



**Imperial Oil and Gas**

**EP 187**

**Appendix 02**

**Archaeological Survey Report**

**IMP 5-1**

# **ARCHAEOLOGICAL SURVEY REPORT: EP 187 PILOT - REFERRAL AND EMP - BASELINE SURVEYS**



**A report for Imperial Oil & Gas Pty Ltd, Sydney NSW**

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## EXECUTIVE SUMMARY

This report combines the results of three archaeological surveys at Imperial Energy's EP 187 lease in the Beetaloo sub-basin approximately 800km from Darwin and 160km east of Borroloola on the Carpentaria Highway. Ellengowan Enterprises was contracted by inGauge to conduct the surveys. Four additional areas were surveyed in EP 187 in September and October 2023, two north of the highway and a further two south of the highway. The survey areas were essentially an expansion of seismic line surveys from 2020, from the width of a vehicle track to two kilometre wide areas to facilitate the location on an additional five gas well pads. The third survey, in December 2023 was to examine proposed expansion areas for the Carpentaria 2, Carpentaria 3 and Carpentaria 4 well pads. The survey also determined the context of a site found on Relief Creek, adjacent to Carpentaria 4, in 2022 by inGauge staff and traditional owners.

The survey crew for the second survey included three Traditional Owners and was conducted in conjunction with an environmental ecologist over a three day period utilizing aviation resources. The results of the initial two surveys found no archaeological sites. It was, however, reported that the artefacts found in 2022 represented isolated finds. The survey results from December indicate that the cultural heritage artefacts found in 2022 are, conversely, from a medium density archaeological site, the most significant site yet found south of the Carpentaria Highway in EP 187. The site is referred to in this study as Balbirini 3. This report documents the survey procedures and outcomes. The following surmises the report's recommendations.

### Summary of recommendations:

- No further action is required by Imperial Energy on EP 187 in respect to the additional survey areas, access tracks and well sites. The proposed works are cleared and comply with the requirements of the Northern Territory *Heritage Act* (2011), as no archaeological material was found in the four survey areas and well pads north and south of the Carpentaria Highway.
- Balbirini 3 on Relief Creek should be avoided. Expansion of Carpentaria 4 to the north of its present location is not recommended.
- Carpentaria 2 and 3 are cleared for expansion works to the south and east. Carpentaria 4 is cleared for expansion work to the south into the lancewood forest.
- Carpentaria 4 is not cleared for expansion to the east as more cultural heritage may occur in that area. Otherwise a mitigation programme to undertake a systematic survey should be conducted to establish artefact distributions, with possible relocation of finds elsewhere on Balbirini 3.

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## 1.0 INTRODUCTION

### 1.1 Background and consultancy brief

InGauge Well Design and Engineering contracted Ellengowan Enterprises to conduct an archaeological survey for Imperial Energy's Exploration Permit 187 (EP 187), approximately 60km west of Cape Crawford, on the Favenc Range in the Beetaloo sub-basin. Five proposed gas-well pads were to be surveyed, two of which are north of the Carpentaria Highway with connecting existing access tracks. The two survey areas north of the highway are: 2.8 x 2km<sup>2</sup> and 3 x 2km<sup>2</sup> respectively in size. Another two survey areas measuring 17 x 2km<sup>2</sup> and 10 x 2km<sup>2</sup> occur south of the highway, again with existing access tracks mainly along existing fence lines. The survey programme included an infrastructure area measuring 2.5km<sup>2</sup> in size, near the McArthur River Pipeline. Two additional expansion areas were to be assessed at the Carpentaria 2/3 (Carp 2/3) and 4 (Carp 4) gas pads. The specific brief of the programme was 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 areas.
- 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).

A three-day survey was planned with mobilisation and field survey starting on 26 September 2023. The expedition was flown with two Robinson R44 helicopters, VH-WDI flown by Blake Leigh-Smith and VH-XIC flown by James Sears. It was cancelled after one day of operations and recommenced on 26 and 27 October 2023 with two helicopters again, but this time with VH-ZWC, flown by James Sears and VH-XIC flown by unknown. The survey team in October consisted of Traditional Owners (TOs): Cain O'Keefe, Peggy Mawson and William John and an ecologist, Paul Fox.

No archaeological sites or objects were recorded in during the September and October 2023 surveys. The survey in December, however, recorded an archaeological site adjacent to Carp 4. The following documents the survey procedures, results and provides recommendations on how best to mitigate the impact on the archaeology.

### 1.2 Location of the study areas and brief environmental description

The survey area within EP 187 is 800km south of Darwin and approximately 60km west of Cape Crawford, or the Heartbreak Hotel. The nearest township is Borroloola, 100km east of Cape Crawford (Fig. 1). The Carpentaria Highway intersects the survey areas. The survey area north of the Carpentaria Highway is characterised by open woodland and savannah. This section is heavily dissected across the Favenc Range, levelling out across black soil plain. North of the highway, quartzite outcrops occur. None of these stone resources occur south of the highway.

In the southern section of the survey area, it is virtually all floodplain with only one major waterway, Relief Creek, which was dry at the time of the survey, although it was flowing during the December

survey. Soil types are typically alluvial and lateritic deposits south of the highway. The vegetation communities are open woodland dry sclerophyll forests of *E. miniata* (Darwin Woolly Butt), *E. tetradonta* (Stringybark) and *E. bleeseri* (Smooth-stemmed Bloodwood), extensively covered by an understory of tussock and spinifex grasses. *E. pruinosa* (Silverleaf Box) occurs extensively in the survey area, south of the Carpentaria Highway.

