APPENDIX 4 – HERITAGE

Heritage Reports

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Wilpinjong Caretakers Cottage Archaeological Excavation Report

Prepared for Wilpinjong Coal Pty Ltd

Prepared by Niche Environment and Heritage | 06 March 2020

niche Environment and Heritage

Document control

Project number	Client	Project manager	LGA
5011	Wilpinjong Coal Pty Ltd	Joshua Madden	Mid-Western Region Council

Version	Author	Review	Status	Date
D1	Samuel Ward	Joshua Madden	Draft	06 March 2020

Cover photo: The Possible location of the Caretakers Cottage (Niche)

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1. Introduction

1.1 Introduction

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Wilpinjong Coal Pty Ltd (WCPL) to undertake an archaeological excavation of a potential former caretaker's cottage site which may be located at E 775088; N 6418963 near Wollar, New South Wales (NSW). The potential site was identified in a previous Niche report (Niche 2015) and will be displaced by the approved Wilpinjong Extension Project (hereafter referred to as the 'Project'). An archaeological Research Design (ARD) was prepared by Niche (Niche 2017) to satisfy the Condition 49(c) of Development Consent (SSD-6764) for the Wilpinjong Mine Expansion project.

1.2 Project Background

The Wilpinjong Coal Mine is owned and operated by WCPL, a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The Wilpinjong Coal Mine is an existing open cut coal mining operation situated approximately 40 kilometers (km) north-east of Mudgee, near the Village of Wollar, within the Mid Western Regional Local Government Area, in central NSW.

Condition 49(c) of Development Consent (SSD-6764) requires the following:

> *49. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Historic Heritage Management Plan for the development to the satisfaction of the Secretary. The plan must:*
>
> *…*
>
> *(c) include the following for the management of historic heritage:*
>
> *…*
>
> - *undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G);*

This Archaeological Research Design (ARD) is included as an appendix to the approved Historic Heritage Management Plan for the Wilpinjong Coal Mine. This Report outlines the test and salvage excavation (archaeological) which was undertaken in response to the above Condition 49(c).

1.3 Site location

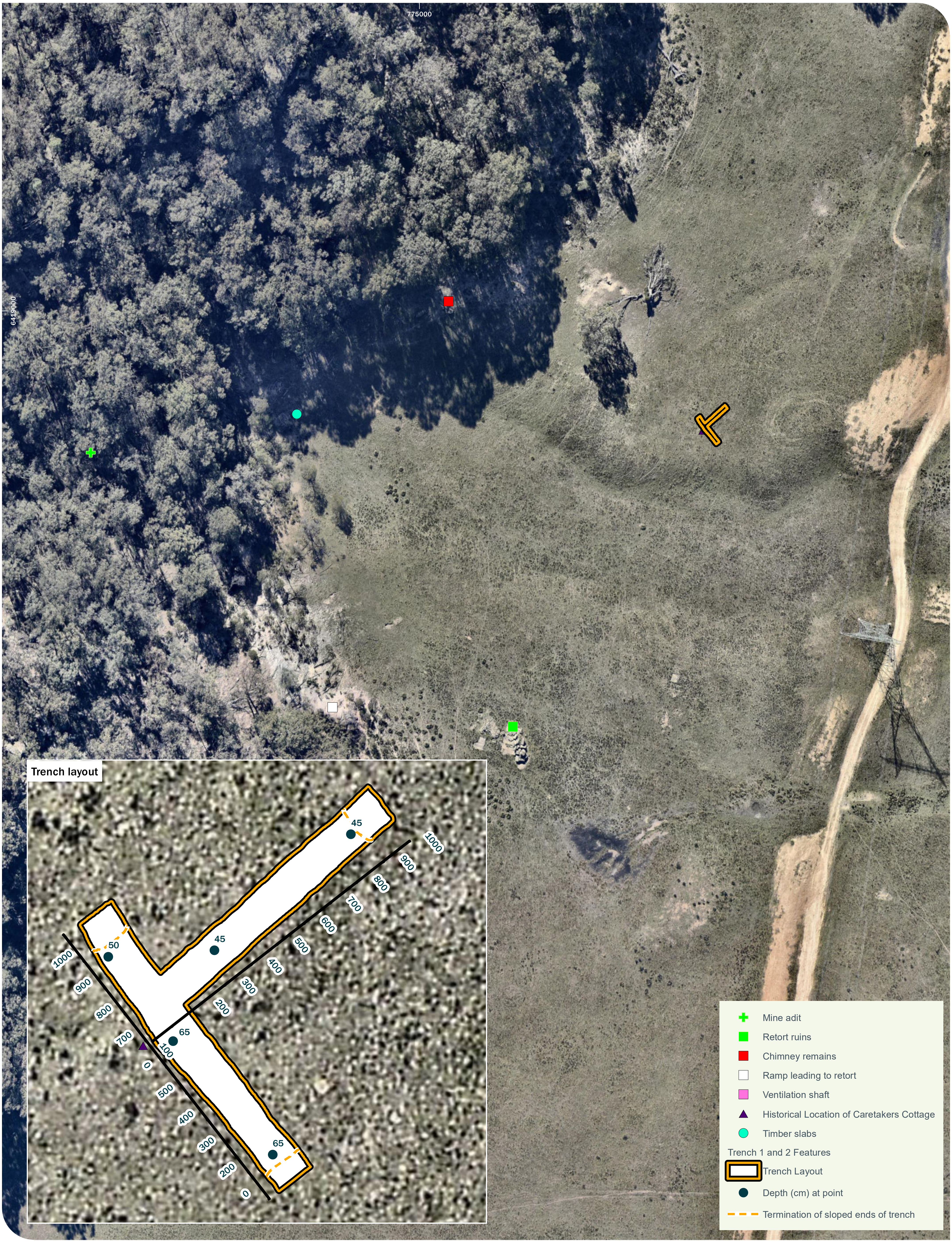
The potential former caretaker's cottage site is located on a property to the south of the Ulan-Wollar Road at coordinates -32.332146, 149.922502. The site is approximately 3 km north-west of the town of Wollar. The general location of the site is shown in Figure 1.

1.4 Limitations and scope

This report provides a limited historical background, and significance assessment and does not include a statement of heritage impact for the caretakers cottage. This ARD has been prepared in accordance with the Heritage Council of NSW's *Archaeological Assessment Guidelines* (1996) and *Assessing Significance for Historical Archaeological Sites and 'Relics'* (2009). Its aim is to satisfy Condition 49(c)(2)(iii) of the Development Consent (SSD-6764): *undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G)*.

1.5 Personnel

Joshua Madden (Team Leader – Historic Heritage of Niche) undertook the archaeological investigation. This report was prepared by Samuel Ward and reviewed by Josh Madden.



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0 25
m
GDA 1994 MGA Zone 55

Excavation Trench Locations

Wilpinjong Caretakers Cottage Archaeological Excavation Report

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Figure 2

0 500
m
GDA 1994 MGA Zone 55

Location of the Project Area

Wilpinjong Caretakers Cottage Archaeological Excavation Report

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Niche Proj. #: 5011
Client: Wilpinjong Coal Pty Ltd

Figure 1

Drawn by: GT File: T:\spatial\projects\a5000\a5011_WilpinjongCaretakersCottage_AER\Maps\report\5011_Figure_1_Location.mxd Last updated: 25-Feb-20 2:21:29 PM

2. Historical Context

1.1 Preamble

This section provides a brief overview of the history of the Carteakers Cottage, and the Wilpinjong region. It has been compiled from existing documents and sources, in particular the previous Niche report and Archaeological Research Design (Niche 2015 and 2017) and has a limited scope. The aim is to provide an historical context for the Archaeological Excavation Report.

