Wpt No. 108 F(C)x3, F(QZ). Scale in 1cm.

Figure 56. Wpt No. 109 RTF(C) Kimberly point, FP(S), F(C)x5. Scale in 1cm.

Figure 57. WPT No. 109 RTF9C) Kimberly point obverse. Scale in 1cm

Figure 58. Wpt No. 109 RTF(C) Kimberly Point reverse. Scale in 1cm.

Figure 59. Wpt No. 110. B(S). Scale in 1cm.

Figure 60. Wpt No. 112 C(Q). Scale in 1cm.

Figure 61. Wpt No. 113 GS(S), F(Q)x2. Scale in 1cm.

Figure 62. Wpt No. 114 GS(SS). Scale in 1cm.

Figure 63. WPT No. 115 TS(S). Scale in 1cm.

Figure 64. Wpt No. 116 GS(SS) conjoined. Scale in 1cm.

Figure 65. WPT No. 117 GS(SS). Scale in 1cm.

Figure 66. Wpt No. 120 RTF(C), RTF(QZ) unifacial points. Scale in 1cm.

Figure 67. Wpt No. 127 RTF(C)x2, RTF(S), RTF(B). Scale in 1cm.

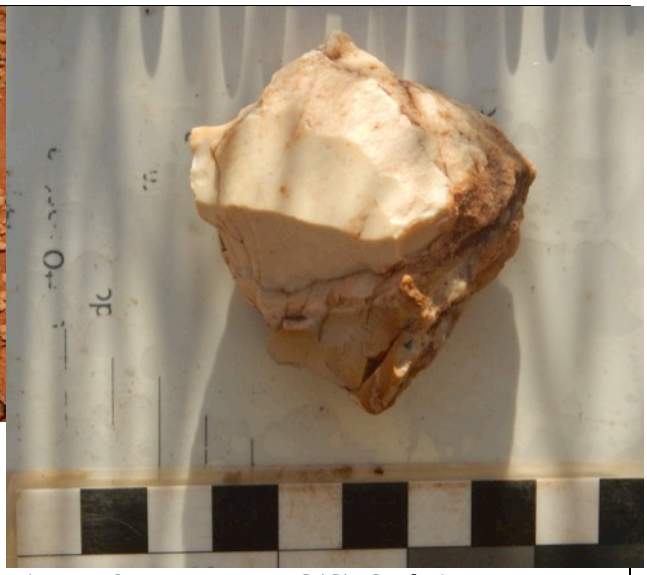
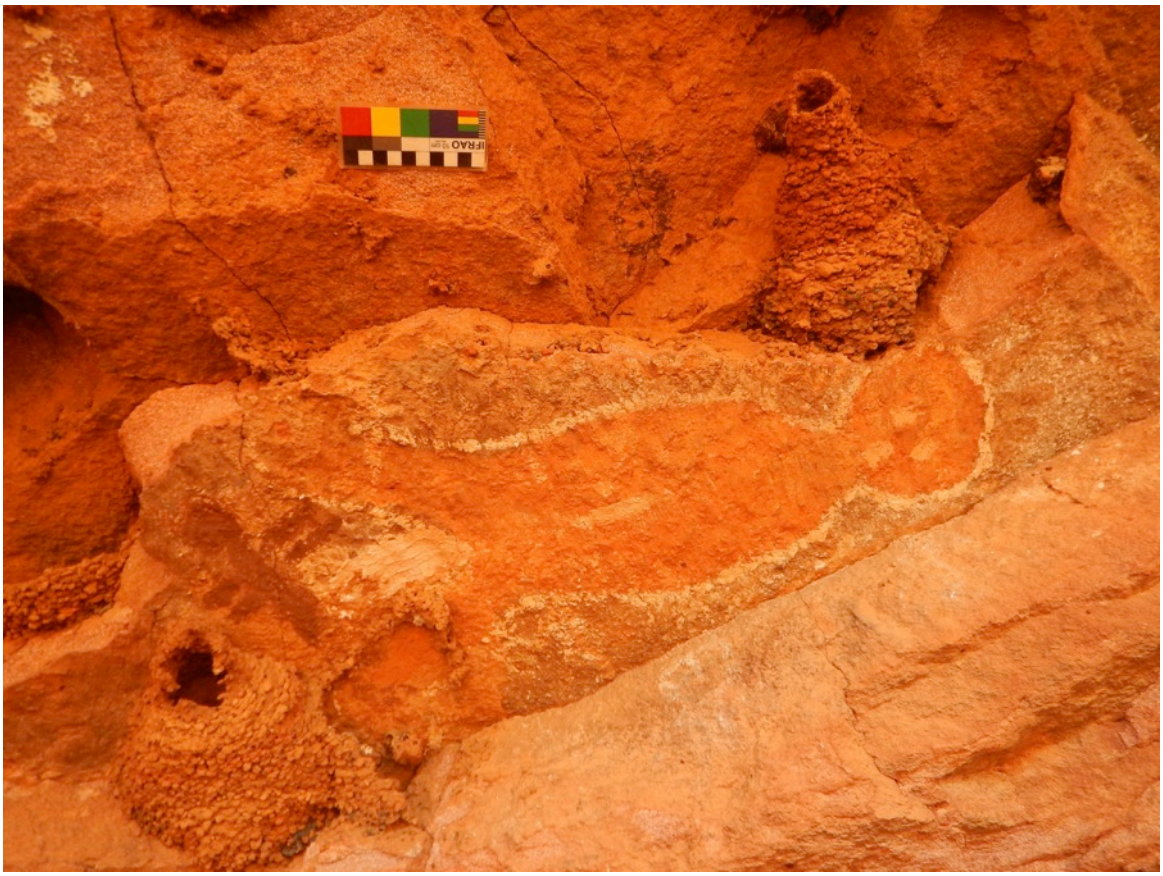
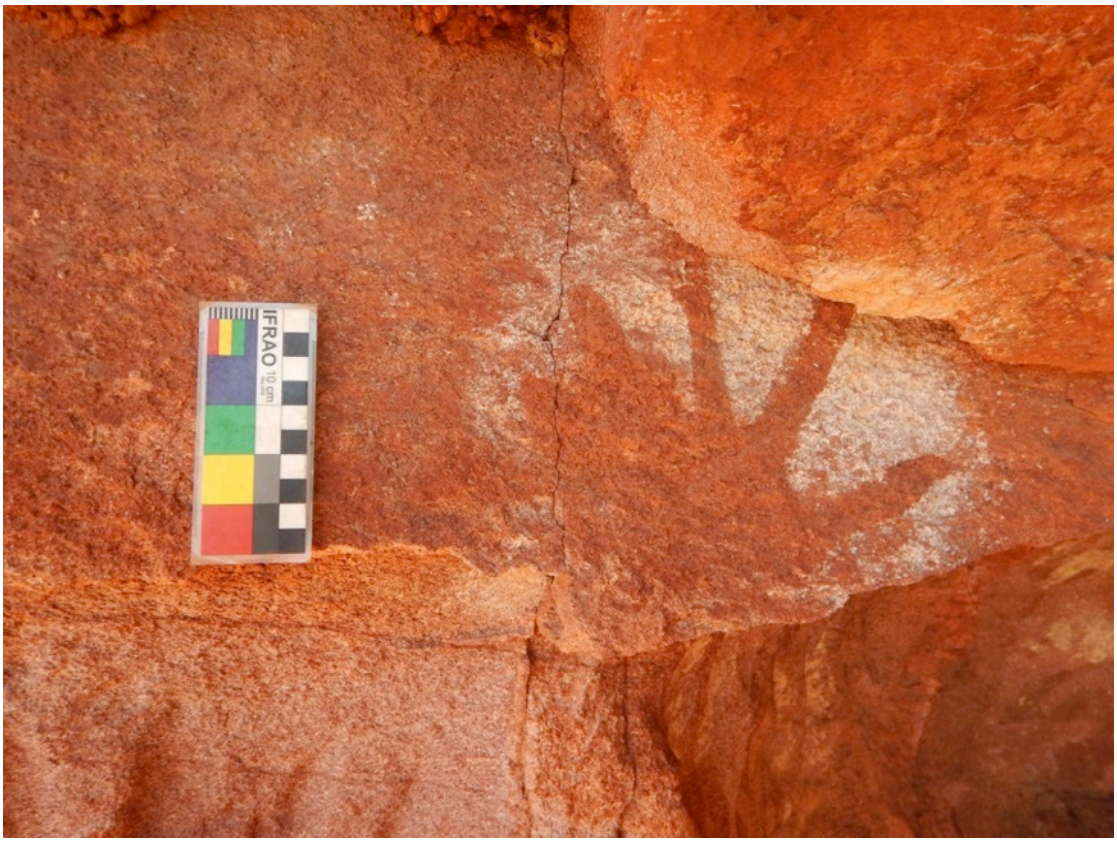


Figure 68. Wpt No. 136 C(C). Scale in 1cm.

