No. WAD37 of 2022

Federal Court of Australia

District Registry: Western Australia

Division: General

Yindjibarndi Ngurra Aboriginal Corporation RNTBC (ICN 8721)

Applicant

State of Western Australia and others

Respondents

APPLICANT'S EXPERT ARCHAEOLOGY REPORT

Filed on behalf of (name & role of party) The Applicant

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EXPERT ARCHAEOLOGY REPORT

INSTRUCTING SOLICITORS: Simon Blackshield, Blackshield Lawyers Level 28, AMP Tower, 140 St Georges Terrace PERTH WA 6000

CLIENT: Yindjibarndi Ngurra Aboriginal Corporation RNTBC (ICN8721)

IN THE MATTER OF: Federal Court of Australia/WAD 37/2022 – Yindjibarndi Ngurra Aboriginal Compensation Claim - Yindjibarndi Ngurra Aboriginal Corporation RNTBC (ICN8721) and State of Western Australia & ORS

DATE: 10TH June 2024

PREPARED BY: Professor Peter Veth FAHA MAACAI and Dr Caroline Bird FAHA MAACAI, Archae-aus Pty Ltd, 1/107 Stirling Hwy, North Fremantle WA 6159

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1. DECLARATION AGAINST GPN-EXPT AND HARMONISED CODE OF CONDUCT

1. Professor Peter Veth was initially requested to provide an Expert Report on matters relating to the Archaeology within the *Warrie (No. 2)* area covered by the Solomon Hub Mining Project. In view of the large volume of representative reports to review (as listed in Attachment 2 of the amended Brief) and issues with Professor Veth's health, Dr Caroline Bird was subsequently contracted as a co-author to the Expert Report and the Brief finalised accordingly.

2. The Brief is to file an archaeological expert Report with the Federal Court based on the documents provided in the Brief, desktop research and based on our experience working in the Pilbara and elsewhere. We have read and complied with the Expert Evidence Practice Note (at Annexure 2) and agree to be bound by it. Our opinions are based wholly or substantially on our specialised knowledge arising from our training, study or experience. We have made all the inquiries that we believe are desirable and appropriate and no matters of significance which we regard as relevant have to our knowledge been withheld from the Court (Harmonised Code of Conduct).

2. INSTRUCTIONS

3. This Report has been prepared on the basis of instructions dated 21 February 2024 and amended on 7 June 2024 from instructing solicitor Simon Blackshield. A copy of the Brief is attached to this report at **Annexure [1]**. The Expert Evidence Practice Note (GPN-EXPT) was considered and is at **Annexure [2].** Our professional qualifications and relevant expertise of the expert witnesses appear in **Annexure [3]** and **Annexure [4].**

3. LIMITATIONS AND RELIANCE

4. This Report has been prepared based on information received, on our knowledge and experience as archaeologists, and limited desktop research. Should further information be subsequently available to us that materially affects the opinions contained herein, we reserve the right to amend our Report.

5. Except where otherwise stated in our Report, we do not imply, and it should not be

construed that we have verified any of the information provided to us, or that our enquiries could have verified any matter which a more extensive examination might disclose.

6. The purpose of this Report is to respond to our instructing solicitors in respect of our instructions (above) and is not to be used for any other purpose. We, and Archae-aus, disclaim any responsibility for reliance on this Report for any other purpose.

4. QUALIFICATIONS AND EXPERIENCE

7. Attached to this report are copies of our CVs outlining our qualifications and experience at **Annexure [3]** (Professor Veth) and **Annexure [4]** (Dr Bird).

5. DOCUMENTS REVIEWED

8. In preparing this report we have reviewed a sample of the reports listed in Attachment 2 of the Brief and made available by the instructing solicitors. Attachment 2 lists a total of 115 reports, prepared for FMG or for YAC, YNAC or JAC. The reports prepared for FMG include: reports associated with s 16 and s 18 permit applications, Summary reports, Preliminary Advice reports, Ethnographic reports and other reports. Some reports have multiple volumes, which in some cases have been listed separately in Attachment 2. There is commonly some overlap between reports, as the process of heritage compliance and the internal management of this process within FMG involves a number of stages of archaeological and ethnographic field recording and assessment, and sometimes salvage. All these stages result in reports, which have varying levels of detail in description and analysis, and which are cumulative. Generally, Preliminary Advice (PA) reports provide brief summary descriptions of sites, with information about areas actually surveyed, and location information for sites. Site information is reported in much more detail in subsequent reporting stages. Therefore, the 12 PA reports listed in Attachment 2 were not reviewed. In preparing s 16 or s 18 applications, information may be repeated verbatim from other reports, or the original report may be appended to the application. For s 18

applications, Dr Bird knows, due to her study, training and experience, that the minimum standard of reporting required for the Aboriginal Cultural Material Committee (ACMC) to assess the application is "site identification" (see discussion at **g)** below). Where additional information has been collected as a result of test excavation under a s 16, this would also be incorporated into the s 18 application. Therefore, reports associated with s 18 applications usually provide the most comprehensive and detailed available information. Where subsequent salvage has occurred, these reports, of course, also provide detailed information, which updates previous site documentation. The most comprehensive documentation for individual sites is therefore in the most recent report associated with s 18 application or later salvage and this report incorporates information provided at earlier stages in documentation. Accordingly in our review, we have focused mainly on those archaeological reports associated with s 18 applications or salvage reports. The criteria for selecting reports to review (N=37) were:

i. Reference to sites where the Brief explicitly requested comment;

ii. Reference to sites reported to have dates older than 40,000 years and/or occupation through the Last Glacial Maximum (LGM);

iii. Reference to sites which appeared to have long stratified sequences of archaeological deposits or particularly rich material culture;

iv. Presence of rock art;

v. Documentation and salvage of surface sites associated with Kangeenarina Creek (Map 1, E2 in Attachment 6).

vi. In the case of multiple cumulative reports, the most recent and/or most comprehensive report available, usually the s 18 report and/or salvage report.

Table **1** lists the reports we have reviewed. Apart from the PA reports which were not reviewed as set out above, Dr Bird has briefly examined all other materials we have been briefed with.

Table 1. Reports selected for review, as listed in Attachment 2

Report reference number	Authors	Title
2	Veritas 2011.	Report of an Archaeological Assessment of 10 Aboriginal sites located within the proposed Firetail Priority Mine and Infrastructure Area.
3	Alpha Archaeology 2011.	Report on Archaeological Assessments at Aboriginal Heritage Sites within the Firetail and Tailings Projects, Solomon Mining and Infrastructure Area, Western Australia. Appended to s 16 application.
6	Mitchell, J., R. Muhlen-Schulte, E. McFarlane and A. Timms 2011.	Section 18 Application for fourteen Aboriginal Heritage Sites within the Firetail Central, Firetail West and Rail Loop, Project Areas, Solomon Infrastructure Area, Western Australia. Alpha Archaeology for Fortescue Metals Group.
10	Yit, R. 2011.	Section 16 Report on Archaeological Assessments at Aboriginal Heritage Sites YIN08-031, YIN10-003, YIN10-021, YIN10-087 and YIN10-107 within the Firetail and Tailings Locations of the Solomon Mine and Infrastructure Area, Western Australia (2 December 2011).
15	Rowland, M. and A. Timms 2012a.	Section 18 Report for Mining and Infrastructure Phase 8, Solomon Mining and Infrastructure Project, Western Australia. Alpha Archaeology Pty Ltd.
16	Rowland, M. and A. Timms 2012b.	Addendum report for Section 18 application lodged on May 25th, 2012. This report provides additional information following the excavation of sites located within the Solomon Mine and Infrastructure project area: Sites YIN08-031 YIN09-002; YIN10-021; YIN10-023; YIN10-062; YIN10-087; YIN10-107; YIN10-111; YIN10-121. Report by Alpha Archaeology for FMG.
21	Timms, A., J. Stradwick and A. Vrbič 2012.	Salvage Program within the “Firetail Central, Firetail West and Rail Loop Project Areas” Section 18 Land, Solomon Mining and Infrastructure Project, Western Australia. Results of Salvage Activities Undertaken in 2012. 20 November 2012.
22	Rowland, M., Timms, A. and A. Vrbič 2012.	Salvage Program within the Firetail West and Trinity Project Areas, Solomon Mining and

		Infrastructure Project, Western Australia. Results of Salvage Activities Undertaken in 2012. 23 November 2012.
25	Chisholm, S., C. Smith, B. Curtis, S. Bhaskar, A. Golden, G. McDevitt, L. McCarthy, S. Willett and L. May 2013.	Report on an archaeological and ethnographic site identification heritage assessment of the Solomon phase 10 S 18 proposed waste dump area, conducted by the Yindjibarndi traditional owners and Terra Rosa Cultural Resource Management Pty Ltd for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Ltd.
29–35	Curtis, B., S. Willett and S. Chisholm. 2013.	Report on an archaeological excavation and heritage assessment of the FMG Solomon phase 15 Kings waste dump area, conducted with the Yindjibarndi Traditional Owners. TRCRM September 2013. Volumes 1-6.
36	Curtis, B. S. McGalliard, F. McFarlane, A. Golden, S. Willett and S. Chisholm 2013.	Report of an archaeological excavation program and heritage assessment of the Solomon Phase 16 Kings Waste Dump Area conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Ltd. Volume 2: results (Heritage places TRYINPAD13-01, TRYINPAD13-02, TRYINPAD13-03, TRYINPAD13-04). Volume 3: Appendices.
37A	Curtis, B. S. Bhaskar, F. Mazieres, G. McDevitt, B. Fuller and N. Haynes 2013.	A report on the archaeological salvage program conducted at FMG's Solomon Hub from September to December 2012 by Terra Rosa CRM and the Yindjibarndi Traditional Owners. Volume 1: Summary report prefacing the salvage program undertaken during 2012 by Terra Rosa CRM and Yindjibarndi Traditional Owners at FMG's Solomon Hub Project.
37B	Curtis, B. S. Bhaskar, F. Mazieres, G. McDevitt, B. Fuller and N. Haynes 2013.	A report on the archaeological salvage program conducted at FMG's Solomon Hub from September to December 2012 by Terra Rosa CRM and the Yindjibarndi Traditional Owners. Volume 2: A report on the archaeological surface salvage program conducted at FMG's Solomon Hub from September to December 2012.
37C	Golden, A., B. Curtis, B.	A report on the archaeological salvage program

	Fuller, C. Rayner, G. McDevitt, F. Mazieres, Francois, F. McFarlane, S. Willett, and S. McGalliard 2013.	conducted at FMG's Solomon Hub from September to December 2012 by Terra Rosa CRM and the Yindjibarndi Traditional Owners. Volume 3: A report on the archaeological salvage excavation program conducted at FMG's Solomon Hub from September to December 2012.
38	Curtis, B. A. Golden, C. Howardand S. Chisholm 2014.	Report of an Archaeological and Ethnographic Heritage Assessment of the Solomon Phase 17 Solomon East Proposed Development Area conducted by The Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and Prepared for Fortescue Metals Group Ltd. 2 volumes. Volume 2 missing.
39	Chisholm, S., A. Golden, B. Curtis, A. Skinner, B. Fuller, and E. Straughan 2014a	Report of an archaeological and ethnographic heritage assessment of the Solomon Mining and Infrastructure Phase 18 Solomon East Project Area conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Ltd. Volume 1: Executive summary, Section 1 to 8, References, Appendices 1 to 4.
39A	Chisholm, S., B. Curtis, A. Skinner, B. Fuller and E. Straughan 2014a.	Report of an archaeological and ethnographic heritage assessment of the Solomon Mining and Infrastructure Phase 18 Solomon East Project Area conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Ltd. Volume 2: Appendix 5 – Heritage information submission forms (YIN09-015, YIN09-020, YIN09-021, YIN10-008, YIN10-009, YIN10-010, YIN10-022, YIN10-112, YIN10-117, YIN11-020)
39B	Chisholm, S., B. Curtis, A. Skinner, B. Fuller and E. Straughan 2014a.	Report of an archaeological and ethnographic heritage assessment of the Solomon Mining and Infrastructure Phase 18 Solomon East Project Area conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Wirlu-Murra Tableland Heritage Pty Ltd on behalf of Yindjibarndi Aboriginal Corporation and

		prepared for Fortescue Metals Group Ltd. Volume 3: Appendix 5 continued – Heritage information submission forms (YIN11-021, YIN11-022, YIN11-053, YIN11-055, YIN11-063, YIN14-001, YIN14-002).
41–43	Timms, A. and M. Rowland 2012.	Final Report for Results of Indigenous Archaeological Assessment Work in 2011, Solomon Mining and Infrastructure, Western Australia: Results of Stage 1 to Stage 16, 9th May – 12th December 2011 – Volumes 1 – 4. [NB. Copy viewed has missing pages].
46	Timms, A., M. Rowland and A. Vrbič 2012.	Salvage Program under Ministerial Consent for S 18 Land "Firetail and Trinity TSF", Solomon Mining and Infrastructure Project, Western Australia. Results of Salvage Activities Undertaken in 2012. 8 November 2012
51, 51A, 51B	Chisholm, S., A. Golden, B. Curtis, A. Skinner, B. Fuller and E. Straughan 2014b.	Archaeological and ethnographic heritage assessment of the Solomon Hub Project Area completed between February 2013 and June 2014, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management. 3 volumes.
60	Tickle, R. 2010a.	Excerpt of Report of a Survey to Avoidance Standard of Firetail, Survey Request Yin 34, Area: Priority One.
64	Tickle, R. 2010b.	Report of a Survey to Complete Infill Clearing in Firetail: Survey Request Yin 33, June 2010.
73	Curtis, B., S. McGalliard, F. McFarlane, A. Golden, B. Fuller and S. Chisholm 2014.	Salvage of TRYINRS12-02, YIN10-095, YIN11-012, YIN11-014, YIN11-028 and YIN12-011, conducted with the Yindjibarndi Traditional Owners.
75	Golden, A. and S. Chisholm 2014.	Report on an Archaeological site identification heritage assessment and salvage in accordance with HWIs YIN_140-r1, YIN_166-r1, YIN_174, YIN_183 and YIN_193-r2, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management for Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Limited.
76	Golden, A., N. Sanders, G. MacDonald, B. Curtis and S. Chisholm 2015.	Report on the archaeological site identification survey, archaeological salvage, cultural salvage and site identification assessment and recording of HWIs YIN_140-r3, YIN_166-r2, YIN_201, YIN_202, YIN_203, YIN_205, YIN_207, YIN_208

		and YIN_213 and the ethnographic site identification assessment of HWIs YIN_211 and YIN_212 conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting for Wirlu-murra Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Limited.
78	Curtis, B., A. Golden, N. Sanders, L. McMahon and S. Chisholm 2015.	Quarterly report on the archaeological site identification assessment and recording of HWIs YIN_207, YIN_208 and YIN_217, the archaeological site identification survey and assessment of YIN_210, YIN_218, YIN_220 and YIN_129-r2 and the archaeological salvage and excavation of HWI YIN_214, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting for Wirlu-murra Yindjibarndi Aboriginal Corporation and prepared for Fortescue Metals Group Limited.
81	Howard, C. and D. Coutant 2016a.	Report on an archaeological site avoidance heritage survey of HWIs YIN_067-r2, YIN_129-r3, YIN_180-r4, YIN237, YIN_238, and YIN_239 at the Solomon Project, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited.
82	Howard, C. and D. Coutant 2016b.	Report on an archaeological site avoidance heritage survey, site identification heritage assessment and archaeological salvage of HWIs YIN_225, YIN_245, and YIN_248 at the Solomon Project conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited.
100	Raftery, D. 2010.	Preliminary Heritage Survey Solomon Project Area – Yindjibarndi Group.
104	Goode, B. and P. Gifford 2011.	A Report of an Ethnographic Aboriginal Heritage Survey of the Solomon Project in the Eastern Pilbara Region of Western Australia. A Report Prepared for Fortescue Metals Group Ltd.
105	Gallagher, M. 2011.	Report of an ethnographic consultation to comment on sixteen archaeological sites in the Firetail West, Central and Rail Loop areas in Fortescue's Solomon Project. Prepared for Wirlu-murra Tableland Heritage Pty Ltd and Fortescue Metals Group.
107	Czerwinski, P. 2012.	Ethnographic Survey Report, FMG YIN_075 & YIN_099 Survey Requests, Solomon Mine Site,

		Pilbara, WA.
111	Chisholm S. 2013.	Report of the Consultation Process and Prior History of the Documentation of Kangeenarina Creek, Conducted by the Yindjibarndi Traditional Owners and Terra Rosa Cultural Resource Management Pty Ltd for Fortescue Metals Group Ltd and Wirlu-Murra Tableland Heritage Pty Ltd on behalf of the Wirlu-murra Yindjibarndi Aboriginal Corporation.
114	Chisholm, S., C. Smith and R. Miniken 2012.	Research Plan for Inclusion in Fortescue Metals Group's Solomon Project Area Excavation Application under Section 16 of the Aboriginal Heritage Act 1972. Unpublished research document prepared for Fortescue Metals Group Ltd., the Yindjibarndi Traditional Owners and the Department of Indigenous Affairs.
116	Howard, C. and S. Chisholm 2016.	Extract from: Addendum report on the dating results of a section 16 excavation of Registered Aboriginal Site heritage DAA ID 30310 (YIN08-031), conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited, Terra Rosa, June 2016.
117	FMG 2020.	Guidelines: Management and protection of Aboriginal Cultural Heritage. Heritage Department, Fortescue Metals Group.
119	Thom, P. and I. Ryan 2007.	Yindjibarndi Aboriginal Corporation (YAC) 2018 Report for the Yindjibarndi Ngurra Aboriginal Corporation (YNAC) Yindjibarndi Cultural heritage Inspection Conducted with Fortescue Metals Group (FMG) Section 18 'Phase 23' Application Area. Prepared for Yindjibarndi Aboriginal Corporation.
121	Brown, V. and S. Winter 2008.	Report on the Results of an Archaeological Work Program Clearance Survey of nominated drill lines and access tracks at Firetail and Valley of the Kings in FMG's Solomon Prospect, Central Pilbara, Western Australia for Juluwarlu Aboriginal Corporation.
125	Yindjibarndi Aboriginal Corporation (YAC) 2018.	Report for the Yindjibarndi Ngurra Aboriginal Corporation (YNAC) Yindjibarndi Cultural heritage Inspection Conducted with Fortescue Metals Group (FMG) Section 18 'Phase 23' Application Area. Prepared for Yindjibarndi Aboriginal

		Corporation.
129	Ryan, P., B. Pentz and T. Raines 2021.	Report of a Heritage Survey of eight Survey Areas scoped as Scopes YIN_335 and YIN_336, on Yindjibarndi Country within FMG's Solomon Project Area, Pilbara, Western Australia.

6. ASSUMPTIONS

9. In preparing this report we have relied upon the documents referred to above, and otherwise as set out in the Annexures to this report.

10. In preparing this report we have made the following assumptions firstly about the Solomon Hub Project (**SHP**) (as provided in the Brief, points a - i); and then about the reports relied on (points j – p), in accordance with our study, training and experience as archaeologists;

(a) The SHP is an open-cut iron ore mine in the Hamersley Ranges located 60km north of Tom Price.

(b) SHP has a production capacity of 72–100 million tonnes per annum (Mtpa) that includes pits outside the *Warrie (No 2)* area.

(c) It comprises conventional open-pit load / haul and strip-mining techniques in the Firetail North and South, Valley of the Kings, Trinity and Valley of the Queens pits (Valley of the Queens is not in the compensation claim area) as well as contour mining of large portions of *Gambalana* (Hamersley Ranges). Mining operations at Firetail commenced in May 2013. As stated above the expected mine life of SHP is 33 years.

(d) The various tenements which comprise the SHP are wholly owned by FMG and were granted between 2006 and 2020. Applications for mining tenements by FMG are ongoing.

(e) A number of the FMG tenements comprising the SHP are located within what was the Yindjibarndi #1 native title determination application area (that was filed on 9 July 2003) but which is now the *Warrie (No 2)* determination area (since 17 November 2017). The external boundary of these tenements is shown in the

Maps at Attachment 6 to this brief.

(f) With the exception of the grant of E47/3464I, no agreement has been reached in relation to the grant of any of the mining tenements which comprise the SHP between FMG and the Applicant/registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) or YNAC (after 17 November 2017).

(g) FMG has entered into financial relationships and agreements in respect of its mining activities with some, but not all, of the common law native title holders without the consent of the registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) or of the YNAC (after 17 November 2017). These agreements and relationships are ongoing. The group of people who have a relationship and agreements with FMG are members of an Aboriginal Corporation called Wirlu-Murra Yindjibarndi Aboriginal Corporation (**WYAC**). This has caused a serious division within the Yindjibarndi community.

(h) Between July 2010 and 17 November 2017, FMG did not consult with the registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) in relation to heritage surveys or work programme clearances. Instead, it dealt with WYAC or WYAC members.

(i) Native title has a physical or material aspect (the right to do something in relation to land) and a cultural or spiritual aspect (the connection with the land). Under the NTA, the Yindjibarndi People have an entitlement to compensation for any loss, diminution, impairment or other effect of the grant of the SHP mining tenements on both aspects of their native title rights and interests.

(j) That the survey coverage for work area and/or site avoidance programs and the means by which this was conducted is as stated (e.g. by pedestrian transect, vehicle or helicopter reconnaissance).

(k) That analysis of salvaged archaeological site assemblages has occurred beyond

physical salvage and *in situ* field recording.

(l) Following on from this, that the dates for Aboriginal occupation and the physical archaeological expression of this occupation are based on relevant mitigation reports and laboratory analyses/advices.

(m) Conclusions made about the availability of peer-reviewed publications or conference proceedings arising from the excavation of sites are based on reasonable searches of journals, databases (such as the CABAH SahulArch database https://octopusdata.org Saktura et al. 2023) and public avenues such as conference publications.

(n) Statements of archaeological site significance are with reference to Sections 5 and 39 of the WA *Aboriginal Heritage Act* 1972 and see details of Amended Aboriginal Heritage Act 1972 Stakeholder Information Kit Nov 2023.

(o) That archaeological sites will have significance against the criteria of the WA *Aboriginal Heritage Act* 1972 for their archaeological and scientific values; and following this that some archaeological sites can also have cultural or social significance to Traditional Owners; for example, due to their great age, associations (burials and stone walls), objects (such as a ritual stone knife), historic associations or where someone has lived during the pastoral era.

(p) It should be noted that radiometric and OSL dates are reported with an error margin, or standard deviation, which indicates the statistical probability that the actual date of the sample occurs within the range indicated. For example, a conventional date reported at 1 standard deviation indicates that there is a 66.7% probability that the actual date falls within the error margin. Conventional radiocarbon dates are known to diverge from absolute calendar dates and therefore must also be calibrated to provide actual age estimates. Calibrated radiocarbon dates are reported as ranges, which indicate the probability that the actual date occurs within the specified range. The abbreviation ka, meaning thousand years, is commonly used in discussion.

11. Our conclusions in this report are based on this reliance and these assumptions. Should these in fact prove to be materially different this may in turn materially affect the content of our report, and the conclusions therein.

7. BACKGROUND

12. Professor Veth provided evidence to the Federal Court in August 2023 during the first season of excavation of the site known generally as *Bangkangarra.* This site was being excavated, along with others in the *Warrie (no.2)* area, as part of a larger Australian Research Council Laureate Fellowship *Desert People: Australian Perspectives*. Yindjibarndi Ngurra Aboriginal Corporation is one of 10 Aboriginal Corporations with which the project has collaboration agreements. The study area of the North-West extend from the Ningaloo coast, through the Pilbara uplands and into the Little and Great Sandy Deserts, covering some c. 300,000 km^2 and includes the following corporations:

    - Nyinggulu Joint Management Board for Cape Range World Heritage Area
    - Buurabalayi Thalanyi Aboriginal Corporation
    - Yindjibarndi Ngurra Aboriginal Corporation
    - Robe River Kuruma Aboriginal Corporation
    - Wintawari Guruma Aboriginal Corporation
    - Yinhawangka Aboriginal Corporation
    - Mungarlu Ngurrarankatja Rirraunkaja Aboriginal Corporation
    - Jamukurnu Yapalikurnu Aboriginal Corporation
    - Nyangumarta Warran Aboriginal Corporation
    - Karajarri Traditional Lands Association

13. Dr Caroline Bird, FAHA, is a graduate of the University of Cambridge and the University of Western Australia and has extensive archaeological experience in a

range of roles in research and consulting in Western Australia and Victoria. She has co-authored *Crafting Country*, a major synthesis of archaeology in the Pilbara, based on the data collected from both rockshelter excavations and surface sites during compliance archaeology projects on Nyiyaparli country in the Chichester Range. She has also served on the Aboriginal Cultural Material Committee (1999–2003), as an expert archaeologist. Under s 39 of Western Australia's *Aboriginal Heritage Act 1972*, the ACMC's functions included evaluating the importance of Aboriginal places and objects, recording and preserving Aboriginal "lore" relating to such places and objects and providing advice to the Minister about matters relating to the administration of the Act.

14. Given the regional research presence with the *Desert People Project,* and long-term research engagement with the archaeology and communities of the wider north-west of Australia for over 40 years, the Expert Witnesses were approached to provide the current report, which was formally commissioned on 21 February 2024.

8. ISSUES TO BE ADDRESSED

15. The Brief outlines 13 matters to be addressed based on the documents provided in the Brief at paragraph 8, above, limited desktop research and based on our experience as archaeologists who have worked in the Pilbara and elsewhere. These matters include the age of Aboriginal occupation of the determination area; impacts on cultural heritage and their significance and value; methodology to mitigate site impacts; recent work at *Bangkangarra* and inferences about wider archaeological record; best practice methodology and reporting; consultation about archaeological sites; and comparison of surveys conducted with YNAC and WYAC. The material in this report specifically relating to recent work at *Bangkangarra* has been written by Professor Veth as this forms part of his five-year ARC Laureate Fellowship research program *Desert People: Australian Perspectives* (discussed in detail at **f),** referred to at **k)** and **l)** and **Annexures 5.1** to **5.11**). The opinions set out in those parts of this report are based on the work carried out by Professor Veth and are jointly held. Dr Bird

conducted a detailed review of the reporting of the salvage of surface artefact scatters along Kangeenarina Creek, including preparing Figure 6 (discussed at **i)** below). This review informed our joint opinion about the importance of these sites and about the salvage process for surface artefact scatters and we have jointly authored this part of the report. Dr Bird also conducted a detailed review of those reports listed in Table 1, which described excavations at sites where occupation dates older than 5000 years ago had been noted and prepared Figure 7 **(Annexure 6).** This review informed our joint opinion about the importance of these sites as a group and we have jointly authored this part of the report. With respect to the other matters discussed in the report, on our review of documents relevant to those matters, we formed a joint opinion based on our study, training and experience as archaeologists and the remainder of the report was jointly authored.

9. MATTERS TO BE ADDRESSED

16. **a) The historical depth of Aboriginal occupation and use of the *Warrie (No 2)* determination area.**

17. The area of the *Warrie (No 2)* determination was checked for published age determinations in the 2023 SahulArch geochronology database hosted on the https://octopusdata.org/?collection=SAHUL_ARCH_C14 (Saktura et al. 2023). SahulArch consists of published OSL (optically stimulated luminescence), TL (thermoluminescence), and C14 (radiocarbon) ages for archaeological records in Greater Australia. We note there are some early dates from consultancy reports, including YIN09-002, which have been commented on in reviews (e.g. Allen and O'Connell 2014; Bird and Rhoads 2020). The reported ages for YIN09-002, if reliable, would place Aboriginal occupation of the determination area before approximately 45 ka (thousand years ago) and likely in the 50 ka – 45 ka bracket (see par. 19, below).

18. A key report identified for review in the Brief is by Howard and Coutant (2016b), which provides a summary of sites dated by Terra Rosa from the wider Yindjibarndi #1 native title claim area which to the best of our knowledge have not been published

(see their Table 4). The table also includes information about four sites excavated by other consultants (including YIN09-002). Two other rockshelters are noted as having conventional ages of the same order of antiquity as YIN09-002: TRYINPAD 13-03, initial occupation bracketed by dates of c. 53 ka (OSL) to 35 ka (conventional radiocarbon); and YIN10-111 with OSL ages of up to 48 ka. In addition, YIN10-014, YIN11-028 and YIN08-031 all have conventional dates greater than 35 ka. Note there are errors up to 2 standard deviations in these results.

19. When all 24 sites listed in Howard and Coutant (2016b: Table 4) are taken together, it is reasonable to conclude that Aboriginal occupation of the determination area began at least 47,000 years ago. This is consistent with recent reviews that conclude evidence for early occupation of the wider Pilbara, and indeed the arid zone, began by 50,000 – 45,000 years ago (Bradshaw et al. 2021; Clarkson et al. 2022; Dortch et al. 2019).

20. It has been recently hypothesised that occupation of the arid zone might have occurred earlier (e.g. Veth et al. 2022) and this hypothesis is actively being tested by the five-year *Desert People Project*, relying on the Optically Stimulated Luminescence single grain dating method which has the ability to break through the radiocarbon barrier, currently sitting at approximately 50,000 years ago (Veth 2017).

21. Dates reported in Table 4 of this report (Howard and Coutant 2016b) show repeated occupation of the area through time, with at least one date falling within the height of the Last Glacial Maximum (LGM). The LGM is dated to approximately 24,000 to 18,000 years ago, when the climate may have been significantly colder (up to degrees 6C) and the area less vegetated.

22. Based on a review of the unpublished reports, regional syntheses and SahulArch geochronology database, we conclude, based on our study, training and experience as archaeologists, that the historic depth of occupation and use by Aboriginal people of the Warrie (No 2) determination area began by at least 47,000 years ago and possibly earlier. This is consistent with the earliest currently accepted ages for the occupation of the Australian arid zone.

23. **b) The nature and extent of the damage to or destruction of archaeological and cultural sites, the result of FMG's mining activities.**

24. FMG's dataset notes that 249 sites have been the subject of an application to use the land on which they occur under s 18 of the WA *Aboriginal Heritage Act 1972.* A review of the Overview Map 1 (Attachment 6) and 14 enlargement maps, labelled Map 1 E1 to E14 (Attachment 6 in the Brief), shows that over 285 locations are mapped as FMG Heritage Salvaged Places. The majority of these heritage places, following salvage, have been physically impacted by mining or the construction of associated infrastructure as shown in the maps we have been briefed with. This impact may be complete, in that the heritage place has been totally destroyed, or partial, in that the heritage place may still exist in part or in altered form. In addition, Map 1 - Overview shows 10 Yindjibarndi Sites as points occurring within five of the enlargement maps; these locations are keyed as burial site, ethnographic site and rockshelter. Numbers 86 and 87 (which are both burials) and 125 (which is an ethnographic site) are shown to be within or directly adjacent to areas of land disturbance. Number 86 is on the edge of a Heritage Restriction Zone centred on the burial site YIN10-004. It is possible that this site and YIN10-004 are in fact the same site and one is mapped incorrectly.

25. Map 1 – Overview also shows 17 sites identified by the Yindjibarndi Aboriginal Corporation in 2012, 2013 and 2014 (depicted by a green triangle), and sites identified by YNAC in March 2018, for the purpose of "auditing" areas that FMG had already surveyed. YNAC has identified an additional 23 sites that were not previously identified by FMG (depicted by a green square), and these are shown in Map 1 E10 and E11.

26. The breakdown of archaeological site types once found in the vicinity of the Solomon Disturbed Area (Map 1 – Overview) appears to be broadly consistent with the overall site distribution from the larger determined area although the frequency of rockshelter sites in the SHP is often noted (see Howard and Coutant 2016b: table 3 and figures 1 and 2). On their DAA figures for the overall Yinjibarndi #1 Native Title

Claim area, including Registered sites and Other Heritage Places (OHP), rockshelters are the most common type of site (48%), with artefact scatters at 32%, and engravings at 4%; all other site types (14 types recognized) making up the remaining 16%. The rockshelters can contain stratified cultural deposits, walled niches and platforms (sometimes for burials and sacred artefacts), ochre sources, usually in seams, and engravings/rock art at the entrance or within the chamber (and see the relationship of artefact scatters and rockshelter records for the eastern Chichester Range in Bird and Rhoads 2015, 2020).

27. The various salvage actions noted in the reports, which are included in Attachment 2 of the Brief, the large number of s 18 applications and higher number of FMG Salvaged Heritage Places documented in Map 1 – Overview attest to a high level of site damage and destruction (reports of mitigation which were reviewed are listed in Table 1 and Attachment 2). A key issue is the work carried out at sites to mitigate their loss before disturbance of the area (the Solomon Disturbed Area). This is done through detailed studies of cultural deposits, artefact assemblages, site geochronology, site formation processes, and reconstruction of past behaviours such as group mobility, settlement behaviour and diet, amongst other considerations.

28. Many sites noted in the reports at Attachment 2 in the Brief appear to have been physically salvaged (e.g., artefacts collected from open sites, inside caves and also from test-pitting or larger excavations of selected rockshelters). Detailed site records and documentation of this work appear in a wide range of reports listed in Attachment 2. However, this list is not exhaustive, even for the more intensively investigated and excavated rockshelter sites summarised in Howard and Coutant (2016b: Table 4). For example, initial test excavation of TRYINPAD13-03 was reported in Curtis, McGalliard, McFarlane, Golden, Willett and Chisholm (2013, Volume 2: 62-102); but we were not able to identify a subsequent salvage report (see par. 64 for additional examples). As noted above (par. 18), TRYINPAD13-03 is stated to have initial occupation bracketed by dates of c. 53 ka to 35 ka. In our view, based on our study, training and experience as archaeologists, the mapped location of

TRYINPAD13-03 in relation to disturbance (see Agreed Map 5(c)) indicates that the site has been destroyed. We have also been unable to locate any detailed reports for TRYINRS12-01. Howard and Coutant (2016b: Table 4) note this site has a date indicating occupation during the Last Glacial Maximum. TRYINRS12-01 is close to disturbed areas but within a Heritage Restriction Zone (HRZ-0476). Summary overviews and syntheses of the evidence recovered from the Solomon Hub appear in a range of reports (such as Chisholm et al. 2014b; Howard and Coutant 2016b) but as these are summary reports they have limited contextual detail. There appears to have been a large number of salvage and mitigation programs carried out across the SHP, with consultants often returning to the same rockshelter sites to excavate additional test-pits or to conduct mitigative salvage excavations. The volume of descriptive reports of artefacts salvaged from rockshelter excavations, and subject to additional analysis such as use-wear analysis (e.g. at artefact scatters from Kangeenarina Creek), is high and in our opinion, based on our study, training and experience as archaeologists, represents a significant effort to mitigate the loss of cultural materials.

29. Significant sites elsewhere in the Pilbara identified during compliance surveys, such as the 41,000 year old Djadjiling Rockshelter in Banjima country at Hope South 1 mine pit, have been reported on with the archaeological values published in considerable detail (Law et al. 2010; Law and Cropper 2018). At Hope Downs, salvage excavations at five other significant rockshelters have also been comprehensively published (Cropper and Law 2018). Elsewhere in the Hamersley Range, rockshelters approved for another s 18 permit in Nyiyaparli country were first subjected to detailed scientific studies of the ochre seams, grindstones, and panels of painted and drawn rock art and published (Huntley and Wallis 2020; Huntley et al. 2021).

30. It was the lack of timely response to new and significant dates and occupation records from the Juukan rockshelters that led to the destruction of the site, with global condemnation, as detailed at length in the Joint Standing Committee on Northern Australia (2021). The values of sites and places need to be determined before

management decisions are made. The first principle of the Burra Charter (2013) is to "i) understand the place and its cultural significance, including its meaning to people, before making decisions about its future".

31. After searching publication lists we were unable to locate publicly available site reports, peer-reviewed papers, published conference proceedings, monographs or volumes from the extensive salvage work across the SHP conducted for over a decade. The sole public presentation of this material appears to have been the results of OSL dating for TRYINRS13-04, focusing on rock art, which were presented at the joint conference of the Australian Archaeological Association and the Australian Society for Historical Archaeology in Cairns 2014 (Curtis, Pietsch and Olley 2014).

32. **c) National significance and cultural value of the archaeological and cultural sites that have been damaged or destroyed or are likely to have been damaged or destroyed by those mining activities.**

33. Based on the level of information available for site content from the reviewed reports in Attachment 2 of the Brief, it is not possible, or appropriate, to make statements about the heritage values of sites as these may once have been assessed against federal legislation (e.g., National Heritage Listing under the *EPBC Act 1999*). Professor Veth has co-authored reports for the National Heritage Listing for the Dampier Archipelago (Murujuga) in 2005 (McDonald and Veth 2005) and also the case for Outstanding Universal Values for World Heritage Inscription (McDonald and Veth 2011). This requires a high level of detail and information about site context and integrity of cultural landscapes. Professor Veth has also acted as a peer-reviewer for the World Heritage Tentative List Application of the Budj Bim Cultural Landscape of Victoria for the Victorian Department of Premier and Cabinet. Dr Caroline Bird has served as a member of the Aboriginal Cultural Material Committee and thus has extensive experience in evaluating cultural and archaeological values of sites in the context of the WA *Aboriginal Heritage Act* 1972.

34. This previous experience does, however, provide us with experience of what a

reasonable threshold might be for sites (as a corpus) to be evaluated as being of state or national significance (Veth 2015).

35. Despite the partial nature of some of the records we have accessed, we believe there is enough evidence as stated in summary form, from the Chisholm et al. (2014b) report (in the Brief as Attachment 2, report 51) and the Howard and Coutant (2016b) report (in the Brief as Attachment 2, report 82), to make some comments about significance.

36. Based on previous survey, dating and the follow-up analyses, Chisholm et al. conclude (2014b: 243):

> *Rockshelter excavations in the Solomon Hub project area have so far yielded significant results, including some of the oldest known dated occupation in the Hamersley Ranges (Terra Rosa CRM 2014), a Pleistocene dated ritual site (Terra Rosa CRM 2013) and secured a relative date for a number of petroglyphs (Terra Rosa CRM forthcoming). These results indicate that the Solomon Hub project area is one of significant heritage values and high archaeological potential.*

37. Further, Chisholm et al. (2014b: Table 54) subsequently list the Pilbara's oldest dated published rockshelters concluding that some rockshelters within the SHP are older than those then known from the Pilbara.

38. Chisholm et al. (2014b: 244) make the important observation that:

> *Of 20 rockshelters excavated by Terra Rosa CRM at the Solomon Hub Project between 2012 and present; seven sites have demonstrated evidence of Pleistocene occupation, see Figure 7 below. Of these rockshelters, four demonstrate occupation older than 25,000 years BP. A further two rockshelters in the Solomon Hub Project area, subject to test excavations by Alpha Archaeology under a s 16 permit in 2012, also indicated evidence of occupation older than 25,000 years ago*.

39. Chisholm et al. (2014b: Figure 7) show that, except for YIN10-111, all of the oldest

dates recovered for occupation from these sites come from depths of less than 50 cm below surface level, and many of the remaining sites from even shallower deposits. This subsample of 20 rockshelter sites from the SHP indicates that ancient occupation records are relatively common and that significantly old occupational remains are not far below the contemporary surfaces of these shelters.

40. Figure 7 (Chisholm et al. 2014b) also shows that initial probing to estimate depth of occupational deposit (to assess if potentially stratified deposits exist, and as a proxy of relative antiquity) is repeatedly and significantly underestimating the actual depth of deposit uncovered through subsequent excavation. For example, in Figure 7, YIN10-111 is dated to c. 35,000 years ago but only had a probe depth of less than 20 cm. The resultant excavation reached a depth of over 1.4 m.