1.2 Historical Background

1.2.1 Aboriginal landscape prior to European contact

The Wilpinjogn region is near the boundary of Wiradjuri country, which spans from the Murray River to the south and the Darling River to the west. Archaeological evidence, such as that from an excavation site at Botobolar, confirms Aboriginal presence in the region at least 5,500 years B.P (Niche 2015). After European settlement, Aboriginal People were displaced from the land and during the nineteenth century some Aboriginal families worked on local farms in the Wilpinjong and Wollar area. The Cassilis Police District employed some Wollar-based Aboriginal trackers however in 1900 most Aboriginal families were forcibly removed from the area around Wollar (Niche 2015).

1.1 Summary chronology

The following is a summary of the chronology of the Wilpingjong region's history, in list form. There were separate expeditions by James Blackman and Willian Lawson with which European settlers explored the Mudgee region in the early 1820's. 1822 saw settlement of Mudgee, and with the redefining of the 'Limits of Location' by Governor Darling in 1826, the region was able to be settled by private subjects.

1821 – James Blackman and William Lawson made separate exploration expeditions to the Mudgee area from Bathurst. Soon access routes to the Central Tablelands could be made from either the Hunter Valley or Bathurst (Niche, 2015).

Mid 1820s – William Lee was thought to be the first settler in the wider area, occupying land in Bylong from the mid-1820s. The prominent emancipist, Robert Fitzgerald, soon followed Lee to the area and took up large blocks of land to become one of the largest landowners in the area. Fitzgerald held a pastoral lease in the Wollar area, and established the "Wollar" run (Wollar Centenary 1984).

1861 – The NSW *Robinson Land Act 1861* was introduced. The Act included free selection and conditional purchase whereby, land parcels of between 40 and 320 acres could be conditionally purchased without a survey on the condition that the purchaser agreed to improve the land acquired and intended to occupy it for at least 3 years (NSW State Library 2014). It was under this Act that settlement in the valley prospered as farmers and pastoralists who otherwise would have been unable to purchase property were able to do so. The more successful settlers would frequently acquire the blocks of their neighbours and build up the size of their holdings.

1870s – Under the NSW *Robinson Land Act 1861* settlement in the area peaked, and is thought to have been a flow on from the Gulgong gold rush.

1882 – Elijah Marskell purchased the subject area and surrounding land at Wilpinjong (Figure 3) (WCPL 2006:11).

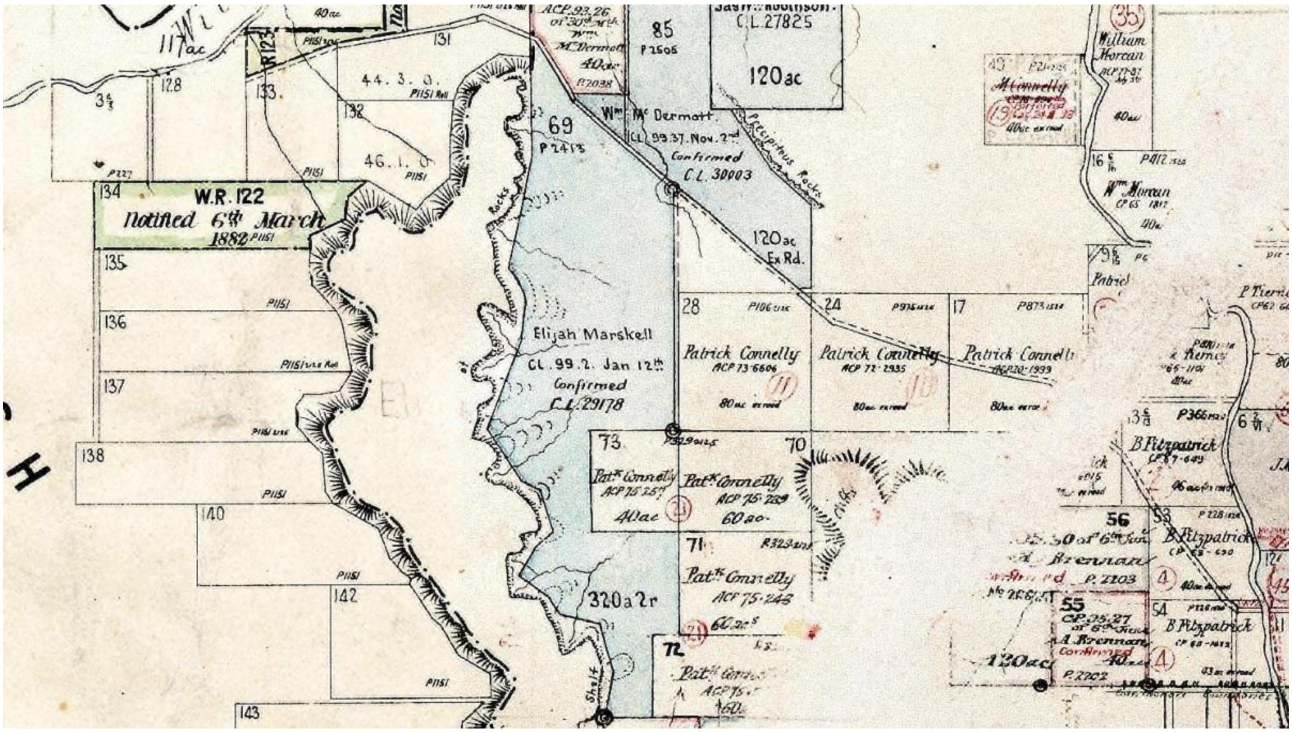

Plate 1: Elijah Marskell's land dated 1882 (Source: LPI)

1927 – It was reported that a rich shale seam had been discovered at Wollar, described as "*the richest and largest seam of oil shale in the world*" (*Mudgee Guardian* 14 November 1927). The shale seam was located after 3 years of prospecting by Mr Mancq (an oil expert who had experience on oil fields in Russia and America) and was three miles long.

Tests on the shale quality were carried out under the supervision of the Government geologist Mr Carr and the results were considered to be highly satisfactory. A local syndicate was formed to mine the shale, which comprised of Mr Joseph Matthews, Mr Joseph Davis and Mr Mancq (*Mudgee Guardian* 14 November 1927:19).

1929 – The shale oil mine ('the shale mine') at Wollar started operations, owned by the Imperial Shale Oil Company. The shale oil was mined from land belonging to Elijah Marskell, as the company did not have the finances to purchase the property. In return for the lease, Marskell was made a shareholder (McDermott 1993: 2).

Circa this time Clarrie Barton, a local to the area, built the cottage along with the site office and dining halls for the workmen, all of these structures are believed to have been located near the mine (the location of the ancillary buildings is unknown); 'There is a small hill down from the face of the mine with a couple of trees, this was where the cottage was situated' (McDermott 1993: 2).

1929 – During the period of 1929-1933[1], Les Chick - the works engineer - lived with his wife and his family in the Caretaker's cottage next to the mine site.

1930 – The crushing plant began to be constructed and the condensers were assembled (*The Sun* 13 September 1930:7).

[1] The dates of operation of the Shale Oil Mine are approximate – more precise information is not currently available

A Schultz retort (P US1931417 A) was erected, which rectified shale to motor oil in a single operation (Figures 4, 5 and 6). Ten people were employed in the mining operations, and retorting was expected to begin in October (*Newcastle Morning Herald* 2 August 1930:8).