Figure 2 details the survey areas and well pads (BA, BB, BC, BD and BD central). Of note is the exclusion of Relief Creek due to environmental and cultural heritage factors. Relief Creek is an area of high archaeological potential (HAP). Virtually the remainder of the survey areas are in low archaeological potential (LAP) areas, apart from some of the braided creeks north of the highway that are more likely to have a higher archaeological potential.



Figure 1. Imperial Energy EP 187 2023 survey area – location map.

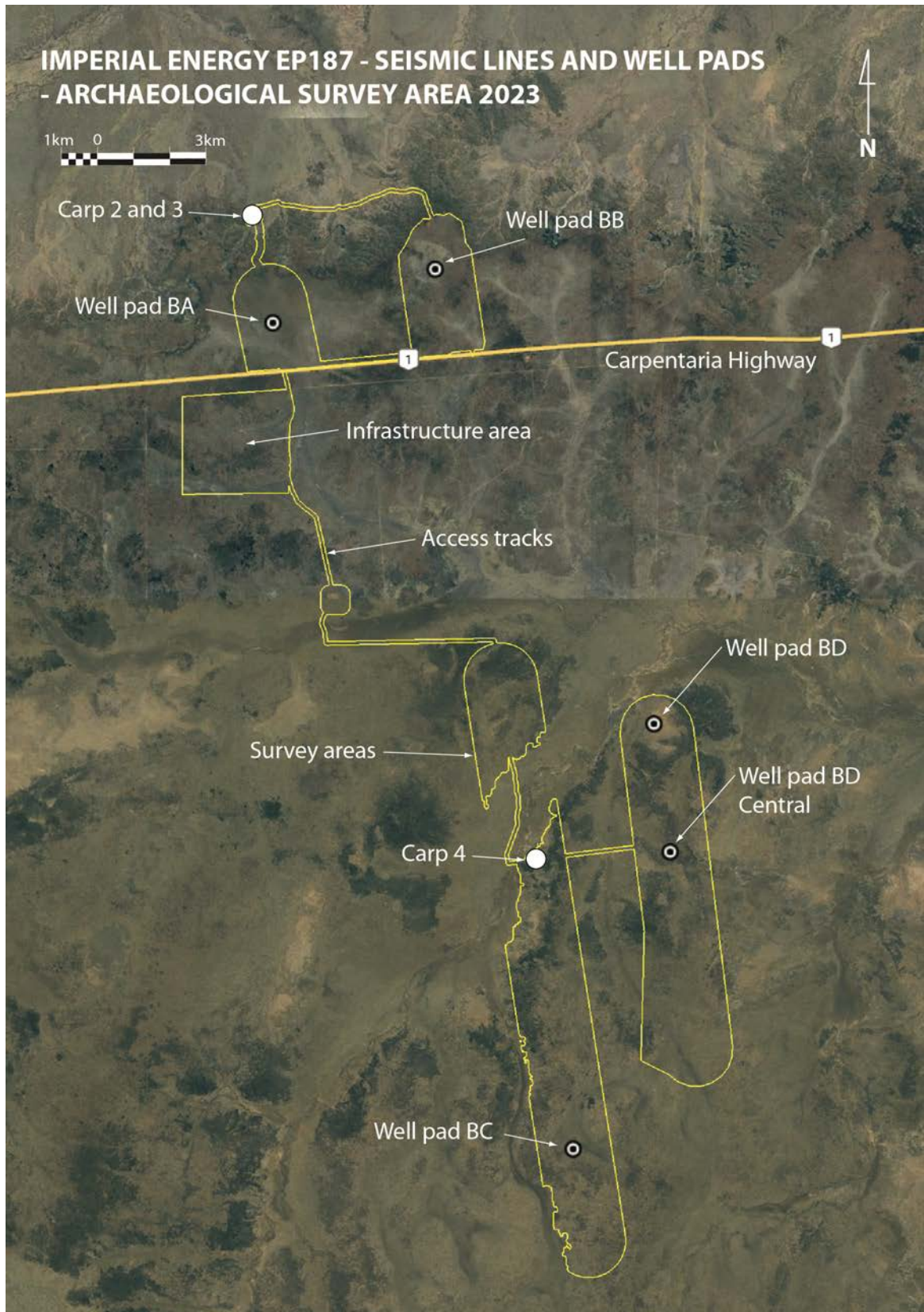


Figure 2. Imperial Energy EP 187 – seismic line areas and well pads, archaeological survey areas 2023, including location data for Carp 2, 3 and 4 (After Google Earth).

## 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 <i>Act</i> .
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 <i>Act</i> but has not yet made its recommendations to the minister.
RV	Revoked. Declaration as a heritage place pursuant to Section 26(1) of the <i>Act</i> is revoked.
N	Nominated. HC* has yet to complete its assessment of the heritage value of the place.

\*Heritage Council

#### 2.1.2 Prescribed archaeological places and objects

No places listed on the National Heritage List, nor the Commonwealth Heritage list occurs within EP 187, nor any places under the *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act* (1984).