41. Another example is the salvage excavation of YIN11-028, which subsequently showed initial occupation occurred more than 40,000 years ago, producing an unusually large number of artefacts. The site had been initially assessed as of low archaeological significance without excavatable deposits, on the basis of initial probing. Chisholm et al. (2014a:63) highlight the limitations of the initial site assessment and observe that the SHP has exceptional heritage values, as follows:

> *This site [YIN11-028] was excavated under the conditions of ministerial consent no. 34-18978, granted in July 2012. The site was not, however, subject to test excavation under a section 16 permit. Consent to disturb this heritage place had already been given prior to any attempt to establish the temporal context of the rockshelter, which in turn meant that the salvage works were completed prior to dating results being returned. If a section 16 excavation had been conducted at DAA ID 31809 - YIN11-028, prior to the site's submission in a section 18 application, then a more informed decision could have been made about the future of the site and heritage mitigation developed.*
>
> *The author cites this example to demonstrate* ***the exceptional cultural heritage values located in the Solomon project area*** *and to support the case*

> *for test excavations, under a section 16 permit, as a vital part of the approvals process. This is vital as section 16 excavation results inform the importance and significance assessments of places which may be sites under the Act and be subject to applications to disturb them under section 18.* [emphasis ours] (Chisholm et al. 2014a: 63)

42. It appears from the materials in the Brief, and additional reports reviewed, that rockshelter sites have been variably subjected to test-pitting (e.g., 1 or 2 square metre pits), through to larger excavations fit for scale for more substantial rockshelters to mitigate the loss of the cultural heritage.

43. The Archaeological Institute of America defines a test pit as "An excavation unit used in the initial investigation of a site or area, before large-scale excavation begins, that allows the archaeologist to 'preview' what lies under the ground" https://www.archaeological.org/programs/educators/introduction-to-archaeology/glossary/

44. The risk of not understanding critical issues, such as the maximum age or continuity of the site use through time, by small sample sizes from test-pits (rather than multiple sample points or a fully-fledged excavation), has been published on with reference to the Pilbara. Discussions include Bird and Rhoads (2020:7) in the context of the limited extent of test-pitting in Pilbara rockshelters, giving examples of multiple test pits producing very different results at sites such as Yurlu Kankala (Morse, Cameron and Reynen 2014) and divergent results from different test pits in Christmas Creek sites (Bird and Rhoads 2020:196). Cropper and Law (2018:450-451) also discuss the issue but more in the context of the difficulty of assessing potential archaeological deposits and the broader issue of site formation processes. YIN10-111 is an example where follow up test-pits produced different results and consequently a quite different assessment of archaeological significance – in this case, largely due to the deployment of OSL dating.

45. Howard and Coutant (2016b), Attachment 2 (report 82) of the Brief, at Table 4 list five rockshelter sites within the SHP, which by virtue of their great age and repeated

occupation through time, are, in our opinion, based on our study, training and experience as archaeologists, of national significance. These sites include TRYINPAD13-03, YIN10-111, YIN10-014, YIN11-028 and YIN09-002 which cover an age span from after approximately 53,000 years ago (range of 59 – 47 ka) to approximately 1750 AD. As a group of sites, and in combination with the other multiple records cited in the reports from the Brief, we concur with Chisholm et al. (2014b: 243) that "These results indicate that the Solomon Hub project area is one of significant heritage values and high archaeological potential".

46. Chisholm et al. (2014b: 245) argue further that:

> *… evidence of Aboriginal occupation from the initial colonisation of the Australian continent is very fragile and is eroding and decaying or has already done so. Currently 20% of the rockshelters excavated by Terra Rosa CRM at the Solomon Hub, compared with 7% of the sites synthesised by Morse in 2009, have yielded evidence of occupation greater than 25,000 years old. The inferences of this statistic are; that the selection criteria for the excavation of rockshelters in the Solomon Hub project area are well defined and stringent,* ***the area possesses exceptional preservation of Pleistocene remains in rockshelters, or the area was more intensely occupied during this period of antiquity than other areas in the Hamersley Ranges****.* [emphasis ours].

47. We therefore conclude, on the basis of our study, training and experience as archaeologists, that the corpus of 24 excavated rockshelters, listed in Howard and Coutant (2016b: Table 4), six of which have produced evidence of occupation more than 25,000 years old, taken together, would constitute a cultural landscape that would be considered significant at the state and national levels. The area holds a representative sample of early occupation sites for the Pilbara, some of which appear to show occupation through the Last Glacial Maximum. Preliminary results from excavations at YIN11-028 (Curtis, McGalliard, McFarlane, Golden, Fuller and Chisholm

2014), TRYINPAD13-03 (Curtis, McGalliard, McFarlane, Golden, Willett and Chisholm 2013), YIN10-111 (Curtis, Willett and Chisholm 2013) and YIN09-002 (Rowland and Timms 2012b) provide support for this conclusion. On the basis of their mapped position on Maps 5(b) and 5(c), two of these sites (YIN11-028 and TRYINPAD13-03) have been destroyed. No further salvage work has been reported for YIN09-002 in the materials we have been briefed with, but from its mapped position in relation to disturbed areas (Overview Map 1 and E4), it appears to have been destroyed.

48. **d) Whether it is possible to place an economic value on the sites that have been so damaged or destroyed or are likely to have been damaged or destroyed by those mining activities.**

49. The tangible and intangible values accorded cultural sites do not easily transfer into economic value. We are aware that a range of different approaches to assessing the economic value of Indigenous heritage have been published on (e.g. SGS 2018; Gillespie and Bennett 2012), for example using non-market valuation methods for open cut mining impacts on Indigenous heritage sites.

50. We are not economists, however, and therefore do not make conclusions about economic value models developed by specialists in the area. We can, however, make observations as archaeologists who have worked with Aboriginal communities in research, preservation and mitigation modes.

51. A recent chapter in the 2023 *Routledge Handbook of Heritage Destruction* (edited by Zarandona, José Antonio González, et al.) has contributions from highly qualified archaeologists, and Pilbara specialists, Professor Lynley Wallis and ARC Future Fellow Dr Jillian Huntley (Huntley and Wallis 2023: 385) who note that:

> *The destruction of heritage is both psychologically and physiologically distressing for the peoples to whom it holds significance. Such distress arguably affects Aboriginal people on a deeper level owing to their strong connection to their land (Albrecht, 2005; Connor et al., 2008). One area*

> *where Aboriginal peoples have been experiencing distress from heritage destruction for decades, at both an individual site level, and also landscape scale, is the Pilbara region of northwest Western Australia… In some regions where resource extraction occurs this distress has been accumulating unabated for decades (Langton et al., 2012; Albrecht, 2019).*

52. They express the view that these impacts can occur before significance assessments are completed, with special reference to Juukan and two other cave complexes (Huntley and Wallis 2023: 388):

> *In the specific case of the Pilbara region, under the Western Australian Aboriginal Heritage Act 1972, assessments of significance are done prematurely, prior to detailed information…being gathered or presented to those responsible for making a decision about whether to grant consent for a site to be destroyed. Further, there is no mechanism for significance assessments to be updated as more information comes to light or for ministerial consents to be rescinded. In some instances, ministerial consents are granted decades in advance of any proposed impact, and by the time impact occurs, considerable new knowledge has come to light that would demonstrably alter the initial assessment of significance.*

53. At various stages of our careers, we have noted distress in Aboriginal people where heritage sites (such as ancient rockshelters or rock art sites of high significance) have been destroyed. We are not qualified to comment on what this economic value to the host communities might be.

54. An area we have experience in, however, is framing consultancy mitigation for sites that might come under future impact or which need a high level of investigation for informed management plans. One such recent example is the excavation of Yirra Rockshelter in Yinhawangka Country of the Hamersley Ranges. Excavated in the early 2000s and dated to 23,000 years of age, it was left *in situ* by Rio Tinto, despite having a s 18 permission (Veitch et al. 2005). After the Juukan destruction, Rio Tinto agreed to requests by the Traditional Owners for more detailed excavation at Yirra to better

understand the site and manage it, despite a compromised context. Collaborative work was costed for Yinhawangka Aboriginal Corporation to carry out the work for Rio Tinto by UWA and Archae-aus Pty Ltd. The resulting excavation resulted in cultural deposits of approximately 50,000 – 45,000 years old being dated by the University of Wollongong Lab, and as reported on at the Australian Archaeological Association Annual General Meeting 2022 and in a major piece by Walkley award-winning journalist Victoria Laurie in the Sydney Morning Herald in July 2023. A report was completed in April 2024. Additional OSL ages have been returned by the University of Wollongong from paired sediment samples taken at Yirra during the original excavation since then. These are currently being modelled (June 2024) in a draft paper being prepared for submission to a peer-reviewed journal in late 2024.

55. That complex multi-year, and interdisciplinary, exercise was costed at approximately $1M and, from our previous experience, is consistent with intensive and larger-scale excavations carried out in WA and the eastern states. Collating high quality data from individual sites, using other specialists in collaboration with the archaeologist, including in geomorphology, micromorphology, geochronology, artefact residues, anthracology and paleofauna provides a necessary basket of skills to accurately interrogate and describe such unique sites.

56. Detailed site investigations provide a significant archaeological and human record for the Aboriginal occupation of different parts of the Pilbara and the wider arid/semi-arid zone. The clear lesson from these investigations, as well as other Eastern States examples, is that mitigation excavation should use specialists in addition to archaeologists to characterise the processes by which sediments and artefacts come to be associated, and that dating methods need to be appropriate to the unique archaeology and matrix of the site.

57. It is not known what the cost of mitigation of the 285+ FMG salvaged places on the SHP has been to date. On the basis of our study, training and experience as archaeologists, we would estimate the monetary value of mitigating this heritage to be substantial.

58. Adding indirect costs, such as transfer and accommodation for native title holders, mine access, logistics, permitting, additional specialist services and presentation of excavation results in public, professional and peer-reviewed venues might see this cost rise significantly.

59. **e) The adequacy or otherwise of the methodology employed by FMG to minimise or avoid damaging or destroying those sites.**

60. The reports commissioned by FMG and appearing at Attachment 2 use a variety of methodologies to locate, document, create boundaries to demarcate the edges of sites, to either avoid these sites or to salvage them. These methods generally fall into three categories for sites:

    i. Site avoidance standard;

    ii. Site identification standard; and

    iii. Site salvage methodology.

61. These methods are defined by the FMG consultants, as outlined at section **(g)**, below.

62. Our review of the reports listed in Table 1 and our reading of the Overview Map 1 and 14 enlargement maps at Attachment 6 concludes that, apart from several large and small heritage exclusion zones (assumed to be based mainly on ethnographic criteria), the majority of archaeological sites that were recorded by the various teams have been subject to salvage. For example, Map 1 enlargements E1, E10, E11 and E14 show extant sites that have not been disturbed. The Maps show these were recorded by the Yindjibarndi Aboriginal Corporation between 2012 – 2014 and 2018. There appear to be a small number of archaeological sites which have been given a protective buffer zone and designated as a Heritage Restricted Zone. These include the burial at YIN10-004 (Map 1 E4 on the Overview Map at Attachment 6), YIN10-012 (Map1 E2), YIN10-014 and YIN10-111 (Map 1 E3), and YIN08-031, YIN11-015 and TRYINRS12-01 (Map 1 E5).

63. The maps at Attachment 6 show that some remaining sites have a modest curtilage. Buffer zones are used to protect sites from direct, as well as indirect impacts. They aim to minimize vibrations, dust, visitor access and fly-rock from detonations. YIN10-004 is at the centre of a Heritage Restricted Zone. However, two other sites also within the same HRZ are very close to the boundary and a third site appears to be a small remnant retained of a much larger and more extensive salvaged site. The YNAC burial site number 86 is marked on the boundary of the HRZ (Map 1 E4 and Map 5(e)). YIN 10-111 has a small Heritage Restricted Zone (about 30 m radius) but appears to lie under an access road (Map 1, E3 and Map 5(a)).

64. In best-practice scenarios sites are avoided and, if not, are described in detail in order to make reasoned decisions about mitigation (also referred to as salvage). This would include, for example, dating a stratified site such as a rockshelter through a test-pit and then making decisions about the final scale and stage of larger-scale mitigation salvage excavations. Some of these reports were provided as listed in Attachment 2, but the list is not complete. Some reports reviewed contained references to other or forthcoming salvage reports, which were not available. For example, Golden and Chisholm (2014: 8) state that salvage of TRYINPAD13-03 was completed in 2014 and will be reported on in a forthcoming salvage report. We have not been able to identify a salvage report for TRYINPAD13-03, although Howard and Coutant (2016b: Table 4) do list additional dates from the site. Chisholm et al (2014b: 143) report that, following further excavation at both TRYINSC13-02 and TRYINRS13-11, salvage of these sites is complete. Again we were not able to identify salvage reports in the list for these sites. Surface salvage of the surface artefact scatter YIN11-053 is reported in Curtis et al. (2015:41–52, and appendix 3), but it is stated that "the results of the excavation and dating of subsurface material are being finalised and will be supplied following the processing of the datable OSL sample at Griffith University" (p. 44). We have not identified this supplementary material in the list at Attachment 2.

65. The WA Aboriginal Heritage Act 1972 places a duty on consultants to report sites; the Registrar to keep a record of such places; and the (previous) Aboriginal Cultural

Material Committee (ACMC) to make judgments of site significance with reference to applications for consent under ss 16 and 18 and recommendations for Protected Area status under s 19(1). It is the ACMC that determines whether sites meet the criteria in s 5 and s 39. S 38(a) notes that the Register should include "all Aboriginal cultural material", while s 15 outlines the requirement to report sites. Dortch and Sapienza (2016) examined changes in site status during the period 2009–2015 and report mass deregistration of sites by the then Department of Aboriginal Affairs, particularly during the period 2012–2014. In the Discussion of surveys by Chisholm et al. (2014b: 234 ff.), from a total of 41 heritage places reported on during surveys undertaken between February 2013 to June 2014 Table 52 lists 28 places (or 68%) which were assessed by the consultants and subsequently determined by them unlikely to be sites under the WA Aboriginal Heritage Act and recorded as "non-site heritage places" or NSHPs. These included 12 rockshelters, including one with a walled structure (YIN14-015) and 11 artefact scatters with clearly identified assemblages (including YIN14-006, YIN14-007, YIN14-008, YIN14-009, YIN14-012, YIN14-013, YIN14-016). Table 53 of their report lists the 17 sites considered likely to be sites under the Act, including some sites previously assessed to site avoidance level. Appendix 7 (volumes 2 and 3) includes Heritage information Submission Forms (HISF) only for these 17 sites. The methodology employed means that only sites considered likely to meet the criteria in s 5 of the Act are reported to the Department through the HISF process, while other sites are only recorded internally on the FMG system as "non-site heritage places" (Chisholm et al. 2014b:80-84). Currently, FMG's GIS delineates these places as "Deemed not an archaeological site" and defines such a place as "A Heritage Place containing archaeological cultural material deemed not to meet section 5 of the AHA by ACMC **or qualified archaeologist** [emphasis ours]" (FMG 2020:18). We assume that "non-site heritage places" identified and assessed as such at the site avoidance stage may be reassessed at a later time, if further site identification surveys are conducted.

66. As a result of the selection process based on assessment by consultants described in

par. 65 and discussed further in pars 84 – 87, we believe some archaeological sites recorded by the FMG consultants may not have been submitted for assessment by the ACMC. Sites assessed by consultants as "non-site heritage places" may be considered for salvage, rather than creating protective curtilages for avoidance and management outside the compliance process, but this is unclear. We have made reasonable efforts to review publicly available media to assess how well the > 280 sites have been mitigated over the last decade and what new knowledge and insights this work has brought to understandings of the Aboriginal society, customs, behaviours, economy, and symbolic practices that existed in the SHP and which no longer exist. A considerable number of mitigation reports were written by the consultants, which make observations and conclusions about these past lifeways of contemporary values. Publication is required following such large-scale mitigation programs, as part of archaeological practice, though it is acknowledged that detailed site analyses and reporting is a lengthy process (see Codes of Ethics of the AAA, AACAI, SAA and EAA discussed in pars 96 – 99 below).

67. **f) The work Professor Veth and Professor Veth's team have recently undertaken at Bangkangarra as part of the Desert People Project and the results from that work as it applies to this Brief**

68. In July 2023 the Desert People team, in collaboration with Traditional Owners of the Yindjibarndi Ngurra Aboriginal Corporation, carried out a three-week excavation of the first study site; the Bangkangarra Rockshelter (full name Yamararra Ganyjingarringunha Rockshelter 2, or YG02) on the flanks of the gorge leading to Bangkangarra Spring (see Map 1, below).

69. The initial test-pits were productive, returning nearly 600 artefacts from excavation which ceased at over 1.6 metres below the contemporary ground level. The deposits were excavated in 2 cm excavation units, unless features such as hearths were located, and a considerable number of cultural materials surveyed in 3-dimensions using a Leica Total Station. Fine-grained sampling for AMS radiocarbon and single

aliquot sand grain Optically Stimulated Luminescence (OSL) dates were made throughout the main square. *In situ* dosimetry readings were obtained ('a' and 'b' samples) in an effort to assess natural background radiation levels in order to accurately calibrate the ages. The 14C samples from 2023 have been processed and finalised by Waikato Radiocarbon Laboratory and the ongoing OSL studies reported on by Dr Nathan Jankowski from the OSL Laboratory at the University of Wollongong (Annexure 5.1). Current estimates for first occupation of the site lie within a wide range of 45 ka – 30 ka. As outlined in Annexure 5.1, continued testing of the OSL signal from the quartz has revealed a number of characteristics that require further examination to ensure accurate age estimates are produced. At present, broad ranges of ages for the individual stratigraphic units are provided. A detailed OSL sampling and dosimetry program will continue at the site in 2024.

70. Local geomorphology is being investigated by A/Professor Timothy Cohen, ARC Future Fellow at the University of Wollongong from the Faculty of Science. Dr Cohen is also supervising a study of phytoliths (fossil particles of plant tissues) from the site, which have preserved through most levels. These may be used to describe major vegetation structure at the site. Micromorphology is being investigated by A/Professor Matthias Leopold, Head of School of Agriculture, Geography and Environment.

71. Yamararra Ganyjingarringunha (Rockshelter) 2 (YG02) is located at the base of a north-facing ironstone ridge within Ganyjingarringunha (Hamersley Gorge; Photo 1 and Map 1). The rockshelter is situated some 700 m east of the culturally significant permanent spring, Bangkangarra, within an east-west aligned side gorge from the main gorge. An ephemeral tributary creek runs through this area – feeding into Bangkangarra – from Kangeenarina Creek in the adjacent gorge system (Map 1, below).

72. YG02 is a long and shallow overhang located within an ironstone ridge. The rockshelter measures 18.5 m wide and 11.5 m high at the dripline and extends into the ridge for some 7.5 m. In collaboration with the Yindjibarndi Ngurra Aboriginal

Corporation (YNAC) and Yindjibarndi Traditional Owners, YG02 was excavated by the *Desert People* team in July 2023. Two 1m x 1m sample squares (SQs A1 and A2) were excavated in the eastern part of the chamber (Photos 2 and 3). SQ A1 was excavated to a depth of approximately 1.6 m below surface while SQ A2 was excavated to a depth of 0.41 m below surface. Neither sample square was excavated to bedrock and the excavations will be continued in August 2024. Archaeological material is expected in the unexcavated deposit in SQ A2 and may also continue at greater depth in the SQ A1 unexcavated deposit. Excavation proceeded via 2cm (and sometimes larger) excavation units (XUs). All excavated sediments were passed through 4mm and 2mm nested sieves. Archaeological materials found *in-situ* were plotted in 3D with a total station and taken in sample bags. This included stone artefacts, bone, shell, and charcoal. Sediment samples were taken for most XUs.

73. Excavation at YG02 revealed six stratigraphic units (SU; Figure 1 and

74. Table **2**). These SUs show some evidence for intra-stratum disturbance (e.g., rootlets and insect activity) but little evidence for inter-strata disturbance. Ongoing micromorphology by A/Prof Matthias Leopold will assess these site formation processes. Charcoal preservation was largely limited to SUs 1 and 2, particularly to Feature 1 which is a hearth feature that was uncovered in the eastern side of SQ A2. Feature 1 sits within SU2. Hearth features are typically associated with controlled burning events for cooking and processing resources in the past. Very little charcoal was noted below SU2 (no samples were taken *in-situ* below SU2). This limited the application of radiocarbon dating at YG02 as all datable organic matter was restricted to SUs 1 and 2. Two *in-situ* charcoal samples were selected for radiocarbon dating from the top and bottom of Feature 1. These were submitted to the Radiocarbon Dating Laboratory at the University of Waikato in New Zealand. The two radiocarbon samples returned dates of 203 ± 59 cal. BP (Wk-57270, calibrated with ShCal20) and 378 ± 47 cal. BP (Wk-57271, calibrated with ShCal20). (Annexure 5.2).

75. Since *in-situ* organic material is restricted to the upper SUs at YG02, optically stimulated luminescence (OSL) was used to date the quartz grains in sediment samples from greater depths in SQ A1. OSL dates the last time quartz grains were exposed to the sun. 16 paired OSL samples (32 in total) were taken under red light conditions at night (to prevent the quartz grains from being exposed to light) and submitted to the University of Wollongong for dating. The preliminary OSL report (Annexure 5.1) notes that only broad time periods are provided at this stage for the likely deposition of respective stratigraphic units. In stratigraphic order, the D_e and dose rate values for sample coming from stratigraphic unit (SU) 6 indicate that these are of considerable antiquity. This antiquity is evidenced by the higher D_e values obtained for these samples and the apparent onset of the quartz OSL signal saturation for these samples. It is estimated that these sediments would have started being deposited in the range of 45–30 thousand years (ka) ago. The D_e distributions for samples collected from the overlying SU5 show no evidence of significant mixing, save for the incorporation of a very minor population of low dose grains thought to

be associated with soil insect activity. These SU5 sediments are considered to have been deposited between approximately 30–20 ka ago. No samples were collected from SU4. The depositional ages for samples collected from SU3 are likely to fall between approximately 20–10 ka ago, and also show no signs of significant post-depositional mixing. The sediments of SU2, based upon the D_e distribution patterns for the associated OSL samples, have evidence for some mixing. These age ranges will likely shift with larger samples collected in 2024 to provide more reliable estimates of dose rate (both beta and gamma). Further testing will be conducted into the accuracy of the D_e value for all samples, specifically those coming from SU6 that show signs of OSL signal saturation.

Table 2. Stratigraphic units at YG02

SU	Description
1	Loose silty sediment with a large fraction of sub-angular and rounded gravels (1 - 5 cm in maximum dimension). High organic component including charcoal flecks, rootlets, and leaf litter.
2	Very loose, light brown silty sediment with few gravels but some moderate sized rocks (5 - 7 cm in maximum dimension). Rootlets are common with some cavities caused by degrading roots.
3	More compacted light brown - yellow sediment with minor gravel fraction. Evidence for some termite activity and some rootlets present.
4	Darker brown silty sediment with a large rock and gravel component. The rocks and gravels are compacted. The rocks have maximum dimensions up to 10 cm. Small rootlets present.
5	Similar to SU3 but much more compacted.
6	Large subangular rocks and gravel dominate this unit with relatively little sediment. The rocks and gravels are closely compacted. Some rocks are approximately 20 cm in maximum dimension.

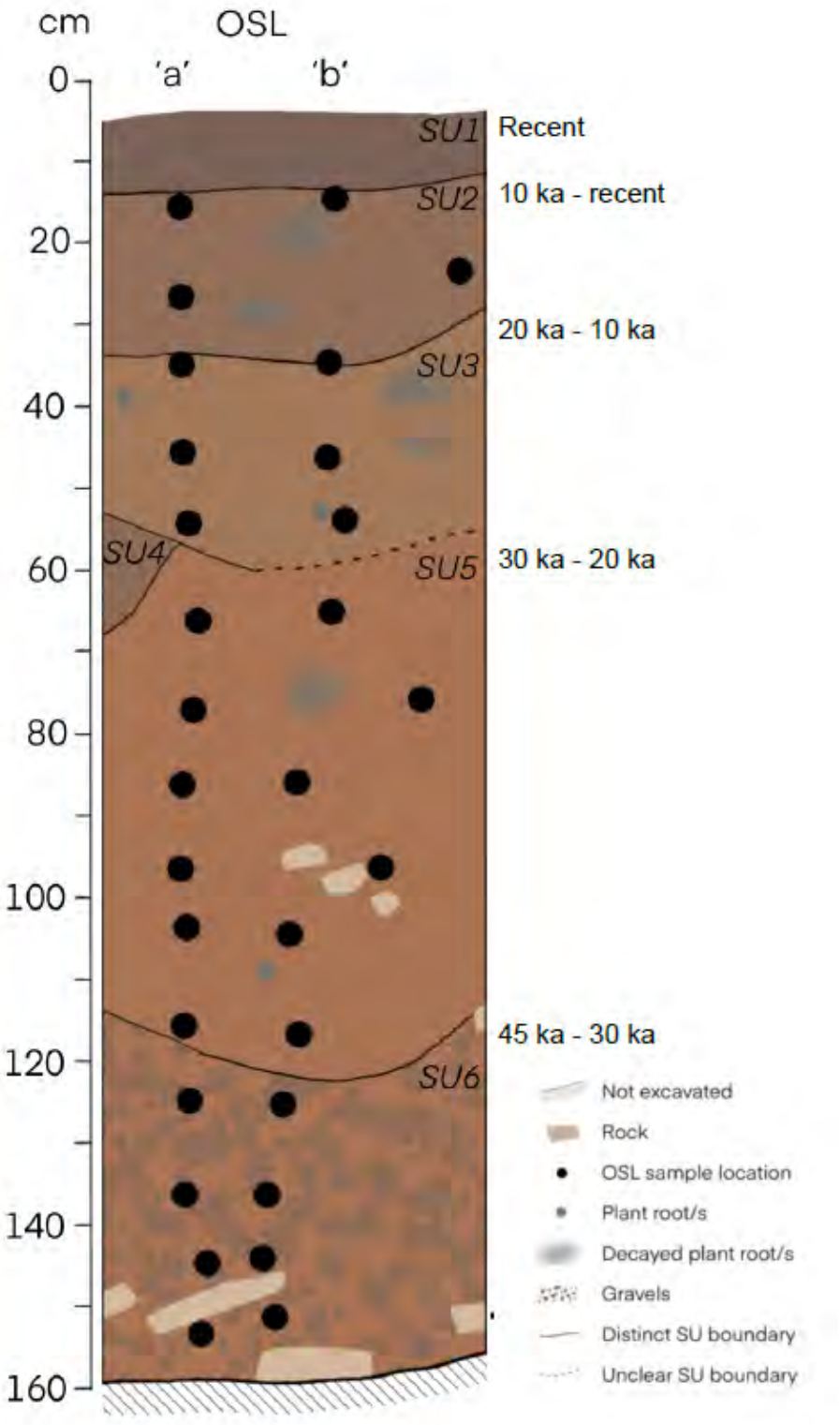


Figure 1. Stratigraphic section for the north wall in SQ A1 at YG02 showing OSL ages

76. A total of 596 flaked stone artefacts was recovered from the two 1m x 1m sample square excavations (SQs A1 and A2, Figure 2 below). A broken mudstone tool and a small quartz flake fragment, both recovered from 143 cm below the surface (SQ A1 XU 71), are the oldest artefacts discarded in the sequence within SU6 (45 – 30 ka). There is repeated artefact discard through the sequence, with three peaks: around 30 ka (SU6-SU5), during the Terminal Pleistocene (SU3-SU2) and during the last few hundred years (SU1). Most artefacts recovered from the site are made from a variety of mudstone (banded, brown, red and yellow, 77%) with a range of other materials represented in much smaller proportions, including quartz, chert, ironstone and chalcedony (see Figure 3 below). A single silcrete flake was recovered from SQ A1 XU23 (44.8 cm bs, SU3). The 274 stone artefacts recorded in detail (>20 mm in maximum dimension) represent all stages of the reduction sequence at YG02 and indicate on-site reduction (Table 3). Most artefacts are either complete or broken flakes (83.2%), while the presence of only nine cores or core fragments (mudstone n=5, ironstone n=1 and quartz n=3) indicates the removal of nodules from the site after on-site knapping. The range of tools discarded in the rockshelter throughout the sequence (n=29, 10.6%) includes both retouched and non-retouched implements made on mudstone (n=23) and chert (n=5). Microscopic use wear and residue analysis will be undertaken on the tools.

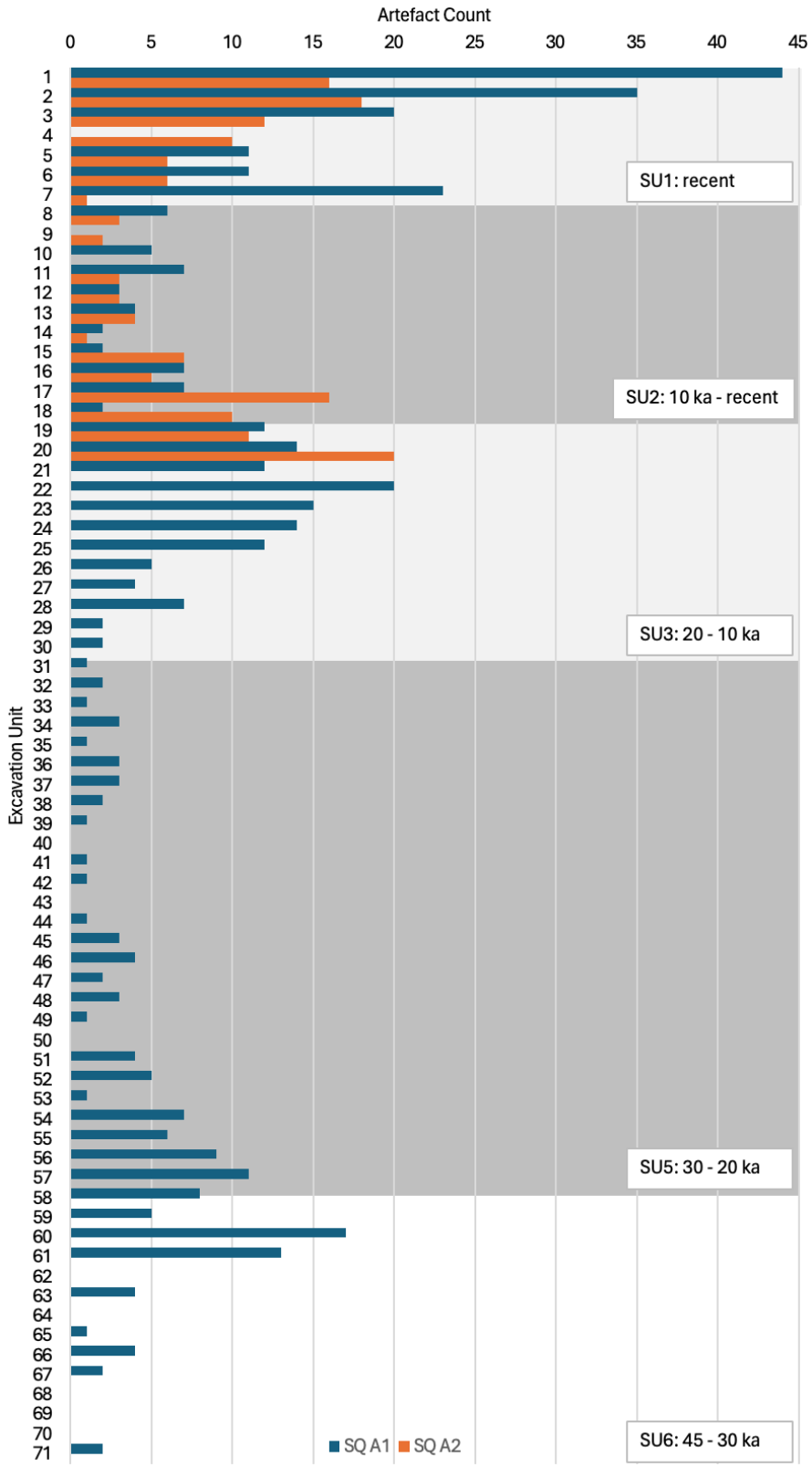


Figure 2. Flaked stone artefacts counts per excavation unit and SQ with stratigraphic units and approximate age ranges at YG02 (n=596).

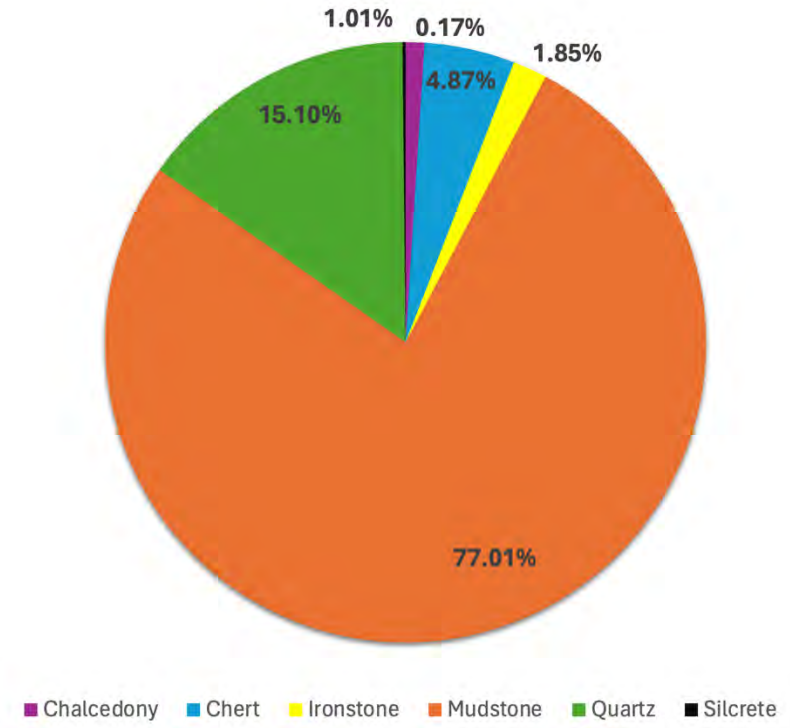


Figure 3. Flaked stone artefacts percentages per raw material at YG02 (n=596).

Table 3. Flaked stone artefact types at YG02 (>20 mm artefacts only, n=274).

Row Labels	Count	Percentage
Angular Fragment	7	2.6
Broken Flake	101	36.9
Complete Flake	127	46.4
Core	6	2.2
Core Fragment	3	1.1
Tool	29	10.6
Manuport	1	0.4

Photo 1. View southwest towards YG02

Photo 2. Traditional Owner John Woodley excavating SQ A2 at YG02

Map 1. Map showing the location of Yamararra Ganyjingarringunha (Rockshelter)

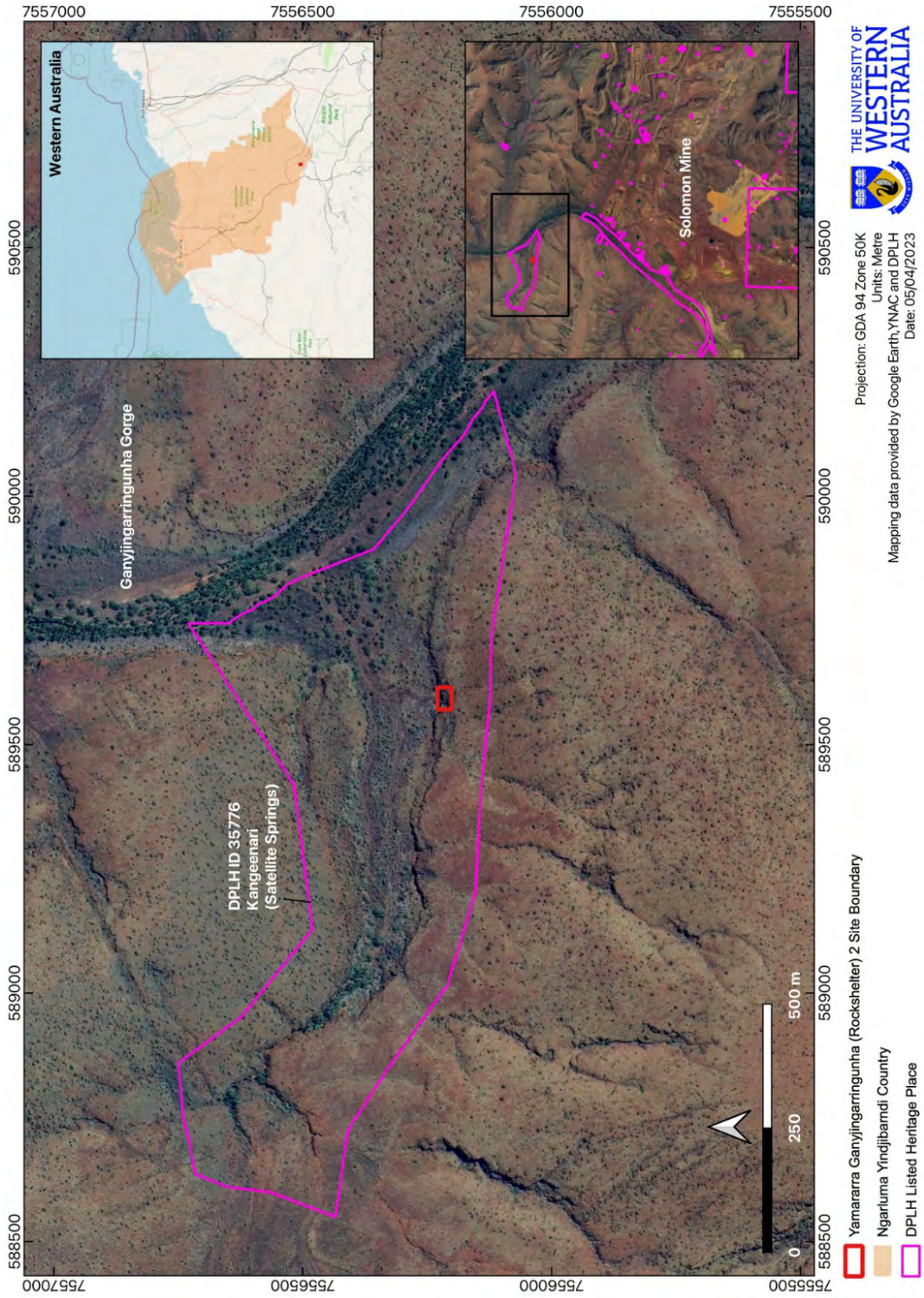


Photo 3. A/Professor Matthias Leopold taking micromorphology peels at Sq A1 YG02

77. In combination with the radiocarbon dates, the preliminary OSL age estimates indicate the site was first occupied before the LGM (Last Glacial Maximum). It has been noted that additional OSL samples and dosimetry readings are needed to improve the accuracy of the D_e value determination for all samples, and specifically those coming from SU6 that show signs of OSL signal saturation.

78. There is archaeological evidence for repeated human occupation throughout the excavated deposit at YG02. Three baler shell (*Melo amphora*) fragments were recovered in-situ from SUs 1 and 2 (two in XU4 and one in XU8). *Melo amphora* is a marine shell species and the presence of these at YG02 demonstrates a connection with the coast which is, at a minimum, located 170km north of YG02. As archaeologists we are aware that Baler shell served primarily as water carriers. They are transported from the coast, and here are probably dated to the last 500 years, given their association with dated charcoal in the site.

79. In short, it is the opinion of Professor Veth that the site is likely to have been occupied before, during and after the Last Glacial Maximum. The excavation had not reached bedrock and will continue in 2024, when further OSL ages and studies of site formation will be carried out. Dating of the charcoal (originating from small burnt branches near the top of the site), where the marine baler shell traded in the from the coast occurs, covers an age range of approximately 1605 - 1783 A.D. There is likely occupation of the site during the Last Glacial Maximum when the conditions are generally thought to be colder (-6 degrees C) and less vegetated (Cadd et al. 2021). Repeated use of such rockshelters so close to a permanent spring, has been predicted in various desert models since the 1980s, however it has taken a new generation of fieldwork to test and validate this (see Cropper and Law 2018; Veth et al. 2022).

80. The first stage of artefact identification from the assemblages in both the 4mm and 2mm sieve fractions has been conducted; sediment samples are currently being analysed (for magnetic susceptibility, pXRF chemistry and elements within and outside the rockshelter; [Annexure 5.11]). Further OSL samples and dosimetry readings will be recovered from continuing excavation in 2024. We will expand the 2

x 1m test-pits in 2024 to provide a more robust sample of the variability in the occupation of the site, to refine dating samples, and to control for site formation processes which are seldom gleaned from initial test-pits.