APPENDIX 4: Rockart photographs from BEAS08

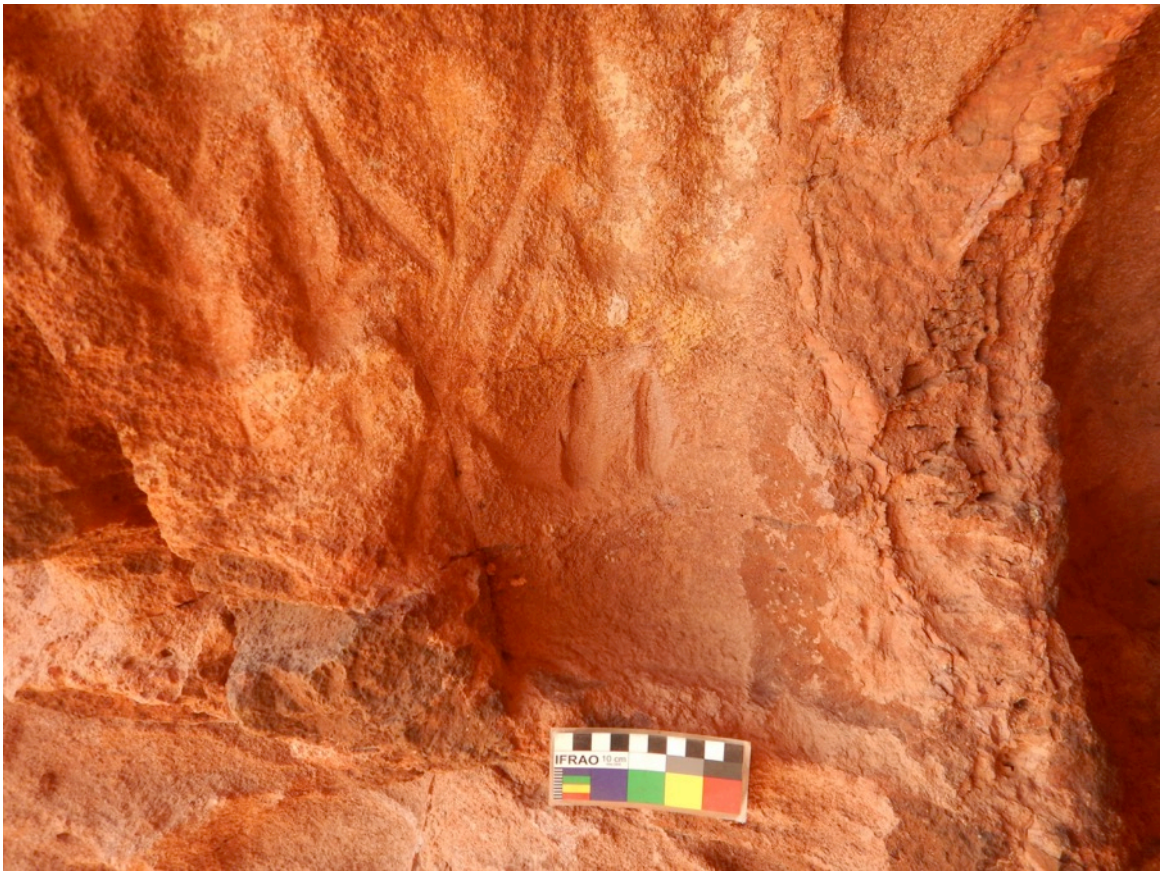


Red ochre anthropomorphic motif outlined in white pigment. Scale in 1cm.



Hand stencil in white pigment. Scale in 1cm.

Vertical linear engravings. Scale in 1cm.