## 2.2. Constraints

### 2.2.1 Ground Integrity (GI)

Assessing ground surface integrity provides an indicator of whether 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 be seen.

Ground surface visibility (GSV) is most inhibited by vegetation, but other inhibitors may include concrete, gravel and bitumen. Levels are determined using a percentage scale like 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

Two previous studies were conducted over EP 187 by Jung (2019 and 2020) that recorded an archaeological site north of the Carpentaria Highway. Only isolated finds were previously made south of the highway and these were recorded as IEBS05 (a flake on silcrete) and IEBS06 (grindstone fragment). These two isolates were both found on Relief Creek, the major water flowing through EP187. The only archaeological site previously found on EP 187 was Imperial Energy Archaeological Site 1 (IEAS1), which is a stone artefact scatter on OT Downs Station, north of the highway.

The first archaeological site found south of the highway is referred to in this report as Balbirini 3. The site, thought to have been isolated artefacts, was found on Relief Creek during a monitoring programme on 4 August 2022 by inGauge staff and Traditional Owners. Despite being outside of the Carp 4 well footprint, the ‘isoliths’ were collected and relocated to a site nominated by the Traditional Owners (Farley, pers. comm., 26 September 2023). The relocation site is a rockshelter approximately 1.4km south of the Heartbreak Hotel, just off the Tablelands Highway, previously record as Balbirini 2 (Jung, 2021). Balbirini 3 on EP 187 was not inspected in September and October, as the grid references for the finds were not available at the time of the surveys. Table 2 lists the previously recorded sites and background scatters, or isoliths on EP 187. They are mapped in Figure 3. Some of the artefacts relocated from Balbirini 3 are shown in Figure 4 i.e., four grind stones photographed in October 2023.

**Table 2. Previously recorded archaeological sites**

No.	Name	Site Type	Number	Datum GDA 94 Zone 53 K		Description	Significance
				Easting	Northing		
1	IEBS05	Isolith	1			F(S)	Low
2	IEBS06	Isolith	1			GS(SS)	Low
3	CH1	Isoliths	1			Grind Stone Base	High, (possibly in greater densities)
	CH2		1			Axe stone	
	CH3		1			Grind Stone	
	CH4		1			Spear Head	