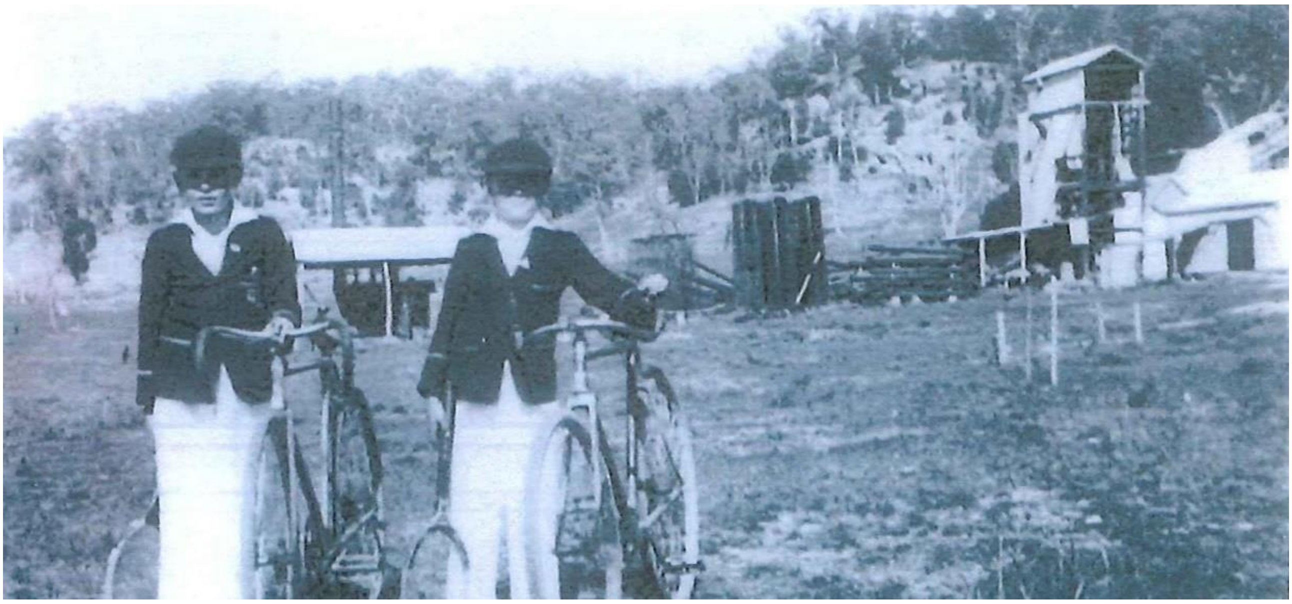

Plate 2: Undated photo of the Wollar shale oil mine refinery works (Source: McDermott 1993)

1930 – The shale mine was closed, as the set up (including the purchase of machinery), operation and production costs of the mine were too great. Drums of oil were abandoned in the paddock for some time after as they were unable to be sold, which was a common theme across NSW at this time.

'With the exception of a small amount taken from the Wollar shale mine, near Mudgee, in the western district, for testing purposes, no oil shale was mined during 1934". This sad comment regarding a potentially great industry is tucked away near the bottom of page 54 of the annual report of the N.S.W. Mines Department' (*Mudgee Guardian* 16 September 1935:04).

1.2 Mining activities

1.2.1 Coal Resources

In December 1924 it was reported that the mining engineer, Mr. T. Cunningham, had discovered a five foot seam of coal, extending over two miles north and one mile west at Ulan (*Sydney Morning Herald* Monday 29 December 1924:9). It was further reported that Cunningham had established the Ulan Coal syndicate which was formed to develop the mine (*Sydney Morning Herald* Monday 5 May 1930:12). The mine opened at the Ulan No 1 Underground Mine. It was further reported in 1933 that Cunningham, part proprietor of the Ulan No 1 Underground Mine, died (Sydney Morning Herald Tuesday 24 October 1933:12). In the years that followed operations were intermittent and there were several changes in ownership. The coal at Ulan was considered inferior to other coal in the region (Roberts c1975:8).

In 1950, the leases were sold to Ulan County Council who began construction of the Ulan Power Station near the mine site. The station was taken over by the Electricity Commission, who called tenders to reopen the Ulan No 1 Underground Mine for a period of 10 years to supply the power plant (Roberts :8; *Mudgee Guardian* and *North-Western Representative* 15 November 1954:1). Development of the Ulan No 1

Underground Mine recommenced in 1956 and various mining operations at the Ulan Coal Mine have continued to the present day.

In 1912 reports of a coal seam at Wilpinjong were made in the papers. A correspondent of the Daily Telegraph reported that he was surprised by the sight of the coal seam at Wilpinjong stating "I was of the opinion when told that a seam of coal 4' thick cropped out in this district was one of those getups for the benefit of the newspaper reporter…..I am surprised at the modest way in which you have brought this before the public, viz. by stating that a coal 4' thick existed when the seam I am looking at is at least 8'thick" (*Mudgee Guardian* 16 May 1912). Another report in June that same year was that the mineral line at Wollar was very rich in coal, and that the coal extended under the entire district. The outcrop at Wilpinjong was reported as being of better quality than that at Lithgow (*Mudgee Guardian* 27 June 1912).

1.2.2 Shale oil resources

NSW was a world leader in extracting oil from shale. Towards the end of the nineteenth century areas such as Mount Kembla, Hartley Vale, Torbane and Joadja gave testament to this industry (Hughes *et al.* 1986: Theme 11).

Shale in the Wollar area had been identified as early as 1887 when Mr. Smith of Barrigan Station sank some pits into a shale deposit on his land. The seam was not mined until 1932 when Mancq and Dewar constructed two substantial adits and a shaft. Shale oil mining also took place at Glen Davis in the region, and the level of activity in the area prompted the Newcastle syndicate, in conjunction with the Mudgee Shale Oil Company, to extract high grade shale and send it to refineries in Newcastle (Hughes *et al.* 1986: Theme 11).

In the late 1860s shale had been identified on land at Ulan owned by Mr Healy and in 1880 the deposit was mined by W.C Wall and J. T. Moir who were able to sell their shale to the Mudgee Gas Co (Hughes *et al*. 1986: Theme 11).

In 1912 newspapers reported on the shale seam at Wollar/Wilpinjong (*Mudgee Guardian* 27 June 1912). This seam was mined from about 1929 to 1933 (see Section 7.1.2). The large expense of the machinery required for building retorts and refineries, and the ongoing expense to operate the mines resulted in the costs outweighing the profits. Many mines were abandoned during the 1930s including the Shale Oil Mine at Wilpinjong.

1.3 Shale Oil Mine Complex, Slate Gully

GPS Reference: Easting 774898; Northing 6418956

The Shale Oil Mine at Wollar was operated from approximately 1929 to 1933 and was owned by the Imperial Shale Oil Company. The directors of the Company were Arnold Resch, Stan Chatterton and Percy Marks, all of whom were from Sydney. The shale oil was mined from land belonging to Elijah Marskell, as the company did not have the finances to purchase the property and Marskell was made a shareholder (McDermott 1993: 2).

Clarence John Camroux was the head of the mine, but only came on site occasionally to inspect proceedings. Les Schulz was the manager of the works. Les Chick was the works engineer, and lived with his wife (who was the sister of Clarence Camroux) and his family in the Caretaker's cottage next to the mine site. Clarrie Barton, a local to the area, built the cottage along with the site office and dining halls for the men. These structures were all located near the mine, "There is a small hill down from the face of the mine with a couple of trees, this was where the cottage was situated" (McDermott 1993: 2).

The main shaft of the mine was 1.5 metres (m) high, 3 m wide and 150 m deep (i.e. into the ridgeline) where the shale was loaded onto skips and pushed out of the mine along tram tracks. There were two skips each approximately three feet high with small wheels “they were pushed out of the mine and along a framework that was built to take them from the hill a short distance down the paddock to the retort. You can still see the marks on the tree from the chains of the winch” (McDermott 1993: 4). The ventilation shaft went into the ridgeline approximately 6 feet and was lined with hessian (McDermott 1993: 4).

The shale oil retort was made from cement blocks. A local recollected the following description of the retort: “An engine with a 8 foot fly wheel was mounted on concrete blocks, this was used to drive the retort. Clay bricks were made in the gully near Marskell’s dam. They were left in the sun to dry and used inside the retort as fire bricks to burn the shale. It had cement gutters running from it out into the paddock. These were to get rid of the oil refuse and keep it away from the base of the retort” (McDermott 1993: 4).