81. We note that site reconstructions are difficult to generate from single, small pits. They provide a window into the history of the site. They require assessment, analysis, return and critique of dates and cultural associations, and then follow up work to corroborate initial patterns and impressions.

82. **g) After examining FMG's s 18 survey materials provided for this Brief and any data collected by FMG in the reports at Attachment 2 (see specifically *Report on an Archaeological Site Avoidance Heritage Survey, Site Identification Heritage Assessment and Archaeological Salvage of HWIs YIN_225, YIN_245 and YIN_248 at the Solomon Project conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited* dated November 2016 by Howard and Coutant), please describe what is in your opinion the best practice methodology for:**

(i) a site avoidance heritage survey;

(ii) a site identification heritage assessment;

(iii) archaeological salvage. Does it include filling the excavated area?;

(iv) field assessment procedures including measuring and protecting the value of heritage places or objects in the SHP; and

(v) archaeological "significance" assessment under s 39. Is "significance" evaluated by the representativeness of the site, the research potential or another measurement(s)?

83. Howard and Coutant (2016b: 7) note that:

> *The objective of site avoidance heritage surveys is to identify and record Brief details of heritage places within the survey areas that may constitute*

> *Aboriginal sites as defined under s 5 of the Act, to negotiate deviations around such places where possible, and to provide FMG with heritage management considerations for heritage values that would otherwise be impacted by the proposed development. As such, the site avoidance method of heritage assessment is designed to document Aboriginal heritage values to a standard sufficient to provide a preliminary understanding of the characteristics of heritage places and to allow the proponent to proceed with works that will not impact those place*s. *This includes accurate delineation of the spatial extent of heritage places using handheld global positioning systems (GPSs), justification of the recorded boundaries, and a Brief description of the heritage values of the places, sufficient to convey the potential importance and significance of the place. However, site avoidance recording is insufficient for a full significance assessment to be made under s 39 for consideration by the Aboriginal Cultural Materials Committee (ACMC).*

84. It is further outlined by Howard and Coutant (2016b: 7):

> *The objective of site identification assessments is to provide FMG with sufficient detail to inform the Department of Aboriginal Affairs (DAA) and ACMC's decision on the significance of Aboriginal heritage values within a project footprint and any future management of those values during the development of the area…Additionally, site identification assessment includes ascertaining the degree to which the proposed development is likely to impact heritage places and objects, and provides the proponent with relevant, informed heritage management recommendations.*

85. In terms of compliance with the *Aboriginal Heritage Act 1972* (WA), this two-stage process provides a preliminary identification of places that may be protected under s 5 and then collects additional information to enable the ACMC to evaluate the significance of such places, usually within the context of a proponent's application under s 18 to use land in such a way as to result in a breach of s 17. In s 18 (2) of the

Act, the role of the ACMC includes determining 'whether there is any site on the land', as well as evaluating the significance of sites and recommending any conditions that should be included if the Minister gives consent to use the land. Conditions for archaeological sites typically may include salvage if the site will be completely destroyed.

86. Terra Rosa CRM have been the primary consultants for the SHP since 2012. Site recording methods for site avoidance are set out in section 2.3 Field assessment procedure and Appendix 2 of Howard and Coutant (2016a). Site recording and assessment methods for both site avoidance and site identification are set out in volume 1 of Chisholm et al. (2014b). We are aware, due to our study training and experience, that in this methodology, both site avoidance and site identification involve the identification of places to which s 5 of the Act might apply, which are then recorded as 'potential sites'. Places which the consultants do not consider will meet the criteria for sites under s 5 are recorded as "other heritage places" (OHPs) or Non Site Heritage Places (NSHPs). Heritage Information Site Forms (HISFs) for submission to the Department are **not** completed for places not considered by the consultants to meet the criteria for sites under s 5.

87. The process used by Terra Rosa CRM for assessing all heritage places in terms of whether they are likely to meet the criteria under s 5 of the Act is set out in Figure 4. The assessment categories at the base of the flow chart correspond broadly to sections of the HISF intended by the Department to provide a basis for assessing the importance and significance of Aboriginal heritage places. For artefact scatters, such sites were considered to be background archaeological materials (BAM) and recorded as isolated artefacts unless:

> *… one or more of the following conditions existed:*
>
> - *The heritage place displayed clear, purposive activity;*
> - *The heritage place and its objects are considered to be relatively intact and in sufficient condition for an assessment of their importance and*

significance to be made;

- *The material was identified in association with other heritage place elements; and*
- *The Traditional Owners requested that the material be recorded as a heritage place.* (Howard and Coutant 2016a:100)

"Clear, purposive activity" is not defined but we assume it refers to distinct activities that had been carried out at the site. For artefact scatters, the criteria of density and intactness are assessed by means of a matrix (Chisholm et al. 2014b:87) in which these attributes are assigned values on a five-point scale from very low to very high.

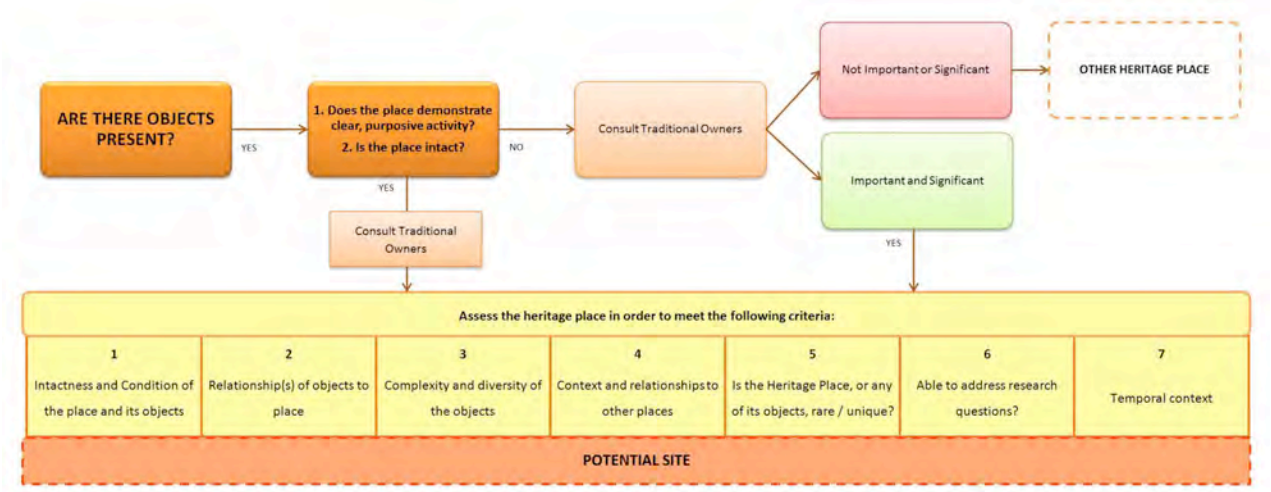


Figure 4. Heritage place assessment process (Howard and Coutant 2016a:99, Figure 3)

88. The assessment of rockshelters follows a slightly different process. Archaeological deposits in rockshelter sites offer important opportunities to recover cultural material in a well-controlled temporal framework and thus have high research potential. However, cultural material in rockshelters may not be visible on the surface and therefore it is important to assess whether sub-surface cultural material is likely to be present. Rockshelters with accumulated deposit but no surface material are termed "Potential Archaeological Deposits" or PADs. The only certain way of determining whether these are sites or not is by test-pitting. However, probing in a number of locations is commonly used to make a preliminary assessment of whether

there is likely to be an excavatable deposit. In the case of Terra Rosa CRM's assessment process, the criteria to determine that a rockshelter is a PAD include proximity to other heritage places and the possession of "other heritage values" as well as deposit >15cm deep (**Figure 5**). In practice, additional criteria of "flat, well-preserved deposit, a lack of disturbance by fauna and other taphonomic processes" are also applied (Howard and Coutant 2016:103). We note that data presented by Chisholm et al. (2014b: 246, Figure 7) suggest that probing is not a reliable predictor of depth of deposit. As noted above (par. 41), the importance and excavation potential of YIN11-028 could not be accurately determined by probing alone (Chisholm 2014a:63). Reliance on probing at some locations, and the requirement for proximity to other heritage place elements, mean that some archaeological sites may not have been test-pitted. In our opinion, based on our study, training and experience as archaeologists, the recovery of datable rockshelter deposits in the SHP is therefore likely to be under- rather than over-represented.

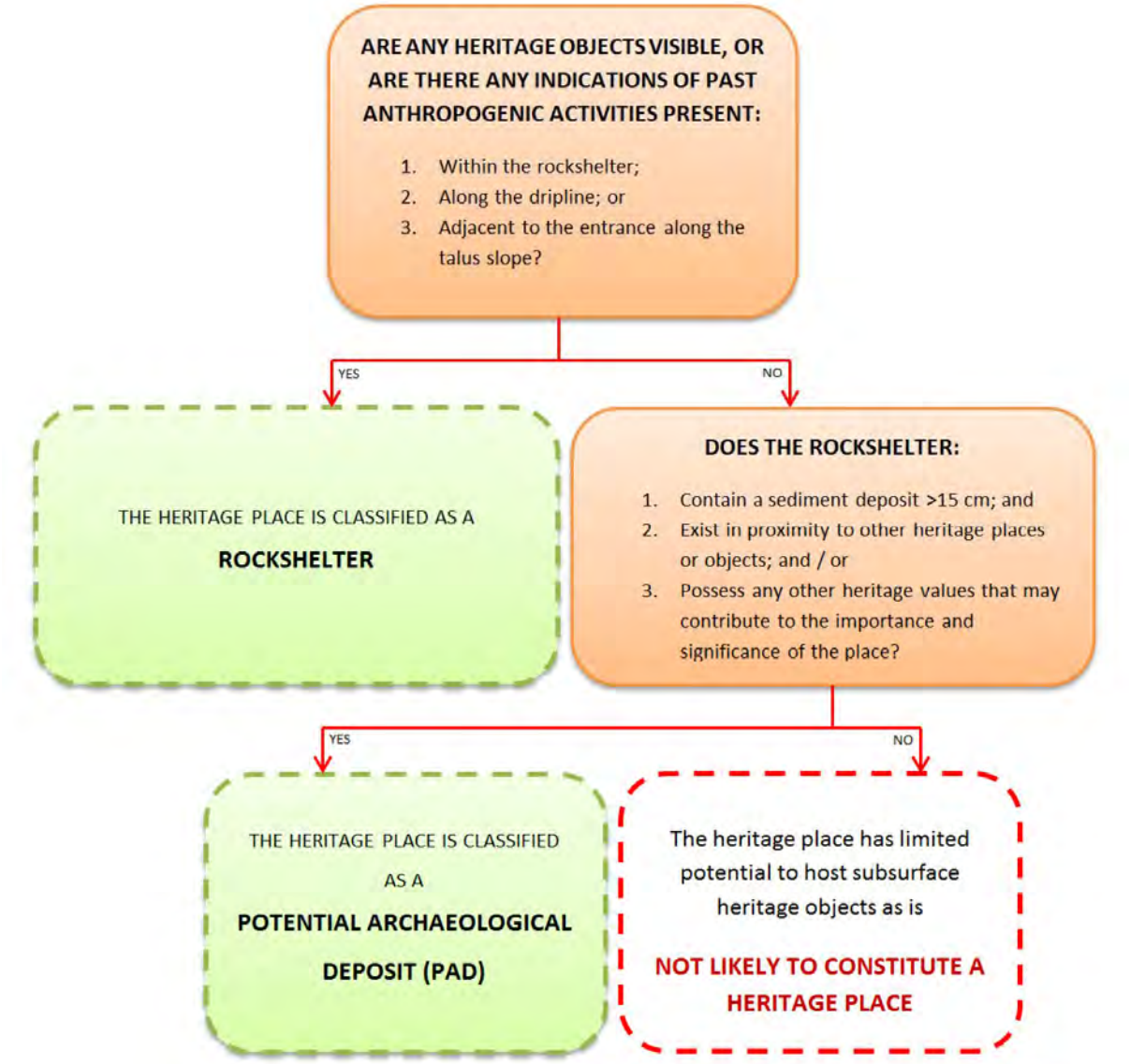


Figure 5. Rockshelter and PAD assessment process (Howard and Coutant 2016a:102, Figure 4)

89. We will comment on each explicit statement of practice and the degree to which this represents best practice methodology:

(i) In our opinion the best practice methodology for site avoidance heritage survey is:

a) Establish a heritage agreement with the Traditional Owner Corporation and land-user as to the level of site recording, degree of (non) disclosure

of specific assemblage content, mode of identifying a boundary and curtilage to manage both direct and indirect impacts, and use of appropriate signage in the field;

b) The nature and details of site content are generally not disclosed for justification of site boundaries, as these are covered by a heritage agreement (as above), good faith between the parties, and is not normally considered part of the case for future sites access/impact. Begun early in the 1970's in the land council areas of the Northern Territory and South Australia initially for anthropological sites, the principles can work well for archaeological sites where there is some latitude in project design; and

c) In our view the site criteria do not have to meet s 5 of the AHA; indeed, these could not be established without a detailed site significance assessment which, as Howard and Coutant (2016b:7) note, happens at a later stage.

(ii) In our opinion the best practice methodology for *site identification* assessments is:

a) With archaeological sites, to document both the surface, and likely subsurface, expression and extent of the site with reference to i) site formation processes [e.g. is the site being buried or eroded], ii) surface visibility [percentage of surface actually visible], iii) dominant physical factors present [e.g. water movement, wind or *in-situ* weathering], iv) integrity of the assemblages [notes on obvious preserved activity areas or size-sorting/absence of certain types of artefacts], and v) with rockshelters and surface sites with potential archaeological deposit, indicators of potential archaeological deposit and preservation of organic component [such as charcoal, bone and botanics];

b) Deploy and measure a suite of relevant assemblage and artefact attributes so that the contents, variability, age, condition and behavioural

content of a site may be accurately and objectively determined (see j, below). These should be widely used and come from authoritative benchmarked sources (e.g., peer-reviewed practice manuals, Field Guides and specialist manuals);

c) The cultural and social significance of archaeological sites should be determined (usually with an anthropologist), where this exists, and how such significance, in combination with archaeological attributes, may be relevant to s 5 and s 39 of the AHA; and

d) Assessment against Burra Charter process (ideal but not mandated under the AHA), namely i) understand the place – its history, use and associations, ii) assess values using relevant criteria and a statement of significance against these, iii) identify all factors and issues (obligations arising from significance, future needs, resources, opportunities and constraints, and condition), iv) develop a policy and prepare a (cultural heritage) management plan, v) Implement the management plan, and vi) monitor the results and review the plan.

e) We are in agreement with Howard and Coutant (2016b: 7), who note that "site identification assessment includes ascertaining the degree to which the proposed development is likely to impact heritage places and objects, and provides the proponent with relevant, informed heritage management recommendations".

(iii) In our opinion the best practice methodology for *salvage methodology* is:

a) Producing meaningful analysis and archaeological/ behavioural narratives from material which is collected in mitigation mode. Archaeological ethics require that any site impact/destruction, including excavation, must report on the site to appropriate scientific standards; use replicable recording and analytical techniques; produce these reports in both cultural heritage and scientific formats for peer-review and

posterity; and make these data available to both Traditional Owners and other archaeologists, as deemed culturally appropriate.

b) Salvaged materials must be adequately labelled, have safe custody of possession documentation, and be stored to curatorial standards acceptable to conservation codes set down by state and federal authorities.

c) Stratified sites that are excavated in rockshelters and in open contexts for salvage/mitigation will come from often deep and culturally significant cultural contexts much of which is not removed and still holds value. Even when an excavation has occurred for a s 18 permit it is not best practice to leave such an excavation open (on the assumption the place will be destroyed). As in the case of Yirra discussed at par. 54, above, and YIN10-111 in the SHP, the granting of a s 18 does not guarantee the immediate use of the land and destruction of the site. Indeed, new values can be established (such as at Juukan), and thus a conservation ethos should still apply.

(iv) field assessment procedures including measuring and protecting the value of heritage places or objects in the SHP.

There generally appears to have been a systematic and high number of archaeological surveys to locate archaeological sites and places in the SHP and repeated efforts to salvage physical objects (for example, as reported on in Howard and Coutant 2016b). The ultimate aim of "*protecting the value of heritage places or objects in the SHP*" may not have been achieved in all cases. We note some issues for consideration:

1) The artefact analysis methodology is outlined at section 2.5. It notes that artefact attributes are collected and then subjected to statistical analysis in order to assess the significance of the place in both a local and regional framework (Howard and Coutant 2016b: 9). Without links between

descriptive statistics to specific archaeological, behavioural or technological questions (e.g. group mobility patterns) it is difficult for us to assess archaeological significance. Exceptions include the residue analyses carried out on a large number of artefacts from Kangeenarina Creek (Kononenko 2012).

2) Table 4 (Howard and Coutant 2016b) lists at least four archaeological rockshelter sites which, in 2016, would have represented some of the oldest sites known in the Pilbara and indeed the entire arid zone of Australia. This information would have been of public and research interest and informed other mitigation and significance assessments subsequently conducted in the wider Pilbara if publicly known. It is not clear why such significant results were not presented on or published.

3) At section 3.2.8 (Howard and Coutant 2016b) it is noted that specific and general questions will help determine the importance and significance of a place. There are six main questions asked with 16 auxiliary questions. In our opinion these are relevant and useful in assessing significance. However, the questions are not clearly or explicitly linked to the broader Pilbara archaeological context and research agenda, including key references then available (e.g. Brown 1987, Marwick 2009, Morse 2009, Morse, Cameron and Reynen 2014, Bird and Rhoads 2015, Law et al. 2010, Slack et al. 2009). We acknowledge that the research plan developed for inclusion in the 2012 application for a "blanket" s 16 application does include a more comprehensive review of the archaeology of the Pilbara, as then understood (Chisholm, Smith and Miniken 2012).

(v) Archaeological "significance" assessment under s 39. Is "significance" evaluated by the representativeness of the site, the research potential, or another measurement(s)?

90. The then Department of Aboriginal Affairs introduced a new site form (Heritage

Information Submission Form, or HISF) in 2012. This form attempts to provide a formal structure for assessing sites in relation to s 5 and s 39 of the Act. Reports by the consultants after this date conform closely to these requirements of the HISF. This requires specific statements addressing the criteria in s 5 and s 39. However, the Department provides no clear guidelines to define "archaeological interest". Consultants' reports commonly provide a regional overview of the environment and local archaeology and articulate relevant research questions to contextualise assessment of archaeological significance (e.g. Howard and Coutant 2016b:13-22). Assessment of archaeological significance then commonly refers to characteristics relating to the regional archaeological record, such as representativeness and rarity, condition and features, as well as research potential (e.g. Ryan, Pentz and Raines 2022: 11-47). Some reports include attempts to quantify these aspects of archaeological significance (e.g. Rowland and Timms 2012b:15-19). Assessment of significance can be difficult, especially where the regional archaeological record is relatively poorly known and understood. However, as noted previously, the Burra Charter (2013) provides practitioners with a reliable framework for assessing significance that can be applied to the assessment of archaeological significance under s 39 (2c).

91. The reports at Attachment 2, where they are explicit about archaeological significance, refer to representativeness, research potential (e.g., ability to address outstanding research questions) and significance to Traditional Owners. The more recent reports (since 2012) tend to address these issues explicitly in the HISF rather than the text of the report. For example, the site rockshelter YIN10-101 HIS Form (Howard and Coutant 2016b) explicitly states under Section 39 (2):

> *YIN10-101 is important and significant under s 39(2a) and s 39(2b) of the Act as the place of meaning and worth to the Yindjibarndi Traditional Owners. The place and the objects contained within it provide physical evidence of where their ancestors stayed and undertook traditional cultural practices, including stone tool manufacture, wooden object production, and hunting.*

The Yindjibarndi Traditional Owners stated that the heritage place was a temporary camp where past Aboriginal people stopped while hunting and foraging in the area. The assemblage identified within this place supports this interpretation.

92. The Heritage Information Site Form includes information about the significance of YIN10-101 under s 39 (2) and suggests that the site is a good candidate for excavation. Thus, we consider YIN10-101 should also be explicitly assessed as significant under s 39(2c).

93. Significance under the WA Aboriginal Heritage Act is defined in s 39 (2) as:

    (a) any existing use or significance attributed under relevant Aboriginal custom;

    (b) any former or reputed use or significance which may be attributed upon the basis of tradition, historical association, or Aboriginal sentiment;

    (c) any potential anthropological, archaeological or ethnographical interest; and

    (d) aesthetic values.

94. S 39 does not explicitly address the representativeness of an archaeological site or its research potential. However, s 39 (3) explicitly notes that associated sacred beliefs, and ritual or ceremonial usage, should be the primary considerations in assessing importance.

95. **h) Whether it is best practice for compliance reports to be provided once sites have been excavated and/or destroyed.**

96. There is a well-established set of professional codes and guidelines, in Australia and internationally, that make it explicit that once sites have been excavated and/or destroyed under permits a) compliance reports should be completed in a timely fashion; and b) further reports or publications should be produced on the contents of these sites for the use of other heritage professionals and the wider public.

97. For example, The Code of Ethics of the Australian Archaeological Association notes

at:

Section 4 Principles Relating to Conduct, that:

4. 4.2 Members will disseminate the results of their work as widely as possible using plain language where appropriate https://australian archaeological association. com.au/governance/code-of-ethics/

98. The Code of Ethics of the Australian Association of Consulting Archaeologists notes:

Under the heading 'Duty to the Public', that:

2.1 A member will take a responsible attitude to the archaeological resource base and to the best of her/his understanding ensure that this, as well as information derived from it, are used wisely and in the best interests of the public https://www.aacai.com.au/about-aacai/code-of-ethics/

99. The Society for American Archaeology has nine Principles of Archaeological Ethics, noting:

Principle 6: Public Reporting and Publication

Within a reasonable time, the knowledge archaeologists gain from investigation of the archaeological record must be presented in accessible form (through publication or other means) to as wide a range of interested publics as possible. The documents and materials on which publication and other forms of public reporting are based should be deposited in a suitable place for permanent safekeeping. An interest in preserving and protecting in situ archaeological sites must be taken into account when publishing and distributing information about their nature and location.

https://www.saa.org/career-practice/ethics-in-professional-archaeology

100. The European Association of Archaeologists notes under the EAA Code of Practice

that:

> *1b (x) Archaeologists have the duty to disseminate the results of their activities, for example through initiatives aimed at engaging the wider public.* EAA Codes (e-a-a.org)

101. **i) I draw your attention to some sites that have been destroyed or salvaged as part of the s 18 process. For example, the Court was taken to sites on 14 August 2023 where FMG undertook a salvage operation of some artifacts adjacent to Ganjingarringunha *wundu* (styled YIN11-002 and YIN11-004), an excavation of an extant cave (styled YIN10-111) and an extant walled niche (YIN10-110). Both the extant cave and walled niche were located under an access road. The Court was also taken to a *thalu* site which was submerged within the tailing dam storage facility (YIN10-095), and a location at which skeletal remains were salvaged (YIN10-004) (see *Section 16 Report on Archaeological Assessments at Aboriginal Heritage Sites YIN08-031, YIN10-003, YIN10-021, YIN10-087 and YIN10-107 within the Firetail and Tailings Locations of the Solomon Mine and Infrastructure Area, Western Australia* dated 2 December 2011 by Alpha Archaeology Pty Ltd in Attachment 2, report 3). There are no compliance reports in evidence for many sites that were identified to be destroyed or salvaged so YNAC does not know whether sites have been destroyed or not.**

102. Under the section titled Archaeological Description (Alpha 2011:38; see also Timms and Rowland 2012:606-616), YIN10-004 is described as a burial complex with two walled niches near a rockshelter. Walled niche 1 is said to be the place "*containing the human skeletal remains*" but then in the same paragraph notes three small rocks sealing the burial "*are no longer in situ, as the retrieval of the bones would have required their removal from the cavity*" and, again in the same paragraph observes " *Preliminary visual identification of the skeletal remains observed a possible ulna and radius, a small unidentifiable bone and a possible tooth and mandible*". These bone elements appear to have been burned and snapped (and are consistent with a

secondary burial). The second niche still has rocks in situ and "*It is not known if this niche contains archaeological deposits*". In the s 16 application report, it is concluded that YIN10-004 "*does possess a high level of significance both in local and regional terms*" and that the potential for concealed deposits/or cultural materials increases the importance of the site. Alpha Archaeology (2011: 39-40) recommends that the human remains are removed from the niche to analyse and record them by a senior archaeologist experienced in human remains. Dating of skeletal remains is proposed by Uranium-series dating; options of "laser track dating" or "laser drilling dating". However, a revised version of the s 16 application report notes that:

> It is important to note that one (1) YIN10-004; of the nine sites noted in the above-mentioned report has been removed from this Section 16 report as its content of Aboriginal burial remains is problematic for processing under the s 16 process and would slow the processing of the other listed sites listed within this report. (Yit 2011: 15)

103. It is noted in Alpha (2011:37) at Attachment 2 [report 3] for YIN10-004 "that the archaeological integrity of the site had been compromised by the removal of the human remains and the introduction of foreign materials into the site extent, prior to a full archaeological recording".

104. YIN10-004 (Registered site ID 33336) is currently within a Heritage Restriction Zone, which also encompasses three other sites (Map 1, E4). There do not appear to be any further compliance reports cited or available for the survey or mitigation of YIN10-004 and we assume that the site is extant within the HRZ. We note that a Yindjibarndi burial site (86) is also marked at this location, mapped at the edge of the HRZ. It is possible that this is the same site, but we have not sighted any documentation as to whether this is the case. We note that initial site avoidance surveys did not identify the presence of a burial at YIN10-004 (Tickle 2010b; Veritas 2011).

105. YIN10-111 is an extant cave which has returned occupation dates from approximately 35,000 years ago. In Chisholm et al. (2014b: Figure 7) the rockshelter is shown as having had a maximum excavation depth of 144 cm below surface with

the oldest date recovered of 35,000 ± 4000 BP. This is a significant-aged rockshelter in the Pilbara context. Both this rockshelter and associated walled niche (YIN10-110) are noted to be located under an access road

106. YIN10-111 was initially test-pitted by Alpha Archaeology and the results reported in Rowland and Timms (2012b: 90-101). Alpha Archaeology reported a substantial depth of cultural material (86 cm), however a lack of dateable material meant that they only obtained two dates from near the top of the deposit (one modern and the second just over 1000 years old). As a result, Alpha reassessed the archaeological significance of YIN10-111 as "low" and recommended no further excavation was required to assess the site for a s 18 application. However, Terra Rosa CRM applied for a new s 16 permit and conducted further excavation, reported in Curtis, Willett and Chisholm (2013, volume 4 – report 32 in Attachment 2). It is assumed the objective was to obtain OSL dates, given the depth of deposit and the sparseness of material that could be dated by radiocarbon (Curtis, Willett and Chisholm 2013:68). Two new test pits were excavated in this second program. Four OSL samples were taken from TP1. These are in stratigraphic order (Curtis, Willett and Chisholm 2013: Table 9). The OSL determination for spit 25, which is associated with the lowest artefact, was 35,000±4000 years ago. As we have noted above (par. 47), we agree with the excavators that at the time "… the dating results returned from YIN10-111 reflect some of the oldest known occupation within the Pilbara…" (Curtis, Willett and Chisholm 2013:67). Some additional dates are also listed for YIN10-111 in Howard and Coutant (2016b: Table 4), including an even older OSL age of 48,000 ± 4000 years ago. However, we have not located any additional reports discussing these in more detail. This age falls within the earliest range currently accepted for Pilbara occupation and indeed the Australian continent with only one site, Madjedbebe in Kakadu, argued to be older at c. 65 ka (Clarkson et al. 2022; Veth 2017; Veth et al. 2022).

107. The excavators recommended that, if FMG applies for s 18 consent to use the land further mitigation excavations should be undertaken prior to any land disturbance.

Currently, YIN10-111 is within a small Heritage Restriction Zone and is underneath an access road and close to other infrastructure (Attachment 6, Map 1 E3 and Map 5(a)). YIN10-111 is reasonably assessed as a significant cultural heritage site under an access road, where indirect impacts such as vibration, dust and potential roof fall would have to be managed. Although we are aware that FMG has an overarching policy for managing Aboriginal heritage sites (FMG 2020), we do not have any information about FMG's internal processes for managing these sites or whether cultural heritage management plans exist for individual sites assessed as highly significant, like YIN10-111.

108. It is noted the *thalu* site (YIN10-095) is submerged within the tailing dam storage facility. YIN10-095 is a Registered site (ID 30312) with place type described as 'Sub surface cultural material, Ritual / Ceremonial and Rockshelter'. YIN10-095 was recorded to site identification level in Rowland and Timms (2012:686-695) and this information was also included in a s 16 application. The site is described as a large stone cairn, forming a linear arrangement abutting the rear of a small rockshelter. The archaeologists considered the site as unusual and thus likely to have high significance, as well as the potential for archaeological deposits and/ or other cultural material. WYAC elders also considered that there could be a burial or a cache of other cultural material (Alpha Archaeology 2011: 56-65).

109. Terra Rosa CRM later re-assessed YIN10-095 as a men's *thalu* site and investigated beneath the stone arrangement with a camera. Following ministerial consent (34-27088), YIN10-095 was salvaged in 2014 (Curtis, McGalliard, McFarlane, Golden, Fuller and Chisholm 2014:180-188). This involved "removal" of the *thalu* by a senior *maban* man. Then the stone arrangement was deconstructed by two male archaeologists to investigate its structure and geology and any subsurface material. No deposit suitable for excavation was identified.

110. Sites YIN11-002 and YIN11-004, adjacent to *Ganjingarringunha wundu,* belong to a complex of 17 surface artefact sites along Kangeenarina Creek. These 17 sites occur in a band 2 km long and 250 m wide to the east of the HRZ (HRZ-0017) along this

section of the creek (see Map 1, E2 and Figure 6).

111. Reporting of the recording and salvage of these sites is found in several reports, including initial site avoidance recording, the site identification stage for s 18 application and salvage. The most detailed information is provided in the salvage reports by Alpha Archaeology (Rowland, Timms and Vrbič 2012, Timms, Rowland and Vrbič 2012, Timms, Stradwick and Vrbič 2012). Ethnographic consultation for some of these sites is reported in Gallagher (2011) and Goode and Gifford (2011). Salvage methods are described in several reports (e.g. Rowland, Timms and Vrbič 2012:27-28). Small sites (<100 artefacts) were salvaged in their entirety by collection of individual artefacts. Large sites were sampled and artefacts collected by systematic sample squares, with the aim of salvaging at least 10% of site contents.

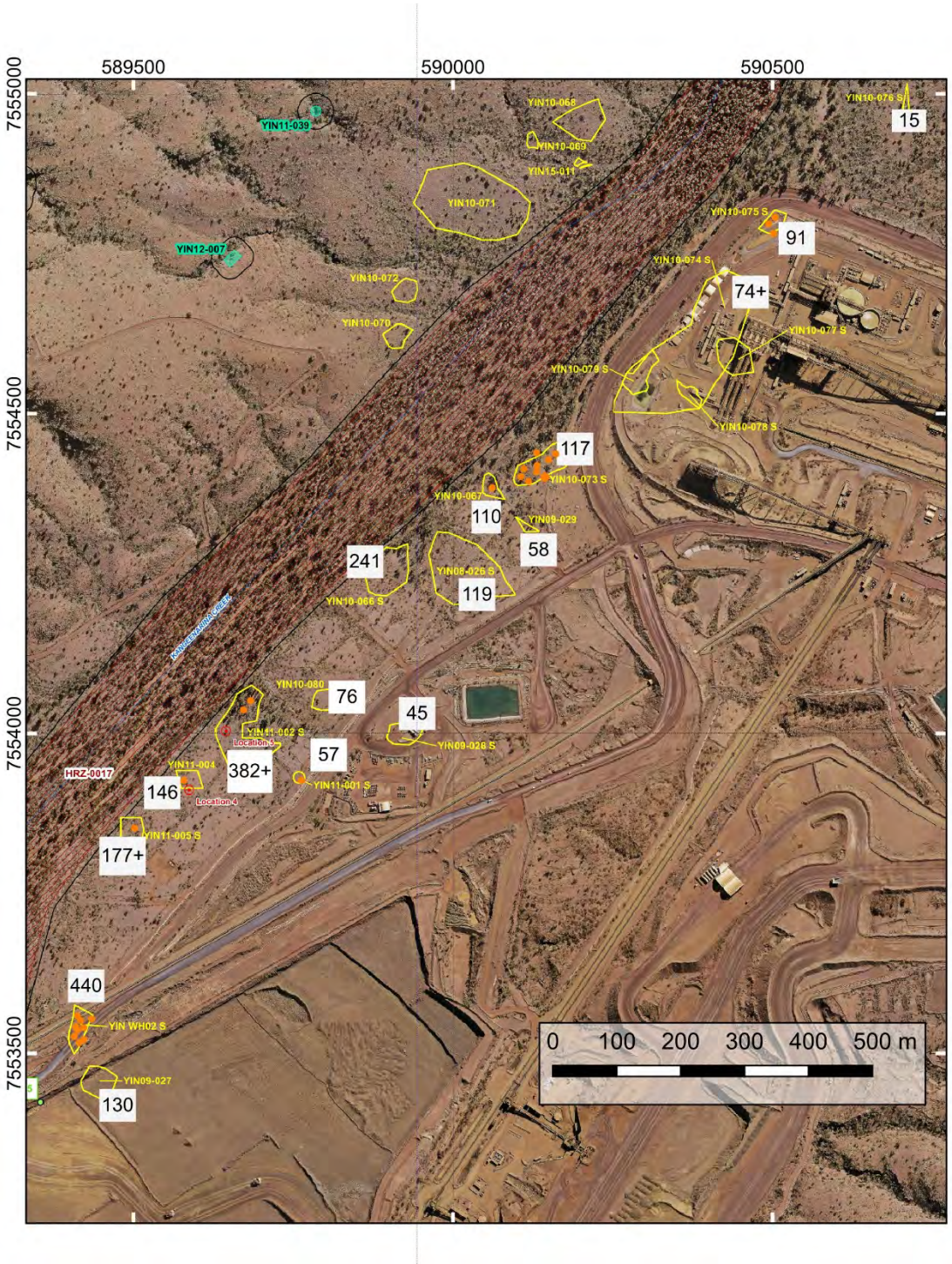


Figure 6. Surface artefact scatters along Kangeenarina Creek salvaged in 2012. Orange dot = grindstone. White square = number of artefacts. Prepared by Dr Bird. Base map: extract from Map 1, E2.

112. The sites range from a small number of artefacts to quite large and dense scatters.

The reporting illustrates some of the problems with recording and documenting surface artefact scatters, as well as assessing their significance. Recording surface artefact scatters is strongly influenced by environmental conditions, the most obvious of which is ground visibility. In many areas, the entire ground surface can be covered by a low-density "background" artefact scatter with "sites" forming local areas of increased density. For largely practical reasons, heritage compliance regimes prioritise sites, rather than the entire cultural landscape. Unlike rockshelters with potential for recovery of datable material through excavation, the study of surface artefact scatters is poorly developed (Holdaway et al. 1998; Holdaway, Shiner and Fanning 2004; Bird and Rhoads 2020).

113. Determining the boundaries of surface sites can therefore be difficult and sites may appear very different under varying conditions of environment and observation. The report maps show that the actual distribution of individual salvaged artefacts often differs markedly from the originally mapped site boundary. For example, three sites that had been recorded as separate heritage places were combined during the salvage program into a single larger site (YIN10-074). The salvage team also noted that sites recorded as separate heritage places due to disturbance of the area between them by an access road, would once have been part of the same site (e.g. YIN09-029 and YIN10-67). YIN10-066, 067, 073, YIN08-26, YIN09-29 are all very close to one another within an area about 300 m x 400 m – but have been mapped separately. As the recorders note:

> *In summary, we can see that sites YIN08-026, YIN09-029, YIN10-066, YIN10-067 and YIN10-073 are all situated in close proximity to one another, and may form a site complex. It is also possible that more artefacts were once contained within these sites, but have been eroded away due to seasonal flooding of nearby Kangeenarina Creek. We must also consider the possibility that YIN09-026 and YIN10-067 once formed one site, before the construction of an access road which divides the two areas. No significant variation was observed across the sites located along Kangeenarina Creek (including YIN10-011, YIN10-075,*

> *YIN10-076 and YIN11-004), suggesting that a range of activities occurred within this area, such as the procurement of raw materials, manufacture and maintenance of stone tools, grinding of food stuffs, and other cultural activities.* (Rowland, Timms and Vrbič 2012:127)

114. These scatters vary considerably in their contents. Some do seem to have a limited range of lithic materials. But there is considerable variation, with several sites clearly having a wider range of raw materials. The distribution of grindstones is also variable, with YIN-WH02 and YIN10-073 having particularly large numbers. This set of sites appears to be an unusual concentration of surface artefacts along a limited stretch of Kangeenarina Creek (Figure 6). In our view, based on our study, training and experience as archaeologists, this cultural landscape should be regarded as a site complex, or even a single site.

115. During a 2011 consultation by Goode and Gifford, Traditional Owners expressed a similar view:

> *… the survey team inspected archaeological site Yin-WH-02. The group reported that the landscape attributes at this archaeological site could be the type of place where law grounds and associated camps would be located. Features such as an open clay pan on the margins of a wooded creek, surrounded by an open grassed plain, provides the perfect attributes to facilitate these gatherings. During the inspection of the area many artefacts were located. Grindstones indicated domestic family camps. All stated that the multiple archaeological sites recorded here should be amalgamated into one site, as along the creek line the scatter is continuous and reflects kinship divisions between camps*. (Goode and Gifford 2011:39)

116. As part of the salvage operations carried out by Alpha Archaeology in 2012 along Kangeenarina Creek, a sample of surface artefacts was sent for use wear and residue analysis to Dr Nina Kononenko. The text of her report (Kononenko 2012) is included as an appendix in the salvage reports as well as relevant plates. A total of 306

artefacts was examined from 32 sites, including several from this site complex. About 10% showed positive evidence of use wear and/ or residues. Tasks identified specifically along Kangeenarina Creek included woodworking, processing animal skin and bone working. Analysis of use wear and residues for surface assemblages is unusual and this study is therefore important in showing that this evidence can be gained from surface artefacts. There is no evidence that this study has ever been published.

117. About 3 km south-west of the site complex discussed was a large and complex artefact scatter on the west side of the creek (YIN14-025), originally recorded as three separate small artefact scatters in site avoidance survey. Site identification for YIN14-025 is reported on in Golden and Chisholm (2014:15-31) and Golden, Sanders, MacDonald, Curtis and Chisholm (2015:122-125 and appendix 5). YIN11-053 was another large and complex artefact scatter recorded about 2 km to the south-west. Salvage of this site is reported in Curtis et al. (2015:41-52, and appendix 3). The rich concentration of cultural material at these two sites may result from the local topography providing a constraint on suitable camping areas, in contrast to the more diffuse pattern of occupation along other parts of Kangeenarina Creek. Both these sites were identified as suitable for open area excavation and Howard and Coutant (2016b: Table 4) list OSL dates of 1,570 ± 160 and 9,030 ± 970 for YIN14-025 and 1,460 ± 150 for YIN11-053; without further information about stratigraphic context and associated cultural assemblages these results cannot be evaluated.

118. **j) Describe in your report useful artefact attribute data utilising contemporary techniques of radiocarbon and luminescence dating (or alternatives), and other scientific techniques undertaken by the University of Wollongong (and elsewhere) to assist with data collection of artifacts and lithology.**

119. The systematic recording of open artefact scatters and quarry sites, assemblages of stone artefacts from rockshelter contexts, analysis of all of the other cultural categories that might occur in stratified sites (e.g. fauna, botanical remains, charcoal,

pollen) and then the dating and characterizing of these is a very large topic. Here we will restrict ourselves to best-practice approaches, that might reasonably be expected in research and mitigation exercises from an area such as the Pilbara uplands and for the SHP specifically.

120. **For open artefact scatters** the suite of attributes selected will depend on the themes, research questions and site processes being investigated. In our experience a heritage survey would typically investigate a range of issues at the site recording stage.