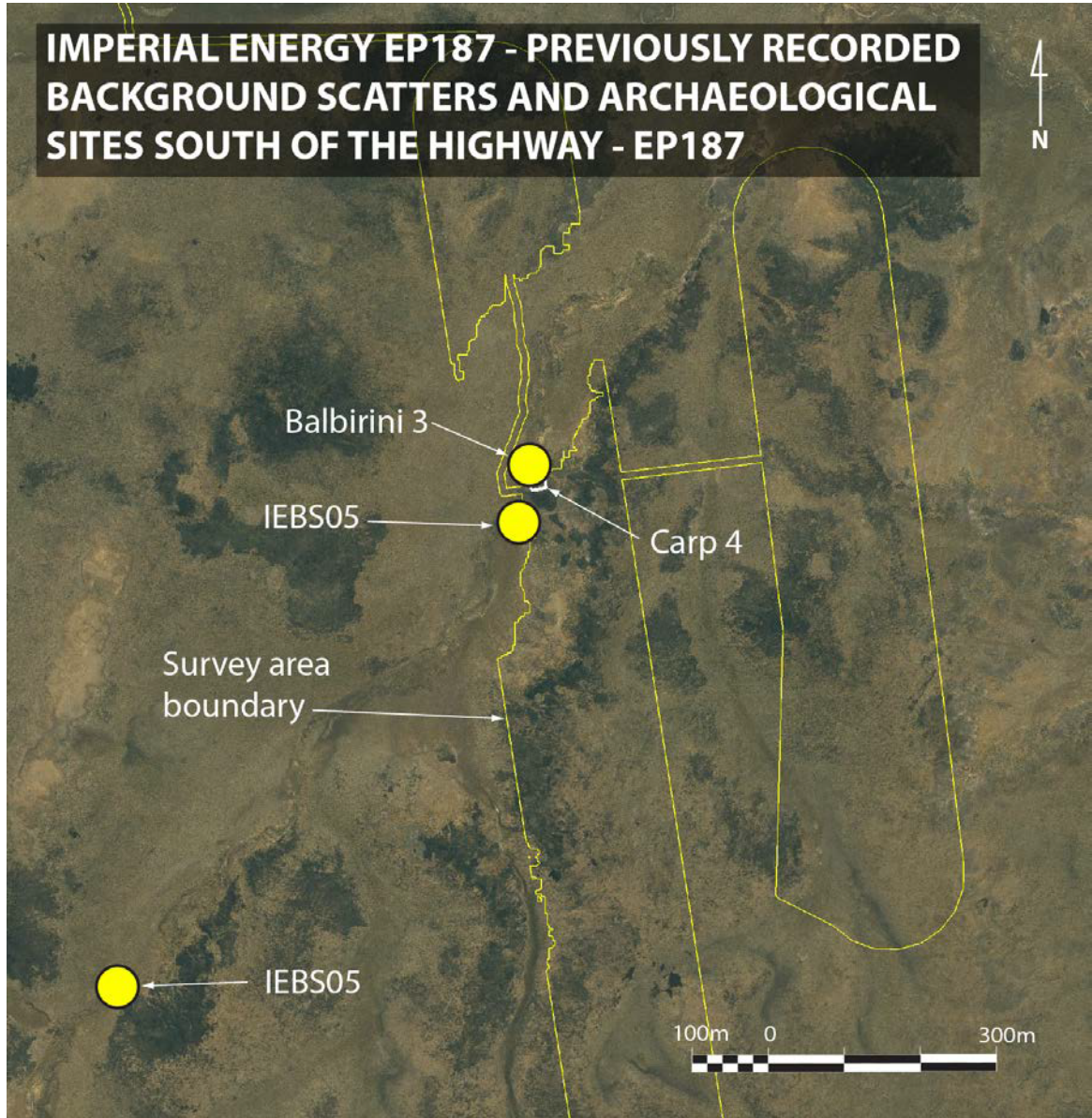
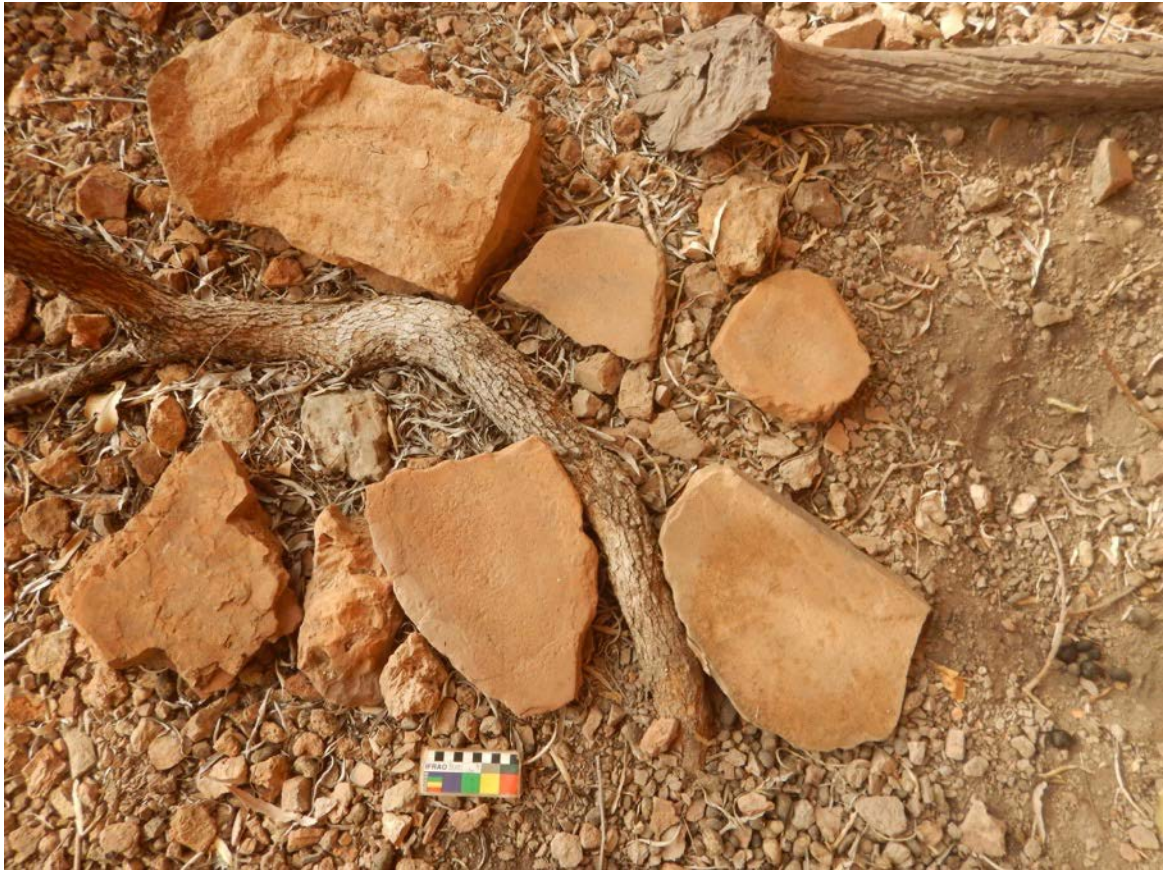


Figure 3. Map of previously recorded background scatters and archaeological site south of the highway - EP 187 (After Google Earth).



*Figure 4. Four grindstones relocated from Balbirini 3 to Balbirini 2. Scale in 1cm.*

## 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 areas (purposive) known to potentially contain Indigenous cultural heritage or contain sites that were identified in previous research or surveys.

The survey utilised aerial resources in September and October to access the survey areas. Water is a key determinate as to where people were in the environment. Waterways and bodies, hence, were targeted as well as stony outcrops that may have been utilised for stone tool production. A pedestrian survey was conducted in December at the Carp 2/3 and Carp 4 expansion areas and of the isoliths found at Relief Creek.

Formal tool types are to be photographed and a GPS grid reference recorded for each find greater than three metres apart i.e., the accuracy reading of the GPS unit. An unmanned aerial vehicle (UAV) was utilised in the December survey to gain aerial perspectives of archaeological sites.