Plate 3: Wollar Shale Oil Mine Adit

It was reported in the newspaper of the Wollar Shale Oil Mine “that Retorts have been erected, of which Mr. E. L. Schultz holds the patent rights. It is claimed that in this process the shale can be rectified down to motor spirit in the one operation” (*Newcastle Morning Herald and Miners' Advocate* 2 August 1930:8). The operations at Wollar were based on new methods of refining coal and shale, the new machinery was described as “a wonderful labour saving device and all Australian” *(Mudgee Guardian* Friday 13 June 1930:1). Newspaper accounts at that time indicate the machinery and processes had revolutionised the industry. The Mudgee Guardian described a demonstration “At the Wollar works last week the Australian Imperial Shale Oil Co. Ltd., gave a demonstration of a full-working unit producing oil from shale at the rate of 1000 gallons a day. The company says that the retort is a radical departure from stabilised methods, and that it is possible to produce oil from coal and shale on a commercial basis…The principle is low temperature distillation.” (*Mudgee Guardian* 21 December 1931:2).

In 1931 the Mudgee Mail reported that the Shale Oil Mine had suspended operations for approximately five weeks (*Mudgee Mail* 16 July 1931). Five months later it was reported that Mr Camroux, on behalf of the Australian Imperial Shale Oil Company, had applied for a further suspension of labour conditions for three months as "substantial expense had been incurred in mining operations and that the company was temporarily unable to continue the operations requiring time to make further financial arrangements" (*Mudgee Mail* 1 September 1932). Mr Camroux believed it would take three months to obtain the additional capital required to run the mine. The application was granted (*Mudgee Mail* 1 September 1932).

Attempts were made by the Directors of the Shale Oil Mine to get the locals to invest in the mine; however they had no success in this (McDermott 1993:3).

In c1933 the Shale Oil Mine was closed as the costs of setting up the mine (including the purchase of machinery) and the operation and production of the mine were too great. Drums of oil were abandoned in the paddock for sometime after as they were unable to be sold, which was a common theme across NSW at this time.

Plate 4: 1961 Aerial close-up of Wollar Shale Oil Mine – the potential caretaker's cottage site is circled in red (Source: LPI with additions by Niche)

3. Previous Site Inspection and Assessment of Archaeological Potential

1.4 Site inspection

A site inspection was carried out by Fiona Leslie (Principal Archaeologist, Niche) and Clare Leevers (Archaeologist, Niche) on 25 May 2017. The inspection was intended to relocate heritage items identified as part of the Shale Oil Mine Complex, as noted in the previous Wilpinjong Extension Project Historical Heritage Assessment (HHA) (Niche 2015), and assess their condition and archaeological potential.

1.4.3 Introduction

The Shale Oil Mine and associated items are located within Slate Gully. The mine adit (see Plate 7) is located at the base of the slope associated with the ridgeline that separates Slate Gully from the existing Wilpinjong Coal Mine. Remnant post and rail fencing, a cart ramp and a ventilation shaft are all located on the lower slopes of the ridgeline. The remains of the retort are located on the valley floor. A chimney from the caretaker's hut is located uphill of a flat rise within the valley. A stockpile of hardwood timber planks is located on the valley floor near the mine adit. The locations of the components of the Shale Oil Mine Complex are presented on Figure 5.

1.4.4 Potential caretaker's cottage site

A level area of land located on a rise above a small gully could be the possible location of the caretaker's cottage. Some fragments of brick are located across the levelled area and down the slope of the rise. Despite general benching of the area to create a level platform, no *in situ* structural material was identified during the site inspection.

A feature previously identified in the HHA (Niche 2015) as likely being the remnant of a chimney from the potential caretaker's cottage was investigated further, and has been re-assessed as being a fragment of the concrete retort which has been relocated in intervening years onto the rise above the potential caretaker's cottage site.

Plate 5: Possible site of the Caretaker's Cottage (Niche 2017)

Plate 6: The potential 'chimney', now believed to be a piece of the retort ruins (Niche 2017)

1.4.5 Mine adit

The shale oil mine adit was constructed into the sandstone at the base of slope associated with the ridgeline that separates Slate Gully from the remainder of the Wilpinjong Coal Mine. The opening of the adit is reinforced with timber sets as shoring, but large quantities of sandstone from the rock overhang of the entrance have collapsed into the adit head, covering approximately three quarters of the original opening.

Plate 7: The mine adit (Niche, 2017)

1.4.6 Retort

The Schultz retort was a vertical externally-heated retort model with an internal mechanism for keeping the material in motion during distillation. It currently lies in ruins on the surface, much of the vertical structure was potentially reused and recycled elsewhere. During the site inspection two mid- twentieth century hexagonal glass soft drink bottles were located on the surface within the ruins, but no other archaeological material was apparent. As shown in the historical photograph of the retort, timber structures were once present behind the ruin. These buildings likely included a site office and possibly a mess hall. No above ground remains of these structures were identified during the site inspection.

Plate 8: The ruins of the Schultz retort (Niche, 2017)

Plate 9: Close up of the concrete block rubble of the retort (Niche 2017)

1.5 Assessment of archaeological potential

This assessment of potential was undertaken in 2017 and informed the development of the Archaeological Research Design.

The location of the possible caretaker's cottage site contains no in situ surface remains and no scatters of archaeological material or refuse are apparent apart from a few brick fragments. However, given the benched and levelled nature of the area and local knowledge of the potential cottage location, limited archaeological test excavation at the location is warranted prior to the commencement of surface disturbance activities at that location. If archaeological remains of the former cottage have survived they may include: structural remains, such as post holes, fireplace footings and building debris, underfloor deposits within the footprint of the former caretaker's cottage, yard deposits, rubbish pits and deeper subsurface deposits including those used to backfill cesspits and a well (if present). Excavation and analysis of such relics (if present) may contribute to our knowledge of the day-to-day operation and domestic life of the shale oil mine during the early to mid-20th century. If substantially intact remains of the caretaker's cottage site are present they have the potential to be of local heritage significance for their historical heritage value and research potential (Niche 2017).

4. Significance Assessment and Research Framework

1.6 Significance assessment

As noted in the previous HHA (Niche 2015) the Shale Oil Mine Complex (including the potential caretaker's cottage) is of local heritage significance:

Criterion	Significance
(a) An item is important in the course, or pattern, or NSW's cultural or natural history (or the cultural or natural history of the local area);	The shale oil mining industry was important in the course of NSW as a way of obtaining crude oil for fuel. The Shale Oil Mine at Wollar reflected this industry, and contributed to the growth of the Wollar Village where many of the miners lived. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(b) An item has strong or special associations with the life or works of a person, or group of persons, of importance in the cultural or natural history of NSW (or the cultural and natural history of the local area);	The Shale Oil Mine has strong associations with the renowned prospector Mancq who worked on many oil mine sites internationally, and in the local area with associations to the Mudgee Imperial Shale Oil Company that ran the operations of the Wollar mine and the operations of other shale mines in the region. The Shale Oil Mine contributed significantly to the shale oil industry in the local area and the long continued history of mining in the wider area. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievements in NSW (or the local area);	The construction of the mine adit, vent shaft and the retort and oil refinery equipment were instrumental in the daily operations of the Shale Oil Mine. The refinery machinery at Wollar was part of a new Australian-made process that extracted greater quantities of oil. The engineering demonstrates a high degree of technical achievement of oil extraction during the early 1930s. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(d) An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;	There is no evidence to indicate that the Shale Oil Mine Complex has a strong or special association with a particular community or cultural group in NSW (or the local area). The Shale Oil Mine Complex is not significant under this criterion.
(e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);	Archaeological investigation of the Caretaker's cottage could potentially reveal some information which could contribute to the understanding of the caretaker's role in operations of the mine, and of the daily life of the caretaker and his family that lived at the mine site. The Shale Oil Mine Complex is of local heritage significance under this criterion.