121. These would include recording of modified artefacts, cores and waste (Holdaway and Stern 2004), to investigate questions such as stone material reduction strategies and quarries, group mobility, sources for stone and ochre artefacts (Ditchfield et al. 2023; Reynen et al. 2018), the relationship of artefact scatters to other features like rockshelters and stone arrangements and activity areas within sites (see Bird and Rhoads 2020), and how open sites form through time (Fanning and Holdaway 2001). The field recording attributes for lithic samples would typically record at least the following attributes: i) square number, ii) artefact identification, iii) artefact type, iv) cortex, v) heat fractures, vi) number of flake scars, vii) overhang removal, viii) platform types, ix) tool type, x) retouch length mm, xi) core type, xii) number of core platforms, xiii) maximum length mm, xiv) maximum width, and xv) maximum thickness.

122. A typical descriptive report at the site identification standard of a medium sized site would include:

a) The name of the site and a table of its boundary coordinates;
b) The methods used to describe and survey the site;
c) A discussion of the location, environment and disturbance (including ground visibility);
d) A photo providing a view across the scatter with scales in frame and any disturbance;

e) A full site description outlining its boundaries, size of the sample square(s) used to estimate density and estimate of artefact population;
f) Photos showing close up of modified artefacts, cores and waste *in situ*;
g) A site plan either generated from GPS points in a GIS plan or from survey by tapes, light theodolite or total station, showing its relationship to creeks, roads, rises or any other context features;
h) A description of the stone artefact assemblage with a breakdown of raw material types (as a %), tally of complete and broken flakes, cores, presence of cortex and degree of reduction (with an index such as SDI), and the proportion of artefact types by raw materials. A discussion of modified pieces (tools) with tally of formal tools (e.g. tula adze slug [chisel] or geometric microlith [small backed knife]) with supporting photos of modified edges. Descriptions of any grinding materials (top stones or basal stones), their location and notes about wear, polish and pitting/dressing should be included; and
i) A discussion and significance assessment should then follow noting i) its inferred function on archaeological criteria, (ii) interpretations about the site and its importance including social values to Traditional Owners, (iii) preliminary interpretations about the assemblage and how it might relate to economic resources including plants and fuel, known local quarry sources, and both local and wider land use patterns with reference to similar and different sites known from desktop survey and regional survey results. Current Pilbara research questions to be addressed for open artefact scatters include (i) understanding procurement, production, transport, use, and discard patterns of artefacts across the landscape; (ii) understanding human movement across local and regional landscapes through petrographic/geochemical analyses; and (iii) usewear and residue analysis on tools and grindstones to establish what resources were being gathered and processed and what food processing methods were dominant in the locality, given its past floral and faunal characteristics.

123. **For excavated assemblages** of cultural artefacts and deposits there are numerous dating and characterisation methods available, which will be at least partly

determined by the preservation status of the site, the complexity of cultural assemblages (does it contain flaked and ground stone artefacts), osseous artefacts (like bone points), terrestrial (or marine) faunal remains from past dietary choices and processing patterns; botanical remains from the collection and processing of seeds, fruits and tubers; charcoal in both discrete hearths and also scattered representing wood fuel choices made by people over millennia; varying sedimentary properties due to internal and external sources, firing, layering, mixing and various physical, chemical and biological agents; as well as microscopic environmental signatures in the form of pollen, phytoliths, starch grains and even human DNA.

124. Initial test-pitting of a rockshelter may be carried out by a small team of archaeologists and Traditional Owners to assess the attributes of a cultural deposit (to establish a "window"), by determining an initial range of dates for occupation, the richness and complexity of the assemblage, and site integrity. However, this cannot normally represent full mitigation and analysis of a site which is to be destroyed, unless the site has demonstrably low or negligible values. It should be noted that a single test pit may be inadequate to assess a rockshelter with a complex history. It is not unusual for more intensive investigation to modify or even completely change the initial assessment of significance. There are several instances from the SHP. One example is YIN10-111, where a second test excavation dramatically altered the timescale over which the shelter was used, yielding some of the earliest evidence of occupation in the region. Salvage excavations conducted at YIN10-120 as mitigation also indicated a long history of occupation throughout the Holocene. At YIN11-028 (discussed above at par. 41), salvage excavation revealed a rich assemblage of cultural material at one of the oldest sites in the region, where probing and lack of test excavation had suggested low significance to previous consultants.

125. In most cases for full mitigation mode there will be a follow-up excavation with a team of specialists involved, in addition to the archaeologists, either on site or in laboratories providing specialist analytical services. This work is necessarily more detailed, time-consuming and costly, but produces substantial new knowledge which

must be documented in compliance reports, be peer-reviewed and eventually finds expression in a range of scholarly, technical and public media.

126. For example, a complex 50,000 year-old site like Boodie Cave on Barrow Island in a mining cultural heritage setting, but not under direct threat, took three seasons of excavation to properly sample. It had four international radiocarbon and OSL dating laboratories involved and required engagement with a wide range of specialists from the fields of zoology, ecology, botany, malacology, geomorphology, geochemistry, micromorphology, anthracology, palaeoclimatology and digital scanning (see Veth et al. 2017). Large scale mitigation excavations from the Pilbara have included these specialists and indeed involved others such as from palynology and residue chemistry. Major analyses, syntheses and site reports have been produced from Pilbara mitigation projects resulting in peer-reviewed publications, including from (i) rockshelters and open sites in the eastern Chichester Ranges (Bird and Rhoads 2020), (ii) rockshelters in the East Hamersley Range (Cropper and Law 2018); (iii) rockshelters from the inland Pilbara (Marsh et al. 2018; Morse et al. 2014); and (iv) 22 rockshelters from the wider eastern Hamersley Ranges (Slack et al. 2018).

127. Sound and reliable dating methods are critical to assessing archaeological significance. The results are also commonly of value to Traditional Owners, as signifiers of their long-standing connection to Country. A fundamental aim of archaeological investigation is to establish a reliable chronological framework for interpreting sites. Careful and fine-grained excavation coupled with the use of scientific dating methods, such as radiocarbon or OSL dating, places cultural material and features within an absolute temporal sequence. All samples for dating must be collected and reported according to the relevant protocols, including the material dated (in the case of radiocarbon dating usually charcoal, wood or bone), the context of collection, and management and treatment of samples. It is also important to clearly establish the relationship between the dated sample and the event or feature or artefact layer that is to be dated.

128. Radiocarbon dating is the best-known method for obtaining dates. It has now been

used by archaeologists and others for about 75 years and the limitations and scope of the method are well-understood. The practical limit of radiocarbon dating is currently about 50,000 years. It should be noted that the oldest sites known in the Pilbara region are very close to that practical limit. The dates produced by radiocarbon dating are known to diverge from calendar dates through time. There are well-established methods of calibration used to correct dates based on the dating of samples of known calendar age. Radiocarbon dates are always reported with a statistical error margin, representing a date range of one or two standard deviations. This is a measure of the probability that the reported date falls within the range. Calibrated dates are commonly reported as 'cal BP' and also refer to a date range, with a statistical probability.

129. Dating using the method of Optically Stimulated Luminescence (OSL) is a more recent development and is becoming increasingly important in archaeological sites. Unlike radiocarbon dating, which requires appropriate organic material to be preserved, OSL is a method of dating buried sediments directly by measuring the last time they were exposed to light. Like radiocarbon dating, OSL dates are always reported with a statistical error. This method has great potential for dating open sites where it is rare for organic material suitable for dating to be preserved.

130. In many cases there have been repeated sampling and dating assays to establish more robust chronologies from sites in the SHP which, often being of 35,000 years of age or greater, were seen to be significant. Critical advances are constantly being made, not the least in OSL measurements of individual grains of quartz (Roberts et al. 2015) and controls for mixing in deposits. All dating techniques require a great deal of background context, including for OSL the use of dosimeters, which are passive devices measuring cumulative radiation doses over time, and sediment samples from the same/close sample points. Dating of early Pilbara and Kimberley occupation sites have been revolutionised through the use of OSL (e.g. Norman et al. 2022).

131. **k) Consider the Report of the Consultation Process and Prior History of the**

Documentation of Kangeenarina Creek, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Resource Management Group Ltd for Fortescue Metals Group Limited and Wirlu-Murra Tableland Heritage Pty Ltd on behalf of the Wirlu-Murra Yindjibarndi Aboriginal Corporation dated February 2013 and provide your expert opinion regarding the process of "consultation" for that area undertaken with WYAC at that time.

132. The Report (Attachment 2, Report 111) notes that 11 Traditional Owners participated in a one-day survey of Kangeenarina Creek on 27th Nov 2012. 14 Traditional Owners (Including some from the survey) were involved in a subsequent heritage subcommittee meeting on 28th Jan 2013.

133. At page 1 of the Report it is noted that Traditional Owners had previously expressed some concerns about the creek context and, combined with EPA directives to conserve standing bodies of water, a *Heritage Restricted Zone* was installed around the creek.

134. At page 4 it is stated that "Ethnographic assessment of the site was conducted as per relevant statutory requirements and guidelines pertaining to the protection of heritage sites within Western Australia". We interpret this to be a survey to the site identification standard, as heritage sites and places along the creek or flanks would need to be visited or sighted to establish their ethnographic significance to the site identification standard.

135. The need to establish heritage values is emphasized at page 5 of the Report where the author states:

> *The objective of the on-country consultation was to establish whether the Yindjibarndi Traditional Owner group consider Kangeenarina Creek to be a place of cultural importance or significance, and if necessary to establish the extent and nature of any heritage values within the immediate area.*

136. The Report notes at 3.2.2 that previous archaeological surveys had located fourteen archaeological sites in the vicinity of Kangeenarina Creek. These sites consist of

artefact scatters, scarred trees, grindstones and rockshelters. At page 9, the Report notes: *"The diversity of classifications suggests that the area around the creek was the site of relatively intensive past habitation*". The list of sites in Chisholm's Table 1 is incomplete, mainly including sites on the north-western side of the creek and HRZ-0017, shown in Map 1 E1 and E2 and discussed above (pars 110-117). Figure 6 shows a series of artefact scatters along the south-eastern margin of the creek, all of which were salvaged in 2012 by Alpha Archaeology (Rowland, Timms and Vrbič 2012; Timms, Rowland and Vrbič 2012; Timms, Stradwick and Vrbič 2012). This set of sites appears to comprise an unusually dense concentration of surface artefacts along a limited stretch of Kangeenarina Creek. Based on our study, training and experience as archaeologists, we believe these occurrences could be regarded as a site complex, or even a single site (see par. 113).

137. While our impression of the previous ethnographic surveys outlined in Section 3 of the Report are that they vary in their coverage and purpose (e.g. the helicopter survey by Czerwinski Attachment 2, Report 107 was only for site avoidance), we will restrict ourselves to the presence of archaeological sites along, and in the near-vicinity, of Kangeenarina Creek.

138. In July of 2023 the Desert People team carried out work in Kangeenarina Creek and Bangkangarra Gorge. Work focused on Bangkangarra Rockshelter (more precisely referred to as Yamararra Ganyjingarringunha Rockshelter 2 [YG02] and see Figure 4 for location). This is one of two significant rockshelters the project has s 16 permits to excavate. Yamararra Ganyjingarringunha Rockshelter 1 [YG01] is located downstream and has significant cultural deposits, a burial cache and stone wall and evidence of stone being sourced for manufacture. Research collaborator Dr Sara Jakica, Senior Geologist from the Department of Mines, Industry Regulation and Safety, was involved in assessing the potential of both sites. Deploying non-destructive Tromino Seismometers (using a shallow station passive seismic horizontal-to-vertical spectral ratio method) the depth of cultural deposits at YG01 was assessed to be well over 1 m. Given the high density of surface artefacts, depth

of cultural deposits and burial cache, in the opinion of Professor Veth this rockshelter is likely to be as, if not more archaeologically, significant than YG02, which we would consider quite high based on preliminary assessments.

139. Map 2 and Table 4 show the locations of other sites recorded by the Desert People team in July 2023. Seven rock art panels (Field Sites AA – AG) were located on the upper reaches of the gorge near the Springs and include depictions of what were described as *Marga* figures. There is a suite of rockshelters along the western flank of the creek between YG01 and YG02, many of which contain artefacts and some of which appear to be stratified. Some open-air occupation sites with artefact scatters, which may also be stratified, were noted but have not been recorded yet. There has been no survey by the team south along the creek between RS08 – RS11.

Map 2. Yamararra Ganyjingarringunha Rockshelters 1 and 2 [YG01 + 2]; Rockshelters YG03-11; and Rock Art Panels RA1-7 along Kangeenarina Creek and Bangkangarra Gorge.

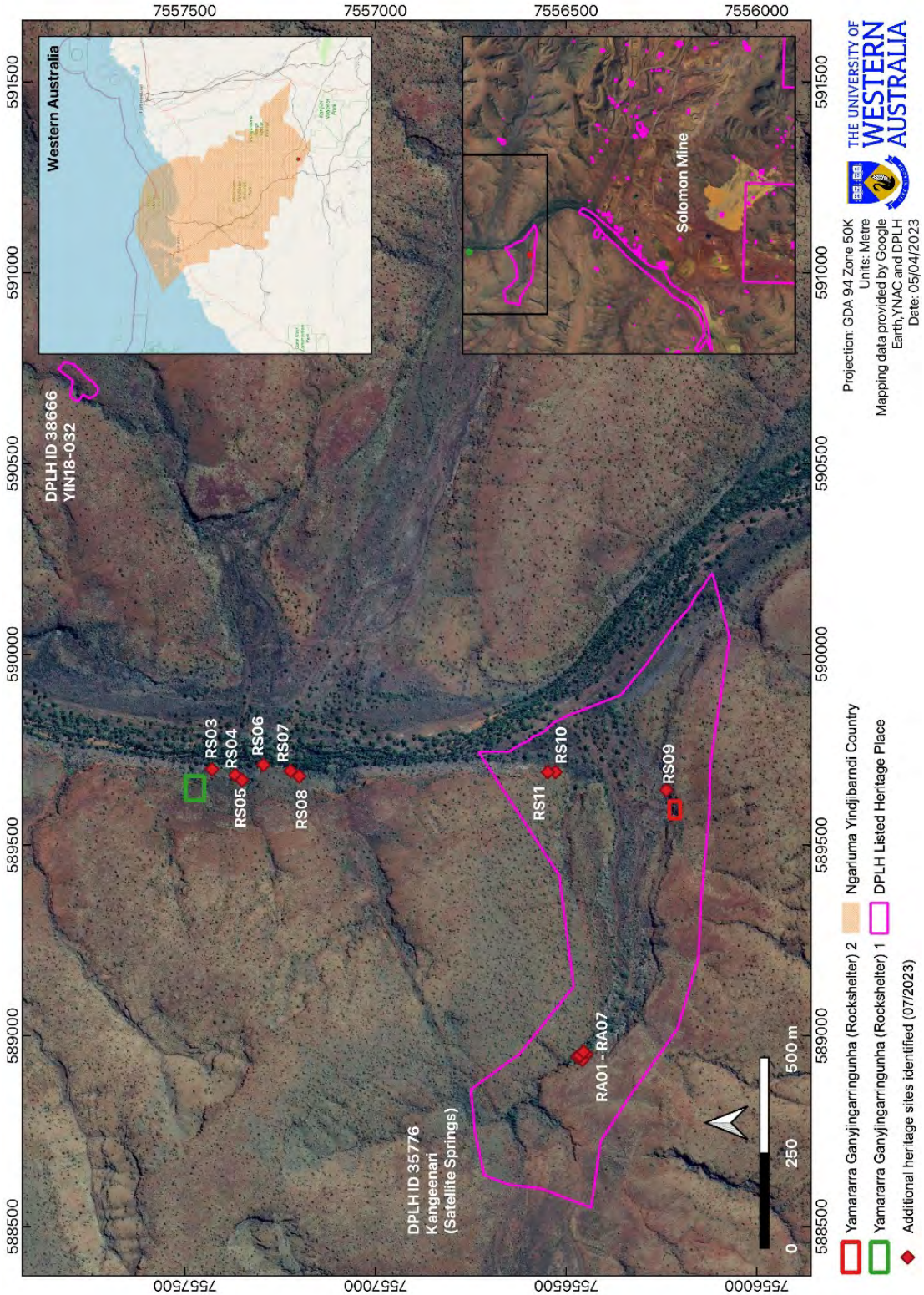


Table 4. Location and Field IDs of rockshelter (RS) and rock art (RA) sites shown in Map 2. These sites were located in the locality of Bangkangarra during the excavation program.

ID	Map ID	mE	mN
AA	RA01	588952	7556447
A	RA02	588937	7556457
AC	RA03	588943	7556468
AD	RA04	588946	7556470
AE	RA05	588947	7556463
AF	RA06	588948	7556464
AG	RA07	588958	7556454
YG03	RS01	589698	7557429
YG04	RS02	589683	7557368
YG05	RS03	589670	7557350
YG06	RS04	589710	7557294
YG07	RS05	589694	7557223
YG08	RS06	589680	7557200
YG09	RS07	589644	7556237
YG10	RS08	589691	7556528
YG11	RS09	589691	7556548

140. It is clear from the short and intermittent opportunities the team had to conduct surveys in July, while excavating YG02, that the creek flanks and uplands have a high density of cultural materials and that some of these have the potential to elucidate long-term patterns of land-use. We concur with Chisholm (2013: 9) that "*The diversity of classifications suggests that the area around the creek was the site of relatively intensive past habitation*".

141. **l) Given Professor Veth's work on the Desert People Project undertaking excavation at Bangkangarra in the Hamersley Range, can you draw inferences from that work that the area of the SHP (also in the Hamersley Range) would have**

contained equally archeologically rich sites that have been destroyed under s 18? Are you able to utilise the reports prepared for ss 16 or 18 applications as listed in Attachment 2, your experience of other areas in the Pilbara, academic literature and YAC / YNAC's records, to form such a view?

142. Initial findings from Professor Veth's first excavation at Bangkangarra indicate the area was occupied from before the Last Glacial Maximum. *In situ* stone artefacts have been plotted repeatedly to the surface, including fragments of baler shell originating from the coast. Ongoing excavation and dating will help confirm the antiquity of first occupation and the nature of occupation during the Last Glacial Maximum. This is likely to add to a growing body of evidence for the persistence of Aboriginal people near permanent water sources in the Hamersley Ranges (Slack et al. 2018; Veth et al. 2022).

143. A recent synthesis of the oldest accepted dated rockshelters from the wider Pilbara appears in Bird and Rhoads (2020: 22–35), where 16 sites are noted as dating to before 30,000 years ago. Ten of these sites occur in the Hamersley Range, however the age of YIN009-002 was deemed unreliable in a continental review of the oldest sites for Greater Australia (Allen and O'Connell 2014: 97), where access to a s 18 report appears to have occurred (Rowland and Timms 2012b). The important role of permanent water sources in the ranges, such as Bangkangarra spring, is emphasized by Bird and Rhoads (2020: 23) who conclude:

> *Increasing aridity and a corresponding decrease in the availability of resources starting about 30,000 years ago would have required reorganisation of settlement patterns. This would have involved changes in residential mobility and reconfiguration of land use to focus on reliable water sources in areas that would have acted as refuges. The inland Pilbara is likely to have been one such area and archaeological evidence provides increasing support for occupation throughout the Last Glacial Maximum*.

144. Though not all site reports for test pits or mitigation excavations noted to have

occurred in the SHP were available to review, summaries of chronological spans of excavated sites appear in several reports, including Chisholm et al. (2014b) and Howard and Coutant (2016a, b). It appears there was a considerable corpus of ancient sites holding rich human and environmental records.

145. We base this view in part on the great age, and repeated occupation, indicated from dated heritage places excavated by Terra Rosa and summarised in their 2016 report, in Table 4 (Howard and Coutant 2016b: 17). With reference to Table 4 they conclude:

> *What is noted from the dating range from sites excavated within Yindjibarndi country however, is not only the extremely early habitation which occurred in the area, likely to be associated with the initial colonisation of the Australian continent by Aboriginal people, but also significant occupation occurring in the area prior to the advent of the Holocene, circa 10,000 years ago (Hiscock 2008). This period is traditionally associated with an expansion of the population and intensification of occupation of the Australian arid zone (Marwick 2009), but the current evidence from Yindjibarndi country indicates sustained periods of occupation in the area prior to this.*

146. Chisholm et al. (2014b) repeatedly emphasise how rich and significant the archaeological record within the SHP is. Explicit comments include:

> *Rockshelter excavations in the Solomon Hub project area have so far yielded significant results, including some of the oldest known dated occupation in the Hamersley Ranges…These results indicate that the Solomon Hub Project area is one of significant heritage values and high archaeological potential*. (Chisholm et al. 2014b: 243);
>
> *In her synthesis of work dating sites in the Inland Pilbara region, Morse (2009) demonstrates that in 2009 just 12 sites in the region, from the 45 publicly available to her, had been dated to the Pleistocene… Of these 12 sites, three…had evidence of dated occupation older than 25,000 years BP; that is, prior to the climatic pejoration of the LGM. Evidence of occupation of this antiquity can be*

> *considered extremely rare.* (Chisholm et al. 2014: 244)
>
> *Of 20 rockshelters, excavated by Terra Rosa CRM at the Solomon Hub Project between 2012 and the present, seven sites have demonstrated evidence of Pleistocene occupation… Of these rockshelters, four demonstrate occupation older than 25,000 years BP. A further two rockshelters in the Solomon Hub project area, subject to test excavations by Alpha Archaeology under a s 16 permit in 2012, also indicated evidence of occupation older than 25,000 years BP. (*Chisholm et al. 2014b: 244*).*

147. Chisholm et al. (2014b: 245) conclude on the basis of the high proportion of excavated rockshelters with Pleistocene dates that:

> *…the inferences of this statistic are; that the selection criteria for the excavation of rockshelters in the Solomon Hub project area are well defined and stringent, the area possesses exceptional preservation of Pleistocene remains in rockshelters, or the area was more intensely occupied during this period of antiquity than other areas in the Hamersley Ranges.*

148. The additional nine sites with Pleistocene dates recovered from the SHP increases Morse's original (2009) tally by two thirds while the number of pre-Last Glacial Maximum sites is doubled. This reflects the relative abundance of early occupation sites in the SHP, in comparison to the wider Pilbara where many mitigation excavations have been carried out.

149. We have considered our preliminary results from the excavation at Bangkangarra in the Hamersley Range, and notes from surrounding sites shown in Map 2 at (j), reviewed the reports prepared for ss 16 or 18 applications as listed in Attachment 2 and Table 1 (above), and consulted relevant academic literature and databases (Bird and Rhoads 2020; Clarkson et al. 2022; Cropper and Law 2018; Huntley et al. 2021;

Law et al. 2010; Law and Cropper 2018; Marsh et al. 2018; Marwick 2009; Morse 2009; Reynen et al. 2019; Saktura et al. 2023; Slack et al. 2009, 2018; Veitch et al. 2005; Veth 1995, 2017; Veth et al. 2017, 2022). There is consistent evidence that the area of the SHP (also in the Hamersley Range) would have contained equally archaeologically rich sites, some of which have been destroyed under s 18 of the Act (**Figure 7.** Excavated rockshelters in the SHP with dates in the Pleistocene and Early Holocene (>5,000 BP) mapped against mine infrastructure and associated disturbance.**Figure 7** and **Annexure 6**).

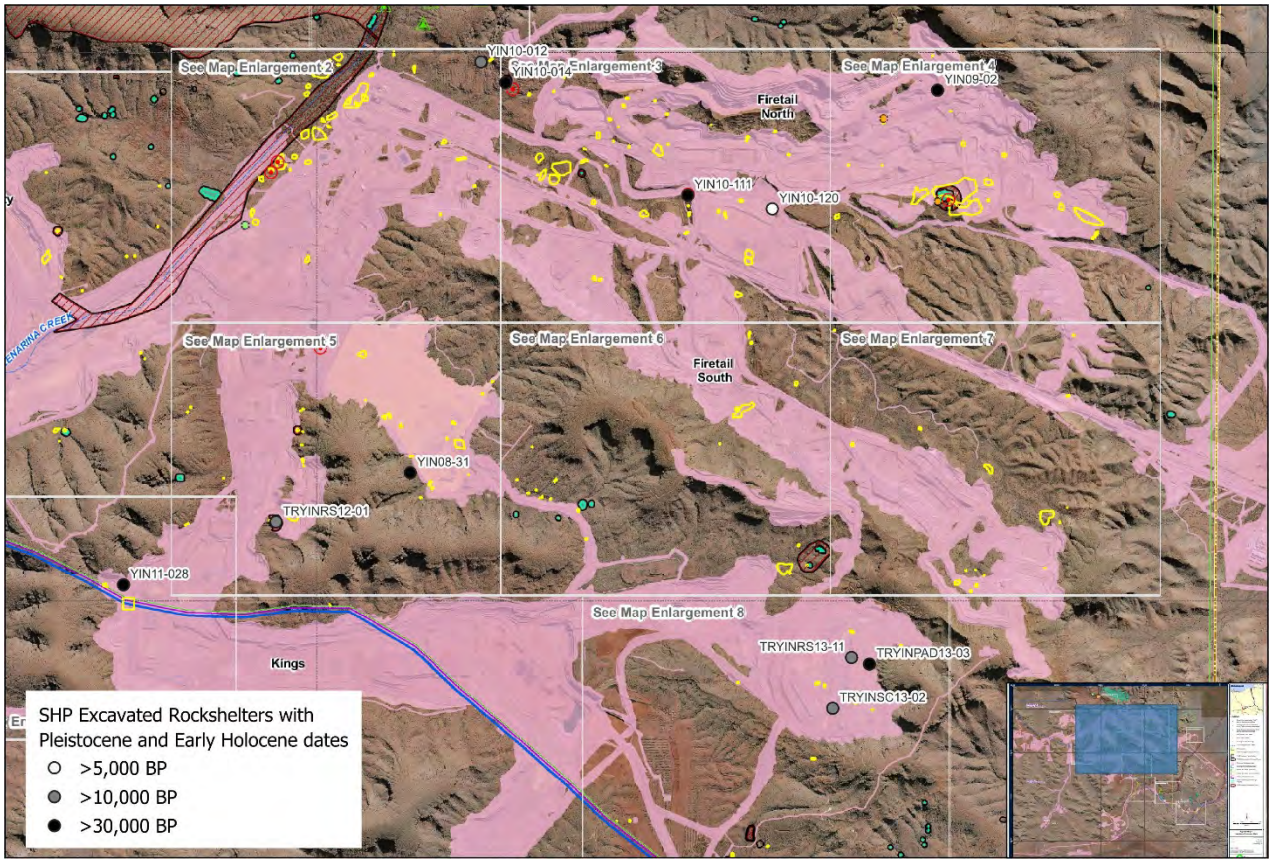


Figure 7. Excavated rockshelters in the SHP with dates in the Pleistocene and Early Holocene (>5,000 BP) mapped against mine infrastructure and associated disturbance. Map prepared by Dr Bird. Site location data from Howard and Coutant 2016b: Table 4. Base map: Map 1 – Heritage overview. (**Annexure 6**)

150. **m) Provide your opinion about the surveys undertaken before 2010 by Michael Woodley and others for YAC/YNAC, and again in 2018 and 2021, and the sites**

identified during those surveys compared to the surveys carried out by archaeologists alone or with members of the Wirlu-Mura Yindjibarndi Aboriginal Corporation, who acted separately from YAC/YNAC during that period (see Attachment 2).

151. There are two major reports conducted with YAC/YNAC before 2010 listed in Attachment 2:

(i) Thom, P. and I. Ryan 2007 Results of an Archaeological Work Program Clearance Survey of Nominated Drill Lines, Access Tracks and Camp Areas located within the Firetail (E47/1447) and Solomon Prospects(E47/1334), Central Pilbara, Western Australia (October 2007) Eureka Archaeological Research and Consulting UWA. [Report 119); and

(ii) Brown, V. and Winter, S. 2008 Report on the Results of an Archaeological Work Program Clearance Survey of nominated drill lines and access tracks at Firetail and Valley of the Kings in FMG's Solomon Prospect, Central Pilbara, Western Australia (June 2008) Eureka Archaeological Research and Consulting UWA. [Report 121]

152. The report conducted with YAC/YNAC in 2018, listed in Attachment 2, is:

(iii) Yindjibarndi Aboriginal Corporation (YAC) 2018 Report for the Yindjibarndi Ngurra Aboriginal Corporation (YNAC) Yindjibarndi Cultural heritage Inspection Conducted with Fortescue Metals Group (FMG) Section 18 'Phase 23' Application Area. Prepared for Yindjibarndi Aboriginal Corporation. [Report 125]

153. Also listed in Attachment 2 is a final report conducted with YNAC in 2021:

(iv) Ryan, P., Pentz, B. and Raines, T. 2021 Report of a Heritage Survey of eight Survey Areas scoped as Scopes YIN_335 and YIN_336, on Yindjibarndi Country within FMG's Solomon Project Area, Pilbara, Western Australia. [Report 129]

154. We will make some specific observations, relevant to the Brief, against these 2007, 2008, 2018 and 2021 reports (the YAC/YNAC reports). We will also make specific observations relevant to the Brief against the following selection of WYAC reports, listed in Attachment 2 of the Brief.

    i. Howard, C. and Coutant, D. 2016b. Report on an Archaeological Site Avoidance Heritage Survey, Site Identification Heritage Assessment and Archaeological Salvage of HWIs YIN_225, YIN_245 and YIN_248 at the Solomon Project conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited (November 2016) [Report 82];

    ii. Rob Tickle, Report of a Survey to Avoidance Standard of Firetail, Survey Request Yin 34: Area: Priority Two (9 March 2010) (no Yindjibarndi People took part in this survey (see pg.5) [Report 60]

    iii. Brad Goode and Peter Gifford, Report of an Ethnographic Aboriginal Heritage Survey of the Solomon Project in the Eastern Pilbara Region of Western Australia (August 2011); [Report 104]

155. Thom and Ryan (2007) adopt a Work Program Clearance model. They provide a clear outline of the regional archaeology and outstanding research questions (2007: 4). Explicit predictions are made about regional sites within a 25 km radius, the expected location of artefact scatters at the base of cliffs and gorges, and size and the composition of artefact scatters (p. 8). The survey methodology at 20 m intervals within 50 m transects is explicit (p.10). In the results section there are requirements for deviating drill lines and access tracks so as to avoid sites (p. 14). It is recommended in the example of Site AS01-07 (pp. 16-17) that:

    1. The Yindjibarndi Prescribed Body Corporate and their representatives are consulted about the plans to disturb and subsequently grant their consent; and
    2. additional recording and archaeological significance assessment of site

Yindjibarndi AS01-07 be undertaken prior to any disturbance at this site.

156. In the Summary of Recommendations (pp. 26-27) further work is suggested and at recommendation 3 “to engage only Yindjibarndi representatives elected by the Yindjibarndi Prescribed Body Corporate managed by Juluwarlu Yindjibarndi heritage management team to monitor any ground surface disturbance undertaken during the Firetail and Solomon drilling projects”.

157. Brown and Winter (2008: 1) also adopt a Work Program Clearance (site avoidance level recording) following the Department of Indigenous Affairs *Guidelines for Aboriginal Heritage Assessment in Western Australia and Aboriginal Heritage Procedures Manual (2002).*

158. A site assessment approach is used where, for example, at Site RS07-08 at Recommendation 4 “The Yindjibarndi people and their representatives are consulted about the plans to disturb and subsequently grant their consent”; and at Recommendation 5. “Detailed recording, test pit excavation and archaeological significance assessment of Site Yindjibarndi RS07-08 be undertaken prior to any disturbance of this site”.

159. YAC (2018) report on their (re)survey of the Section 18 (S 18) ‘Phase 23’ Application area [‘Land’] and note (2018: 6) there are 23 additional sites not previously found. Our reading of the primary site data in the YAC (2018) report indicates that 15 would be considered sites under the WA *Aboriginal Heritage Act.* Three descriptions (YNAC2018-11, YNAC2018-16), both trees with honey, and YNAC2018-14 (an ephemeral rock hole) may be of social significance but would likely not meet threshold under the AHA. Five shelters with ochreous seams (YNAC 2018-6, YNAC 2018-7, YNAC 2018-8, YNAC 2018-13, YNAC 2018-15) again may be of social significance and potentially have been used in Yindjibarndi ceremony. However, there are no details of historic use or archaeological manifestations of extraction/scratching/quarrying to qualify their classification as an archaeological site. We are satisfied that the remaining 15 descriptions of occupied rockshelters, walled niches and scarred trees represent sites under the WA *Aboriginal Heritage Act*

that were not previously identified in the 'Land'.

We have checked the *current* status of these sites in the Aboriginal Cultural Heritage Inquiry System (ACHIS) on 08/12/2023 and there are two named places - YNAC 2018-22 and YNAC 2018-23 (DIA ID 37622 and DIA 37623), the status of which is currently 'historic'. Only one of the sites has been registered - walled niche YNAC 2018-03 (ID 37603). Of the other walled niches, YNAC 2018-19 and YNAC 2018-20 (ID 37619, ID 37620) are Lodged; YNAC 2018-21 (ID 37621) is historic, though would qualify as a site under the Act. Of the five rockshelters described only YNAC2018-18 (ID 37618) has been lodged. Therefore, of the 23 sites, three have the status Lodged (and therefore presumably have not been assessed by the ACMC); one has been registered and the remainder are classed as historic - so presumably assessed by the ACMC. It is not clear why the entire group of sites has not been assessed by the ACMC.

160. An apparent anomaly in the registration process by the DPLH is that despite the occurrence of a "large rock shelter complex with one confirmed and seven suspected burials, walled niches, cache, manuports and intelligent cave storage systems (YIN09-049) and related replete occupation site (YIN16-008) which are both located on the 'Land'" (YAC 2018: 12) that "The 'Land' does not currently contain any Aboriginal sites that are listed on the DPLH Register of Aboriginal Site" (YAC 2018: 13). It is also noted that 11 other cultural heritage value locations on the 'Land' were recommended by DPLH not to constitute sites (YAC 2018: 13, 14). A search of the ACHIS failed to locate either YIN09-049 or YIN16-008.

161. The practice of collecting piles of artefacts and leaving "stacks" as part of the s 18 process was noted in the field by YAC (2018: 15) observing that:

> *In March 2018, the YNAC Yindjibarndi heritage survey participants inspected YIN 16-008 while in the field and found three distinct piles of artefacts 'stacked' up…It was evident that the site had been disturbed by the implementation of the S 18 site identification method.*

The stacking and leaving of artefacts on site, in a non-cultural context, is not best-

practice.

162. There are further comments about heritage practice on the SHP noting (YAC 2018: 21) that only YNAC is the authorised representative for 'The Land'; that a Yindjibarndi Cultural Heritage Plan be implemented for the Land (p. 22); that a transparent dialogue be established between YNAC and FMG (p. 22); and that "YNAC re-evaluate the ethnographic cultural heritage values of the 'Land'."

163. Section 4 of the report (2018: 38-onwards) outlines a Yindjibarndi philosophy that notes, among other matters, that i) Yindjibarndi see heritage surveys as both cultural maintenance and income, ii) Due to connections and responsibilities Yindjibarndi must be consulted and concerns and beliefs respected; iii) all sites hold some value.

164. The more recent report reviewed here by Ryan et al. (2021), and carried out with YNAC, is stated to have been carried out to locate new sites and check on old ones in an additional eight survey areas. At (2021: v) it is noted that examination of existing site YIN14-020 (DPLH ID 35772) concluded that it should be included in a larger site complex "including YIN09-037 (DPLH ID 35771), YIN15-007 (a rock art site not lodged with the DPLH) and YIN15-008 (DPLH ID 36226), as well as additional water holes".

165. Yindjibarndi representatives stated that Heritage Restricted Zone HRZ-1166 established at this site complex should be avoided and that additional heritage works were required in order to establish an adequate site boundary and to record the site to a Site Identification standard.

166. At Recommendation 2 (p. vi) it is noted that Yindjibarndi representatives expressed their preference for all heritage sites to remain *in situ* and be avoided and protected by FMG. It is recommended that… FMG endeavour to achieve "… avoidance of impact [to heritage sites] where reasonable".

167. There are further detailed Archaeological recommendations at:

- 4.c for excavation and OSL dating standards beyond the Ministerial Consent noting "excavation, at a minimum comprising two 1 m by 1 m excavation squares, be undertaken at site YIN16-016 (DPLH ID 38235), in

preference to the bulk sampling specified in the Consent, by Yindjibarndi representatives and appropriate heritage consultants prior to any disturbance";

- 4.d to carry out excavations (test-pits) at "sites TRYINSC13-01 (DPLH ID 38244) and TRYINRS13-07 (DPLHID 38245), in preference to the shovel test pit specified in the Consent, by Yindjibarndi representatives and appropriate heritage consultants prior to any disturbance";
- 4.e to carry out excavations (test-pits) at "sites YIN08-009 (DPLH ID 38240) and YIN16-015 (DPLH ID 38236), by Yindjibarndi representatives and appropriate heritage consultants prior to any disturbance";
- 4.f for additional OSL dating be conducted at sites YIN08-009 (DPLH ID 38240), YIN16-015 (DPLH ID 38236) "in addition to site YIN16-016 (DPLH ID 38235) specified in the Consent, by Yindjibarndi"; and
- 4g. That a Cultural Heritage Management Plan and data repository be set up to "provide access to heritage reports and spatial data collected (historically and in the future) by FMG on Yindjibarndi Country".

168. At Recommendation 6, amongst other matters, an active management strategy is sought between YAC and FMG including auditing and site visitation involving Rangers, the checking of signage and fencing, monitoring of sites for dust, blasts and vehicular traffic impacts.

169. Finally, at Recommendation 7 the significance of Thandabadina Wundu (*Tharndibirndinha Wurndu*) watercourse is noted, with a recommended review of heritage management plans with YNAC. We note this watercourse is DPLH ID 37622 (YNAC 2018-22) and is classed by DPLH as a historic site (i.e. having been judged by the ACMC not to be a site). The boundary on ACHIS is different from that on the Map 1, E9 (Attachment 6). The enlargement map E9 only has two sites marked (YNAC 2018-22 and YIN08-15). Comparison with ACHIS shows there are other registered and lodged sites in this general area.

170. There is a clear, well-referenced and current discussion of Archaeological Research Potential; questions that can be addressed by stratified sites and by the examination of surface assemblages (Ryan et al. 2021: 33-35). Representativeness, rarity and uniqueness are well defined and made explicit (Ryan et al. 2021: 53).

171. The difference between archaeological and cultural significance is well explicated (Ryan et al. 2021: 59) noting that "that the archaeological significance assessments of Aboriginal archaeological sites contained in this report are, in accordance with the following discussion, based mainly on archaeological principles. The Yindjibarndi People reserve the right to determine the cultural significance of all of the sites recorded and described in this report. Such cultural significance assessments can, and often do, differ markedly from any archaeological significance that may be attributed to such sites".

172. Finally, the section on "Aboriginal Knowledge Holders comments on the Archaeological Report" (Ryan et al. 2021: 78) provides for Indigenous views on the tangible heritage. Such practice has become common throughout Australia.

173. We now will make specific observations on a selection of the WYAC reports relevant to the Brief to Archaeologist (listed above par. 153).

174. Howard and Coutant (2016b: 16) emphasise the high values of the land where:

> rockshelter sites occur in higher proportions comparative to the rest of the native title claim area, due to the presence of large ironstone ranges and steep valleys with few areas suitable for the preservation of sites within open contexts within the Hamersley Ranges.

This is consistent with a range of consultants' views on the archaeology of the SHP noting the high significance of sites in many of their reports (e.g. par. 38).

175. At Table 4 (Howard and Coutant 2016b) there are extremely early dates for Aboriginal occupation noted from excavations by Terra Rosa. For example, ages of 53 ka and 59,000 – 47,000 years ago for DAA ID 34022 TRYINPAD13-03 [TP2] make them the oldest known for the Pilbara and indeed the entire arid zone of Australia. There

are other dated sequences in the table also sourced to mitigation work by Terra Rosa. For example, DIA ID 30586 YIN10-111 is noted to have OSL ages of 48,000 ± 4,000 to 35,000 ± 4,000, presumably with cultural deposits in association. On the face of it these would constitute a collection of highly significant sites, the presence of which are of wider cultural, public and research value.