#### 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
- Ercilure scar (on the ventral surface)
- Waves of force
- Point of force application (PFA) and associated ring crack
- Termination types (e.g., feathered, stepped, hinged, plunge, bending initiation)
- 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 (Burrens, Tulas etc.)
- An – Anvil
- B – Blade
- C – core
- Cp – Core piece
- 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
- D – Dolerite
- Ch – Chalcedony
- G – Greywacke
- Gr – Granite
- Hs – Hornsfil
- 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 seven 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 (‘dinnertime’ 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; Sullivan, 1983). 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. 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

Seventeen landings in total were made in the September and October surveys. Appendix 1 documents them, providing descriptions, grid references and photographs. No archaeological material was found. Figure 5 maps the survey tracklog and landing zones.

No archaeological material was found in the Carp 2/3 expansion areas. Figure 6 maps the area and the survey tracklog.

#### 5.1.1 Balbirini 3

The site of the reported isolated artefacts was inspected, which revealed more archaeological material. The site measures approximately 300m x 240m in area. It is a medium density artefact scatter, referred to as Balbirini 3. The main artefact concentrations at the site occur on exposed laterite and in erosion areas. The site is on a gentle rise along the eastern side of Relief Creek, which intersects a broadening flood area to the east. The expansion area to the south of Carp 4 is on higher ground and is vegetated by a dense stand of lancewood. The artefact density dropped out in this area as no further finds were made. It is quite likely, however, that the site extends further to the north along Relief Creek. Some isolated artefacts were found in the 2020 survey to the southeast of Carp 4, but these are unlikely to be part of Balbirini 3.

Figure 7 maps the site. The site consists of formal tool types such as retouched flakes (Fig. 8) and cores (Fig. 9), with material mainly of quartzite, quartz and some cherts (Fig. 10). The finds are listed in Table 3. Figures 11 to 13 show context views and 14 to 16 are of UAV aerial perspectives.

**Table 3. Balbirini 3 - all finds location data**

Format: UTM Datum[037]: GDA 2020						
Site Name	Abbreviation	Comment	Zone	Zone	Easting	Northing
<b>Balbirini 3</b>						
SJ23_0288	P(S)	Point on silcrete	53	K		
SJ23_0289	S(QZ)	Scraper on silcrete	53	K		
SJ23_0290	FP(S), FP(Q)	Flake piece on silcrete, flake piece on quartz	53	K		
SJ23_0291	F(QZ)	Flake on quartzite	53	K		
SJ23_0292	C(S)	Core on silcrete	53	K		
SJ23_0293	F(QZ)	Flake on quartzite	53	K		
SJ23_0294	F(Q)	Flake on quartz	53	K		
SJ23_0295	F(QZ)	Flake on quartzite	53	K		
SJ23_0296	F(QZ)	Flake on quartzite	53	K		
SJ23_0297	F(QZ)	Flake on quartzite	53	K		
SJ23_0298	F(S)	Flake on silcrete	53	K		
SJ23_0299	F(S)	Flake on silcrete	53	K		
SJ23_0300	F(QZ)	Flake on quartzite	53	K		
SJ23_0301	FP(C)	Flake piece on chert	53	K		
SJ23_0302	FP(QZ)	Flake piece on quartzite	53	K		

SJ23_0303	F(QZ)	Flake on quartzite	53	K		
SJ23_0304	F(QZ)	Flake on quartzite	53	K		
SJ23_0305	RTF(C)	Retouched flake on chert. possible platform preparation flake?	53	K		