Criterion	Significance
(f) An item possess uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);	Shale mines were not particularly rare or uncommon in the area during the early 1930s. An earlier and larger shale mine operated at nearby Barrigan. However, the status of the former Barrigan mine is uncertain and there are no shale mines listed on the Mid Western Regional LEP. As shale is rarely mined these days, physical evidence of this once common activity is becoming increasingly rare. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(g) An item is important in demonstrating the principal characteristics of a class of NSW's: *— Cultural or natural places; or* *— Cultural or natural environments;* *(or a class of the local area's)* *— Cultural or natural places; or* *— Cultural or natural environments;*	The mine adit, ventilation shaft, the remains of the retort and evidence of the Caretaker's cottage demonstrate the principle characteristics of shale mine sites in the early 1930s. The Shale Oil Mine Complex is of local heritage significance under this criterion.

1.7 Historical themes

Based on the historical research completed to-date, the following historical themes would be relevant to the potential caretaker's cottage site:

National Theme	NSW Theme	Local Theme	Examples
3 Developing local, regional and national economies	Mining	Activities associated with the identification, extraction, processing and distribution of mineral ores, precious stones and other such inorganic substances.	Mine, quarry, race, mining field or landscape, processing plant, manager's office, mineral specimen, mining equipment, mining license, ore laden shipwreck, collier, mine shaft, sluice gate, mineral deposit, slag heap, assay office, water race.
3 Developing local, regional and national economies	Technology	Activities and processes associated with the knowledge or use of mechanical arts and applied sciences.	Computer, telegraph equipment, electric domestic appliances, underwater concrete footings, museum collection, office equipment, Aboriginal places evidencing changes in tool types.

5 Working	Labour	Activities associated with work practices and organised and unorganised labour.	Trade union office, bundy clock, time-and-motion study (document), union membership card, strike site, staff change rooms, servants quarters, shearing shed, green ban site, brothel, kitchen, nurses station, hotel with an occupational patronage.
8 Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living in and working around houses and institutions.	Domestic artefact scatter, kitchen furnishings, bed, clothing, garden tools, shed, arrangement of interior rooms, kitchen garden, pet grave, chicken coop, home office, road camp, barrack, asylum.

1.8 Research questions

The main aims of the archaeological investigation would be to determine the nature and extent of archaeological relics at the potential caretaker's cottage site by undertaking a program of test excavation. In the event that locally significant relics were identified by the testing, a program of limited salvage or further investigation may be considered.

The following research questions have been formulated for the potential caretaker's cottage site and would guide the strategy and archaeological methods employed during the investigation:

- Have archaeological relics relating to the early to the 1930s caretaker's cottage survived at the site? If so, what are their condition, nature, extent and significance?
- Does the site contain significant archaeological deposits i.e. underfloor deposits, cesspit fills or well fills? If so, what can they tell us about former occupants of the site?
- What is the spatial arrangement of the archaeological evidence? Can it provide insight into former use of the caretaker's cottage or nearby associated structures (i.e. mine worker's mess hall and mine office)?

5. Archaeological Investigation

5.1 Excavation Methodology

The excavation was carried out on 26/11/2019 by Joshua Madden (Historic Heritage Team Leader, Niche) according to the methodology presented in Appendix E (Niche 2017). The original co-ordinates designated for the location of the possible caretaker's cottage were relocated, and marked out in a runoff line coming off a small spur leading toward the gravelled road. The area and location of the excavated slip trenches are shown in Figure 2 and Plate 10, Plate 11 and Plate 12.

Plate 10: Pre-excavation, possible location of the Caretakers Cottage and location of Trenches 1 and 2.

Prior to excavation, the area was surveyed on foot, and not surface artefacts were found, nor any brick fragments. There was no evidence of cut and benching in the area, with all landforms appearing of natural formation. A 10 metre (m) by 10m area was marked out in preparation for excavation, as per the ARD. The following steps were taken in adherence with this research methodology:

5.2 Slip Trenches

Two strip trenches were positioned within the investigation area to determine the presence / absence of any archaeological remains of the former cottage. An excavation machine (Yanmar ViOss with a 1.2m blade) was used to remove the topsoil and fills, with monitoring from Joshua Madden. The trenches were exposed, and any features were investigated. The natural layer of archaeologically sterile soil was used to gauge the maximum depth to excavate. The excavation methods described in Appendix E were followed and two trenches were excavated, with the results documented below.

Plate 11: The location of Trenches 1 and 2, taken after the excavation was finished, looking west.

Plate 12: The location of Trenches 1 and 2, taken after the excavation was finished, looking east.

5.2.1 Trench 1

Trench 1 was 1.2m wide and 10m in length and was excavated to a depth of 650mm at maximum. This trench was orientated northwest/southeast nearby the datum co-ordinates as shown on Figure 2. Table 1 records the contexts found whilst excavating this trench, and Appendices A and B provide a schematic top-down view and a section drawing of this trench, respectively and photographs are below in Plate 13 to Plate 18.

During the course of excavation of this trench, evidence of a previously burnt/decomposed tree was found (Context 2). This was assessed as this feature was too large to be anything but the location of a former tree stump. It was known that the land was formerly bushland and had been cleared prior to the date that the historical record provides for the construction of the caretaker's cottage. A sondage was excavated in the light brown deposit, with no artefacts or evidence of introduced material.

No archaeological remains were identified in Trench 1.

Table 1: Trench 1 Contexts

No	Category	Description
T1:1	Top soil layer	Up to 150mm of light brown very friable material, mixed with
T1:2	Deposit	Tree roots evident causing staining: high lumic content and had a fill composition of gravels and lumic soils
T1:3	Deposit	Light grey very friable and fine-grained material
T1:4	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles

Plate 13: Trench 1 Partially Excavated, facing northwest.

Plate 14: Trench 1 at context T1:4, looking northwest.

Plate 15: Deposit found in Trench 1.

Plate 16: Deposit found in Trench 1 after excavation of sondage.

Plate 17: View of the stratigraphy of the southern wall of Trench 1.

Plate 18: View of the stratigraphy of the sondage excavated in Trench 1.

5.2.2 Trench 2

Trench 2 was 1.2m wide and 8m in length and was excavated to a depth of 750mm at maximum. This trench was orientated southwest/northeast nearby the datum co-ordinates as shown on Figure 2, and abuts Trench 1 at its southwestern end. Table 2 records the contexts found whilst excavating this trench, and Appendices C and D provide a schematic top-down view and a section drawing of this trench, respectively and photographs are below in Plate 19 to Plate 26.

During the course of excavation of this trench, two features were identified on the southern wall at the interface of the Trench 2: Context 2 and Trench 2: Context 3 horizons. Both of these features elongated on to a east-northeast axis from the Trench 1: Context 2 Tree root feature found in Trench 1. Both had evidence of high lumic content and had a fill composition of gravels and lumic soils. A burnt tree root was found in the most northerly feature. Note that Trench 2: Contexts 4 and 5 are identical to Trench 2: Context 3, and Trench 1: Context 4. This trench was excavated into the Context 3 horizons, however no artefacts or evidence of introduced material was found.

No archaeological remains were identified in Trench 2.

Table 2:Trench 2 Contexts

No	Category	Description
T2:1	Top soil layer	Up to 150mm of light brown very friable material, mixed with
T2:2	Deposit	Light grey very friable and fine-grained material
T2:3	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T2:4	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T2:5	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T1:2	Tree root staining	Feature matching that found in T1 - Tree roots evident causing staining: high lumic content and had a fill composition of gravels and lumic soils

Plate 19: View looking east at the start of excavation of Trench 2.

Plate 20: Detail of Trench 2 looking Northeast after the removal of Context T2:1

Plate 21: looking southwest along Trench 2 after Context T2:3,4,5 were reached, showing deposits.

Plate 22: View of Trench 2 looking northeast after Context T2:3,4,5 were reached, showing deposits.