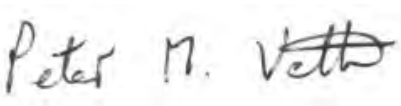
176. Tickle (2010a: 2) notes there are steep portions of the survey area and that "Only parts of five blocks were surveyed due to the steepness of slopes and escarpments. It is extremely doubtful that there was Aboriginal occupation in these areas". We believe that burials and caches can, and do, occur in such steep country (see YNAC 2018). Tickle notes there were no Traditional Owners on this survey.

177. Goode and Gifford (2011: 38) note the significance of Bangkangarra, associated engravings and need for protection of the Spring and water flow to it. Walled niches and specifically those which had burials were important; "Once the bones had been placed in a rock shelter/walled niche it was considered dangerous to move the bones" (2011: 39).

178. Chisholm et al. (2014b: 205) outline how YIN14-015 is a newly identified and recorded rockshelter with an associated stone arrangement. After assessing the place they conclude "YIN14-015 is unlikely to satisfy s 5(a) of the Act. The only cultural material identified within the heritage place was the stone arrangement, which appears to be relatively intact (2014:205)". It is unclear why an intact stone arrangement would not be considered a site under the WA Aboriginal Heritage Act.

179. Based on the evidence reviewed, and in our opinion, the YNAC-linked surveys show an acceptable and professional standard of site identification and mitigation. Native Title holders from the PBC are involved in all of the surveys. Explicit discussions make distinctions between archaeological significance and the cultural significance of sites to Traditional Owners. The values of sites in context and measures to avoid impacts feature throughout the reports. Best-practice standards are observed generally throughout the reports. The YAC (2018) report lists 23 additional sites of which 15 would be considered sites under s5 of the Act, in our view.

180. The WYAC-linked surveys are more variable in the explicit methods and analyses used. We note there have been a large number of surveys and mitigation studies carried out on the SHP with members of WYAC. There are repeatedly strong statements about the significance of sites, the great age of Aboriginal occupation and indeed the high values of the cultural landscapes of the SHP in both Chisholm et al. (2014b) and Howard and Coutant (2016b). There appears to be a lack of dissemination and publication of excavation site reports for early Aboriginal occupation and use of the SHP. It is not clear why this information has not been disseminated for wider heritage management and significance assessment both in the Pilbara and the wider Australian arid zone.



Signed: Professor Peter Veth FAHA MAACAI

Dated: 10th June 2024

Dr Caroline Bird FAHA MAACAI

10th June 2024

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ANNEXURE 1: BRIEF TO ARCHAEOLOGIST

The Brief

~~21 February~~ 7 June 2024

Professor Peter Veth and Dr Caroline Bird
Archae-aus Pty Ltd,
Unit 1, 107 Stirling Highway,
NORTH FREMANTLE WA 6159
By email: peter.veth@uwa.edu.au; carolineb@archae-aus.com.au

Dear Professor Veth and Dr Bird

BRIEF FOR PREPARATION OF AN EXPERT ARCHAEOLOGY REPORT FOR THE APPLICANT IN PROCEEDINGS WAD 37/2022 – Yindjibarndi Ngurra Aboriginal Corporation Compensation Claim

Introduction

1. I act for the Yindjibarndi Ngurra Aboriginal Corporation (**YNAC**), the Applicant in this proceeding. Under s 56(3) of the *Native Title Act 1993* (Cth) (**NTA**), YNAC holds in trust for the common law holders (**Yindjibarndi People**) the native title rights and interests the subject of a determination of native title made by the Federal Court in *Warrie (formerly TJ) on behalf of the Yindjibarndi People v State of Western Australia (No 2)* [2017] FCA 1299; (2017) 366 ALR 467 (***Warrie (No 2)***).

2. YNAC has filed a compensation application in the Federal Court under ss 50(2) and 61(1) of the NTA (WAD37/2022), seeking a determination of compensation on behalf of the Yindjibarndi People. The acts in respect of which compensation is sought are the grants of mining tenements to the Fortescue Metals Group (**FMG**) over a significant portion of the land and waters within the *Warrie (No 2)* determination area. Those mining tenements collectively underpin and provide the legal basis for FMG's Solomon Hub Project (**SHP**). Mining operations at the SHP commenced in about October 2012. FMG says that the SHP has an "expected life" of about 33 years but realistically the life of the

mine is unknown. Mining leases, exploration licences, prospecting licences, miscellaneous licences and groundwater licences have been granted for mining and auxiliary infrastructure, including gas pipelines and power stations over an area that includes the Kings, Trinity, Firetail North and Firetail South in the *Warrie (No 2)* determination area. A portion of the SHP is located in the Eastern Guruma determination area to the south-west.

3. YNAC says that the grant of the mining tenements to FMG over that portion of the *Warrie (No 2)* determination area has caused significant loss, diminution and impairment of the Yindjibarndi People's native title rights and interests. I include as **Attachment 1** a map of the *Warrie (No 2)* determined native title area. This map also shows the location of FMG's mining tenements and the area of the mine footprint. **Attachment 2** contains an index of, and the documents provided by FMG and by third parties that you are asked to read and consider for your report. You should also conduct a review of any literature you consider relevant. **Attachment 3** is a glossary of acronyms and definitions of frequently used terms in reports, materials and legislation. **Attachment 4** is a copy of the Applicant's Further Amended Points of Claim (**AFAPC**), filed on 5 July 2023 (signed 15 June 2023), which describes, in detail, YNAC's compensation case. Your attention is directed to [34A] of the AFAPC where YNAC asserts that FMG's mining activities have damaged and/or destroyed ancient occupation sites within the *Warrie (No 2)* determination area. The AFAPC at [34A(a)–(d)] lists 32 FMG applications made under ss 16 or 18 of the *Aboriginal Heritage Act 1972* (WA) (**AHA**). **Attachment 5** is a copy of the relevant statutory provisions of the AHA.

4. You are briefed to prepare an expert archaeology report for YNAC to file in support of its compensation application.

Maps

5. FMG, the State of Western Australia and YNAC have agreed on a bundle of maps for use in the compensation claim proceedings. I attach Maps 1–6 divided into 6 categories (**Attachment 6)**. The maps were produced from GIS datasets provided by YNAC, FMG

and the NNTT (except for Map 4). The parties have prepared an accompanying explanatory statement which explains the data and labels used in the maps. That statement is also included at **Attachment 6**.

6. FMG's dataset indicates there are 249 sites that have been the subject of an application under s 18 of the *Aboriginal Heritage Act 1972* (WA). Many sites physically do not exist anymore. The map shows where many sites have been destroyed – by the construction of a road, for example – but YNAC has not been provided with any compliance records, if they exist, for the sites that have not been destroyed. YNAC is aware that all sites have s 18 approval. An example of the destruction of sites is site YIN10-111, an ancient rock shelter, which the Court was taken to on 14 August 2023. It was one of three very old rock shelters in the area. The other two, YIN11-028 and Tri-inpad 11-03 [Tryinpad 13-03], are destroyed.

Assumed Facts

7. For the purpose of preparing your report, you should adopt the following assumptions:

   (a) The SHP is an open-cut iron ore mine in the Hamersley Ranges located 60km north of Tom Price.

   (b) SHP has a production capacity of 72–100 million tonnes per annum (Mtpa) that includes pits outside the *Warrie (No 2)* area.

   (c) It comprises conventional open-pit load / haul and strip-mining techniques in the Firetail North and South, Valley of the Kings, Trinity and Valley of the Queens pits (Valley of the Queens is not in the compensation claim area) as well as contour mining of large portions of *Gambalana* (Hamersley Ranges). Mining operations at Firetail commenced in May 2013. As stated above the expected mine life of SHP is 33 years.

(d) The various tenements which comprise the SHP are wholly owned by FMG and were granted between 2006 and 2020. Applications for mining tenements by FMG are ongoing.

(e) ~~Approximately 75%~~A number of the FMG tenements comprising the SHP are located within what was the Yindjibarndi #1 native title determination application area (that was filed on 9 July 2003) but which is now the *Warrie (No 2)* determination area (since 17 November 2017). The external boundary of these tenements is shown in the Maps at Attachment 6 to this brief.

(f) With the exception of the grant of E47/3464I, n~~N~~o agreement has been reached in relation to the grant of any of the mining tenements which comprise the SHP between FMG and the Applicant/registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) or YNAC (after 17 November 2017).

(g) FMG has entered into ~~a~~ financial relationships and agreements in respect of its mining activities with some, but not all, of the common law native title holders without the consent of the registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) or of the YNAC (after 17 November 2017). These agreements and relationships are ongoing. The group of people who have a relationship and agreements with FMG are members of an Aboriginal Corporation called Wirlu-Murra Yindjibarndi Aboriginal Corporation (**WYAC**). This has caused a serious division within the Yindjibarndi community.

(h) Between July 2010 and 17 November 2017, FMG did not consult with the registered claimant for the Yindjibarndi #1 native title determination application (prior to 17 November 2017) in relation to heritage surveys or work programme clearances. Instead, it dealt with WYAC or WYAC members.

(i) Native title has a physical or material aspect (the right to do something in relation to land) and a cultural or spiritual aspect (the connection with the land). Under

the NTA, the Yindjibarndi People have an entitlement to compensation for any loss, diminution, impairment or other effect of the grant of the SHP mining tenements on both aspects of their native title rights and interests.

Nature and scope of the consultancy services

8. The Brief requires you to write an expert archaeological report for filing in the Federal Court based on the documents provided in this Brief, desktop research and based on your experience working as an archaeologist in the Pilbara and elsewhere. The report should address:

   (a) The historical depth of Aboriginal occupation and use of the *Warrie (No 2)* determination area;

   (b) The nature and extent of the damage to or destruction of archaeological and cultural sites, the result of FMG's mining activities;

   (c) National significance and cultural value of the archaeological and cultural sites that have been damaged or destroyed or are likely to have been damaged or destroyed by those mining activities;

   (d) Whether it is possible to place an economic value on the sites that have been so damaged or destroyed or are likely to have been damaged or destroyed;

   (e) The adequacy or otherwise of the methodology employed by FMG to minimise or avoid damaging or destroying those sites;

   (f) The work Professor Veth and Professor Veth's team have recently undertaken at Bangkangarra as part of the Desert People Project and the results from that work as it applies to this Brief;

   (g) After examining FMG's s 18 survey materials provided for this Brief and any data collected by FMG in the listed reports at Attachment 2 (see specifically *Report on an Archaeological Site Avoidance Heritage Survey, Site Identification Heritage Assessment and Archaeological Salvage of HWIs YIN_225, YIN_245 and YIN_248*

at the Solomon Project conducted by the Yindjibarndi Traditional Owners and Terra Rosa Consulting and prepared for Fortescue Metals Group Limited dated November 2016 by Howard and Coutant p.1), please describe what is in your opinion the best practice methodology for:

(i) a site avoidance heritage survey;

(ii) a site identification heritage assessment;

(iii) archaeological salvage. Does it include filling the excavated area?;

(iv) field assessment procedures including measuring and protecting the value of heritage places or objects in the SHP; and

(v) archaeological "significance" assessment under s 39. Is "significance" evaluated by the representativeness of the site, the research potential or another measurement(s)?

(h) Whether it is best practice for compliance reports to be provided once sites have been excavated and/or destroyed;

(i) I draw your attention to some particular sites that have been destroyed or salvaged as part of the s 18 process. For example, the Court was taken to sites on 14 August 2023 where FMG undertook a salvage operation of some artifacts adjacent to Ganjingarringunha *wundu* (styled YIN11-002 and YIN11-004), an excavation of an extant cave (styled YIN10-111) and an extant walled niche (YIN10-110). Both the extant cave and walled niche were located under an access road. The Court was also taken to a *thalu* site which was submerged within the tailing dam storage facility (YIN10-095), and a location at which skeletal remains were salvaged (YIN10-004) (see *Section 16 Report on Archaeological Assessments at Aboriginal Heritage Sites YIN08-031, YIN10-003, YIN10-021, YIN10-087 and YIN10-107 within the Firetail and Tailings Locations of the Solomon Mine and Infrastructure Area, Western Australia* dated 2 December 2011 by Alpha Archaeology Pty Ltd in Attachment 2). There are no compliance reports in evidence for many sites that were identified to be destroyed or salvaged so YNAC

does not know whether sites have been destroyed or not;

(j) Describe in your report useful artifact attribute data utilising contemporary techniques of radiocarbon and luminescence dating (or alternatives), and other scientific techniques undertaken by the University of Wollongong (and elsewhere) to assist with data collection of artifacts and lithology;

(k) Consider the Report of the Consultation Process and Prior History of the Documentation of Kangeenarina Creek, conducted by the Yindjibarndi Traditional Owners and Terra Rosa Resource Management Group Ltd for Fortescue Metals Group Limited and Wirlu-Murra Tableland Heritage Pty Ltd on behalf of the Mirlu-Murra Yindjibarndi Aboriginal Corporation dated February 2013 and provide your expert opinion regarding the process of "consultation" for that area undertaken with WYAC at that time;

(l) Given Professor Veth's work on the Desert People Project undertaking excavation at Bangkangarra in the Hamersley Range, can you draw inferences from that work that the area of the SHP (also in the Hamersley Range) would have contained equally archeologically rich sites that have been destroyed under s 18? Are you able to utilise the reports prepared for ss 16 or 18 applications as listed in Attachment 2, your experience of other areas in the Pilbara, academic literature and YAC / YNAC's records, to form such a view?; and

(m) Provide your opinion about the surveys undertaken in 2010 by Michael Woodley and others for YAC/YNAC, and again in 2018 and 2021, and the sites identified during those surveys compared to the surveys carried out by archaeologists alone or with members of the Wirlu-Mura Yindjibarndi Aboriginal Corporation, who acted separately from YAC/YNAC during that period (see Attachment 2).

9. The Brief requires you to provide me with a draft of your report by no later than 3 June 2024.

Methodology

10. You must use defensible and sound methodologies in your report to support your opinions.

11. In preparing and compiling your report, you are asked to:

    (a) review and critically assess the material provided with this Brief to the extent that it is relevant; and

    (b) conduct further research, or request YNAC to conduct further research, to obtain any additional material required in order to provide a proper and informed basis for any opinions expressed. Such further research may include, if required by YNAC or requested by you, a field trip to the SHP area.

12. You are then, based upon the material provided and further research conducted, required to:

    (a) provide YNAC with a draft report by **3 June 2024**, prepared in accordance with the Federal Court's *Expert Evidence Practice Note (GPN-EXPT)* dated 25 October 2016 annexing the Harmonised Expert Code of Conduct (a copy is **Attachment 7** to this Brief),

    (b) consider any comments or feedback by YNAC about the draft report which may be provided to you on or before **7 June 2024**;

    (c) having reviewed the comments / feedback provided by YNAC, provide a final report to YNAC, by no later than **10 June 2024**;

    (d) attend at the Federal Court in Perth, if required, in the weeks of **14-18 October 2024 or an alternative date if the court so orders**, to give expert evidence concurrently regarding the issues addressed in your report.

13. FMG or the State may Brief and provide an expert report from their own archaeology experts. Part of your Brief, therefore, may be to consider and provide comments to YNAC on any such reports relevant to your expertise and background within a timeframe to be agreed (but in any event before your attendance at any experts' conference).

The form and content of your report

14. In compliance with *GPN-EXPT*, your report must:

    (a) give details of your qualifications and experience (by attaching a curriculum vitae), and of the literature and other materials used in writing the report;

    (b) clearly and fully state all assumptions of fact that you have made in arriving at the conclusions expressed in your report;

    (c) identify with precision the factual premises upon which your opinions are based;

    (d) explain the process of reasoning by which you reached the opinions expressed in your report; and

    (e) clearly differentiate between the facts upon which your opinions are based and the opinions themselves.

15. If you are assisted by any other people in the preparation of the report, the nature of that assistance must be identified with details given of the work carried out by, and the qualifications of, each other such person who has assisted you.

16. The report should be set out in numbered paragraphs and should append a copy of this Brief. It would also be desirable if you could set out very early in the report, a short description of the materials that you have had regard to, and the methodology employed in the preparation and writing of the report.

17. You should also provide an explanation of the way in which your specialised knowledge, based upon your training, study and experience, has equipped you to provide expert opinion evidence on the issues that are addressed in your report.

The *Harman* undertaking

18. As part of the Brief, we will likely provide you with documents that are not in the public domain and were provided by FMG or the State of Western Australia. Information that is not in the public domain and was obtained by discovery or subpoena cannot be used for a collateral or ulterior purpose unrelated to the proceedings in which the information was obtained. This is called an implied or "*Harman*" undertaking after *Harman v Secretary of State for the Home Department* [1983] 1 AC 280. It is a substantive legal obligation owed to the party who produces the documents and to the court: *Hearne v Street* (2008) 235 CLR 125 (***Hearne***) at [107]–[108].

19. The rationale for the undertaking is that the compulsion to produce material violates a party's right to confidentiality, and it would be inequitable for that material to be used for purposes other than that which compelled its production.

20. The *Harman* undertaking binds the litigants in proceedings and also any third party who receives documents and is aware that they have come from legal proceedings: *Hearne* at [109]–[112]. The third party does *not* need to know about the undertaking to be bound by it. Nevertheless, we consider it important that you are aware that you cannot utilise any documents or data provided to you obtained from FMG as part of the YNAC compensation claim discovery process with FMG unless we indicate otherwise.

21. Using information for “a collateral or ulterior purpose" includes using information from one proceeding to maintain a different proceeding, even if the parties and causes of action are identical: *Crest Homes plc v Marks* [1987] 1 AC 829 at 837.

22. Information can be disclosed among a litigant's solicitors, counsel and advisers, as well as to actual and prospective witnesses and to the directors and officers of a corporate litigant. In all cases, those receiving the information are themselves bound by the undertaking.

23. Breach is a contempt of court, and therefore very serious for litigants, third party recipients and legal practitioners. A person can be guilty of contempt of court if they do not comply with a lawful direction of the court such as a "*Harman*" undertaking. There is no "public interest" defence to a breach of the *Harman* undertaking.

Conclusion

24. If you have any questions in relation to this Brief, please contact Simon Blackshield on 0414 257 435 or at simon@blackshield.net or Sophie Kilpatrick on 0412 411 023 or Sophie.kilpatrick@crosscountrynts.com.au.

Yours sincerely

Simon Blackshield

ANNEXURE 2: EXPERT EVIDENCE PRACTICE NOTE

EXPERT EVIDENCE PRACTICE NOTE (GPN-EXPT)

General Practice Note

1. INTRODUCTION

1.1 This practice note, including the *Harmonised Expert Witness Code of Conduct* (**"Code"**) (see Annexure A) and the *Concurrent Expert Evidence Guidelines* (**"Concurrent Evidence Guidelines"**) (see Annexure B), applies to any proceeding involving the use of expert evidence and must be read together with:

(a) the Central Practice Note (CPN-1), which sets out the fundamental principles concerning the National Court Framework (**"NCF"**) of the Federal Court and key principles of case management procedure;

(b) the Federal Court of Australia Act 1976 (Cth) **("Federal Court Act")**;

(c) the *Evidence Act 1995* (Cth) **("Evidence Act"),** including Part 3.3 of the Evidence Act;

(d) Part 23 of the *Federal Court Rules 2011* (Cth) **("Federal Court Rules")**; and

(e) where applicable, the Survey Evidence Practice Note (GPN-SURV).

1.2 This practice note takes effect from the date it is issued and, to the extent practicable, applies to proceedings whether filed before, or after, the date of issuing.

2. APPROACH TO EXPERT EVIDENCE

2.1 An expert witness may be retained to give opinion evidence in the proceeding, or, in certain circumstances, to express an opinion that may be relied upon in alternative dispute resolution procedures such as mediation or a conference of experts. In some circumstances an expert may be appointed as an independent adviser to the Court.

2.2 The purpose of the use of expert evidence in proceedings, often in relation to complex subject matter, is for the Court to receive the benefit of the objective and impartial assessment of an issue from a witness with specialised knowledge (based on training, study or experience - see generally s 79 of the Evidence Act).

2.3 However, the use or admissibility of expert evidence remains subject to the overriding requirements that:

(a) to be admissible in a proceeding, any such evidence must be relevant (s 56 of the Evidence Act); and

(b) even if relevant, any such evidence, may be refused to be admitted by the Court if its probative value is outweighed by other considerations such as the evidence being unfairly prejudicial, misleading or will result in an undue waste of time (s 135 of the Evidence Act).

2.4 An expert witness' opinion evidence may have little or no value unless the assumptions adopted by the expert (ie. the facts or grounds relied upon) and his or her reasoning are expressly stated in any written report or oral evidence given.

2.5 The Court will ensure that, in the interests of justice, parties are given a reasonable opportunity to adduce and test relevant expert opinion evidence. However, the Court expects parties and any legal representatives acting on their behalf, when dealing with expert witnesses and expert evidence, to at all times comply with their duties associated with the overarching purpose in the Federal Court Act (see ss 37M and 37N).

3. INTERACTION WITH EXPERT WITNESSES

3.1 Parties and their legal representatives should never view an expert witness retained (or partly retained) by them as that party's advocate or "hired gun". Equally, they should never attempt to pressure or influence an expert into conforming his or her views with the party's interests.

3.2 A party or legal representative should be cautious not to have inappropriate communications when retaining or instructing an independent expert, or assisting an independent expert in the preparation of his or her evidence. However, it is important to note that there is no principle of law or practice and there is nothing in this practice note that obliges a party to embark on the costly task of engaging a "consulting expert" in order to avoid "contamination" of the expert who will give evidence. Indeed the Court would generally discourage such costly duplication.

3.3 Any witness retained by a party for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based in the specialised knowledge of the witness should, at the earliest opportunity, be provided with:

(a) a copy of this practice note, including the Code (see Annexure A); and

(b) all relevant information (whether helpful or harmful to that party's case) so as to enable the expert to prepare a report of a truly independent nature.

3.4 Any questions or assumptions provided to an expert should be provided in an unbiased manner and in such a way that the expert is not confined to addressing selective, irrelevant or immaterial issues.

4. ROLE AND DUTIES OF THE EXPERT WITNESS

4.1 The role of the expert witness is to provide relevant and impartial evidence in his or her area of expertise. An expert should never mislead the Court or become an advocate for the cause of the party that has retained the expert.

4.2 It should be emphasised that there is nothing inherently wrong with experts disagreeing or failing to reach the same conclusion. The Court will, with the assistance of the evidence of the experts, reach its own conclusion.

4.3 However, experts should willingly be prepared to change their opinion or make concessions when it is necessary or appropriate to do so, even if doing so would be contrary to any previously held or expressed view of that expert.

Harmonised Expert Witness Code of Conduct

4.4 Every expert witness giving evidence in this Court must read the *Harmonised Expert Witness*

Code of Conduct (attached in Annexure A) and agree to be bound by it.

4.5 The Code is not intended to address all aspects of an expert witness' duties, but is intended to facilitate the admission of opinion evidence, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is expected that compliance with the Code will assist individual expert witnesses to avoid criticism (rightly or wrongly) that they lack objectivity or are partisan.

5. CONTENTS OF AN EXPERT'S REPORT AND RELATED MATERIAL

5.1 The contents of an expert's report must conform with the requirements set out in the Code (including clauses 3 to 5 of the Code).

5.2 In addition, the contents of such a report must also comply with r 23.13 of the Federal Court Rules. Given that the requirements of that rule significantly overlap with the requirements in the Code, an expert, unless otherwise directed by the Court, will be taken to have complied with the requirements of r 23.13 if that expert has complied with the requirements in the Code and has complied with the additional following requirements. The expert shall:

(a) acknowledge in the report that:

(i) the expert has read and complied with this practice note and agrees to be bound by it; and

(ii) the expert's opinions are based wholly or substantially on specialised knowledge arising from the expert's training, study or experience;

(b) identify in the report the questions that the expert was asked to address;

(c) sign the report and attach or exhibit to it copies of:

(i) documents that record any instructions given to the expert; and

(ii) documents and other materials that the expert has been instructed to consider.

5.3 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the other parties at the same time as the expert's report.

6. CASE MANAGEMENT CONSIDERATIONS

6.1 Parties intending to rely on expert evidence at trial are expected to consider between them and inform the Court at the earliest opportunity of their views on the following:

(a) whether a party should adduce evidence from more than one expert in any single discipline;

(b) whether a common expert is appropriate for all or any part of the evidence;

(c) the nature and extent of expert reports, including any in reply;

(d) the identity of each expert witness that a party intends to call, their area(s) of

expertise and availability during the proposed hearing;

(e) the issues that it is proposed each expert will address;

(f) the arrangements for a conference of experts to prepare a joint-report (see Part 7 of this practice note);

(g) whether the evidence is to be given concurrently and, if so, how (see Part 8 of this practice note); and

(h) whether any of the evidence in chief can be given orally.

6.2 It will often be desirable, before any expert is retained, for the parties to attempt to agree on the question or questions proposed to be the subject of expert evidence as well as the relevant facts and assumptions. The Court may make orders to that effect where it considers it appropriate to do so.

7. CONFERENCE OF EXPERTS AND JOINT-REPORT

7.1 Parties, their legal representatives and experts should be familiar with aspects of the Code relating to conferences of experts and joint-reports (see clauses 6 and 7 of the Code attached in Annexure A).

7.2 In order to facilitate the proper understanding of issues arising in expert evidence and to manage expert evidence in accordance with the overarching purpose, the Court may require experts who are to give evidence or who have produced reports to meet for the purpose of identifying and addressing the issues not agreed between them with a view to reaching agreement where this is possible ("**conference of experts**"). In an appropriate case, the Court may appoint a registrar of the Court or some other suitably qualified person ("**Conference Facilitator**") to act as a facilitator at the conference of experts.

7.3 It is expected that where expert evidence may be relied on in any proceeding, at the earliest opportunity, parties will discuss and then inform the Court whether a conference of experts and/or a joint-report by the experts may be desirable to assist with or simplify the giving of expert evidence in the proceeding. The parties should discuss the necessary arrangements for any conference and/or joint-report. The arrangements discussed between the parties should address:

(a) who should prepare any joint-report;

(b) whether a list of issues is needed to assist the experts in the conference and, if so, whether the Court, the parties o r the experts should assist in preparing such a list;

(c) the agenda for the conference of experts; and

(d) arrangements for the provision, to the parties and the Court, of any joint-report or any other report as to the outcomes of the conference ("**conference report**").

Conference of Experts

7.4 The purpose of the conference of experts is for the experts to have a comprehensive discussion of issues relating to their field of expertise, with a view to identifying matters and issues in a proceeding about which the experts agree, partly agree or disagree and why. For

this reason the conference is attended only by the experts and any Conference Facilitator. Unless the Court orders otherwise, the parties' lawyers will not attend the conference but will be provided with a copy of any conference report.

7.5 The Court may order that a conference of experts occur in a variety of circumstances, depending on the views of the judge and the parties and the needs of the case, including:

(a) while a case is in mediation. When this occurs the Court may also order that the outcome of the conference or any document disclosing or summarising the experts' opinions be confidential to the parties while the mediation is occurring;

(b) before the experts have reached a final opinion on a relevant question or the facts involved in a case. When this occurs the Court may order that the parties exchange draft expert reports and that a conference report be prepared for the use of the experts in finalising their reports;

(c) after the experts' reports have been provided to the Court but before the hearing of the experts' evidence. When this occurs the Court may also order that a conference report be prepared (jointly or otherwise) to ensure the efficient hearing of the experts' evidence.

7.6 Subject to any other order or direction of the Court, the parties and their lawyers must not involve themselves in the conference of experts process. In particular, they must not seek to encourage an expert not to agree with another expert or otherwise seek to influence the outcome of the conference of experts. The experts should raise any queries they may have in relation to the process with the Conference Facilitator (if one has been appointed) or in accordance with a protocol agreed between the lawyers prior to the conference of experts taking place (if no Conference Facilitator has been appointed).

7.7 Any list of issues prepared for the consideration of the experts as part of the conference of experts process should be prepared using non-tendentious language.

7.8 The timing and location of the conference of experts will be decided by the judge or a registrar who will take into account the location and availability of the experts and the Court's case management timetable. The conference may take place at the Court and will usually be conducted in-person. However, if not considered a hindrance to the process, the conference may also be conducted with the assistance of visual or audio technology (such as via the internet, video link and/or by telephone).

7.9 Experts should prepare for a conference of experts by ensuring that they are familiar with all of the material upon which they base their opinions. Where expert reports in draft or final form have been exchanged prior to the conference, experts should attend the conference familiar with the reports of the other experts. Prior to the conference, experts should also consider where they believe the differences of opinion lie between them and what processes and discussions may assist to identify and refine those areas of difference.

Joint-report

7.10 At the conclusion of the conference of experts, unless the Court considers it unnecessary to do so, it is expected that the experts will have narrowed the issues in respect of which they agree, partly agree or disagree in a joint-report. The jointreport should be clear, plain and

concise and should summarise the views of the experts on the identified issues, including a succinct explanation for any differences of opinion, and otherwise be structured in the manner requested by the judge or registrar.

7.11 In some cases (and most particularly in some native title cases), depending on the nature, volume and complexity of the expert evidence a judge may direct a registrar to draft part, or all, of a conference report. If so, the registrar will usually provide the draft conference report to the relevant experts and seek their confirmation that the conference report accurately reflects the opinions of the experts expressed at the conference. Once that confirmation has been received the registrar will finalise the conference report and provide it to the intended recipient(s).

8. CONCURRENT EXPERT EVIDENCE

8.1 The Court may determine that it is appropriate, depending on the nature of the expert evidence and the proceeding generally, for experts to give some or all of their evidence concurrently at the final (or other) hearing.

8.2 Parties should familiarise themselves with the *Concurrent Expert Evidence Guidelines* (attached in Annexure B). The Concurrent Evidence Guidelines are not intended to be exhaustive but indicate the circumstances when the Court might consider it appropriate for concurrent expert evidence to take place, outline how that process may be undertaken, and assist experts to understand in general terms what the Court expects of them.

8.3 If an order is made for concurrent expert evidence to be given at a hearing, any expert to give such evidence should be provided with the Concurrent Evidence Guidelines well in advance of the hearing and should be familiar with those guidelines before giving evidence.

9. FURTHER PRACTICE INFORMATION AND RESOURCES

9.1 Further information regarding Expert Evidence and Expert Witnesses is available on the Court's website.

9.2 Further information to assist litigants, including a range of helpful guides, is also available on the Court's website. This information may be particularly helpful for litigants who are representing themselves.

J L B ALLSOP
Chief Justice
25 October 2016

Annexure A

HARMONISED EXPERT WITNESS CODE OF CONDUCT

APPLICATION OF CODE

1. This Code of Conduct applies to any expert witness engaged or appointed:

   (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or

   (b) to give opinion evidence in proceedings or proposed proceedings.

GENERAL DUTIES TO THE COURT

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

CONTENT OF REPORT

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide:

   (a) the name and address of the expert;

   (b) an acknowledgment that the expert has read this code and agrees to be bound by it;

   (c) the qualifications of the expert to prepare the report;

   (d) the assumptions and material facts on which each opinion expressed in the report is based [a letter of instructions may be annexed];

   (e) the reasons for and any literature or other materials utilised in support of such opinion;

   (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;

   (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;

   (h) the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and the opinion expressed by that other person;

   (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly in the report), and that no matters of significance which the expert regards as relevant have, to the knowledge of the expert, been withheld from the Court;

   (j) any qualifications on an opinion expressed in the report without which the report is or may be incomplete or inaccurate;

   (k) whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and

   (l) where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

SUPPLEMENTARY REPORT FOLLOWING CHANGE OF OPINION

4. Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (l) of clause 3 of this code and, if applicable, paragraph (f) of that clause.

5. In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

DUTY TO COMPLY WITH THE COURT'S DIRECTIONS

6. If directed to do so by the Court, an expert witness shall:

   (a) confer with any other expert witness;

   (b) provide the Court with a joint-report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and

   (c) abide in a timely way by any direction of the Court.

CONFERENCE OF EXPERTS

7. Each expert witness shall:

   (a) exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and

   (b) endeavour to reach agreement with the other expert witness (or witnesses) on any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

ANNEXURE B

CONCURRENT EXPERT EVIDENCE GUIDELINES

APPLICATION OF THE COURT'S GUIDELINES

1. The Court's Concurrent Expert Evidence Guidelines (**"Concurrent Evidence Guidelines"**) are intended to inform parties, practitioners and experts of the Court's general approach to concurrent expert evidence, the circumstances in which the Court might consider expert witnesses giving evidence concurrently and, if so, the procedures by which their evidence may be taken.

OBJECTIVES OF CONCURRENT EXPERT EVIDENCE TECHNIQUE

2. The use of concurrent evidence for the giving of expert evidence at hearings as a case management technique will be utilised by the Court in appropriate circumstances (see r 23.15 of the *Federal Court Rules 2011* (Cth)). Not all cases will suit the process. For instance, in some patent cases, where the entire case revolves around conflicts within fields of expertise, concurrent evidence may not assist a judge. However, patent cases should not be excluded from concurrent expert evidence processes.

3. In many cases the use of concurrent expert evidence is a technique that can reduce the partisan or confrontational nature of conventional hearing processes and minimises the risk that experts become "opposing experts" rather than independent experts assisting the Court. It can elicit more precise and accurate expert evidence with greater input and assistance from the experts themselves.

4. When properly and flexibly applied, with efficiency and discipline during the hearing process, the technique may also allow the experts to more effectively focus on the critical points of disagreement between them, identify or resolve those issues more quickly, and narrow the issues in dispute. This can also allow for the key evidence to be given at the same time (rather than being spread across many days of hearing); permit the judge to assess an expert more readily, whilst allowing each party a genuine opportunity to put and test expert evidence. This can reduce the chance of the experts, lawyers and the judge misunderstanding the opinions being expressed by the experts.

5. It is essential that such a process has the full cooperation and support of all of the individuals involved, including the experts and counsel involved in the questioning process. Without that cooperation and support the process may fail in its objectives and even hinder the case management process.

CASE MANAGEMENT

6. Parties should expect that, the Court will give careful consideration to whether concurrent evidence is appropriate in circumstances where there is more than one expert witness having the same expertise who is to give evidence on the same or related topics. Whether experts should give evidence concurrently is a matter for the Court, and will depend on the circumstances of each individual case, including the character of the proceeding, the nature of the expert evidence, and the views of the parties.

7. Although this consideration may take place at any time, including the commencement of the hearing, if not raised earlier, parties should raise the issue of concurrent evidence at the first appropriate case management hearing, and no later than any pre-trial case management hearing, so that orders can be made in advance, if necessary. To that end, prior to the hearing at which expert evidence may be given concurrently, parties and their lawyers should confer and give general consideration as to:

   (a) the agenda;

   (b) the order and manner in which questions will be asked; and

   (c) whether cross-examination will take place within the context of the concurrent evidence or after its conclusion.

8. At the same time, and before any hearing date is fixed, the identity of all experts proposed to be called and their areas of expertise is to be notified to the Court by all parties.

9. The lack of any concurrent evidence orders does not mean that the Court will not consider using concurrent evidence without prior notice to the parties, if appropriate.

CONFERENCE OF EXPERTS & JOINT-REPORT OR LIST OF ISSUES

10. The process of giving concurrent evidence at hearings may be assisted by the preparation of a jointreport or list of issues prepared as part of a conference of experts.

11. Parties should expect that, where concurrent evidence is appropriate, the Court may make orders requiring a conference of experts to take place or for documents such as a joint-report to be prepared to facilitate the concurrent expert evidence process at a hearing (see Part 7 of the Expert Evidence Practice Note).

PROCEDURE AT HEARING

12. Concurrent expert evidence may be taken at any convenient time during the hearing, although it will often occur at the conclusion of both parties' lay evidence.

13. At the hearing itself, the way in which concurrent expert evidence is taken must be applied flexibly and having regard to the characteristics of the case and the nature of the evidence to be given.

14. Without intending to be prescriptive of the procedure, parties should expect that, when evidence is given by experts in concurrent session:

    (a) the judge will explain to the experts the procedure that will be followed and that the nature of the process may be different to their previous experiences of giving expert evidence;

    (b) the experts will be grouped and called to give evidence together in their respective fields of expertise;

    (c) the experts will take the oath or affirmation together, as appropriate;

    (d) the experts will sit together with convenient access to their materials for their ease of reference, either in the witness box or in some other location in the courtroom, including (if necessary) at the bar table;

    (e) each expert may be given the opportunity to provide a summary overview of their current opinions and explain what they consider to be the principal issues of disagreement between the experts, as they see them, in their own words;

    (f) the judge will guide the process by which evidence is given, including, where appropriate:

        (i) using any joint-report or list of issues as a guide for all the experts to be asked questions by the judge and counsel, about each issue on an issue-by-issue basis;

        (ii) ensuring that each expert is given an adequate opportunity to deal with each

issue and the exposition given by other experts including, where considered appropriate, each expert asking questions of other experts or supplementing the evidence given by other experts;

(iii) inviting legal representatives to identify the topics upon which they will cross-examine;

(iv) ensuring that legal representatives have an adequate opportunity to ask all experts questions about each issue. Legal representatives may also seek responses or contributions from one or more experts in response to the evidence given by a different expert; and

(v) allowing the experts an opportunity to summarise their views at the end of the process where opinions may have been changed or clarifications are needed.

15. The fact that the experts may have been provided with a list of issues for consideration does not confine the scope of any cross-examination of any expert. The process of cross-examination remains subject to the overall control of the judge.

16. The concurrent session should allow for a sensible and orderly series of exchanges between expert and expert, and between expert and lawyer. Where appropriate, the judge may allow for more traditional cross-examination to be pursued by a legal representative on a particular issue exclusively with one expert. Where that occurs, other experts may be asked to comment on the evidence given.

17. Where any issue involves only one expert, the party wishing to ask questions about that issue should let the judge know in advance so that consideration can be given to whether arrangements should be made for that issue to be dealt with after the completion of the concurrent session. Otherwise, as far as practicable, questions (including in the form of cross-examination) will usually be dealt with in the concurrent session.

18. Throughout the concurrent evidence process the judge will ensure that the process is fair and effective (for the parties and the experts), balanced (including not permitting one expert to overwhelm or overshadow any other expert), and does not become a protracted or inefficient process.