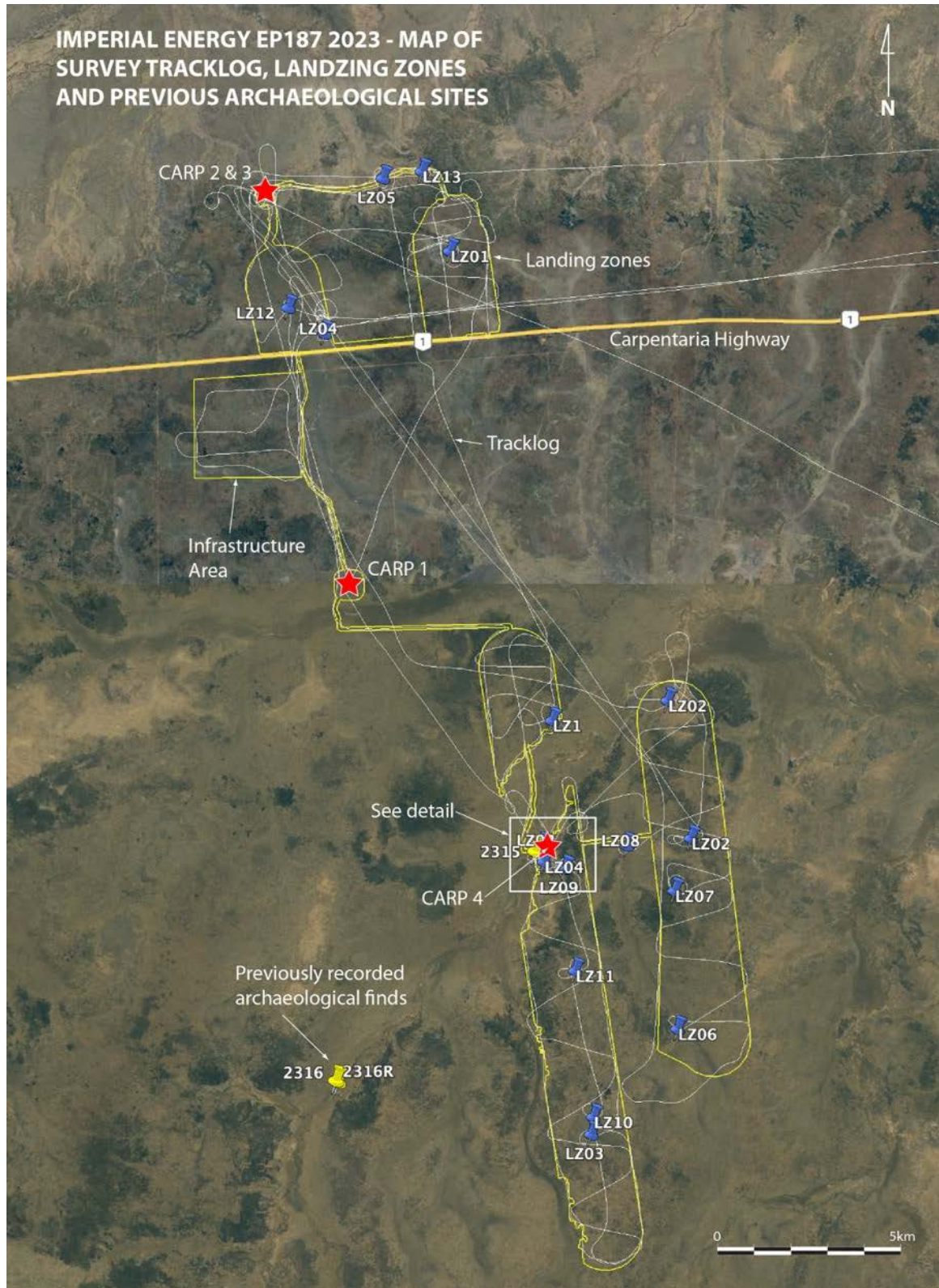


Figure 5. Map of survey tracklog, landing zones and previously recorded archaeological find (After Google Earth).



Figure 6. Imperial Energy EP 187 - map of proposed expansion areas for Carp 2 and 3 (After Google Earth).

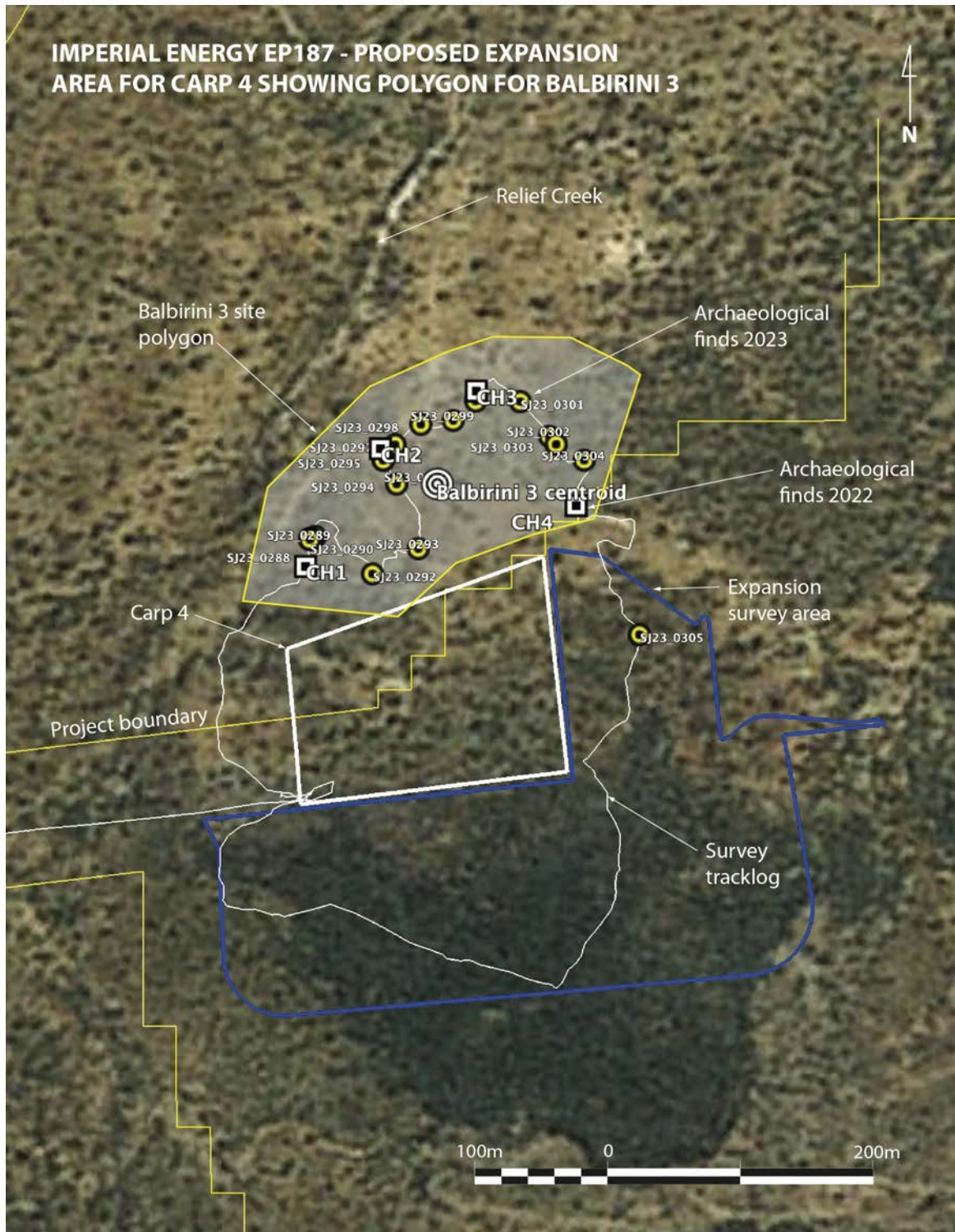


Figure 7. Imperial Energy EP 187 map of proposed expansion area for Carp 4 and location of finds (After Google Earth).