Plate 23: detail of deposits found in Trench 2

Plate 24: Detail of deposits found in Trench 2

Plate 25: Detail of excavated deposit in Trench 2

Plate 26: Detail of excavated deposit in Trench 2

5.3 Summary of Excavation Results

The excavation carried out on 26/11/2019 by Joshua Madden (Historic Heritage Team Leader, Niche) proceeded according to the archaeological methodology found in Appendix E, and in response to the possible location of the caretaker's cottage identified in the previous heritage survey undertaken by Niche (Niche 2015).

In both trenches, several natural layers were identified, and the remains of what was identified to be a felled tree was noted. No introduced material was discovered, nor any artefacts uncovered. There were therefore no archaeological remains identified in either trench, and nothing to warrant an increase of scope for this excavation. The excavation did confirm that clearing of natural vegetation had been conducted in this area.

It can be understood from these results that this location was either not the location of the caretakers cottage, or that this structure was built of insubstantial materials which have left no archaeological remains.

6. Response to Research Questions

The archaeological test and salvage program conducted within the Project Area, Wilpinjong was carried out in accordance with the archaeological research design outlined in the 2017 ARD (Niche, 2017).

A number of general questions in relation to the nature and extent of the archaeological resource were posed in the 2017 research design to provide a basic archaeological context for the archaeological investigation. These are responded to below:

1.9 Research Questions and Responses

- Have archaeological relics relating to the early to the 1930s caretaker's cottage survived at the site? If so, what are their condition, nature, extent and significance?

There were no archaeological relics relating to the early to the 1930s caretaker's cottage identified at the Project area, either at the surface or in the sub-surface investigation.

- Does the site contain significant archaeological deposits i.e. underfloor deposits, cesspit fills or well fills? If so, what can they tell us about former occupants of the site?

The site did not contain significant archaeological deposits, with the only identifiable feature relating to the clearing of bushland in the region.

- What is the spatial arrangement of the archaeological evidence? Can it provide insight into former use of the caretaker's cottage or nearby associated structures (i.e. mine worker's mess hall and mine office)?

The arrangement of the evidence suggests that the cottage was not constructed in this location. This could indicate that the position of the gravel track leading to the shale mine site, which was identified in historical aerial imagery, is not an accurate indicator of the location of this cottage, with a different layout of this complex than originally thought. The lack of identifiable remains at this location could also suggest that the caretaker's cottage was not as substantial as originally thought and did not include brick construction or substantial foundations. The brick structure shown in Plate 6 was originally thought to be from the caretakers cottage but is now thought to have been a part of the shale oil retort stand. The greater arrangement of features associated with the shale oil site as shown in Figure 2 may indicate that the machinery of shale oil extraction were the most important structures built at this location, with worker's accommodation being of a more temporary nature.

7. Conclusions

This report documents the archaeological test and salvage excavation of the possible location of the Caretakers Cottage feature identified in the Wilpinjong historical heritage survey report completed by Niche in 2015 for the Wilpinjong Mine Expansion Project.

The excavation was undertaken according to the archaeological Research Design (ARD) prepared by Niche in 2017 to satisfy the Condition 49(c) of Development Consent (SSD-6764) for the Wilpinjong Mine Expansion Project. The excavation was carried out for the purpose of undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G), and to answer research questions which related to the nature and location of this historical item, and to determine if this location was the site of the 1930s Caretakers Cottage.

The results of this excavation found the following: In both trenches, several natural layers were identified, and the remains of what was identified to be a felled tree was noted. No introduced material was discovered, nor any artefacts uncovered. There were therefore no archaeological remains identified in either trench, and nothing to warrant an increase of scope for this excavation. The excavation did confirm that clearing of natural vegetation had been conducted in this area.

The responses to the archaeological research questions can be found in Section 1.9, and due to the lack of artefacts found, no post-excavation artefact analysis was necessary.

It was determined that this location was either not the location of the caretakers cottage, or that this structure was built of insubstantial materials which have left no archaeological remains.

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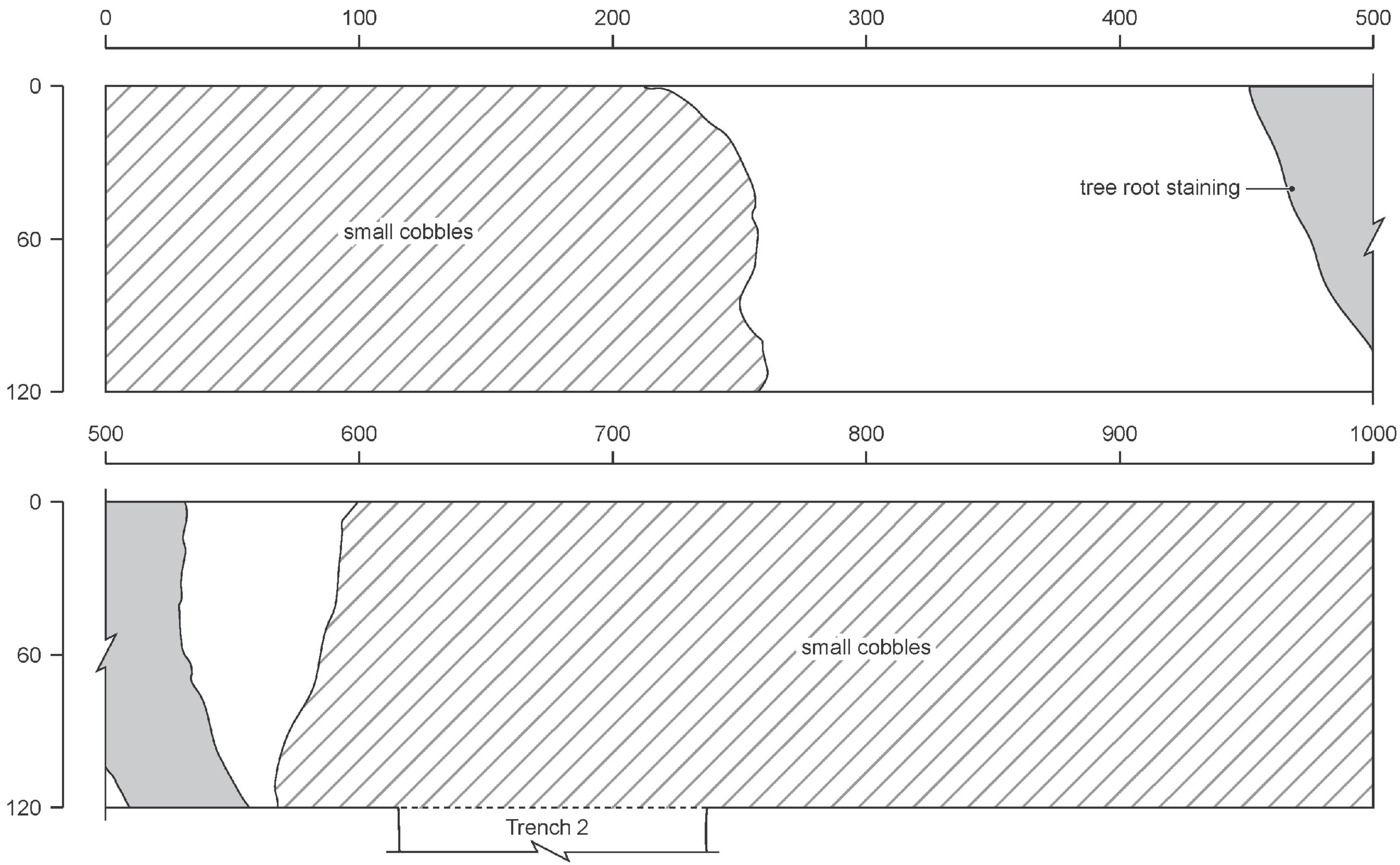
Mudgee Guardian 14 November 1927

The Sun 13 September 1930

Appendix A Trench 1 Schematic Plan



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Schematic Plan of Trench 1
Wilpinjong Caretakers Cottage Archaeological Excavation Report

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Niche Proj. #: 5011
Client: Wilpinjong Coal Pty Ltd