ANNEXURE 3: PROFESSOR VETH SHORT CV

PETER MARIUS VETH FAHA MAACAI MICOMOS
UWA Professor of Archaeology
ARC Laureate Fellow 2023 – 2027
The University of Western Australia (M257)
35 Stirling Highway, Perth, Western Australia
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EDUCATION

PhD	The University of Western Australia	January 1990
BA. Hons	The University of Western Australia (First Class Honours)	December 1982
Cert IV	Commercial Diving AS 2815 Part 2	August 1996
College	Perth Modern School	December 1976
College	Wesley College (Music Honours)	December 1974

HONORS AND AWARDS

The ARC Laureate Fellowship Award 2022
Laureate Professor-level Fellowship for the Desert People Project
The University of Waikato Radiocarbon Dating Prize 2016
Best paper on dating presented at Annual Meeting (with Balanggarra)
Rhys Jones Medal for Outstanding Contributions to Australian Archaeology 2014
Highest award for archaeologist working in Indigenous, historic or maritime
The Ulm-Ross Prize for the Best Paper in Australian Archaeology 2014
The best paper published in Australian Archaeology Journal
The ARC Discovery Outstanding Researcher Award 2013
Professorial Fellowship for the Barrow Island Archaeology Project
The Eureka Award for Excellence in Archaeological Interpretation 2011
The best paper in Australian Archaeology Journal
The Bruce Veitch Award for Excellence in Indigenous Engagement 2011
National award for ethical engagement with Aboriginal communities
The James Cook University Award for Excellence in Research 1993
An award for research excellence in the Faculty of Arts

COMPETITIVE GRANTS AWARDED (completed or current)

Postgraduate Commonwealth Scholarship Award	1986-89
AIATSIS Major Grant Western Desert Archaeology	1986
AIATSIS C14 Grant Western Desert Archaeology	1987
Australian Museum Grant Arid Zone Archaeology	1988
W.D.P.A.C. Grant Arid Zone Archaeology	1989
AIATSIS Grant Montebello Island Prehistory	1991
AHC National Estate Grants Program for Burrup Peninsula (CALM)	1992
ARC IRG - Montebello Island Prehistory	1993
ARC IRG - Barrow/Montebello Prehistory	1994
ARC – IRG Grant for the Prehistory of the Aru Islands	1995
JCU MRG Grant Magnetic Island Shipwreck Project	1995
ARC DP Grant - Prehistory of the Aru Islands	1996
WAM Centre of Excellence Grant - Excavation of HMAV Bounty	1997
AINSE/160R Veth, O'Connor and Spriggs Bridging Sunda and Sahul	1998
ARC The Archaeology of East Timor Project (with Spriggs and O'Connor)	2000-02
ARC SPIRT Land tenure and native title CQLC (with Henry and Kapferer)	2000
ARC Murray Islands Archaeology Project (with Meriam Council)	2000
NSP Norfolk Island/Sirius Archaeology (Erskine NI and JCU)	2001
EPA In situ protocols for wreck management Great Barrier Reef Province	2001
AINSE/111 O'Connor, Spriggs and Veth - East Timor dating	2001
ARC/AINSE AMS dates for project Archaeology of East Timor	2002
Academy of the Humanities – Publication subsidy – ANU Terra Australis	2004
AINGRA04117 O'Connor and Veth Dating shell artefacts from East Timor	2004
Grant Ngaanyatjarra Land Council – Cultural mapping, Canning Stock Route	2005
Australia on the Map and NMA subsidies Conference: Strangers on the Shore	2006
ARC Linkage Grant (Morphy and McDonald) Canning Stock Route Project	2007-11
ARC Linkage Grant Australian Historic Shipwrecks Preservation Project	2012-15
ARC DP/DORA 3 The Barrow Island Archaeology Project (Lead CI)	2012-15
ARC Linkage Grant – Murujuga: Dynamics of the Dreaming	2015-18
ARC Linkage Grant – Conservation and Dating of Kimberley Rock Art	2014-17
ARC Linkage Grant – Kimberley Visions: Art Provinces of Nth Australia	2016-21
ARC Linkage Grant – Dating Kimberley Rock Art	2018-21
ARC Linkage Grant – From the Desert to the Sea	2021-26
ARC Laureate Fellowship Award – Desert People: Australian Perspectives	2023-28
ARC Centre of Excellence for Indigenous and Environmental Histories and Futures	2024-30

PUBLICATIONS

Books and Monographs (n = 12)

Peer-reviewed Papers in Journals and Chapter Publications (n = 211)

Commissioned Heritage Reports (n = 135)

Total number of publications and technical reports December 2023 (N = 358 items)

Books, Monographs and Edited Volumes:

1) Veth, P., Bradshaw, E., Gara, T., Hall, N., Haydock, P. and P. Kendrick 1993 *Burrup Peninsula Aboriginal Heritage Project.* Department of Conservation and Land Management, Perth.

2) Harrison, R., Veth, P. and J. McDonald eds 2005 Native Title and Archaeology. *Australian Aboriginal Studies* 2005/1. AIATSIS, Canberra.

3) O'Connor, S., Spriggs, M. and P. Veth 2005 *The Archaeology of The Aru Islands, Maluku Province. Terra Australis*. The Research School of Pacific and Asian Studies, The Australian National University, Canberra.

4) O'Connor, S. and P. Veth 2000 *East of Wallace's Line: Studies of Past and Present Maritime Cultures in the Indo-Pacific Region*. Modern Quaternary Research in South East Asia 16: V-VI. A.A. Balkema, Rotterdam.

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Ward, I. and P. Veth 2017 To the islands: the archaeology of the archipelagos of NW Australia and its implications for drowned cultural landscapes. In Bailey, G. N., Harff, J. and D. Sakellariou (eds) *Under the Sea: archaeology and Paleolandscapes of the Continental Shelf.* Coastal Research Library 20, doi 10.1007/978-3-3319-53160-1_1

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Ward, I., Salvemini, F. and P. Veth 2016 3D visualisation of a chert artefact from Barrow Island. *Journal of Archaeological Science: Reports* 7: 432–436.

Ward, I., Smyth, D., Veth, P., McDonald, J. and S. McNear 2018 Recognition and value of submerged prehistoric landscape resources in Australia. *Journal of Ocean and Costal Management* https://doi.org/10.1016/j.ocecoaman.2018.04.013.

Ward, I., Veth, P., Prossor, L., Denham, T., Ditchfield, K., Manne, T., Kendrick, P., Byrne, C., Hook, F. and U. Troitzsch 2017 50,000 years of archaeological site stratigraphy and micromorphology in Boodie Cave, Barrow Island, Western Australia. *Journal of Archaeological Science: Reports* 15: 344-369.

Williams, A.N., Veth, P., Steffen, W., Ulm, S., Turney, C.S.M., Phipps, S., Smith, M., Reeves, J. 2015 A Continental Narrative: Human Settlement Patterns and Australasian Climate Change over the last 35,000 Years. *Quaternary Science Reviews* 123: 91 – 112.

Zeanah, D.W., Codding, B., Bird, D.W., Bliege Bird, R., and P. Veth 2015 Diesel and damper: Changes in seed use and mobility patterns following contact amongst the Martu of Western Australia. *Journal of Anthropological Archaeology* 39: 51-62.

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MEDIA EXPERIENCE

I have conducted a substantial number of domestic and international interviews for radio, television, newspaper and magazine outlets on topics concerning heritage legislation, Indigenous heritage, professional accreditation and significant scientific discoveries e.g. The Barrow Island Project, The Canning Stock Route Project, The Pitcairn Island Project, Murray Island Archaeology Project and the Archaeology of Eastern Indonesia and East Timor. I have been an elected public media spokesperson and participated in film production with regular contributions to national broadsheets.

PROFESSIONAL AND HONORARY AFFILIATIONS

Member the Australian Institute of Aboriginal and Torres Strait Islander Studies	1991
Fellow of the Australian Academy of the Humanities	2005
Full Member, Australian Association of Consulting Archaeologists Incorporated	1991
Member of the Australian Archaeological Association	1988
Honorary Research Associate the Western Australian Museum	2012
AI, The ARC Council Centre of Excellence for Australian Biodiversity and Heritage	2017
CI, ARC Centre of Excellence for Indigenous and Environmental Histories and Futures	2023

CULTURAL HERITAGE, RESEARCH, MANAGEMENT AND EXPERT WITNESS REPORTS

I have been a heritage researcher and completed many heritage and archaeology reports for varied organisations including government departments, Aboriginal legal services, resource developers, heritage groups, PBCs and Aboriginal Land Councils.

These reports have all been assessed by statutory authorities/heritage agencies/Aboriginal

legal bodies located in Western Australia, the Northern Territory, Queensland, South Australia and Tasmania.

Thirteen reports have been written for native title cases from 1992 to 2006 including the *Ngarluma-Yindjibarndi,* De Rose Hill, *Wongatha*, *Mantjiltjarra/Ngalia, Koara*, *Koara* overlap with *Wutha*, *Wutha*, Sir Samuel, *Bundjalang Peoples*, Central West, *Ngadju*, *Martu* and *Birriliburu* Native Title Claims. I was retained as a part-time Senior Heritage Advisor to Rio Tinto 2006 – 2008.

I was the Archaeology Consultant for the ABC Series *First Footprints* on the Indigenous Heritage of Australia working with Martin Butler and Bentley Dean (whose film *Contact* won the PM's History Prize). The *First Footprints* series was awarded the NSW Premier's History Award, an ATOM award for best documentary, the Walkley Award for excellence in documentary and a HUGO at the Chicago Film Festival. I have continued to develop content and present into film series including for the ABC and independents. I have recently contributed to the film *Two Ways Documentary* – a film on Kimberley Traditional Owners, the dating and significance of the rock art and their cultural estates. I was consulted on Aboriginal heritage and appeared in the recent *Tim Winton's Ningaloo Nyinggulu series* (Artemis Media and Matter of Factual for ABC and Love Nature). This has received a number of awards including the Best Natural History Program by the International Association for Broadcasting Awards, Whitehall, London.

ANNEXURE 4: DR CAROLINE BIRD CV

Dr Caroline Bird FAHA, MAACAI

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Mobile: 0402 131335. **Email:** birho@optusnet.com.au

SUMMARY

- Current position:
  - Senior Archaeologist, Archae-aus, 1/107 Stirling Hwy, North Fremantle WA 6159.
  - Research Adjunct, Western Australian Museum.
- Postgraduate qualifications in archaeology, science and technology studies, and workplace assessment and training.
- Over 40 years diverse professional experience in archaeology and heritage in Australia and overseas in a range of roles. Specialist in Aboriginal heritage, lithic analysis, writing and editing, and education and training.
- Extensive experience includes:
  - research in the government, academic and private sectors,
  - provision of heritage advice,
  - teaching and curriculum development,
  - writing and editing technical/specialist and general publications,
  - development of museum displays and other educational material,
  - conducting archaeological field and laboratory programs.

EDUCATION

1985 PhD, Centre for Prehistory, University of Western Australia
Thesis: *Prehistoric lithic resource utilisation: a case study from the Southwest of Western Australia*
1997 MA (STS), Science and Technology Studies, Deakin University
1977 BA (Hons) (First class), Archaeology and Anthropology, Cambridge University, UK.
2003 Certificate IV Assessment and Workplace Training

POSITIONS HELD

2016–present Research Manager (Archaeology)/ Senior Archaeologist, Archae-aus (casual)
2024–present Research Adjunct, Western Australian Museum
2013–2016 Research Manager, Archae-aus (50% job share)
2013–2023 Honorary Editor, Journal of Association of Australian Consulting Archaeologists
2012–2020 Honorary Research Associate, Western Australian Museum
2008–2013 Research Officer, Land Claims, State Solicitors Office, Western Australia
2009, 2010 Examiner, Curriculum Council of Western Australia.
WACE Aboriginal and Intercultural Studies Course of Study Stage 2.
1999–2005 Casual lecturer, TAFE, Western Australia. Cert IV Tourism and Cert IV

	Environmental Practice (Units in Aboriginal Studies and Heritage Studies)
1999–2003	Specialist Archaeologist, Aboriginal Cultural Material Committee
1998	Panel Member, Planning Panels Victoria, Dept of Infrastructure
1995–1998	Research Associate, Department of Archaeology, La Trobe University
1989–1992	Training Officer, Victoria Archaeological Survey
1983–1989	Senior Tutor (1986-1989), Tutor (1983-1985), Department of Archaeology, La Trobe University
1977–1978	Research Assistant, Museum of London
1973–1974	Research Assistant, Guildhall Museum, London

CONSULTANCY HISTORY

Exhibition curator. Projects include: Rottnest Island (*Survivors of Wadjemup* – exhibition about 20th Indigenous prisoners and descendants); City of Perth (development of exhibition for Perth Town Hall 150th anniversary, including online exhibition Heritage Perth Exhibitions); Department of Housing (through Archae-aus) display on underfloor archaeology at Perth Girls' Orphanage.

Freelance writer/ researcher. Contributions to general and specialist books, encyclopedias, dictionary and atlas entries, covering aspects of the archaeology and heritage of Australia and the Pacific. Clients include:

- Routledge – Contributor, *The history of archaeology: an introduction* (2014). Winner: *Current Archaeology* Book of the Year 2015.
- Cambridge University Press – Contributor, *Cambridge Illustrated History of Archaeology* (1996) and *The Cambridge World Prehistory* (2014)
- Penguin Books – Contributor, *The Penguin Archaeology Guide* (2001)
- Forestry Tasmania – *Places of the Pioneers* (1994)

Archaeological consultancy and provision of heritage advice. Projects include:

- ERM – Cataloguing and analysis of artefact collections (2011)
- National Trust of Australia (WA) - *A review of archaeology and rock art in the Dampier Archipelago* and *Archaeology and rock art in the Dampier Archipelago: Non-technical summary report*. (2006) (www.burrup.org.au)
- Victoria Archaeological Survey – Various background studies (1992-1993)
- VAS and Dept of Conservation and Land Management (Victoria) – excavations at Mt Talbot (1987)
- Land Conservation Council, Victoria – background studies (1993 and 1985)

Training and education provider. Develop educational material and deliver short courses in heritage. Clients include:

- Mark Simpson and Associates. Proposed Cert II level course for Archaeological Assistants. Client: Rio Tinto. (2012)
- Curriculum Council of Western Australia. Writer for WACE Aboriginal and Intercultural Studies course of study (years 11 and 12); revising and updating curriculum framework

for the 'culture' outcome (K-10); assisted with new WACE course of study Australian Indigenous Languages. (2003-2008)

- Western Australian Museum. Contributed to the development of Teachers' Guide for *Katta Djinoong* Exhibit (2005)
- Department of Indigenous Affairs. Training in stone artefact recognition and recording, with associated manual (2002)

PROFESSIONAL ORGANISATIONS

- Fellow, Australian Academy of Humanities – elected 2022
- Australian Institute of Aboriginal and Torres Strait Islander Studies
- Member, Australian Association of Consulting Archaeologists Inc
- Australian Archaeological Association
- The Prehistoric Society

PUBLICATIONS

Books

2020 *Kuraree the heart of Perth—150 years of the Perth Town Hall*. City of Perth. Exhibition catalogue.

2020 *Crafting country: Aboriginal archaeology in the eastern Chichester Range, North-West Australia*. Sydney University Press. (With J. Rhoads)

2015 *Kakutungutanta to Warrie Outcamp: 40,000 years in Nyiyaparli country*. Nyiyaparli Community, with Caroline Bird and Edward McDonald. Archae-aus, Fremantle. Winner, John Mulvaney Book Award 2016.

2011 *Fire and Hearth 40 years on: essays in honour of Sylvia Hallam,* Caroline Bird and Esmée Webb (eds). Records of the WA Museum Supplement 79.

2005 *An archaeology of Gariwerd: from Pleistocene to Holocene in western Victoria*. Tempus 8. (With D. Frankel)

1994 *Places of the Pioneers: life and work in Tasmania's forests*. Forestry Tasmania and Australian Government Publishing Service, Canberra

Journal articles

2021 A comment on Ward et al.'s 'Insights into the procurement and distribution of fossiliferous chert artefacts across Southern Australia from the archival record'. *Australian Archaeology*. https://doi.org/10.1080/03122417.2021.1975714 (With J. Dortch and F. Hook)

2019 Tracing pathways: writing archaeology in Nyiyaparli Country. *Archaeology in Oceania*. DOI:10.1002/arco.5206. (With F. Hook and J.W. Rhoads)

2019 Persistent places and places of memory: archaeological markers of long-term connection to Country in the inland Pilbara, Western Australia. *Archaeological Review from Cambridge* 34:28-49. (With F. Hook and J.W. Rhoads)

2016 Reflections on CB08-500: alternative narratives, Aboriginal heritage and significance assessment in Western Australia. *Hunter-Gatherer Research* 2 (3): 327-343. (With F. Hook and J.W. Rhoads)

2015 Rock shelters as indicators of mobility patterns in the inland Pilbara. *Archaeology in Oceania* 50 (Supplement):37-46. (With J.W. Rhoads)

2014 Time and efficiency in data recovery: an experiment comparing wet and dry sieving in Pilbara rockshelter excavations. *Journal of the Australian Association of Consulting Archaeologists* 2:1-8. (With F. Hook and others)

2001 Excavations at Koongine Cave: Lithics and land-use in the Terminal Pleistocene and Holocene of South Australia. *Proceedings of the Prehistoric Society* 67:49-83. (With D. Frankel)

1999 Prokrustes in Gariwerd. *Archaeology in Oceania* 34:86. (With D. Frankel and N. Van Waarden)

1998 Pleistocene and early Holocene archaeology in Victoria. A view from Gariwerd. *The Artefact* 21:48-62. (With D. Frankel)

1998 New radiocarbon determinations from the Grampians-Gariwerd region. *Archaeology in Oceania* 33:31-36. (With D. Frankel and N. Van Waarden)

1998 University, community and government: developing a collaborative archaeological research project in western Victoria. *Australian Aboriginal Studies* 1998 (1): 35-39. (With D. Frankel)

1996 From time to time: Radiocarbon information on Victorian archaeological sites held by Aboriginal Affairs Victoria. *The Artefact* 19: 3-51. (With M.C.S. Godfrey, D. Frankel, J.W. Rhoads and S. Simmons)

1995 Mount Talbot 1: a rockshelter in the southern Wimmera, Victoria, Australia. *The Artefact* 18:12-21.

1992 Chronology and explanation in Western Victoria and South-east South Australia. *Archaeology in Oceania* 26: 1-16. (With D. Frankel)

1991 Problems in establishing a chronological sequence in Western Victoria and South-east South Australia. *World Archaeology* 23: 179-192. (With D. Frankel)

1989 Coastal archaeology in South Gippsland. *Australian Archaeology* 28:14-25. (With D. Frankel, D. Gaughwin, R. Hall)

1985 The university in the community: the Hamilton and Western District Museum. *Bulletin of the Conference of Museum Anthropologists* 17:8-11. (With D. Frankel)

1980 Bone points and spatulae: salvage ethnography in the Southwest of Western Australia. *Archaeology and Physical Anthropology in Oceania* 15:168-171. (With C. Beeck)

Conference proceedings and collections of papers

2013 Integrating hunter-gatherer sites, environments, technology and art in Western Victoria. In D. Frankel, J.M. Webb and S. Lawrence (eds) *Archaeology in Environment and Technology: Intersections and Transformation.* Taylor & Francis/ Routledge. (With D. Frankel)

2011 Topographic archaeology revisited: regional archaeological structure in the southern

Wimmera, Victoria, Australia. In Caroline Bird and Esmée Webb (eds) *Fire and Hearth 40 years on: essays in honour of Sylvia Hallam*, pp. 109-122. Records of the WA Museum Supplement 79. (With J.W. Rhoads)

1993 Woman the toolmaker: evidence for women's use and manufacture of stone tools in Australia and New Guinea. In H. du Cros and L. Smith (eds) *Women in Archaeology a feminist critique*, pp.22-30. Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra.

1992 The Victorian Archaeological Survey's Site Officer Training Scheme. In T. De Lacey et al. (eds) *Aboriginal involvement in parks and protected areas*. Australian Studies Press, Canberra. (with J. Gallagher)

1988 Traditional plant foods in the Southwest of Western Australia: the evidence from salvage ethnography. In B. Meehan and R. Jones (eds) *Archaeology with ethnography*, pp.113-122. Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra. (With C. Beeck)

Contributions to books

2020 Sections on Budj Bim and Kakadu. In Paul Bahn (ed.) *Great Sites of the Ancient World*. Quarto Publishing.

2017 Sections on Australia and the Pacific. In Paul Bahn (ed.) *Archaeology—the whole story*. Smithsonian (USA) and Thames and Hudson (UK). American Library Association Choice Outstanding Academic Titles for 2017.

2014 Australasia. In Paul Bahn (ed.) *The history of archaeology: an introduction*. Routledge. Winner *Current Archaeology* Book of the Year 2015

2014 Chapter 1.37. The Later Prehistory of Australia. In Colin Renfrew and Paul Bahn (eds) *The Cambridge World Prehistory*. Cambridge University Press.

2009 Aboriginal Art, pre-contact. In *Historical Encyclopedia of Western Australia,* Jenny Gregory and Jan Gothard (eds). University of Western Australia Press, Crawley.

2008 Sections on Australian and Pacific heritage. *Exploring the Ancient World*. Paul Bahn (ed.) Automobile Association.

2007 Sections on Australia and the Pacific. *The World Encyclopedia of Archaeology*. Paul G. Bahn (ed.) Toucan Books

2003 *Batavia*'s graveyard. In *Written in Bones: How Human Remains Unlock the Secrets of the Dead,* Paul G. Bahn (ed.) Firefly Books.

2002 Sections on Australia and the Pacific, and archaeology and gender. *Archaeology: The Definitive Guide*, Paul G. Bahn (ed.) Weldon Owen

2001 Entries on Australia and the Pacific. *Penguin Archaeology Guide*, Paul G. Bahn (ed.) Penguin Books

2001 The wreck of the *Rapid*. In *The Archaeology Detectives*, Paul G. Bahn (ed.) Readers Digest.

2000 Australia and the Pacific. *The Atlas of World Archaeology*, Paul G. Bahn (ed.) Time Life Books, Andromeda Oxford.

1999 Treasures of Australasia. In *Wonderful Things: uncovering the world's great archaeological treasures*, Paul G. Bahn (ed.) Weidenfeld and Nicolson, London.

1997 Port Essington. In *Lost Cities: 50 discoveries in world archaeology*, Paul G. Bahn (ed.) Weidenfeld and Nicolson, London.

1996 Earliest Australians; Murray Valley cemeteries; Early Pacific Islanders. In *Tombs, Graves and Mummies: 50 discoveries in world archaeology*, Paul G. Bahn (ed.) Weidenfeld and Nicolson, London.

1996 Text on Australia and the Pacific (passim). *Cambridge Illustrated History of Archaeology*, Paul G. Bahn (ed.) Cambridge University Press.

1995 Lake Mungo; Australia's rock art; Ice age hunters of Tasmania; Colonizing the Pacific. In *The story of archaeology: 100 great archaeological discoveries*, Paul G. Bahn (ed.). Weidenfeld and Nicolson, London.

1993 Contribution to Chapter 5, Cultural resources. In *Marine and Coastal Special Investigation Descriptive Report*, Land Conservation Council, Victoria.

1992 Entries on Australia and the Pacific. *Dictionary of Archaeology*, Paul G. Bahn (ed.) Collins, London.

1985 Aboriginal Associations. In Land Conservation Council, Victoria, *Report on the Wimmera Area*, pp.11-23.

Selected reports

2023 Training program: Introduction to Aboriginal cultural heritage recording. Prepared for BTAC by Archae-aus Pty Ltd, North Fremantle, November 2023. DRAFT – primary author.

2023 Report of review and risk assessment of the current section 18 approval for Jinker/Jinka Hill (ACH Directory ID 5353), held by Ausgold Ltd for the Katanning gold project, Katanning, WA. Prepared for WSP Australia Pty Ltd by Archae-aus Pty Ltd, North Fremantle. DRAFT – co-author.

2023 A research plan for Registered Site Wagerup 1 (DPLH ID 3232). Prepared for Alcoa of Australia Ltd by Archae-aus Pty Ltd, North Fremantle. DRAFT – primary author.

2023 Report of detailed archaeological site recording at Registered Site Wagerup 1 (DPLH ID 3232). Prepared for Alcoa of Australia Ltd by Archae-aus Pty Ltd, North Fremantle. Primary author.

2023 The Report of a Ground Penetrating Radar Survey of Dilyan's Grave and Reserve, Shire of Boddington; Prepared for Hotham River Aboriginal Corporation by Archae-aus Pty Ltd, North Fremantle. Primary author.

2023 Dampier Cargo Wharf Extension Project – specialist lithics report. Prepared for Cosmos Archaeology by Archae-aus Pty Ltd, North Fremantle. Primary author.

2022 Report on Archaeological Site Location and Assessment Level 1 Recording for the Western Range Mine Development, Greater Paraburdoo Operations, Pilbara, WA; Prepared for Yinhawangka Aboriginal Corporation by Archae-aus Pty Ltd, North Fremantle. Co-author

2022 Report on an Archaeological and Ethnographic Site Identification Assessment and Shovel Test Pitting Programme of the proposed Surge Management and Borrow Pit

Areas, Pinjarra Refinery; Prepared for Alcoa World Alumina by Archae-aus Pty Ltd, North Fremantle. Primary author.

2022 Report on salvage of cultural material and excavation at Thomas Road, Casuarina (ID 38661); Prepared for Aigle Royal Developments by Archae-aus Pty Ltd, North Fremantle. Primary author.

2021 Report on Aboriginal Archaeological Investigations at the Roe 8 Rehabilitation Management Area, Lake Walliabup (Bibra Lake) and Lake Coolbellup (North Lake). Prepared for City of Cockburn, Perth, Western Australia by Archae-aus Pty Ltd, North Fremantle, July 2021. Co-author.

2021 Cultural Heritage Management Plan for Thomas Road Skeletal Remains, Casuarina, WA. Prepared for the Aigle Royal Group Pty Ltd by Archae-aus Pty Ltd, North Fremantle. Co-author.

2021 Heritage report – P26460 AA Dam No. 190 James, Lake Grace. Prepared for Water Corporation by Archae-aus Pty Ltd. North Fremantle. Co-author.

2020 A thematic historical heritage assessment of 137 agricultural and other dams in Western Australia's Wheatbelt and Goldfields regions. Archae-aus for Water Corporation. Primary author.

2020 A Report on the Archaeological Investigation of the Government House Earth Closet, Rottnest Island. Prepared for Hocking Heritage and Architecture/FIRM Construction by Archae-aus Pty Ltd, North Fremantle. Co-author.

2019 Report on the Aboriginal heritage monitoring during clearing works for Main Roads Western Australia's Northlink WA Central Section Project. Archae-aus for Great Northern Connect. Co-author. Primary author for artefact analysis.

2019 A report of an Aboriginal ethnographic and archaeological site identification heritage survey of the bridges 0381 and 0387 on the Brookton Highway. Archae-aus and Ethnosciences for Main Roads WA. Co-author. Primary author for archaeological section.

2017 A report of historical archaeological investigations of Internment Camp No 11, 3rd Australian Corp Training facility and the fmr Harvey Agricultural School at 25 James Stirling Place, Harvey. Archae-aus for Priority Property on behalf of LandCorp. Co-author.

2006 A review of archaeology and rock art in the Dampier Archipelago. A report prepared for the National Trust of Australia (WA). (With S. Hallam)

2006 Archaeology and rock art in the Dampier Archipelago. Non-technical summary report prepared for the National Trust of Australia (WA). (With S. Hallam)

2000 An archaeological survey of the south-west Wimmera. A report to Aboriginal Affairs Victoria. (With J.W. Rhoads)

ANNEXURE 5.1: OSL SUMMARY TEXT FROM DR NATHAN JANKOWSKI 24/05/2024

OSL sample collection

A duplicate series of 16 optically stimulated luminescence (OSL) samples (32 in total) were collected systematically at ~10 cm intervals down the northern profile of the SQA excavation trench at the Bangkangarra (YG02) location during the July 2023 fieldwork season. These samples were collected at night under subdued red light conditions by Dr Kane Ditchfield. The outer light-exposed sediments were carefully removed with a trowel, before the underlying light-safe sediments were collected and stored black plastic sample bags. The location of the OSL samples are shown in Fig. 1. These samples were then further wrapped in black plastic before transportation to the University of Wollongong via the University of Western Australia. The samples were received at the Optical Dating Facility in August 2023 for processing and age determination.

OSL dating method

OSL (or optical) dating provides a means of determining burial ages for sediments (Aitken, 1998; Huntley et al., 1985; Jacobs and Roberts, 2007). The method is based on the time-dependent increase in the number of trapped electrons in the crystal lattice of mineral grains—such as quartz—by low levels of ionising radiation from the decay of natural uranium, thorium and potassium in the surrounding deposits, as well as from cosmic rays from space. This luminescence 'clock' is reset by just a few seconds of exposure to sunlight that effectively empties all of the electrons from their trapped location within the crystal defects of the quartz grains. Having been reset (or bleached) and buried within a sedimentary deposit, the number of trapped electrons begins to re-accumulate at a predictable rate, with the OSL signal intensity increasing as a function of the number of trapped electrons. These same light-sensitive traps are stimulated using lasers in the laboratory, resulting in the production and measurement of an OSL signal. An estimate of the time elapsed since this last resetting event can be determined by dividing the amount of radiation needed to induce a corresponding OSL signal in the laboratory as that recorded during burial (known as the equivalent dose, D_e, measured in Gray, Gy) by the rate of radioactivity within the sediments (known as the environmental dose rate, measured in Gy per thousand years, Gy/ka). Thus, the D_e (Gy) divided by the environmental dose rate

(Gy/ka) gives the burial time of the grains in calendar years (ka).

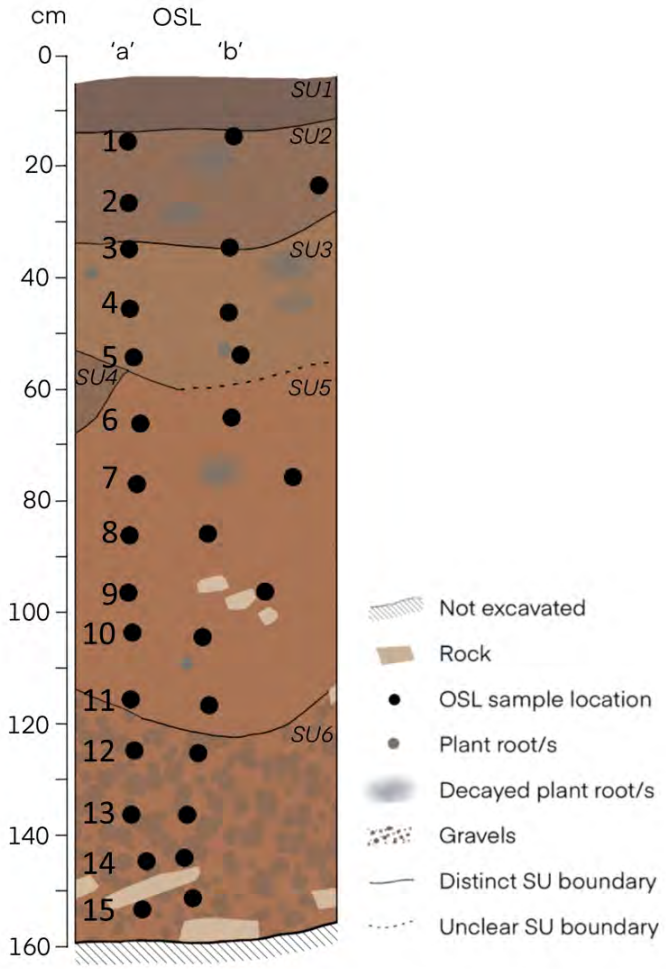

Fig. 1. Preliminary stratigraphic drawing of a portion of the YG02 northern section showing the location of the duplicate OSL samples. Those samples labelled 'a' were used for dose rate determination, with the 'b' samples prepared for equivalent dose (D_e) measurement. Sample 16 was collected from ~158 cm depth on the eastern wall to the right of this image.

Interim Comments on OSL ages

The volume of sediments available from each sample point was insufficient for calculating both D_e and dose rate determinations. This situation was brought about as a consequence of the very silty and gravelly nature of the deposit, and having only a minor sand component

that is critical for OSL dating studies. A decision was made, therefore, to prepare the OSL 'a' samples for dose rate measurements, and the 'b' samples for D_e determination. Due to the ~20 cm horizontal distance between the adjacent duplicate samples there will be differences in both the beta and gamma dose rates. Therefore, these results are provisional with an extended sampling and dating program planned for the next two years. Further sediment samples will be collected from the OSL 'b' sample positions, and an extension made to the excavation in August 2024 to ensure direct correspondence of dose rate and D_e values.

Equivalent dose determination

The OSL 'b' samples were prepared for equivalent dose (D_e) determination using standard preparation procedures (Aitken, 1998; Wintle, 1997) to extract purified subset of quartz grains of grain sizes 180–212 µm. This was achieved for all samples with the exception of YG02-14b that had insufficient material in the 180–212 µm grain size range, and so 90–125 µm was instead used for D_e measurements for this sample. Single-grain OSL measurements used to determine the D_e for each sample using the single-aliquot regenerative-dose (SAR) procedure (Murray and Roberts, 1998; Murray and Wintle, 2000). Individual grains were mounted into bespoke aluminium discs with 100 individual holes (300 µm in diameter) drilled into the surface (Bøtter-Jensen et al., 2000; 2003). The discs were then loaded into a sample carousel for OSL measurement using Risø TL/OSL-DA-20 readers with a built in $^{90}Sr/^{90}Y$ irradiator and a single-grain laser attachment. Optical stimulation was achieved using a green (532 nm) Nd:YVO_4 solid-state pumped green laser and an IR (875 nm) LED array for feldspar contamination checks. The resulting ultra-violet OSL emission was detected through Hoya U340 optical filters placed in front of an Electron Tubes Ltd 9235QA photomultiplier tube.

The OSL characteristics make these sediments well suited to the OSL dating method. The OSL signals for the majority of grains measured are bright and display rapid decays to a background level after between ~0.1–0.5 s of stimulation time with the green laser. Typical dose response curves for favourable grains from YG02 grow with a saturating exponential form having a roughly linear portion to dose of ~80 Gy before beginning to show signs of saturation. These characteristics are well documented for Australian quartz grains (Clarkson

et al., 2017; Jankowski et al., 2016; 2020; Wood et al., 2016).

At present, between 300 and 700 individual grains per sample have been measured, with a total of 6400 grains measured overall. Not all grains measured are suited to the OSL method due to the variability in their inherent luminescence properties. These grains with aberrant physical properties were screened from the data using a series of routinely applied OSL signal quality-assurance criteria. On average, 26% of the grains measured had acceptable OSL characteristics, with individual samples having returns of between 11 and 33%. These values are consistent with those found at other Australian locations, and would be considered to be substantially higher than the global average.

Preliminary sample equivalent doses have been determined for each sample. However, these values require further testing and scrutiny to ensure they are accurate estimates of the true radiation dose received throughout the period of burial.

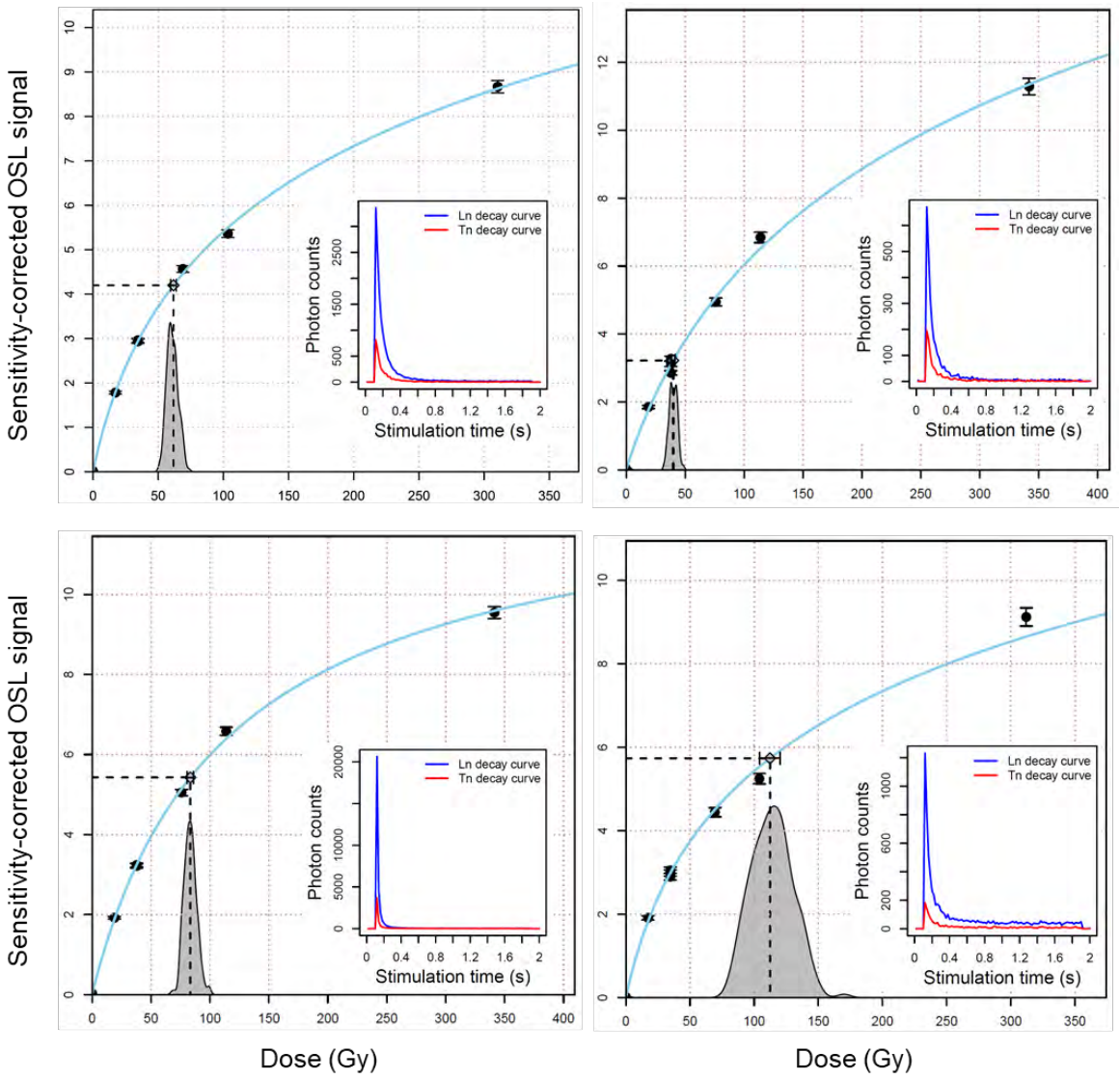

Fig 2. Typical dose response curves and OSL signal decay curves (inset) for four separate grains of quartz from sample YG02-15B.

Environmental dose rate determination

The total environmental dose rate delivered to the quartz grains measured from the YG02 excavation consists of contributions from beta, gamma and cosmic radiation external to the grains, plus a small alpha dose rate due to the radioactive decay of uranium and thorium inclusions inside sand-sized grains of quartz. As previously stated, the OSL 'a' samples were used for provisional dose rate determinations for these samples at present due to the small volume of material available during the July 2023 excavation.

The current water content was for each OSL sample to allow correction of the gamma, beta

and cosmic-ray dose rates (Nathan and Mauz 2008). For every 1% increase in long term water content, the total dose rate reduced by ~1% as water attenuates the incoming radiation, resulting in an ~1% increase on optical age. The current moisture contents showed no systematic variation with depth, and range between 1.3 and 4.6%.

The dried samples where then sieve to < 1mm to remove gravel clasts. The < 1 mm fraction was then pulverised and homogenised before a subsample of each was sent to Genalysis Intertek, Perth, WA, for ICP-MS/OES analyses. These analyses determine the elemental concentrations of U, Th and K and were subsequently converted to beta dose rate using the conversion factors of Guerin et al. (2011) and corrected for both beta particle attenuation and sediment water content. Given that these samples are not in 1:1 relationship with the prepared D_e sample, the values are currently considered provisional estimates rather than a true reflection of beta dose rate experienced by the D_e sample across the period of burial.

The gamma dose rate was measured for 5 sample positions in the field using in situ using a 1-inch NaI(Tl) crystal gamma detector. Only two of the five measurement positons provided reliable estimates of gamma dose and thus further measurements are required in the upcoming August 2024 field season, to produce reliable estimates.

Account was also taken of the cosmic-ray contribution using the equations described in Prescott and Hutton (1994). Given the significant thickness of rock overburden above and behind the excavation area providing shielding for the vast majority of cosmic ray dose, the total cosmic dose rate to all samples is very small (0.02 ± 0.00 Gy/ka), but not negligible.

We have currently assumed an effective internal alpha dose rate of 0.03 ± 0.01 Gy/ka, based on measurements made previously on quartz grains from south-eastern Australia (Bowler et al. 2003). However, it is important that a similar characterisation of the internal dose rate be carried out on quartz samples from the Pilbara region, to ensure that this reported figure in the literature is relevant to samples from this region. This characterisation will be one action of the Desert People geochronology program over the next four years.

Preliminary age estimates

Given the caveats noted in the D_e and dose rate determinations of the YG02 samples, here I describe broad time periods for the likely deposition of respective stratigraphic units. These ranges are based upon the two samples (YG02-10B and -13B) that have reliable gamma

spectrometry readings and, thus, have preliminary age estimates that can be viewed with greater confidence. Definitive absolute dates will be obtained with increased sampling and dosimetry programs in 2024.