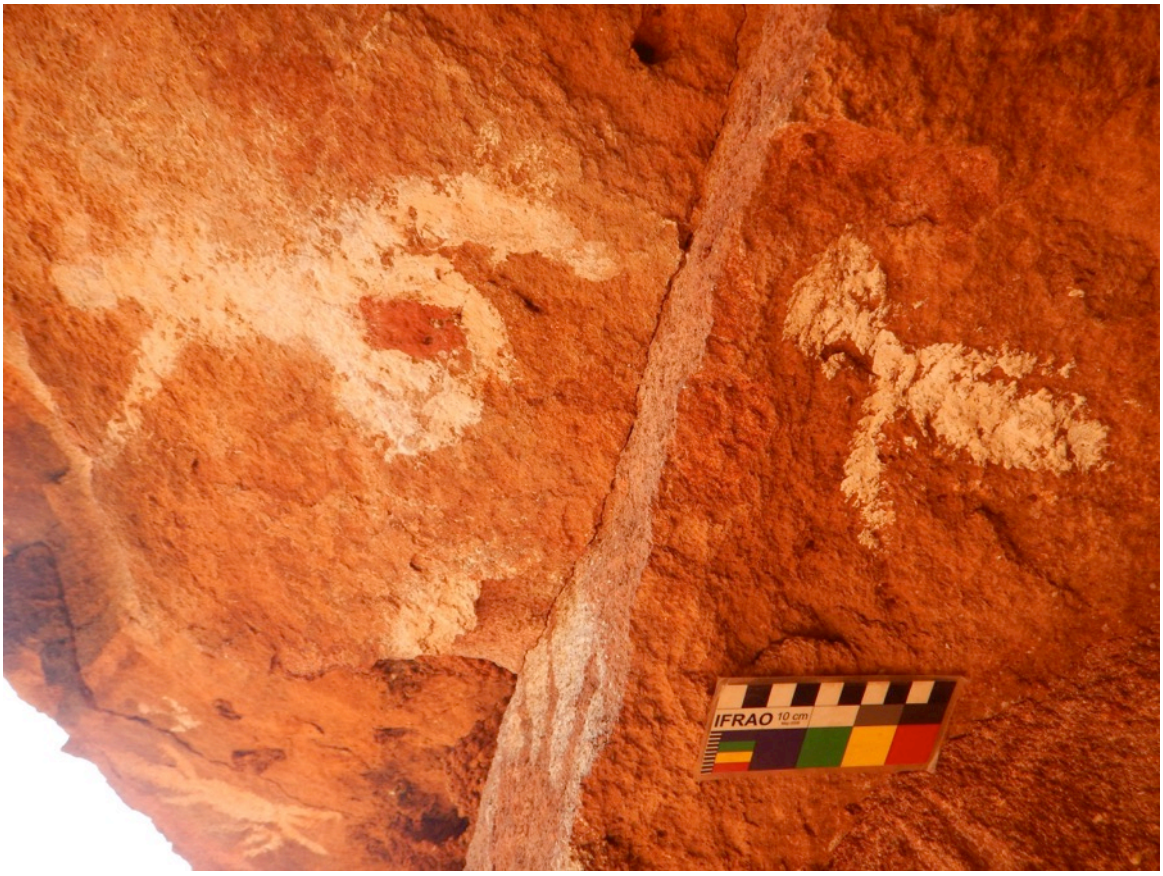


Engraved macropod feet. Scale in 1cm.

Vertical linear engravings. Scale in 1cm.

Hand stencils, left and right hands. Scale in 1cm.

Outlined hand stencils. Scale in 1cm.



Anthropomorphic figures. Scale in 1cm.

Hand stencil and anthropomorphic figure. Scale in 1cm.

Male anthropomorphic wearing a headdress and emu foot. Painted in white pigment. Scale in 1cm.