Figure 8. Formal tool types at Balbirini 3. L-R: unifacial point, scraper, flake pieces. Scale in cms.



Figure 9. Wpt SJ23\_0292 silcrete core. Scale in cms.



*Figure 10. Wpt SJ23\_0305. Retouch chert flake. Scale in cms.*



*Figure 11. Balbirini 3 context view looking to the southeast towards Carp 4. Low GSV.*



*Figure 12. A drainage channel of Relief Creek flowing, looking southeast towards Carp 4.*



*Figure 13. Balbirini Site 3 context view. Scale 2m.*



*Figure 14. UAV imagery of Carp 4 and its proximity to Relief Creek.*



*Figure 15. UAV imagery of Balbirini 3 looking with northwest at top of photograph.*



*Figure 16. UAV imagery of the proposed expansion area for Carp 4 to the south through the lancewood forest.*

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

The September and October archaeological survey of Imperial Energy's EP 187 was to assess four areas along previously surveyed seismic lines. These were expanded to approximately 2km wide sections, including the sites for five well pads. Two helicopters were utilised to conduct the surveys in September and October 2023, particularly of the areas south of the highway that have no access tracks. GSV was poor throughout the survey at roughly 20% due to extensive grass cover, but GI was acceptable at roughly 80% on account of cattle. The survey, which was conducted specifically on 26 September, 26 and 27 October 2023 effected 17 landings to assay possible ground targets for HAP sites, particularly targeting waterholes and other water bodies. The results of the survey found no archaeological sites or artefacts.

Further expansion areas were proposed for Carp 2/3 and Carp 4. Although no finds were made at Carp 2/3, the December outcomes recorded an archaeological site, Balbirini 3, which is an artefact scatter adjacent to Carp 4. The site was previously believed to be that of four isolated stone artefacts, but has been assessed in this report to be a highly significant medium-density archaeological site containing a range of formal tool types.

The following recommendation arises from this report.

### 6.2 Recommendations

#### 6.2.1 Recommendation 1: Work clearance

- The proposed works at EP 187 for the 2023 field season is cleared to proceed as no cultural heritage material was found. The proponent requires no further action under the *Act* (2011).
- Proposed expansion areas for Carp 2/3 are cleared for works as no archaeological material was found.
- Proposed expansion areas for Carp 4 are cleared in the southern area, but not to the east of the existing pad.

#### 6.2.2 Recommendation 2: Site avoidance

- The archaeological site, Balbirini 3, should be avoided. No works should occur within the site polygon. No expansion north into Relief Creek and hence the site, is planned. The site centroid follows:

GPS Grid Reference (Site Centroid) Datum: GDA 94, Zone: 53 K	
Easting	Northing

Site polygon coordinates (see Fig. 7 for polygon map):

GPS Grid Reference Datum: GDA 94, Zone: 53 K		
Boundary Point	Easting	Northing
1		
2		
3		

4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

6.2.3 *Recommendation 3: Mitigation Carp 4*

- Mitigation measures should be instigated for expansion to the east of Carp 4, as more artefacts may be found. A systematic survey would be required within the cultural heritage exclusion zone, with artefact relocation to a possible keeping place elsewhere within Balbirini 3. The boundary points for the systematic survey area (0.02km<sup>2</sup>) are listed below and mapped in Figure 17:

<b>GPS Grid Reference</b> <b>Datum: GDA 94, Zone: 53 K</b>		
<b>Boundary Point</b>	<b>Easting</b>	<b>Northing</b>
1		
2		
3		
4		