Appendix A

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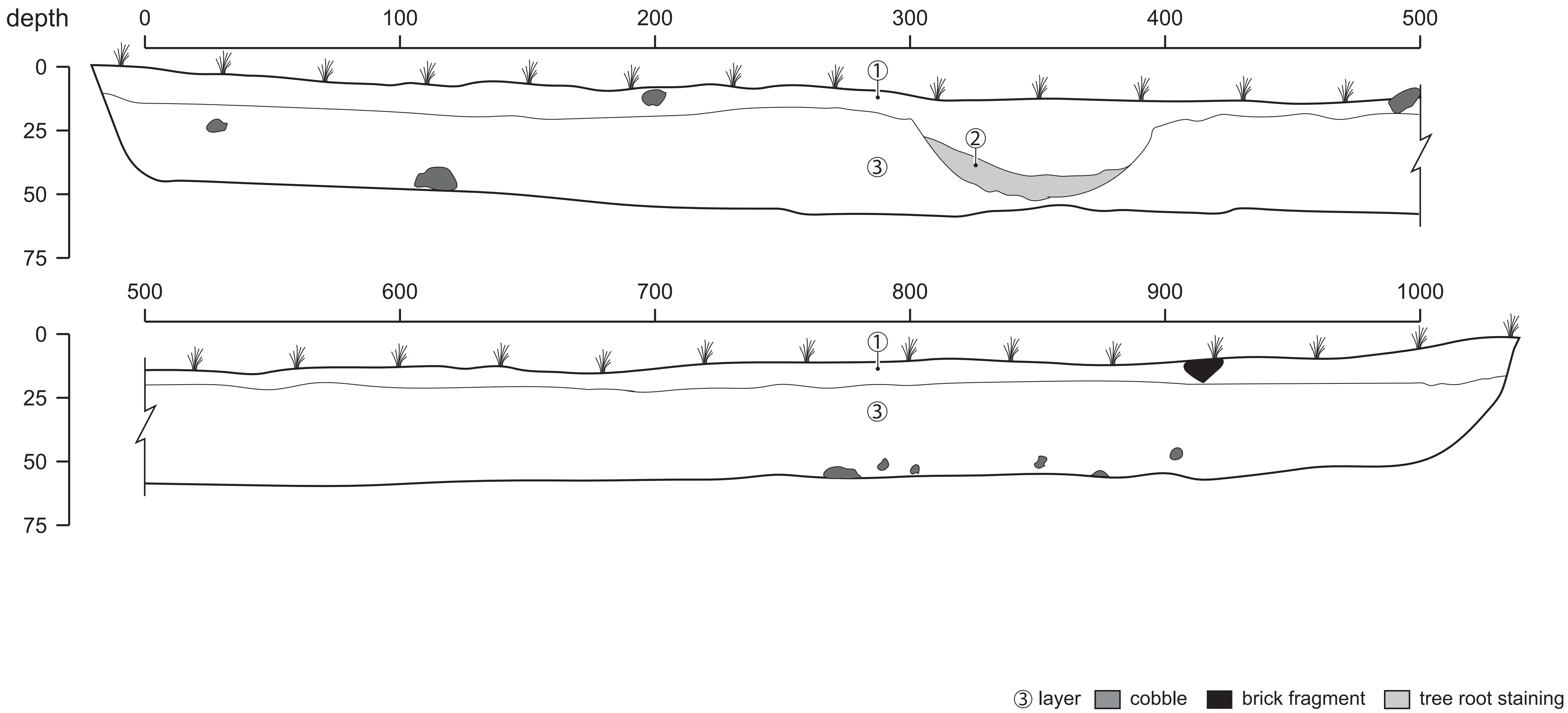
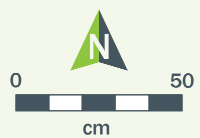
Appendix B Trench 1 Section Plan





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Trench 1 Section Drawing: Southeast Profile

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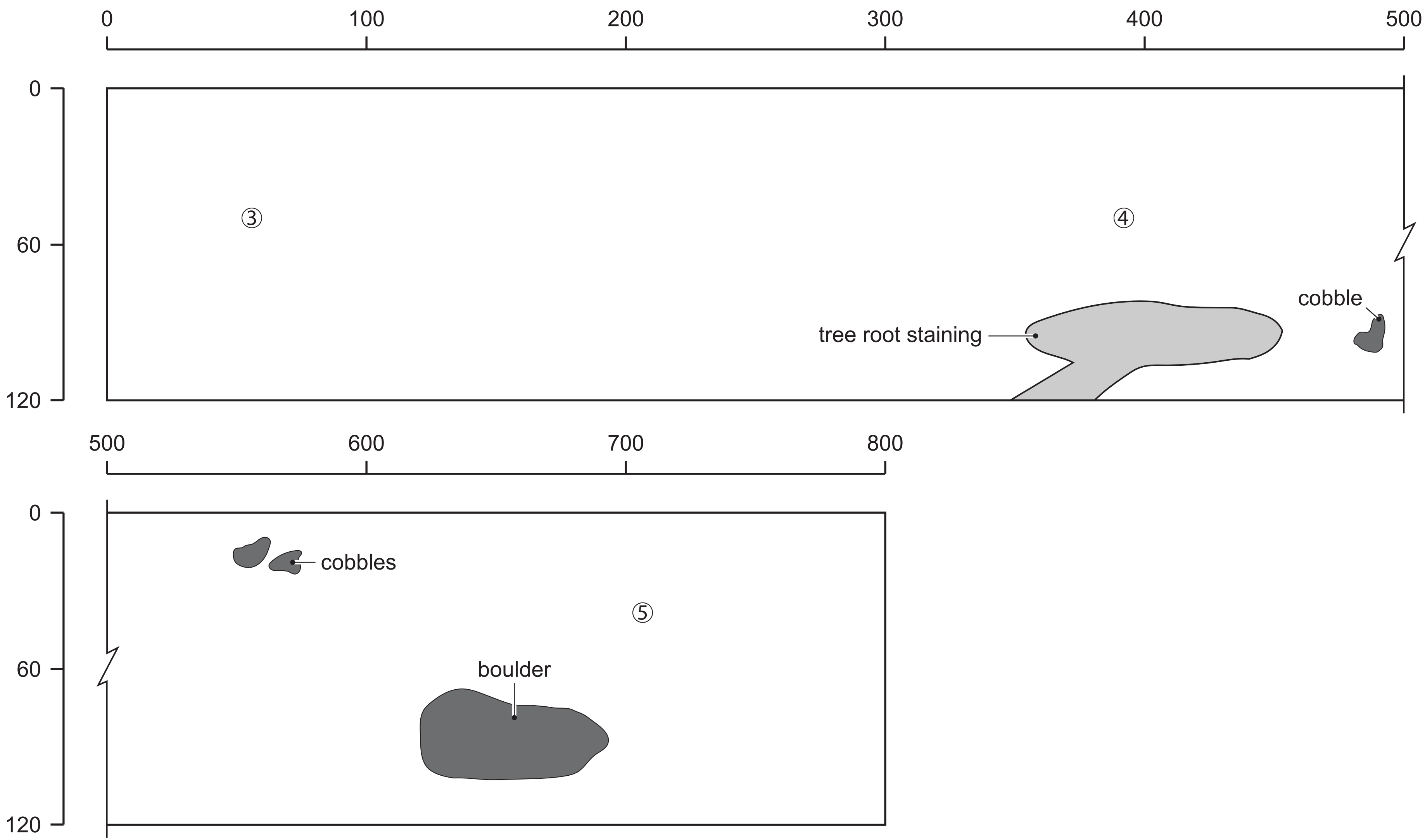
Appendix B