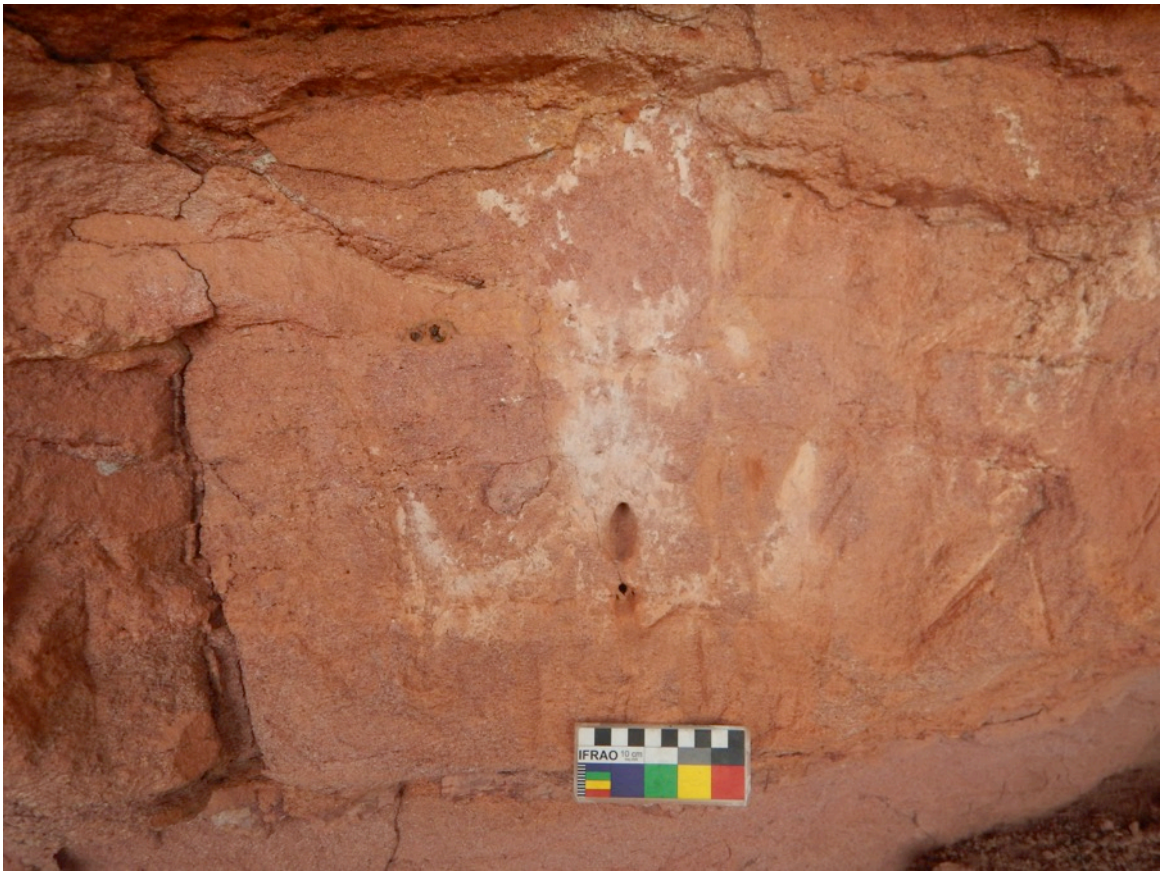
Hand stencil. Scale in 1cm.

Serpent figure in red ochre. Scale in 1cm.

Anthropomorphic figure - female. Scale in 1cm.

Anthropomorphic figure – male in white pigment. Scale in 1cm.

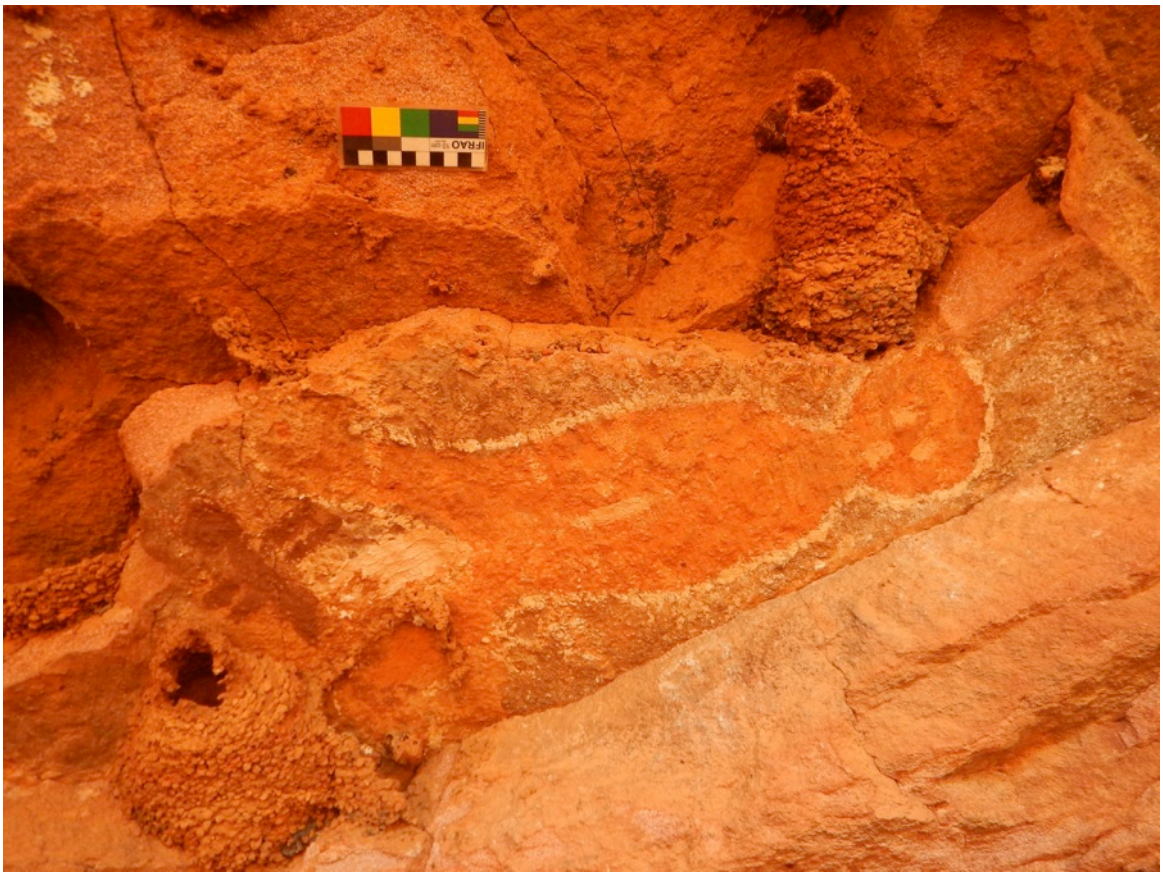
Anthropomorphic figure in white pigment, superimposed by red lines. Scale in 1cm.