In stratigraphic order, the D_e and dose rate values for sample coming from stratigraphic unit (SU) 6 indicate that these are of considerable antiquity. This antiquity is evidenced by the higher D_e values obtained for these samples and the apparent onset of the quartz OSL signal saturation for these samples. It is estimated that these sediments would have been deposited in the range of 45–30 thousand years (ka) ago. The D_e distributions for samples collected from the overlying SU5 show no evidence of significant mixing, save for the incorporation of a very minor population of low dose grains thought to be associated with soil insect activity. These SU5 sediments are considered to have been deposited between approximately 30–20 ka ago. No samples were collected from SU4. The depositional ages for samples collected from SU3 are likely to fall between approximately 20–10 ka ago, and also show no signs of significant post-depositional mixing. The sediments of SU2, based upon the D_e distribution patterns for the associated OSL samples, have evidence for mixing following burial are likely to date to the Holocene.

These time ranges are provisional and represent the likely depositional packages that comprise the YG02 location based upon current available data. These age ranges will likely shift as larger samples of material are collected to provide more reliable estimates of dose rate (both beta and gamma) and as further testing is conducted into the accuracy of the D_e value determination for all samples, specifically those coming from SU6 that show signs of OSL signal saturation.

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ANNEXURE 5.2: RADIOCARBON DATING REPORTS FROM WAIKATO UNIVERSITY

THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Radiocarbon Dating
Laboratory,
University of Waikato,
Hamilton,
New Zealand.

Thursday, 9 November 2023

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 57270

(AMS measurement)

Submitter	P.M. Veth
Submitter's Code	A1/XU3/F1 TS28/#16
Site & Location	YG02, Australia
Sample Material	Charcoal: Acacia sp. Large branch
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-24.2 ±	1.8 ‰
$F^{14}C$%	97.6 ±	0.2 %
Result	**197 ± 15 BP**	

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.

- Result is *Conventional Age or Percent Modern Carbon (pMC)* following Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Radiocarbon Dating
Laboratory,
University of Waikato,
Hamilton,
New Zealand.

Thursday, 9 November 2023

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 57271

(AMS measurement)

Submitter	P.M. Veth
Submitter's Code	A1/XU7(#A)/F1 TS91/#53
Site & Location	YG02, Australia
Sample Material	Charcoal: Unknown sp. small branch/sapwood
Physical Pretreatment	Sample cleaned.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-40.0 ±	2.1 ‰
$F^{14}C$%	96.0 ±	0.2 %
Result	**328 ± 17 BP**	

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.

- Result is *Conventional Age or Percent Modern Carbon (pMC)* following Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC)*.

ANNEXURE 5.3: ALL IN-SITU FINDS FROM YG02

XU	Stone	Bone	Charcoal	Shell
1	6	0	0	0
2	1	0	0	0
3	4	0	2	0
4	9	0	3	2
5	1	0	2	0
6	2	2	2	0
7	2	0	2	0
8	1	0	1	1
9	1	0	0	0
10	1	0	0	0
11	4	0	0	0
12	1	0	0	0
13	1	0	0	0
14	0	0	0	0
15	0	0	0	0
16	1	0	0	0
17	3	0	0	0
18	0	0	0	0
19	3	0	0	0
20	9	0	0	0
21	1	0	0	0
22	6	0	0	0
23	2	0	0	0
24	3	0	0	0
25	2	0	0	0
26	1	0	0	0
27	1	0	0	0
28	2	0	0	0
29	1	0	0	0
30	1	0	0	0
31	0	0	0	0
32	1	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	1	0	0	0

40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	1	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	1	0	0	0
53	2	0	0	0
54	3	0	0	0
55	0	0	0	0
56	6	0	0	0
57	5	0	0	0
58	4	0	0	0
59	1	0	0	0
60	3	0	0	0
61	3	0	0	0
62	0	0	0	0
63	0	0	0	0
64	0	0	0	0
65	0	0	0	0
66	2	0	0	0
67	0	0	0	0
68	0	0	0	0
69	0	0	0	0
70	0	0	0	0
71	0	0	0	0
72	1	0	0	0
73	0	0	0	0
74	0	0	0	0
75	0	0	0	0
76	0	0	0	0
77	0	0	0	0
Total	**104**	**2**	**12**	**3**

ANNEXURE 5.4: REPRESENTATIVE IMAGE SELECTION FROM BANGKANGARRA SITES

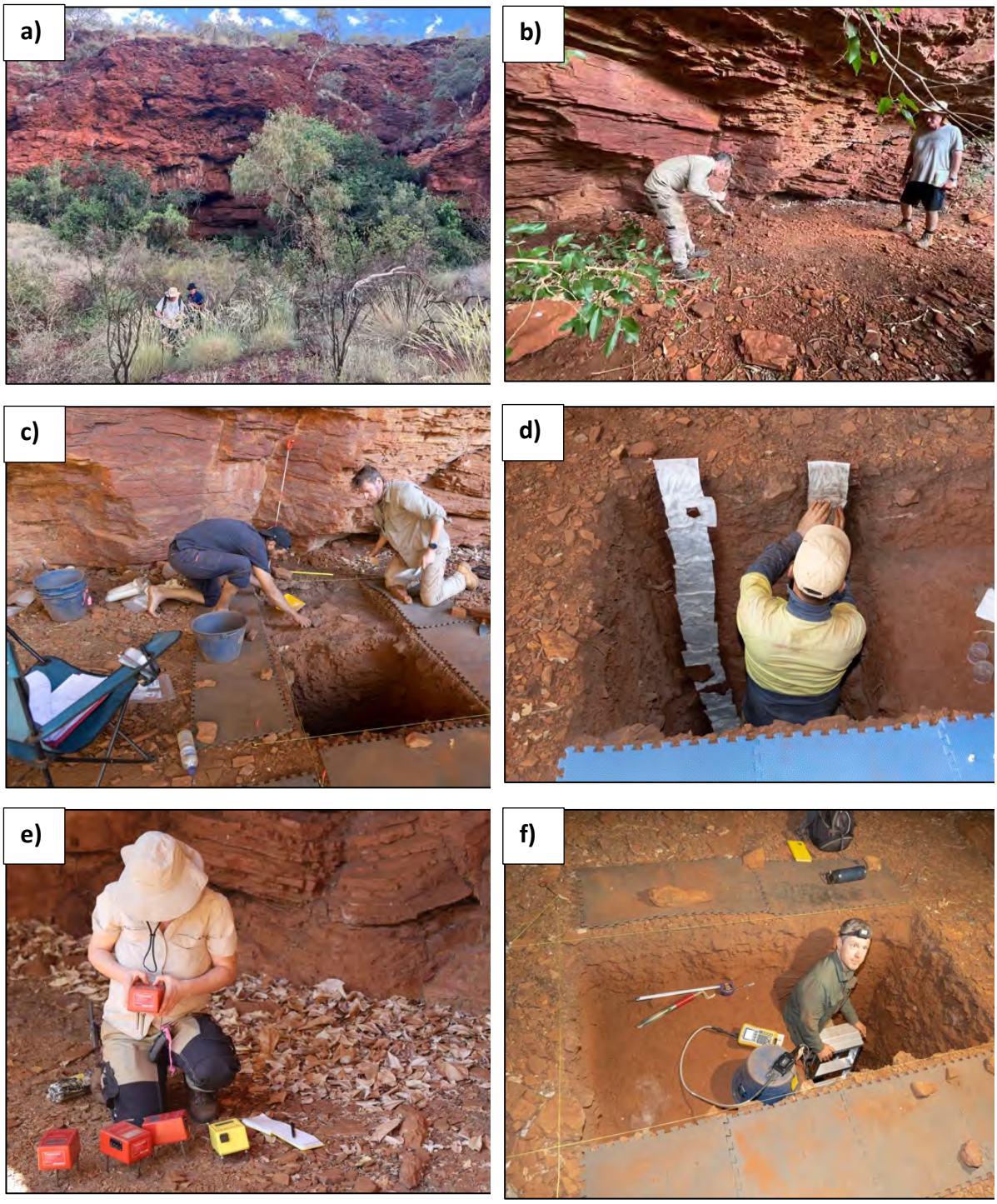


Photo 4. a) view southwest towards YG02, b) view west across western section of YG02, c) excavating SQ A2 at YG02, d) taking micromorphology samples from SQ A1, e) using seismometers to examine the sub-surface deposit, f) taking OSL samples for dating in SQ A1

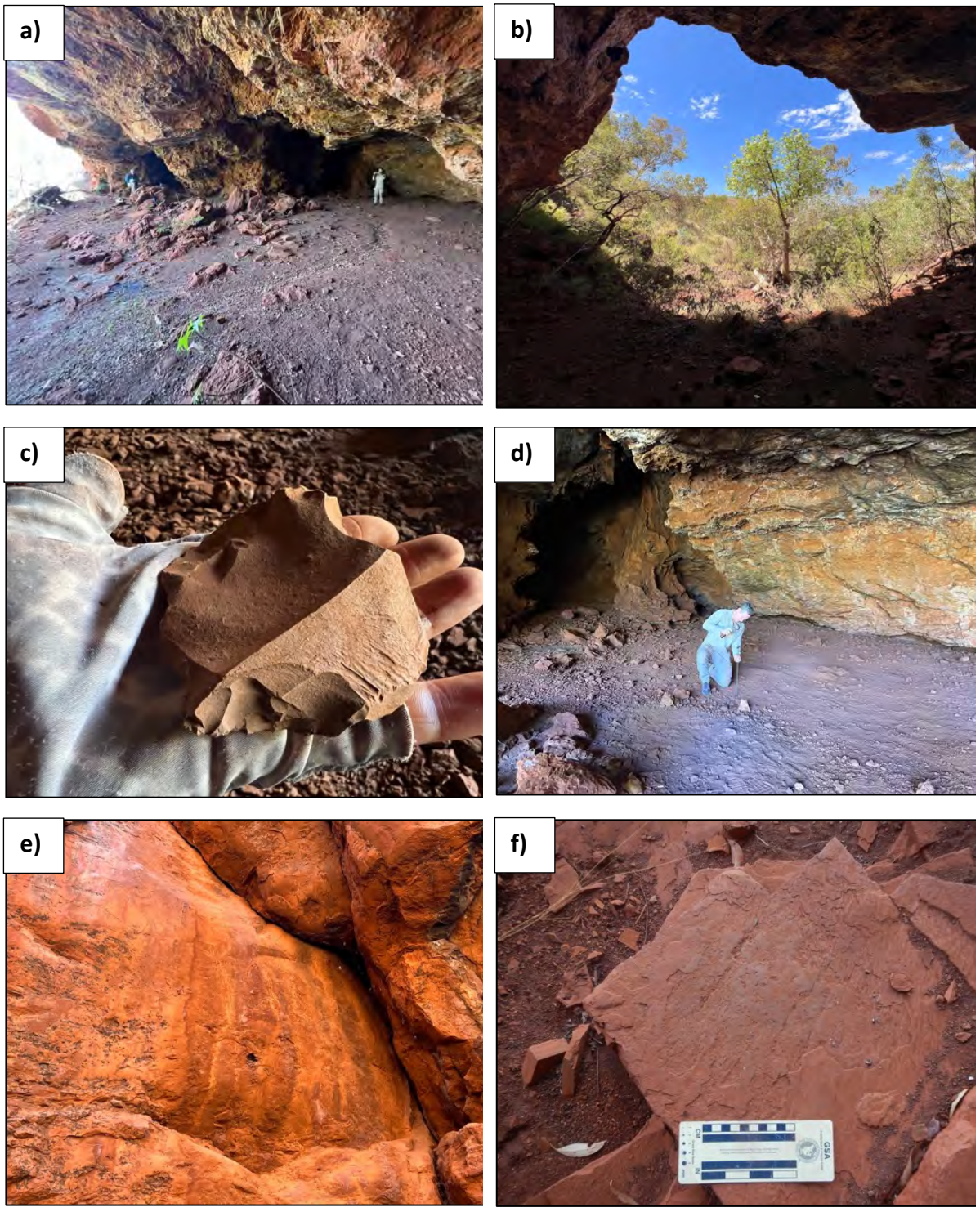
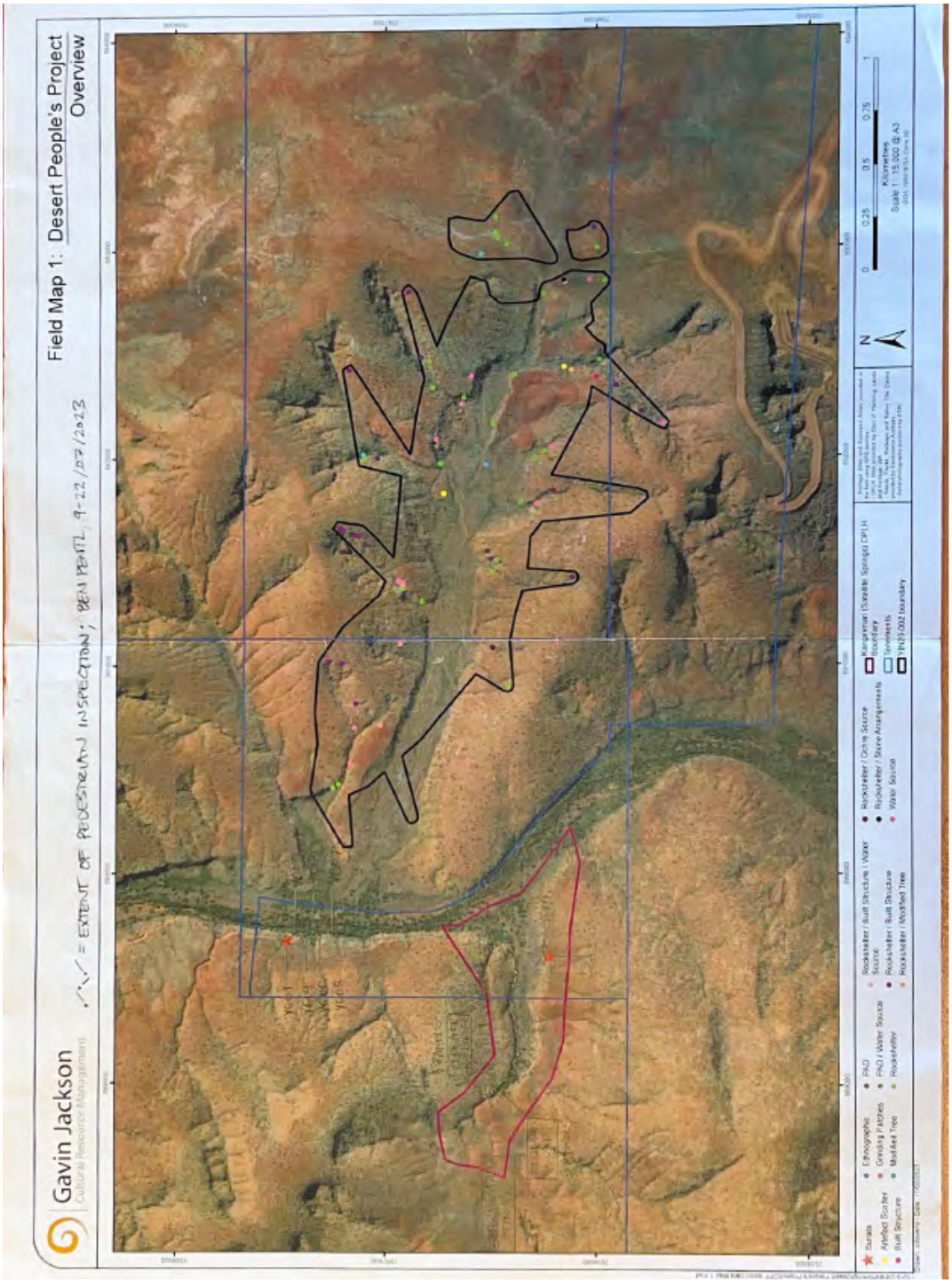


Photo 5. a) View west towards YG01, b) view east outside YG01, c) stone tool found on the surface at YG01, d) hammering in a probe to test sub-surface depth in YG01, e) Rock art at Bangkangarra, f) grindstone found on the surface at a rockshelter

ANNEXURE 5.5: BANKANGARRA ADDITIONAL SITES DATA FROM SEVERAL SURVEYS

Site ID	mE	mN
YG03	589698	7557429
YG04	589683	7557368
YG05	589670	7557350
YG06	589710	7557294
YG07	589694	7557223
YG08	589680	7557200
YG09	589644	7556237
YG10	589691	7556528
YG11	589691	7556548

ANNEXURE 5.6: BANKANGARRA ROCK ART RECORDING SCANNED



BANKANGARRA JINBY ROCK ART: PRELIMINARY RECORDING (BEN PENTZ, ARMITA GHASSEMIFAR) JULY 15, 2023 DESERT PEOPLE PROJECT

SURVEY AREA: GORGE IMMEDIATELY DOWNSTREAM FROM BANGKANGARRA GINBY, S-CLIFF (588971/7556417 TO 588932/7556493) PAGE: 1/2
N-CLIFF: (589009/7556417 TO 588946/7556473)

*"H.A.G." = HEIGHT ABOVE GROUND (FROM BASE OF PANEL), IN CM

* BASE ROCK COLOUR FOR ALL PANELS = "REDISH-BROWN"

CLIFF	PANEL	WAYPOINT	MOTIF	TYPE	ASPECT	CONTRAST	CONDITION	COMMENTS	SKETCH
SOUTH	AA cm H: 120 W: 143 HAG: 190	588952mE 7556447mN	01 cm H: 34 W: 22	ANTHROPOMORPH; PIGMENT (YELLOW?)	70°	2	POOR	MALE FIGURE, HEAD OBSCURED/MISSING; 4x PARALLEL LINES; HOLDING A CURVED OBJECT (POSSIBLY IN BOTH HANDS?)	
			02	GEOMETRIC; PIGMENT (YELLOW)	70°	1	POOR	3x VERTICAL PARALLEL LINES, HEAVILY WEATHERED + OBSCURED BY OXIDIZED PATINA FROM WATER WASHING DOWN CLIFF	
	AB cm H: 177 W: 154 HAG: 156		01						
			02						
			03						
			04						
	AA1 cm H: 35 W: 72 HAG: 182	588937mE 7556457mN	01 cm H: 45 W: 38	ANTHROPOMORPH; PIGMENT (YELLOW?)	5°	1	POOR	2x ANTHROPOMORPHS, SIDE-BY-SIDE; ONE WITH TAIL + HANDS RAISED, ONE WITH NO PENIS + HANDS DOWN; PARALLEL LINEAR FINGER MARKS.	

DESERT PEOPLE PROJECT – BANKANGARRA JINBY ROCKART: PRELIMINARY RECORDING — JULY 15, 2023 — PAGE: 2/2

CLIFF	PANEL	WAYPOINT	MOTIF	TYPE	ASPECT	CONTRAST	CONDITION	COMMENTS	SKETCH
NORTH	AC H: 257 cm W: 132 MAG: 10	588943mE 7556468mN	01 H: 26 cm W: 38	ANTHROPOMORPH (x4) ("CHAIN-MEN"); PIGMENT (YELLOW?)	210°	2-3	FAIR	4x ANTHROPOMORPHS (MALE), STANDING SIDE-BY-SIDE (HANDS NOT TOUCHING), SOME MAY BE HOLDING OBJECTS (?). MOTIF IS ADJACENT TO A SMALL CAVITY (SW FACING) IN CLIFF.	
			02 H: 57 cm W: 13	GEOMETRIC; PIGMENT (YELLOW?)	210°	2	POOR	3x VERTICAL, PARALLEL LINES, WITH 3x CURVILINEAR, PARALLEL LINES DRAWN OVER TOP. CURVILINEAR LINE IS SLIGHTLY HIGHER CONTRAST, BUT ALL LINES APPEAR TO BE CONCURRENT.	
			03 H: 190 cm W: 93	GEOMETRIC; PIGMENT (YELLOW?)	210°	1-3	POOR	MULTIPLE SETS OF MOSTLY VERTICAL + SOME OBLIQUE + HORIZONTAL + CURVILINEAR FINGER-LINES ACROSS THE PANEL. SOME SETS OF LINES INTERSECT, BUT ALL APPEAR CONCURRENT.	
	AD H: 62 cm W: 87 MAG: 102	588946mE 7556490mN	01 H: 38 cm W: 7	ANTHROPOMORPH(?); PIGMENT (YELLOW?)	185°	2	POOR	POSSIBLE "LIZARD-MAN"; 5 VERTICAL, PARALLEL LINES, WITH TWO LINES CONTINUING DOWN TO FORM AN ENLARGED PENIS OR TAIL (?)	
	AE H: 97 cm W: 95 MAG: 117	588947mE 7556463mN	01 H: 32 cm W: 15	ANTHROPOMORPH(?); PIGMENT (YELLOW)	280°	1-3	POOR	3 SETS OF 3 HORIZONTAL LINES, (ALL) CONNECTED BY A THICK VERTICAL LINE * ALSO NOTED: 2 SETS OF SHORT VERTICAL LINES POSITIONAL SOUTH ON SAME PANEL — MAY REPRESENT ADDITIONAL MOTIFS (?)	
	AF H: 180 cm W: 150 MAG: 85	588948mE 7556464mN	01 H: 121 cm W: 44	ANTHROPOMORPH; PIGMENT (YELLOW?)	210°	1	POOR	4 (?) x ANTHROPOMORPHIC "CHAIN-MEN" WITH ENLARGED PENISES.	
			02 H: 121 cm W: 44	ANTHROPOMORPH; PIGMENT (YELLOW)	210°	1-3	POOR	1x LARGE ANTHROPOMORPH (?), WITH POSSIBLE HEAD ORNAMENT (VERTICAL LINE WITH 5x INTERSECTING LINES). BODY (?) IS FORMED BY 8x SYNCHRONIZED CURVILINEAR LINES. SPECIFIC FEATURES ARE NOT CLEAR * ADDITIONAL MOTIFS MAYBE PRESENT E+W OF THIS PANEL	
	AG H: 120 cm W: 170 MAG: 400	588958mE 7556459mN	01 H: ~80 cm W: ~100	ANTHROPOMORPH (x3) PIGMENT (WHITE?)	180°	1-3	FAIR	3x ANTHROPOMORPHS (ARMS UP + ARMS DOWN), NO PENISES NOTED, EASTERN-MOST FIGURE IS MOSTLY OBSCURED (ONLY "DOTS" LEGS CLEARLY VISIBLE). STYLE = 5x PARALLEL, VERTICAL LINES FORM THE TORSO'S + ARMS. * THIS PANEL IS HIGHEST ABOVE GROUND + MOST PIGMENT IN GALLY	

DESERT PEOPLE PROJECT (YNAC) - BANKANGARRA, RESULTS OF PEDESTRIAN INSPECTION (BEN PENTZ)

* A PRELIMINARY PEDESTRIAN INSPECTION OF CLIFFS ASSOCIATED WITH BANKANGARRA JINBY CONDUCTED BY BEN PENTZ ON 16/07/23 AND 22/07/23. RESULTS ARE ROUGH + INTENDED TO FOCUS FUTURES RECORDING IN THE AREA AND PROVIDE THE DPP AND YNAC WITH A MORE COMPLETE UNDERSTANDING OF THIS CULTURAL LANDSCAPE.

SITE	WAYPOINT	~SIZE (m) W / D / H	NOTES	PHOTOS
YG03	589698 mE / 7557429 mN	5 × 2 × 2	• EAST-FACING, SINGLE CHAMBER RS; • LARGE MPC (IS) AT N END OF DRIPLINE	P. 1334 (N) = RS FRONT P. 1335 = MPC (IS)
YG04	589683 mE / 7557368 mN	13 × 3 × 2	• EAST-FACING, SINGLE CHAMBER RS; • 3× GB (IS), AND FLAKES OF (IS) + (MS)	P. 1336 (W) = RS FRONT
YG05	589670 mE / 7557350 mN	6 × 3 × 2	• SOUTHEAST-FACING, SINGLE CHAMBER RS; • 1× GBF (IS)	P. 1337 (W) = RS FRONT P. 1338 = GBF (IS)
YG06	589710 mE / 7557294 mN	7 × 2 × 1.5	• EAST-FACING, SINGLE CHAMBER RS; • FLAKE (IS), MICROBLADE (CH), GBF (IS), MU (IS)	P. 1339 (NW) = RS INTERIOR P. 1340 (PLAN) = MU, GBF, FLAKE
YG07	589694 mE / 7557223 mN	10 × 6 × 3	• EAST-FACING, SINGLE CHAMBER RS; • N-HALF OF FLOOR IS VERY SILTY, WITH CEMENTED CAP. • STONE PILE INSIDE CENTRE OF DRIPLINE • 1× RETOUCHED FLAKE (MS), NEAR CEMENTED CAP; 2× GB (IS) @ DRIPLINE	P. 1341 (N) = RS INTERIOR P. 1342 (PLAN) = 2× GB (IS) @ DRIPLINE P. 1343 (PLAN) = RF (MS) P. 1344 (S) = STONE PILE @ DRIPLINE
YG08	589680 mE / 7557200 mN	7 × 3 × 2	• SOUTHEAST-FACING, SINGLE CHAMBER RS; • FINE SEDIMENT FLOOR • 1× RETOUCH FLAKE (MS) AT DRIPLINE	P. 1345 (N) = RS INTERIOR P. 1346 (PLAN) = RF (MS)
YG09	589644 mE / 7556257 mN	8 × 3 × 2	• NORTH-FACING, SINGLE CHAMBER RS WITH DEEP ANTI-CHAMBER (EXTENDING 6m SE) IN REAR SLOPING WALL. • 2× GBF (IS) @ EAST END OF RS FLOOR • 1× FLAKE (MS) @ ENTRANCE OF ANTI-CHAMBER	P. 1350 (S) = RS FRONT P. 1351 (PLAN) = GBF (IS)
YG10	589691 mE / 7556528 mN	12 × 4 × 6	• ESE-FACING, 2 CHAMBER RS; • UPPER CHAMBER HAS MASSIVE ROCKFALL AT DRIPLINE (FORMING NARROW STRIP OF FINE SEDIMENT FLOOR. • SITE OVERLOOKS CONFLUENCE OF BANKANGARRA "GORGE" N KANYINARENA CK. • LARGE GB (IS) ALONG BACK WALL OF UPPER CHAMBER; 2× GBF (IS) IN SLOPING FLOOR OF LOWER CHAMBER	P. 355 (SW) = RS INTERIOR P. 356 (PLAN) = GB (IS) w/ 357 PECKING ON BACK WALL (UPPER CHAMBER) P. 1358 (N) = SLOPING FLOOR OF LOWER CHAMBER P. 1359 (PLAN) = GBF (IS), CHAMBER 2
YG11	589691 mE / 7556518 mN	8 × 4 × 4	• ENE-FACING, SINGLE CHAMBER RS; • SHALLOW SEDIMENT OVER STEPPED BIF BEDROCK FLOOR • 5+ GRINDING PATCHES ON BEDROCK FLOOR	P. 1360 (N) = RS INTERIOR P. 1361 (PLAN) = 1× GP P. 1362 (PLAN) = 1× GP

NOTE: PEDESTRIAN INSPECTION WAS NOT COMPLETED BETWEEN YG08 AND YG11. (SEE ANOTATED MAP FOR AREAS / EXTENT OF PEDESTRIAN INSPECTION).

ANNEXURE 5.7: YG02 EXCAVATION DATA 2023

Bag ID	Description	Fraction	SQ	SU	XU	TS
1	Sediment	In Situ	A1	A	1	6
2	Lithic	In Situ	A1	A	1	7
3	Lithic	In Situ	A1	A	1	8
4	Lithic	In Situ	A1	A	1	9
5	Lithic	In Situ	A1	A	1	10
6	Lithic	In Situ	A1	A	1	11
7	Lithic	In Situ	A1	A	1	12
8	Sediment	In Situ	A1	A	2	
9	Bone	In Situ	A1	A	2	18
10	Sediment	In Situ	A1	A	3	
11	Lithic	In Situ	A1	A	3	24
12	Lithic	In Situ	A1	A	3	25
13	Lithic	In Situ	A1	A	3	26
14	Bulk sediment	In Situ	A1	F1	3	
15	Charcoal	In Situ	A1	F1	3	27
16	Charcoal	In Situ	A1	F1	3	28
17	Lithic	In Situ	A1	A	3	29
18	Sediment	In Situ	A1	F1	4	
19	Sediment	In Situ	A1	B	4	
20	Lithic	In Situ	A1	B	4	35
21	Lithic	In Situ	A1	F1	4	36
22	Lithic	In Situ	A1	F1	4	37
23	Lithic	In Situ	A1	F1	4	38
24	Lithic	In Situ	A1	F1	4	39
25	Lithic	In Situ	A1	F1	4	40
26	Lithic	In Situ	A1	F1	4	41
27	Lithic	In Situ	A1	F1	4	42
28	Charcoal	In Situ	A1	F1	4	43
29	Lithic	In Situ	A1	F1	4	44
30	Charcoal	In Situ	A1	F1	4	45
31	Charcoal	In Situ	A1	F1	4	46
32	Shell	In Situ	A1	F1	4	47
33	Charcoal	In Situ	A1	F1	4	48
34	Sediment	In Situ	A1	F1	5	
35	Sediment	In Situ	A1	B	5	
36	Charcoal	In Situ	A1	B	5	54
37	Charcoal	In Situ	A1	F1	5	55
38	Lithic	In Situ	A1	B	5	56
39	Sediment	In Situ	A1	F1	6	

40	Sediment	In Situ	A1	B	6	
41	Bulk sediment	In Situ	A1	F1	6	
42	Bone	In Situ	A1	F1	6	66
43	Charcoal	In Situ	A1	F1	6	67
44	Charcoal	In Situ	A1	B	6	68
45	Bone	In Situ	A1	F1	6	73
46	Lithic	In Situ	A1	B	6	74
47	Lithic	In Situ	A1	B	6	75
48	Sediment	In Situ	A1	B	7	
49	Sediment	In Situ	A1	F1	7	
50	Bulk sediment	In Situ	A1	B	7	
51	Lithic	In Situ	A1	B	7	89
52	Charcoal	In Situ	A1	B	7	90
53	Charcoal	In Situ	A1	F1	7	91
54	Lithic	In Situ	A1	B	7	92
55	Sediment	In Situ	A1	B	8	
56	Sediment	In Situ	A1	F1	8	
57	Bulk sediment	In Situ	A1	F1	8	
58	Charcoal	In Situ	A1	B	8	102
59	Lithic	In Situ	A1	B	8	103
60	Shell	In Situ	A1	F1	8	104
61	Sediment	In Situ	A1	B	9	
62	Sediment	In Situ	A1	F1	9	
63	Bulk sediment	In Situ	A1	F1	9	
64	Lithic	In Situ	A1	F1	9	118
65	Sediment	In Situ	A1	B	10	
66	Lithic	In Situ	A1	B	10	124
67	Sediment	In Situ	A1	B	11	
68	Lithic	In Situ	A1	B	11	130
69	Lithic	In Situ	A1	B	11	131
70	Lithic	In Situ	A1	B	11	133
71	Lithic	In Situ	A1	B	11	134
72	Sediment	In Situ	A1	B	12	
73	Lithic	In Situ	A1	B	12	140
74	Sediment	In Situ	A1	B	13	
75	Sediment	In Situ	A1	B	14	
76	Lithic	In Situ	A1	B	14	151
77	Sediment	In Situ	A1	B	15	
78	Sediment	In Situ	A1	B	16	
79	Lithic	In Situ	A1	B	16	162
80	Sediment	In Situ	A1	B	17	
81	Lithic	In Situ	A1	B	17	168
82	Lithic	In Situ	A1	B	17	169

83	Lithic	In Situ	A1	B	17	170
84	Sediment	In Situ	A1	B	18	
85	Sediment	In Situ	A1	B	19	
86	Lithic	In Situ	A1	B	19	181
87	Lithic	In Situ	A1	B	19	182
88	Lithic	In Situ	A1	B	19	183
89	Sediment	In Situ	A1	B	20	
90	Lithic	In Situ	A1	B	20	189
91	Lithic	In Situ	A1	B	20	190
92	Lithic	In Situ	A1	B	20	191
93	Lithic	In Situ	A1	B	20	192
94	Lithic	In Situ	A1	B	20	193
95	Lithic	In Situ	A1	B	20	194
96	Lithic	In Situ	A1	B	20	195
97	Lithic	In Situ	A1	B	20	196
98	Lithic	In Situ	A1	B	20	197
99	Sediment	In Situ	A1	B	21	
100	Lithic	In Situ	A1	B	21	203
101	Sediment	In Situ	A1	B	22	
102	Lithic	In Situ	A1	B	22	209
103	Lithic	In Situ	A1	B	22	210
104	Lithic	In Situ	A1	B	22	211
105	Lithic	In Situ	A1	B	22	212
106	Lithic	In Situ	A1	B	22	213
107	Lithic	In Situ	A1	B	22	214
108	Sediment	In Situ	A1	B	23	
109	Lithic	In Situ	A1	B	23	220
110	Lithic	In Situ	A1	B	23	221
111	Sediment	In Situ	A1	B	24	
112	Lithic	In Situ	A1	B	24	227
113	Lithic	In Situ	A1	B	24	228
114	Lithic	In Situ	A1	B	24	229
115	Sediment	In Situ	A1	B	25	
116	Lithic	In Situ	A1	B	25	235
117	Lithic	In Situ	A1	B	25	236
118	Sediment	In Situ	A1	B	26	
119	Lithic	In Situ	A1	B	26	242
120	Sediment	In Situ	A1	B	27	
121	Lithic	In Situ	A1	B	27	248
122	Sediment	In Situ	A1	B	28	
123	Lithic	In Situ	A1	B	28	254
124	Lithic	In Situ	A1	B	28	255
125	Sediment	In Situ	A1	B	29	

126	Lithic	In Situ	A1	B	29	261
127	Sediment	In Situ	A1	B	30	
128	Lithic	In Situ	A1	B	30	267
129	Sediment	In Situ	A1	B	31	
130	Sediment	In Situ	A1	B	32	
131	Lithic	In Situ	A1	B	32	278
132	Sediment	In Situ	A1	B	33	
133	Sediment	In Situ	A1	B	34	
134	Sediment	In Situ	A1	B	35	
135	Sediment	In Situ	A1	B	36	
136	ERROR	In Situ	A1	B		
137	Sediment	In Situ	A1	B	37	
138	Sediment	In Situ	A1	B	38	
139	Sediment	In Situ	A1	B	39	
140	Lithic	In Situ	A1	B	39	315
141	Sediment	In Situ	A1	B	40	
142	Sediment	In Situ	A1	B	41	
143	Sediment	In Situ	A1	B	42	
144	Sediment	In Situ	A1	B	43	
145	Sediment	In Situ	A1	B	44	
146	Sediment	In Situ	A1	B	45	
147	Sediment	In Situ	A1	B	46	
148	Lithic	In Situ	A1	B	46	351
149	Sediment	In Situ	A1	B	47	
150	Sediment	In Situ	A1	B	48	
151	Sediment	In Situ	A1	B	49	
152	Lithic	In Situ	A1	B	49	367
153	Sediment	In Situ	A1	B	50	
154	Sediment	In Situ	A1	B	51	
155	Sediment	In Situ	A1	B	52	
156	Lithic	In Situ	A1	B	52	383
157	Sediment	In Situ	A1	B	53	
158	Lithic	In Situ	A1	B	53	389
159	Lithic	In Situ	A1	B	53	390
160	Sediment	In Situ	A1	B	54	
161	Lithic	In Situ	A1	B	54	396
162	Lithic	In Situ	A1	B	54	397
163	Lithic	In Situ	A1	B	54	398
164	Sediment	In Situ	A1	B	55	
165	Sediment	In Situ	A1	B	56	
166	Lithic	In Situ	A1	B	56	409
167	Lithic	In Situ	A1	B	56	410
168	Lithic	In Situ	A1	B	56	411

169	Lithic	In Situ	A1	B	56	412
170	Lithic	In Situ	A1	B	56	413
171	Lithic	In Situ	A1	B	56	414
172	Sediment	In Situ	A1	B	57	
173	Lithic	In Situ	A1	B	57	420
174	Lithic	In Situ	A1	B	57	421
175	Lithic	In Situ	A1	B	57	422
176	Lithic	In Situ	A1	B	57	423
177	Lithic	In Situ	A1	B	57	424
178	Sediment	In Situ	A1	B	58	
179	Lithic	In Situ	A1	B	58	430
180	Lithic	In Situ	A1	B	58	431
181	Lithic	In Situ	A1	B	58	432
182	Lithic	In Situ	A1	B	58	433
183	Sediment	In Situ	A1	B	59	
184	Lithic	In Situ	A1	B	59	439
185	Sediment	In Situ	A1	B	60	
186	Lithic	In Situ	A1	B	60	445
187	Lithic	In Situ	A1	B	60	446
188	Lithic	In Situ	A1	B	60	447
189	Sediment	In Situ	A1	B	61	
190	Lithic	In Situ	A1	B	61	453
191	Lithic	In Situ	A1	B	61	454
192	Lithic	In Situ	A1	B	61	455
193	Sediment	In Situ	A1	B	62	
194	Sediment	In Situ	A1	B	63	
195	Sediment	In Situ	A1	B	64	
196	Sediment	In Situ	A1	B	65	
197	Sediment	In Situ	A1	B	66	
198	Lithic	In Situ	A1	B	66	481
199	Lithic	In Situ	A1	B	66	482
200	Sediment	In Situ	A1	B	67	
201	Sediment	In Situ	A1	B	68	
202	Error	In Situ				
203	Lithic	In Situ	A2	A	Surface	498
204	Lithic	In Situ	A2	A	Surface	499
205	Lithic	In Situ	A2	A	Surface	500
206	Sediment	In Situ	A2	A	1	
207	Lithic	In Situ	A2	A	1	506
208	Lithic	In Situ	A2	A	1	507
209	Sediment	In Situ	A2	A	2	
210	Lithic	In Situ	A2	A	2	513
211	Lithic	In Situ	A2	A	2	514

212	Sediment	In Situ	A2	A	3	
213	Lithic	In Situ	A2	A	3	520
214	Sediment	In Situ	A2	A	4	
215	Bone	In Situ	A2	A	4	526
216	Lithic	In Situ	A2	A	4	527
217	Sediment	In Situ	A2	A	5	
218	Sediment	In Situ	A2	A	6	
219	Sediment	In Situ	A2	B	6	
220	Sediment	In Situ	A2	B	7	
221	Sediment	In Situ	A2	B	8	
222	Sediment	In Situ	A2	B	9	
223	Sediment	In Situ	A2	B	10	
224	Sediment	In Situ	A2	B	11	
225	Lithic	In Situ	A2	B	11	563
226	Sediment	In Situ	A2	B	12	
227	Sediment	In Situ	A2	B	13	
228	Sediment	In Situ	A2	B	14	
229	Sediment	In Situ	A2	B	15	
230	Lithic	In Situ	A2	B	15	584
231	Lithic	In Situ	A2	B	15	585
232	Lithic	In Situ	A2	B	15	586
233	Sediment	In Situ	A2	B	16	
234	Lithic	In Situ	A2	B	16	592
235	Lithic	In Situ	A2	B	16	593
236	Sediment	In Situ	A2	B	17	
237	Lithic	In Situ	A2	B	17	599
238	Lithic	In Situ	A2	B	17	600
239	Lithic	In Situ	A2	B	17	601
240	Sediment	In Situ	A2	B	18	
241	Lithic	In Situ	A2	B	18	607
242	Lithic	In Situ	A2	B	18	608
243	Lithic	In Situ	A2	B	18	609
244	Lithic	In Situ	A2	B	18	610
245	Lithic	In Situ	A2	B	18	611
246	Lithic	In Situ	A2	B	18	612
247	Lithic	In Situ	A2	B	18	613
248	Sediment	In Situ	A2	B	19	
249	Lithic	In Situ	A2	B	19	619
250	Lithic	In Situ	A2	B	19	620
251	Lithic	In Situ	A2	B	19	621
252	Lithic	In Situ	A2	B	19	622
253	Sediment	In Situ	A1	B	69	
254	Sediment	In Situ	A1	B	70	