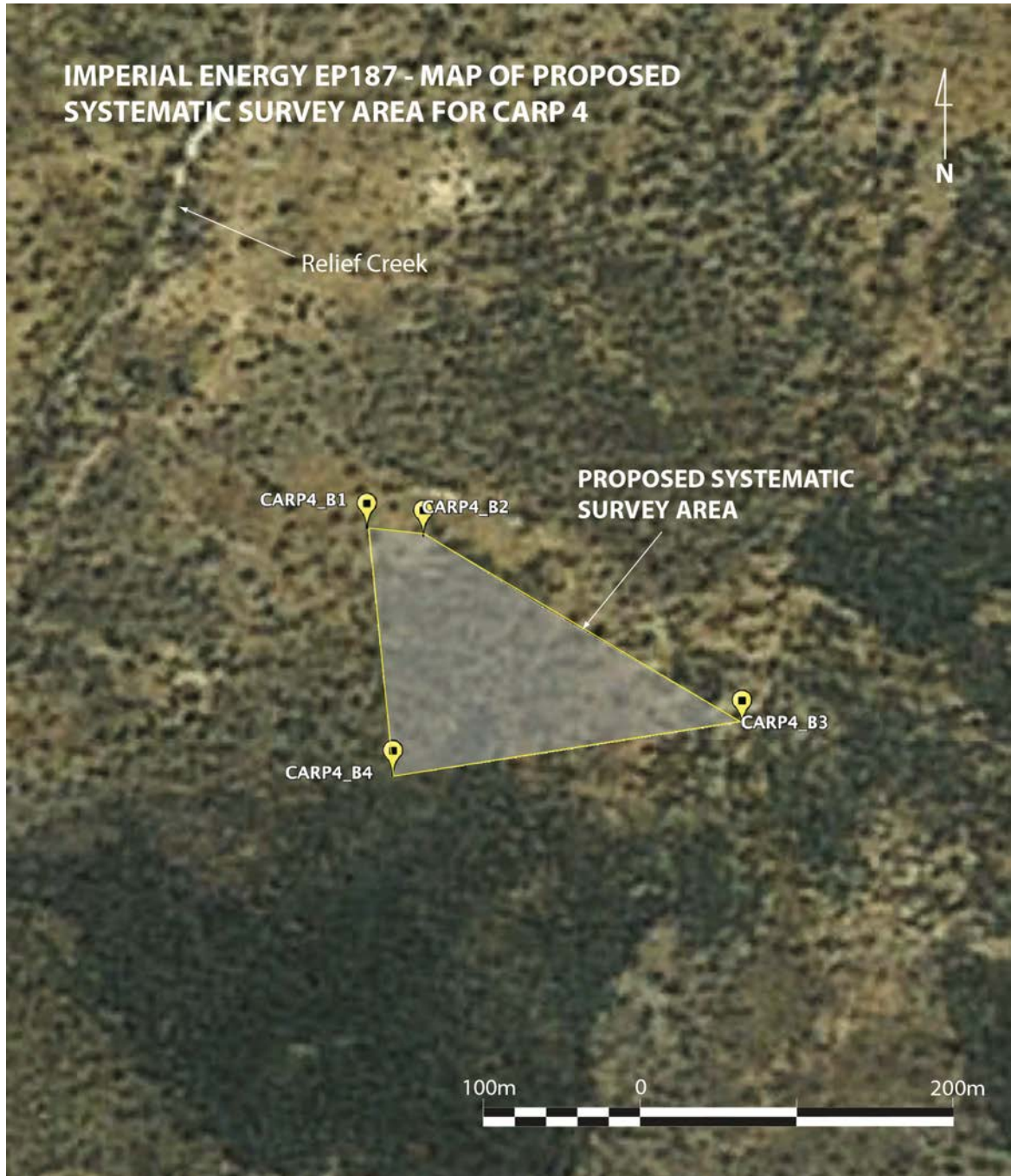


Figure 17. Map of proposed systematic survey area at Carp 4 (After Google Earth).

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## APPENDIX 1: Landing zone descriptions and photographs

Datum GDA 2020				
Name	Description	Zone	Easting	Northing
26/09/2023				
LZ01	Small flood area amongst lancewood. At edge of Relief Creek	53 K		
LZ02	@Capr 4. Arch site found nearby, report the with NLC	53 K		
LZ03	Ephemeral waterhole, flat, open woodland	53 K		
LZ04	Edge of lancewood, seismic line, small ephemeral creek.	53 K		
26/10/2023				
LZ01	Well C2A, black soil plain, soaks, flat, open woodland, GSV 40, GI 90.	53 K		
LZ02	@CBA, yellow/brown soils, flat, swampy, GSV5, GI80 (Cattle), silver box. Permissible to move drill pad 500m to the north to avoid swamp.	53 K		
27/10/2023				
LZ03	Shallow waterhole, open woodland, extensive grass cover, black cracking soils. Pedestrian transect to adjacent waterhole to the north	53 K		
LZ04	On creek line along access track. Stoney, open woodland, grey soils. GSV60, GI80	53 K		
LZ05	LZ3 @C4A on fence line, lancewood, flat, open woodland GSV40, GI80	53 K		
LZ06	Waterhole, flat, open woodland, GSV10, GI80.	53 K		
LZ07	Spinifex patch, GSV20, GI80	53 K		
LZ08	Waterhole, black cracking soils, open woodland, GSV20, GI80.	53 K		
LZ09	Near Carp 4 at edge of lancewood, small creek	53 K		
LZ10	On edge of swamp. GSV10, GI80.	53 K		
LZ11	Waterhole, GSV20. GI80	53 K		
LZ12	Pad C1A, open woodland, laterite soils. GSV10, GI80	53 K		
LZ13	On main access track traversing creek	53 K		

**LANDING ZONE PHOTOGRAPHS**



*LZ1. 26/9/23. IMG 7580.*



*LZ2. IMG 7582.*



*LZ3. IMG 7583.*



*LZ4. IMG\_7584.*



*LZ1. 26/10/23. DSCN8079.*



*LZ2. DSCN8080 – Drill Pad.*



LZ3. DSCN8081. Landing zone.



LZ4. DSCN8082.



LZ5. DSCN8093.



LZ6. DSCN8094.



LZ7. DSCN8096.



LZ8. DSCN8101.



LZ9. DSCN8102.



LZ10. DSCN8104.



*LZ11. DSCN8111.*



*LZ12. DSCN8118.*



*LZ13. DSCN8119.*