Anthropomorphic figure – female with vagina. Scale in 1cm.

Vertical linear engravings. Scale in 1cm.

Anthropomorphic figures with head dresses/crocodiles? Scale in 1cm.

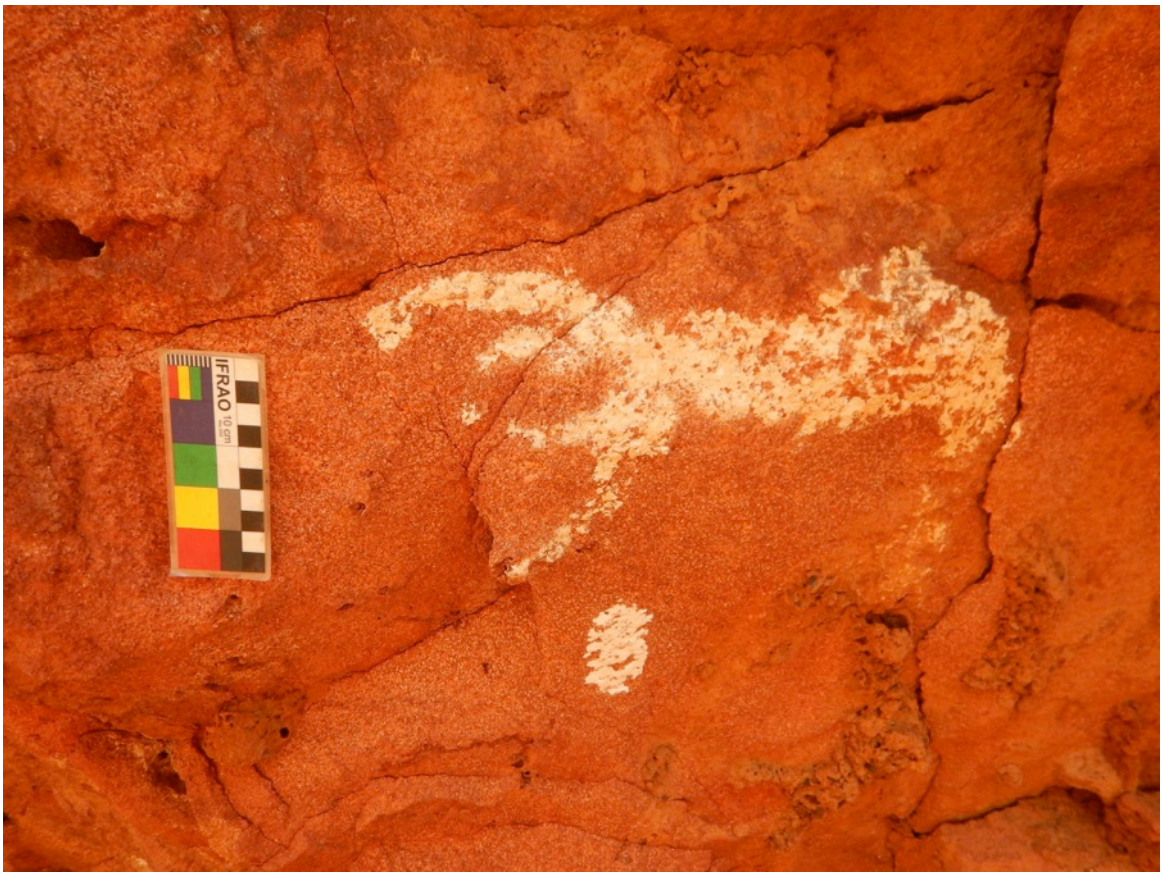


Anthropomorphic figure in red ochre fill with white pigment outline, showing eyes and mouth. Red motif (baby?) at feet. Scale in 1cm.

Long neck turtle with red ochre infill and outlined with white pigment. Scale in 1cm.