255	Sediment	In Situ	A1	B	71	
256	Sediment	In Situ	A1	B	72	
257	Lithic	In Situ	A1	B	72	644
258	Sediment	In Situ	A1	B	73	
259	Sediment	In Situ	A1	B	74	
260	Sediment	In Situ	A1	B	75	
261	Sediment	In Situ	A1	B	76	
262	Sediment	In Situ	A1	B	77	
263	Sediment	In Situ	A2	B	20	
264	Lithic	In Situ	A2	B	20	675
265	Lithic	In Situ	A2	B	20	676
266	Lithic	In Situ	A2	B	20	677
267	Lithic	In Situ	A2	B	20	678
268	Lithic	In Situ	A2	B	20	679
269	Lithic	In Situ	A2	B	20	685
1000	Lithic	4mm	A1	A	1	
1001	Charcoal	4mm	A1	A	1	
1002	Seeds	4mm	A1	A	1	
1003	Shell	4mm	A1	A	1	
1004	Lithic	2mm	A1	A	1	
1005	Bone	4mm	A1	A	1	
1006	Bone	2mm	A1	A	1	
1007	Charcoal	2mm	A1	A	1	
1008	Lithic	4mm	A1	A	2	
1009	Charcoal	4mm	A1	A	2	
1010	Lithic	2mm	A1	A	2	
1011	Charcoal	2mm	A1	A	2	
1012	Bone	4mm	A1	A	2	
1013	Seeds	4mm	A1	A	2	
1014	Shell	4mm	A1	A	2	
1015	Lithic	4mm	A1	A	3	
1016	Charcoal	4mm	A1	A	3	
1017	Seeds	4mm	A1	A	3	
1018	Lithic	2mm	A1	A	3	
1019	Charcoal	2mm	A1	A	3	
1020	Bone	4mm	A1	A	3	
1021	Lithic	4mm	A1	B	4	
1022	Charcoal	4mm	A1	B	4	
1023	Bone	4mm	A1	B	4	
1024	Charcoal	2mm	A1	B	4	
1025	Charcoal	4mm	A1	F1	4	
1026	Bone	4mm	A1	F1	4	
1027	Lithic	4mm	A1	F1	4	

1028	Shell	4mm	A1	F1	4
1029	Shell	2mm	A1	F1	4
1030	Charcoal	2mm	A1	F1	4
1031	Lithic	2mm	A1	F1	4
1032	Seeds	4mm	A1	F1	4
1033	Lithic	4mm	A1	B	5
1034	Charcoal	4mm	A1	B	5
1035	Charcoal	2mm	A1	B	5
1036	Shell	2mm	A1	B	5
1037	Bone	2mm	A1	B	5
1038	Lithic	2mm	A1	B	5
1039	Lithic	2mm	A1	B	6
1040	Charcoal	2mm	A1	B	6
1041	Lithic	4mm	A1	B	6
1042	Charcoal	4mm	A1	B	6
1043	Seeds	4mm	A1	B	6
1044	Charcoal	4mm	A1	B	7
1045	Lithic	4mm	A1	B	7
1046	Lithic	2mm	A1	B	7
1047	Charcoal	2mm	A1	B	7
1048	Lithic	4mm	A1	B	8
1049	Charcoal	4mm	A1	B	8
1050	Bone	4mm	A1	B	8
1051	Charcoal	2mm	A1	B	8
1052	Lithic	2mm	A1	B	8
1053	Bone	2mm	A1	B	8
1054	Charcoal	4mm	A1	B	9
1055	Lithic	4mm	A1	B	9
1056	Charcoal	2mm	A1	B	9
1057	Lithic	2mm	A1	B	9
1058	Lithic	4mm	A1	B	10
1059	Charcoal	4mm	A1	B	10
1060	Bone	2mm	A1	B	10
1061	Lithic	2mm	A1	B	10
1062	Charcoal	2mm	A1	B	10
1063	Bone	4mm	A1	B	10
1064	Lithic	4mm	A1	B	11
1065	Charcoal	4mm	A1	B	11
1066	Lithic	2mm	A1	B	11
1067	Charcoal	2mm	A1	B	11
1068	Lithic	4mm	A1	B	12
1069	Charcoal	4mm	A1	B	12
1070	Charcoal	2mm	A1	B	12

1071	Lithic	4mm	A1	B	13
1072	Charcoal	4mm	A1	B	13
1073	Charcoal	2mm	A1	B	13
1074	Shell	2mm	A1	B	13
1075	Lithic	4mm	A1	B	14
1076	Bone	2mm	A1	B	14
1077	Charcoal	2mm	A1	B	14
1078	Lithic	4mm	A1	B	15
1079	Shell	2mm	A1	B	15
1080	Lithic	2mm	A1	B	15
1081	Charcoal	2mm	A1	B	15
1082	Lithic	4mm	A1	B	16
1083	Lithic	2mm	A1	B	16
1084	Lithic	4mm	A1	B	17
1085	Bone	4mm	A1	B	17
1086	Lithic	2mm	A1	B	17
1087	Charcoal	2mm	A1	B	17
1088	Lithic	4mm	A1	B	18
1089	Charcoal	4mm	A1	B	18
1090	Bone	2mm	A1	B	18
1091	Lithic	2mm	A1	B	18
1092	Lithic	4mm	A1	B	19
1093	Error		A1	B	
1094	Lithic	4mm	A1	B	20
1095	Lithic	2mm	A1	B	20
1096	Lithic	4mm	A1	B	21
1097	Lithic	2mm	A1	B	21
1098	Charcoal	4mm	A1	B	21
1099	Lithic	4mm	A1	B	22
1100	Lithic	2mm	A1	B	22
1101	Lithic	4mm	A1	B	23
1102	lithic	2mm	A1	B	13
1103	Lithic		A1	B	23
1104	Lithic	4mm	A1	B	24
1105	Lithic	2mm	A1	B	24
1106	Charcoal	2mm	A1	B	24
1107	Lithic	2mm	A1	B	25
1108	Lithic	4mm	A1	B	25
1109	Lithic	4mm	A1	B	26
1110	Lithic	2mm	A1	B	26
1111	Lithic	4mm	A1	B	27
1112	Lithic	2mm	A1	B	27
1113	Lithic	2mm	A1	B	29

1114	Lithic	4mm	A1	B	29
1115	Lithic	4mm	A1	B	28
1116	Lithic	2mm	A1	B	28
1117	Lithic	4mm	A1	B	30
1118	Lithic	2mm	A1	B	30
1119	Lithic	4mm	A1	B	31
1120	Lithic	2mm	A1	B	31
1121	Lithic	2mm	A1	B	32
1122	Lithic	2mm	A1	B	33
1123	Charcoal	2mm	A1	B	33
1124	Lithic	4mm	A1	B	33
1125	Lithic	4mm	A1	B	34
1126	Lithic	2mm	A1	B	34
1127	Lithic	2mm	A1	B	35
1128	Lithic	4mm	A1	B	35
1129	Lithic	4mm	A1	B	36
1130	Lithic	2mm	A1	B	36
1131	Lithic	4mm	A1	B	WALL
1132	Lithic	2mm	A1	B	37
1133	Lithic	4mm	A1	B	38
1134	Lithic	2mm	A1	B	38
1135	Lithic	4mm	A1	B	40
1136	Shell	2mm	A1	B	40
1137	Lithic	2mm	A1	B	40
1138	Charcoal	2mm	A1	B	40
1139	Lithic	4mm	A1	B	41
1140	Lithic	2mm	A1	B	41
1141	Charcoal	2mm	A1	B	41
1142	Lithic	2mm	A1	B	42
1143	Shell	2mm	A1	B	42
1144	Charcoal	2mm	A1	B	42
1145	Lithic	4mm	A1	B	42
1146	Charcoal	2mm	A1	B	43
1147	Lithic	2mm	A1	B	43
1148	Lithic	4mm	A1	B	43
1149	Lithic	2mm	A1	B	44
1150	Lithic	4mm	A1	B	44
1151	Lithic	4mm	A1	B	45
1152	Lithic	2mm	A1	B	45
1153	Lithic	2mm	A1	B	46
1154	Lithic	4mm	A1	B	46
1155	Lithic	4mm	A1	B	47
1156	Lithic	2mm	A1	B	48

1157	Lithic	4mm	A1	B	48
1158	Lithic	4mm	A1	B	49
1159	Charcoal	2mm	A1	B	49
1160	Charcoal	4mm	A1	B	49
1161	Lithic	2mm	A1	B	49
1162	Charcoal	4mm	A1	B	50
1163	Charcoal	2mm	A1	B	50
1164	Lithic	4mm	A1	B	Wall
1165	Lithic	4mm	A1	B	51
1166	Lithic	2mm	A1	B	51
1167	Lithic	4mm	A1	B	52
1168	Charcoal	4mm	A1	B	52
1169	Lithic	4mm	A1	B	54
1170	Lithic	4mm	A1	B	55
1171	Charcoal	4mm	A1	B	55
1172	Lithic	4mm	A1	B	56
1173	Lithic	4mm	A1	B	57
1174	Lithic	4mm	A1	B	58
1175	Lithic	2mm	A1	B	58
1176	Lithic	2mm	A1	B	59
1177	Lithic	4mm	A1	B	59
1178	Lithic	4mm	A1	B	60
1179	Lithic	2mm	A1	B	60
1180	Lithic	2mm	A1	B	61
1181	Lithic	4mm	A1	B	61
1182	Lithic	4mm	A1	B	62
1183	Lithic	2mm	A1	B	62
1184	Lithic	2mm	A1	B	63
1185	Lithic	4mm	A1	B	63
1186	Lithic	2mm	A1	B	64
1187	Lithic	4mm	A1	B	64
1188	Lithic	4mm	A1	B	65
1189	Lithic	2mm	A1	B	65
1190	Lithic	2mm	A1	B	66
1191	Lithic	4mm	A1	B	66
1192	Lithic	4mm	A1	B	67
1193	Lithic	2mm	A1	B	67
1194	Lithic	2mm	A1	B	68
1195	Lithic	4mm	A2	A	1
1196	Charcoal	4mm	A2	A	1
1197	Lithic	2mm	A2	A	1
1198	Lithic	2mm	A2	A	2
1199	Lithic	4mm	A2	A	2

1200	Charcoal	4mm	A2	A	2
1201	Bone	4mm	A2	A	2
1202	Charcoal	2mm	A2	A	2
1203	Lithic	2mm	A2	A	3
1204	Lithic	4mm	A2	A	3
1205	Charcoal	4mm	A2	A	3
1206	Lithic	4mm	A2	A	4
1207	Charcoal	4mm	A2	A	4
1208	Bone	2mm	A2	A	4
1209	Lithic	2mm	A2	A	4
1210	Lithic	2mm	A2	A	5
1211	Bone	4mm	A2	A	5
1212	Charcoal	4mm	A2	A	5
1213	Lithic	4mm	A2	A	5
1214	Lithic	4mm	A2	B	6
1215	Lithic	2mm	A2	B	6
1216	Charcoal	4mm	A2	A	6
1217	Lithic	4mm	A2	A	6
1218	Lithic	2mm	A2	A	6
1219	Charcoal	4mm	A2	A	6
1220	Bone	4mm	A2	A	6
1221	Lithic	4mm	A2	B	7
1222	Charcoal	4mm	A2	B	7
1223	Lithic	2mm	A2	B	7
1224	Lithic	4mm	A2	B	8
1225	Lithic	2mm	A2	B	8
1226	Charcoal	4mm	A2	B	8
1227	Lithic	4mm	A2	B	9
1228	Lithic	2mm	A2	B	9
1229	Charcoal	4mm	A2	B	9
1230	Lithic	4mm	A2	B	11
1231	Lithic	2mm	A2	B	11
1232	Charcoal	4mm	A2	B	11
1233	Shell	4mm	A2	B	11
1234	Lithic	4mm	A2	B	12
1235	Lithic	2mm	A2	B	12
1236	Lithic	4mm	A2	B	13
1237	Lithic	4mm	A2	B	14
1238	Lithic	2mm	A2	B	14
1239	Lithic	4mm	A2	B	15
1240	Charcoal	4mm	A2	B	15
1241	Lithic	4mm	A2	B	16
1242	Lithic	4mm	A2	B	17

1243	Lithic	2mm	A2	B	17
1244	Lithic	4mm	A2	B	18
1245	Lithic	2mm	A2	B	18
1246	Lithic	4mm	A2	B	19
1247	Lithic	2mm	A2	B	19
1248	Lithic	4mm	A1	B	69
1249	Lithic	2mm	A1	B	69
1250	Lithic	4mm	A1	B	70
1251	Lithic	2mm	A1	B	70
1252	Lithic	4mm	A1	B	71
1253	Lithic	2mm	A1	B	71
1254	Charcoal	4mm	A1	B	71
1255	Lithic	4mm	A1	B	72
1256	Lithic	4mm	A1	B	75
1257	Lithic	4mm	A2	B	20
1258	Lithic	2mm	A2	B	20

ANNEXURE 5.8: SUMMARY STATEMENT A/PROFESSOR TIMOTHY COHEN UOW APRIL 2024

Note on Bangkangarra rock shelter geomorphology

In August 2023 the Bangkangarra rock shelter (YG02) was visited as part of the ARC-funded *Desert People Project* under the lead of Laureate Professor Peter Veth. The rock shelter is at the foot of scarp of an ephemeral plunge pool (see Figure 1) whose stream drains a very small catchment area of < 0.3 km^2. The plunge pool, which flows only in wet seasons, drains to an east-flowing tributary which in itself has a catchment area of ~ 6.5 km^2 and with a waterhole at the gorge head (star in Figure 1). The valley floor of the east-flowing tributary is narrow (70 – 130 m wide) and is dominated by one alluvial surface, which is presumably the Holocene floodplain and is characterised by coarse-grained angular gravels.

The front of the rock shelter is characterised by a small plunge pool comprised of large (0.5 - 1.0 m) blocks of ironstone that form the framework of the pool. Behind this ironstone framework is the rock shelter and the fill which has accumulated behind (upslope) of the plunge pool. The rock shelter fill is comprised of roof spoil, a possible fluvial component (back filling from the plunge pool), a potential aeolian contribution and archaeological material. The plunge pool discharges downslope via a small, incised channel that cuts a fan apron (see Figure 1) elevated above the Holocene floodplain. It is presumed the fan apron is equivalent in age to the bulk of the fill in the rock shelter given the similar elevations. Ongoing research in 2024 will consolidate the topography and age of these major geomorphic features within the locality.

PhD student Kelsey Boyd has undertaken a preliminary analysis of sediments for plant phytoliths and Dr Haidee Cadd inspected the same samples for pollen. Nine depth intervals from the archaeological excavation chosen for the pilot phytolith analysis included: 5 – 10 cm, 25 – 30 cm, 45 – 50 cm, 65 – 70 cm, 85 – 90 cm, 100 – 105 cm, 115 – 120 cm, 130 – 135 cm. Little to no pollen was present in the samples but all samples showed phytoliths which were dominated by tree phytoliths, but which cannot be taxonomically discriminated.

However, the types of tree phytoliths and tree:grass ratios appear to change down profile. Grasses mostly consist of spinifex (*Triodia* species) phytoliths. It is envisaged that out of

these two palaeoenvironmental proxies that phytoliths will yield the best potential for recording changes in abundance of trees to grass through time – a good indicator of environmental change for the site. It is proposed that the 2024 field season would collect modern reference plant material to assess modern plant phytoliths, modern plant diversity and abundance and additional soil samples from ongoing excavations.

Figure 1 Google Earth image of Bangkangarra rock shelter (YG02) and the west to east flowing tributary, the fan apron downslope of the rockshelter. Solid white line shows bedrock valley margin. Star shows location of pool at gorge head.

ANNEXURE 5.9: YG02 EXCAVATION HEIGHTS AND DEPTHS

Unit	Average Height (masl)	Depth (cm bs)
Surface	511.82472	0
1	511.81906	0.00566
2	511.80032	0.0244
3	511.77284	0.05188
4	511.76206	0.06266
5	511.7435	0.08122
6	511.71412	0.1106
7	511.6916	0.13312
8	511.67722	0.1475
9	511.65476	0.16996
10	511.63462	0.1901
11	511.609	0.21572
12	511.59902	0.2257
13	511.58314	0.24158
14	511.5533	0.27142
15	511.53516	0.28956
16	511.5018	0.32292
17	511.48816	0.33656
18	511.4858	0.33892
19	511.4622	0.36252
20	511.44208	0.38264
21	511.42314	0.40158
22	511.4038	0.42092
23	511.3761	0.44862
24	511.35628	0.46844
25	511.33836	0.48636
26	511.31286	0.51186
27	511.29322	0.5315
28	511.2767	0.54802
29	511.24928	0.57544
30	511.22928	0.59544
31	511.21094	0.61378
32	511.19334	0.63138
33	511.17378	0.65094
34	511.15606	0.66866
35	511.133	0.69172
36	511.11782	0.7069
37	511.09658	0.72814
38	511.07092	0.7538

39	511.05564	0.76908
40	511.03226	0.79246
41	511.01448	0.81024
42	510.9991	0.82562
43	510.9757	0.84902
44	510.9516	0.87312
45	510.94318	0.88154
46	510.91422	0.9105
47	510.8927	0.93202
48	510.86676	0.95796
49	510.85838	0.96634
50	510.83028	0.99444
51	510.81266	1.01206
52	510.78622	1.0385
53	510.77516	1.04956
54	510.75116	1.07356
55	510.72948	1.09524
56	510.70484	1.11988
57	510.68334	1.14138
58	510.6647	1.16002
59	510.64618	1.17854
60	510.62908	1.19564
61	510.60968	1.21504
62	510.5917	1.23302
63	510.57324	1.25148
64	510.56862	1.2561
65	510.5397	1.28502
66	510.52382	1.3009
67	510.49972	1.325
68	510.47246	1.35226
69	510.4501	1.37462
70	510.42462	1.4001
71	510.39292	1.4318
72	510.37966	1.44506
73	510.3576	1.46712
74	510.33926	1.48546
75	510.31804	1.50668
76	510.30142	1.5233
77	510.27832	1.5464

ANNEXURE 5.10: TOTAL STATION DATA

Total Station Set-Up Text

A manual Leica TS06 *plus* total station was used to collect point spatial data to sub-centimetre precision at Yamararra Ganyjingarringunha (Rockshelter) 2 (see Figure 1). Point data was collected for the exact position of all *in-situ* samples, five end heights (excavation unit centre as well as the north-west, north-east, south-east and south-west corners) for every excavation unit, all OSL samples and important rockshelter features (e.g. dripline, cross-section etc). The total station was established on a floating grid with the foresight (STN1) being: x = 10000, y = 10000 and z = 100. The total station was set-up and levelled on a tripod exactly over STN1 every-day. To ensure the total station was set-up on exactly the same grid, four known backsight reference points (STNs 2 – 5) were used to orient the station each day. Two additional floating reference points were established on the flats in front of the rockshelter (STNs 6 and 7; taken from STN1). The purpose of these was to be reference points that were capable of being recorded to a different projection system using a Differential GPS. It is important that these points were established on the flats in front of the rockshelter so that the Differential GPS could achieve satellite reception (not possible inside the rockshelter).

A Differential GPS was then used to record STN6 and STN7 to UTM GDA2020 Zone 50 (also at sub-centimetre precision). This means that STN6 and STN7 could be used as a basis to rotate the floating grid onto UTM. This was achieved with the help of Alan Hoskings at C.R. Kennedy & Company. Table 1 below shows the seven reference points (STNs 1 – 7 in UTM) used for the Yamararra Ganyjingarringunha (Rockshelter) 2 excavation.

Figure 8. Excavation of SQ A1 in progress with Leica TS06 plus total station set up in background

Table 5. The seven reference points (or fixed points) used to collect spatial data at Yamararra Ganyjingarringunha (Rockshelter) 2

PtID	East	North	Height
STN1	589574.2	7556219	511.8589
STN2	589578.3	7556215	511.8582
STN3	589572.5	7556226	512.9478
STN4	589583.5	7556217	511.9189
STN5	589575.9	7556216	511.8221
STN6	589597.7	7556258	509.7409
STN7	589584	7556253	510.5871

Table 6. YG02 OSL Spatial Data

PtID	East	North	Height	Code	OSL	Depth
686	589578.7	7556217	510.2866	OSL	OSL 16A	1.5381
687	589578.7	7556217	510.3463	OSL	OSL 16B	1.4784
688	589578.6	7556217	510.3667	OSL	OSL 15A	1.458
689	589578.8	7556217	510.39	OSL	OSL 15B	1.4347
690	589578.7	7556217	510.4397	OSL	OSL 14A	1.385
691	589578.8	7556217	510.4745	OSL	OSL 14B	1.3502
692	589578.7	7556217	510.5351	OSL	OSL 13A	1.2896
693	589578.8	7556217	510.5461	OSL	OSL 13B	1.2786
694	589578.7	7556217	510.6702	OSL	OSL 12A	1.1545
695	589578.8	7556217	510.6594	OSL	OSL 12B	1.1653
696	589578.7	7556217	510.758	OSL	OSL 11A	1.0667
697	589578.8	7556217	510.7375	OSL	OSL 11B	1.0872
698	589578.7	7556217	510.8561	OSL	OSL 10A	0.9686
699	589578.8	7556217	510.8568	OSL	OSL 10B	0.9679
700	589578.7	7556217	510.923	OSL	OSL 9A	0.9017
701	589578.9	7556217	510.912	OSL	OSL 9B	0.9127
702	589578.7	7556217	511.0526	OSL	OSL 8A	0.7721
703	589578.8	7556217	511.0452	OSL	OSL 8B	0.7795
704	589578.7	7556217	511.1339	OSL	OSL 7A	0.6908
705	589578.9	7556217	511.1531	OSL	OSL 7B	0.6716
706	589578.7	7556217	511.2468	OSL	OSL 6A	0.5779
707	589578.9	7556217	511.2446	OSL	OSL 6B	0.5801
708	589578.7	7556217	511.3276	OSL	OSL 5A	0.4971
709	589578.9	7556217	511.3348	OSL	OSL 5B	0.4899
710	589578.7	7556217	511.4fi	OSL	OSL 4A	0.4112
711	589578.9	7556217	511.4232	OSL	OSL 4B	0.4015
712	589578.7	7556217	511.5721	OSL	OSL 3A	0.2526
713	589578.9	7556217	511.5536	OSL	OSL 3B	0.2711
714	589578.7	7556217	511.6543	OSL	OSL 2A	0.1704
715	589579	7556217	511.6707	OSL	OSL 2B	0.154
716	589578.7	7556217	511.7532	OSL	OSL 1A	0.0715
717	589578.9	7556217	511.7458	OSL	OSL 1B	0.0789

Table 7.YG02 SQA1 Excavation finds spatial data

PtID	East	North	Height	SQ	XU	SU	Code
6	589578.6	7556217	511.8373	A1	1	A	STONE
7	589579	7556217	511.8349	A1	1	A	STONE
8	589578.6	7556216	511.8338	A1	1	A	STONE
10	589578.4	7556217	511.8227	A1	1	A	STONE
11	589578.7	7556217	511.8167	A1	1	A	STONE
12	589578.7	7556216	511.8191	A1	1	A	STONE
18	589578.7	7556217	511.801	A1	2	A	STONE
24	589578.4	7556217	511.7928	A1	3	A	STONE
25	589578.5	7556217	511.7857	A1	3	A	STONE
26	589578.6	7556217	511.7756	A1	3	A	STONE
27	589578.6	7556217	511.7782	A1	3	A	CHARCOAL
28	589578.2	7556217	511.7758	A1	3	A	CHARCOAL
29	589578.6	7556217	511.7538	A1	3	A	STONE
35	589578.2	7556217	511.7544	A1	4	B	STONE
36	589578.4	7556217	511.7678	A1	4	F1	STONE
37	589578.4	7556217	511.7612	A1	4	F1	STONE
38	589578.5	7556217	511.7701	A1	4	F1	STONE
39	589578.4	7556217	511.7634	A1	4	F1	STONE
40	589578.4	7556217	511.7584	A1	4	F1	STONE
41	589578.5	7556217	511.7625	A1	4	F1	STONE
42	589578.5	7556217	511.7593	A1	4	F1	STONE
43	589578.5	7556217	511.7584	A1	4	F1	CHARCOAL
44	589578.4	7556217	511.7604	A1	4	F1	STONE
45	589578.6	7556217	511.7727	A1	4	F1	CHARCOAL
46	589578.9	7556217	511.7714	A1	4	F1	SHELL
47	589578.9	7556217	511.7682	A1	4	F1	SHELL
48	589578.8	7556217	511.7606	A1	4	F1	CHARCOAL
54	589578.4	7556217	511.7465	A1	5	B	CHARCOAL
55	589578.8	7556217	511.7407	A1	5	F1	CHARCOAL
56	589578.5	7556217	511.7555	A1	5	B	STONE
66	589578.8	7556217	511.7285	A1	6	F1	BONE
67	589578.8	7556217	511.7222	A1	6	F1	CHARCOAL
68	589578.3	7556217	511.7149	A1	6	B	CHARCOAL
73	589578.5	7556217	511.734	A1	6	F1	BONE
74	589578.7	7556217	511.71	A1	6	B	STONE
75	589578.6	7556217	511.7189	A1	6	B	STONE
89	589578.5	7556217	511.6916	A1	7	B	STONE
90	589578.7	7556216	511.6868	A1	7	B	CHARCOAL
91	589578.5	7556217	511.7239	A1	7	F1	CHARCOAL
92	589578.2	7556217	511.722	A1	7	B	STONE
102	589578.2	7556217	511.6808	A1	8	B	CHARCOAL

103	589578.8	7556217	511.6677	A1	8	B	STONE
104	589578.7	7556217	511.6749	A1	8	F1	SHELL
118	589578.8	7556217	511.6692	A1	9	F1	STONE
124	589578.7	7556217	511.6321	A1	10	B	STONE
130	589578.3	7556217	511.6509	A1	11	B	STONE
131	589578.8	7556217	511.6099	A1	11	B	STONE
133	589578.4	7556218	511.618	A1	11	B	STONE
134	589578.4	7556217	511.6117	A1	11	B	STONE
140	589578.3	7556217	511.6086	A1	12	B	STONE
151	589579	7556217	511.5776	A1	13	B	STONE
162	589578.7	7556218	511.504	A1	16	B	STONE
168	589578.7	7556218	511.4912	A1	17	B	STONE
169	589578.7	7556218	511.492	A1	17	B	STONE
170	589578.8	7556218	511.4945	A1	17	B	STONE
181	589578.6	7556216	511.4591	A1	19	B	STONE
182	589578.8	7556217	511.4632	A1	19	B	STONE
183	589578.8	7556217	511.4587	A1	19	B	STONE
189	589578	7556217	511.4395	A1	20	B	STONE
190	589578.2	7556217	511.4504	A1	20	B	STONE
191	589578.3	7556217	511.4511	A1	20	B	STONE
192	589578.6	7556216	511.4526	A1	20	B	STONE
193	589578.5	7556216	511.4441	A1	20	B	STONE
194	589578.8	7556217	511.4522	A1	20	B	STONE
195	589578.6	7556217	511.4498	A1	20	B	STONE
196	589578.5	7556217	511.4628	A1	20	B	STONE
197	589578.3	7556217	511.4421	A1	20	B	STONE
203	589578.2	7556217	511.4311	A1	21	B	STONE
209	589578.1	7556217	511.4154	A1	22	B	STONE
210	589578.1	7556217	511.4224	A1	22	B	STONE
211	589578.3	7556216	511.4096	A1	22	B	STONE
212	589578.6	7556217	511.4144	A1	22	B	STONE
213	589578.6	7556217	511.418	A1	22	B	STONE
214	589578.5	7556217	511.4166	A1	22	B	STONE
220	589578.2	7556217	511.3958	A1	23	B	STONE
221	589578.2	7556217	511.3857	A1	23	B	STONE
227	589578.8	7556217	511.3631	A1	24	B	STONE
228	589578.7	7556217	511.3659	A1	24	B	STONE
229	589578.7	7556217	511.3686	A1	24	B	STONE
235	589578.3	7556217	511.3435	A1	25	B	STONE
236	589578.7	7556217	511.3516	A1	25	B	STONE
242	589578.8	7556217	511.3379	A1	26	B	STONE
248	589578.2	7556217	511.2952	A1	27	B	STONE
254	589578.3	7556217	511.297	A1	28	B	STONE

255	589578.6	7556217	511.2834	A1	28	B	STONE
261	589578.7	7556217	511.2547	A1	29	B	STONE
267	589578.5	7556217	511.2397	A1	30	B	STONE
278	589578.8	7556217	511.1917	A1	32	B	STONE
315	589578.5	7556217	511.063	A1	39	B	STONE
351	589578.6	7556217	510.8911	A1	46	B	STONE
383	589578.3	7556216	510.7833	A1	52	B	STONE
389	589578.5	7556217	510.7364	A1	53	B	STONE
390	589578.8	7556217	510.7762	A1	53	B	STONE
396	589578	7556217	510.7473	A1	54	B	STONE
397	589578.3	7556217	510.7667	A1	54	B	STONE
398	589578.2	7556217	510.7607	A1	54	B	STONE
409	589578.3	7556217	510.7197	A1	56	B	STONE
410	589578.3	7556217	510.7232	A1	56	B	STONE
411	589578.5	7556217	510.7115	A1	56	B	STONE
412	589578.7	7556217	510.7062	A1	56	B	STONE
413	589578.6	7556217	510.7147	A1	56	B	STONE
414	589578.2	7556217	510.6971	A1	56	B	STONE
420	589578.3	7556217	510.6818	A1	57	B	STONE
421	589578.4	7556217	510.7013	A1	57	B	STONE
422	589578.4	7556217	510.6887	A1	57	B	STONE
423	589578.5	7556217	510.685	A1	57	B	STONE
424	589578.7	7556217	510.7065	A1	57	B	STONE
430	589578.3	7556217	510.6731	A1	58	B	STONE
431	589578.4	7556217	510.6615	A1	58	B	STONE
432	589578.4	7556217	510.6845	A1	58	B	STONE
433	589578.2	7556217	510.6699	A1	58	B	STONE
439	589578.2	7556217	510.6699	A1	59	B	STONE
445	589578.1	7556217	510.632	A1	60	B	STONE
446	589578.2	7556217	510.6491	A1	60	B	STONE
447	589578.2	7556217	510.6399	A1	60	B	STONE
453	589578.3	7556217	510.6042	A1	61	B	STONE
454	589578.2	7556217	510.62	A1	61	B	STONE
455	589578.7	7556217	510.6405	A1	61	B	STONE
481	589578.4	7556217	510.5314	A1	66	B	STONE
482	589578.8	7556217	510.5052	A1	66	B	STONE

Table 8. YG02 Station Data

PtID	East	North	Height	Code
STN1	589574.2	7556219	511.8589	STATION
STN2	589578.3	7556215	511.8582	STATION
STN3	589572.5	7556226	512.9478	STATION
STN4	589583.5	7556217	511.9189	STATION
STN5	589575.9	7556216	511.8221	STATION
STN6	589597.7	7556258	509.7409	STATION
STN7	589584	7556253	510.5871	STATION

ANNEXURE 5.11: SEDIMENTOLOGIC & PEDOLOGIC STUDIES IN PROGRESS AT BANGKANGARRA

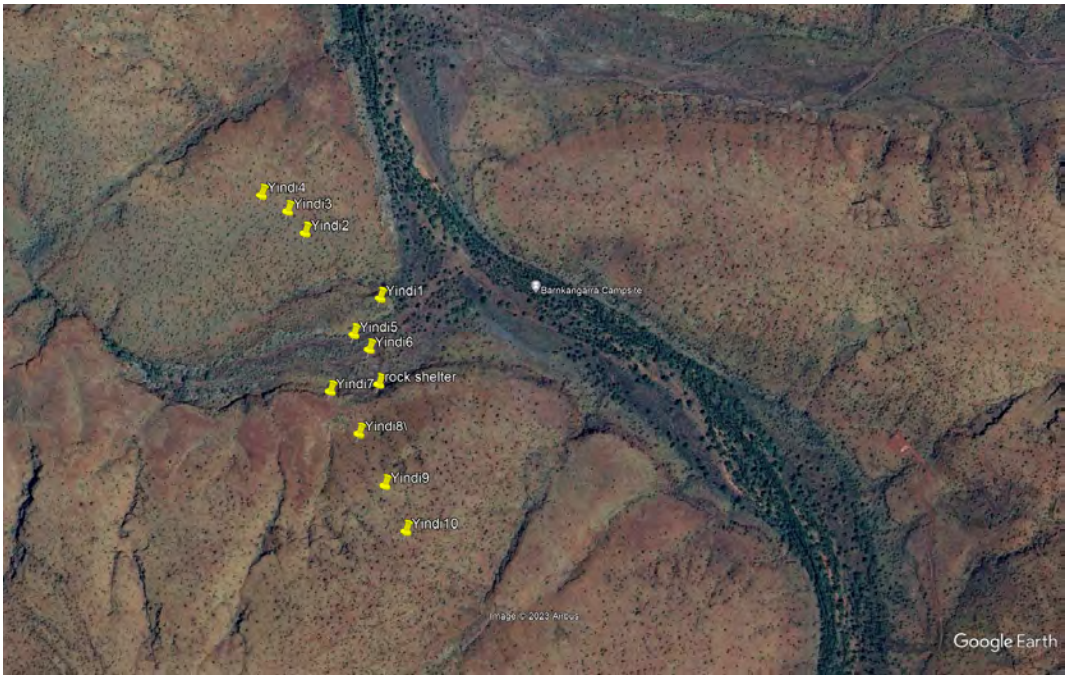
A/Professor Matthias Leopold

Head School of Agriculture and Environment

24/05/2024

There are a range of sedimentologic and pedologic (= soil forming processes) studies in progress which aim to differentiate between natural processes and human-induced processes stored in the physical and chemical nature of the rock shelter sediments. Certain processes are locally limited, but intense, with fires (hearths), trampling horizons, artefacts assemblages, the sorting or rocks and other aspects of the sediment fabric correlated to human activities. Together and treated critically these can serve as evidence for the nature and intensity of rockshelter occupation.

Ten samples (Yindi 1-10) were taken from small sample pits from both hillsides and the river channel next to the rock shelter in 2023 (see image below). Additional samples are planned to be taken in fieldwork between July and August 2024. Sample materials will be used to establish the background values for mineral and elemental composition in natural soil conditions. These results can be compared with results from the rock shelter sediments to identify potential human imprints. Additional samples will be taken from extensions of the excavations at YG02 in 2024.



Soil samples were taken during excavation of the rock shelter sediments in 2023 and stored in plastic zip lock bags. They have been used in the first instance to analyse mineralogic, sedimentologic and pedologic properties. The following analyses have been completed/are planned for 2024:

(i) Grain size distribution (important for identifying sediment source: aeolian, fluvial, local, distant etc.);

(ii) pH and EC (important for identifying soil forming environment, preservation of bones and other organic material);

(iii) organic carbon content (comparison between natural soil in the surrounding and rock shelter sediments);

(iv) colour (Munsell colour code, important to identify human activity such as finely distributed ash/charcoal/hearth layers);

(v) magnetic susceptibility (identify use of fire where no hearth is visually identifiable);

(vi) elemental composition using fusion and subsequent ICP-OES analysis (cross

check of material source); and

(vii) mineralogical analysis using powder X-Ray diffraction (crosscheck of material source and use of fire – maghemite formation).

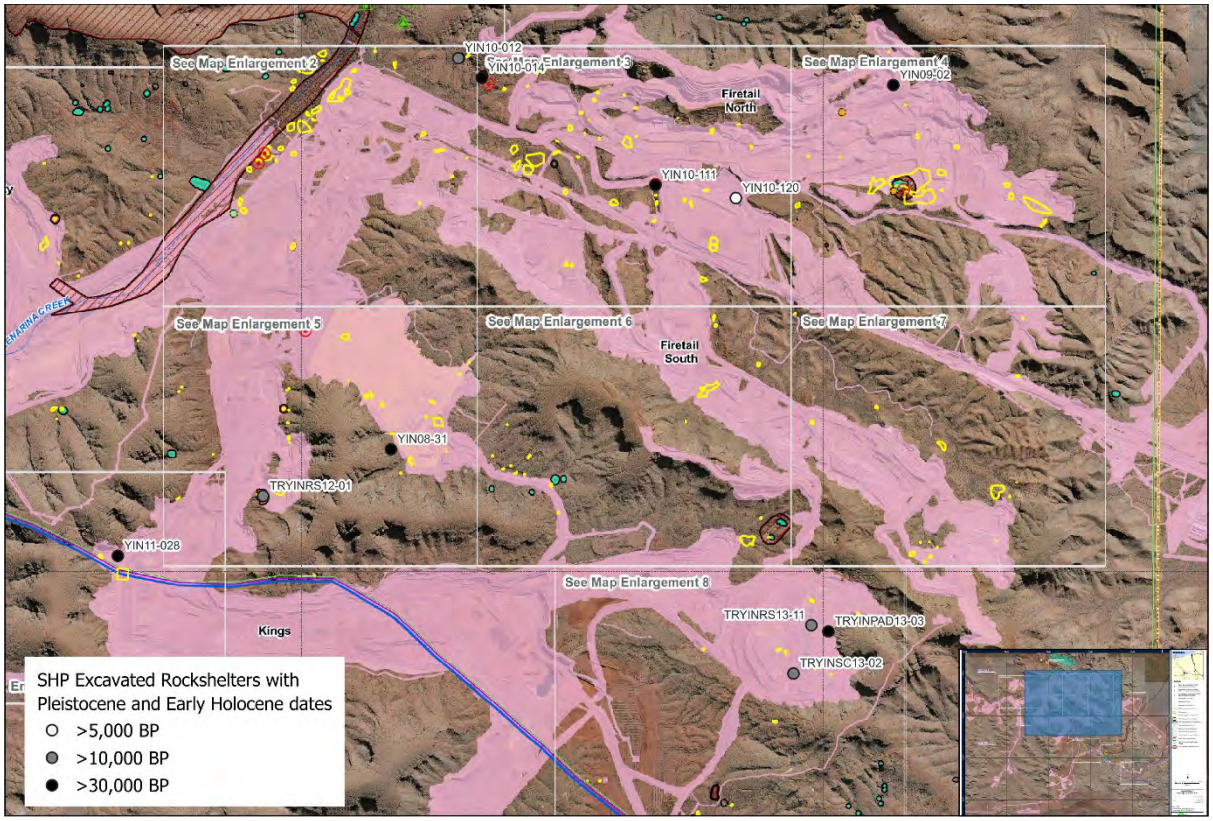
Thin section sampling and preparation

Several sections of the excavation pit in 2023 were impregnated with polyurethane spray over successive applications. Thin dry paper sheets were fixed as a stabilisation layer at the end of the preparation and sediment peels were subsequently taken. A 60 cm long and 10 cm wide peel is displayed on the right (photo 6). Peels were scaffolded and wrapped in aluminium foil for transport to the UWA laboratories. Sediment layers arrived well-preserved in the lab indicating sediment integrity. Peels were impregnated with clear polyurethan resin (image below). Once cured, subsections will be cut and polished (µm thickness) for subsequent light microscopic studies.

Photo 6. Samples taken from excavation

Micromorphology will address a range of site formation issues and will include samples from both the 2023 and forthcoming 2024 excavations. Micromorphology is useful for examining the boundaries between units and distinguishing between natural and anthropogenic deposits. Small fragments of charcoal, burnt bone, lithics and seeds might be recovered from such Pilbara shelters. A portable XRF from Niton was used to generate general chemical composition of rock shelter sediments and to compare them to the soils outside the rock shelter. A small number of replicates were taken at the end, so readings can be compared. These were all run for 2 mins of spectra collection, (30 seconds per filter) using a Niton XL5 pXRF (additional preliminary chemistry data are available).

ANNEXURE 6: EXCAVATED ROCKSHELTERS IN THE SHP WITH DATES IN THE PLEISTOCENE AND EARLY HOLOCENE (>5,000 BP) MAPPED AGAINST MINE INFRASTRUCTURE AND ASSOCIATED DISTURBANCE



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