Anthropomorphic (female with breasts and vagina) figure in white pigment. Scale in 1cm.

Anthropomorphic (female with breasts and vagina) figure in white pigment. Scale in 1cm.



Anthropomorphic (female with vagina) figure in white pigment. Scale in 1cm.

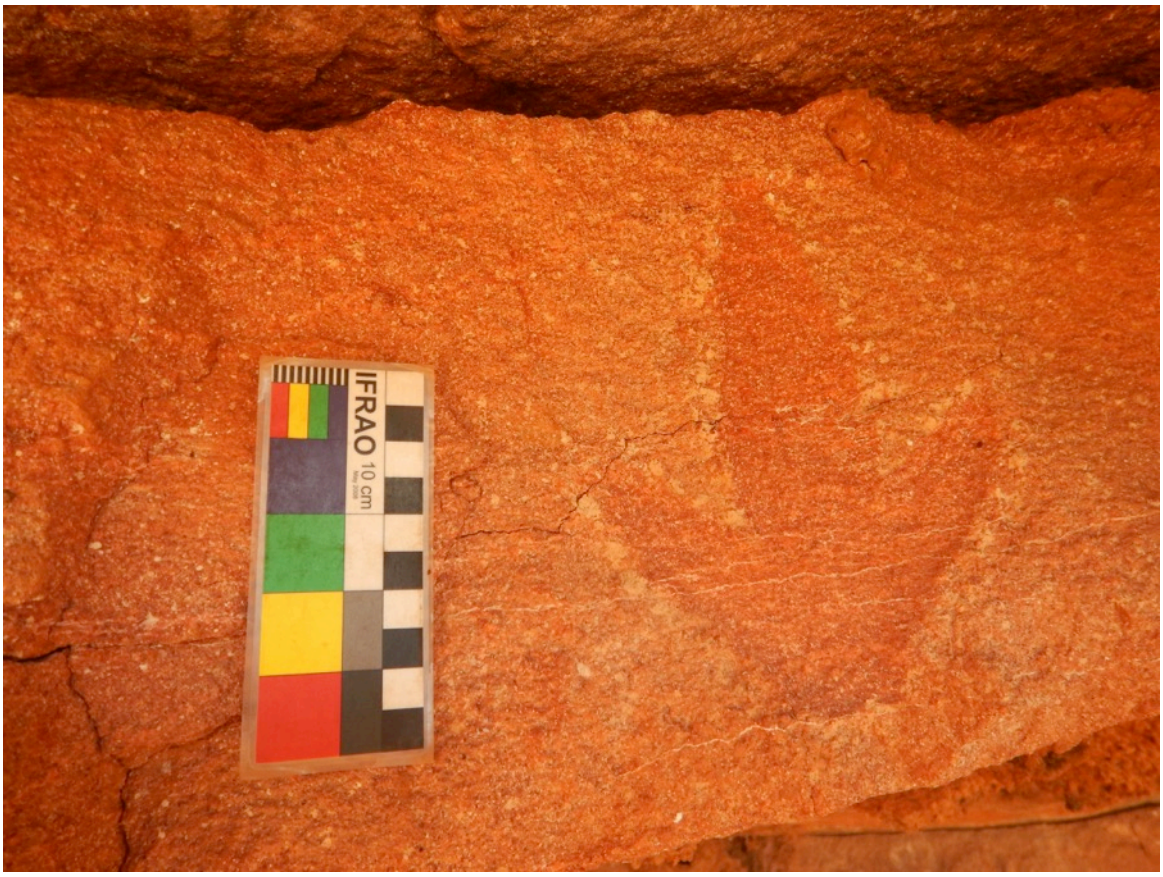
Circular motif in white pigment outline. Scale in 1cm.

Vertical linear engravings. Scale in 1cm.

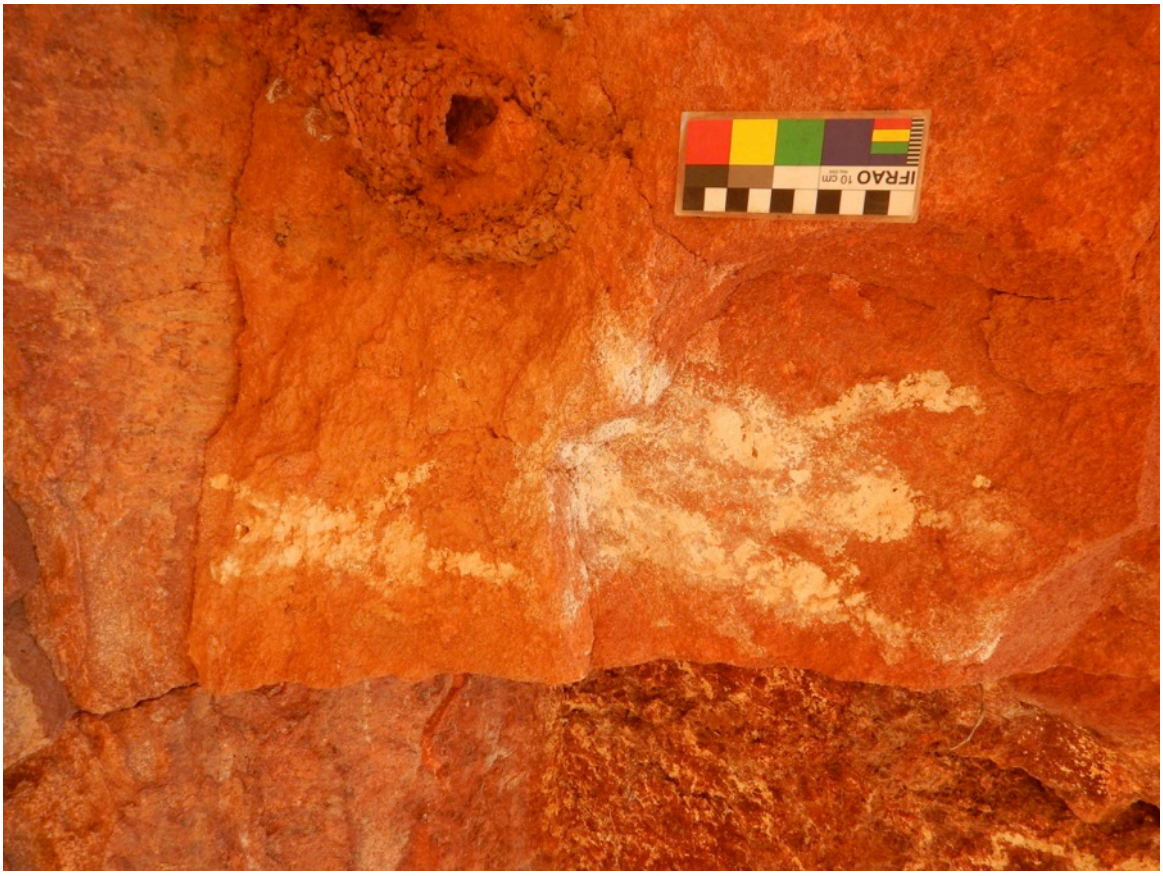
Goanna motif in white pigment. Scale in 1cm.

Anthropomorphic figure in white pigment. Scale in 1cm.

Anthropomorphic figure in white pigment with swallow nests superimposing some of the motifs. Scale in 1cm.



Engraved emu foot. Scale in 1cm.



Anthropomorphic figure in white pigment. Woman giving birth? Scale in 1cm.

Horizontal red ochre motif. Scale in 1cms.

Panel view on ceiling.