Appendix C Trench 2 Schematic Plan



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Trench 2 Schematic Plan

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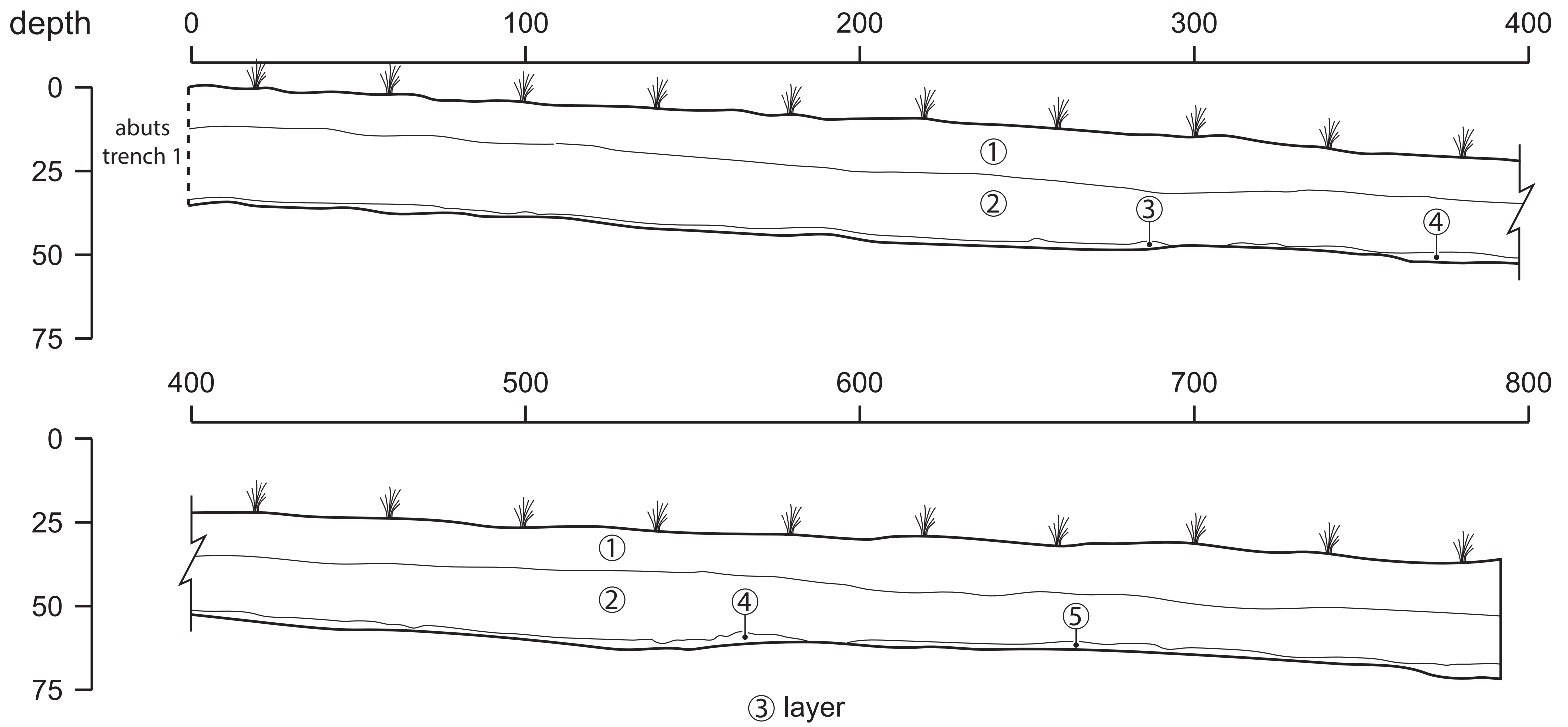
Appendix C

Appendix D Trench 2 Section Plan



Trench 2 Section Drawing: North Profile
Wilpinjong Caretakers Cottage Archaeological Excavation Report

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Appendix D

Appendix E Archaeological Research Design (Niche 2017)

1.1 Proposed strategy and approach

An initial investigation area is proposed for the subject site and is shown in Figure 7.

The area of the initial investigation is believed to be the former caretaker's cottage location (See Plates 4 and 5). This area would measure roughly 10 m wide by 10 m long. Two initial strip trenches would be positioned within this area to determine the presence / absence of any archaeological remains of the former cottage.

If substantially intact archaeological remains were identified within the proposed strip trenches the investigation area would be expanded to capture the full extent of the locally significant archaeological features and deposits.

In general terms, the proposed methodology would involve:

- Machine removal of grass and topsoil and any introduced modern fills, if present, within the strip trenches; and, if relics were identified,
- Open area manual excavation to expose and investigate locally significant archaeological features. The maximum depth of excavation would be the depth of natural / archaeologically sterile soil.

Please note: This methodology does not include provision for the removal of State-significant relics. If State significant archaeological features or deposits were encountered during the excavation, they would be recorded in-situ, where possible, and the NSW Heritage Division, OEH and the DPE would be notified.

1.2 Excavation methods

Standard archaeological excavation and recording methodologies would be adopted during the investigation. These include undertaking the following tasks:

- A survey datum would be established in order to record the levels of extant deposits and features;
- Vegetation and grass would be removed using a small excavator fitted with a batter bucket;
- After the removal of grass and topsoil manual excavation, cleaning and recording of deposits would be undertaken in reverse order of deposition to either the surface of significant archaeological features and / or structures or deposits or culturally sterile levels (e.g. 300mm to 1m, depending on the depth at which sterile subsoil or bedrock is encountered);
- If significant archaeological features or deposits were identified, they would be exposed to their full extent to ensure complete recording;
- Scaled site plans and profile or cross-section drawings showing the location of all archaeological deposits and features revealed by excavation would be prepared as required. These would be keyed to the site datum;
- Photographic recording of all phases of the work on site would be undertaken. This would involve recording of archaeological features using an appropriate photographic scale;
- A standard context recording system would be employed, namely the location, dimensions and characteristics of all archaeological features and deposits would be recorded on sequentially

numbered *proforma* context recording sheets. This form of written documentation would be supplemented by preparation of a Harris Matrix showing the stratigraphic relationships between features and deposits;

- Cultural artefacts retained for analysis would be cleaned on site, sorted according to their fabric classes, bagged and boxed with reference to the context from which they were recovered; and,

Excavation would be conducted until sufficient information to address the research questions was recovered.

Plate 27: Map showing the proposed investigation area (Source: Google 2017 with additions by Niche)

1.3 Post excavation analysis and reporting

Artefact processing may be undertaken off site, as follows:

- Artefacts would be cleaned and dried;
- Items would then be divided into categories according to their type and fabric and in the case of glass and ceramics, by colour. These would be further divided into those which are non-diagnostic and those which require more close consideration;
- Items such as unmarked broken glass, shells, small wooden fragments, metal fragments etc. would be weighed and recorded, then discarded;
- Remaining items would be retained for analysis and research.
- Upon completion of analysis and research, artefactual material may be offered to the nearest local historical society or museum. If the society / museum does not wish to accept the material then Wilpinjong Coal Pty Ltd Mine would provide a safe secure storage place at the Mine.

Any post excavation analysis of materials recovered during excavation would be undertaken in a suitable secure location by a suitably qualified heritage specialist.

On completion of the on-site excavation and any post excavation analyses, an Excavation Report would need to be prepared for the site. The report would present the results of the investigation in accordance with best practice and address the research questions listed in Section 3.3

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Wilpinjong Caretakers Cottage
Archaeological Excavation Report

Prepared for Wilpinjong Coal Pty Ltd

Prepared by Niche Environment and Heritage | 06 March 2020

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Document control

Project number	Client	Project manager	LGA
5011	Wilpinjong Coal Pty Ltd	Joshua Madden	Mid-Western Region Council

Version	Author	Review	Status	Date
D1	Samuel Ward	Joshua Madden	Draft	06 March 2020

Cover photo: The Possible location of the Caretakers Cottage (Niche)

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1. Introduction

1.1 Introduction

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Wilpinjong Coal Pty Ltd (WCPL) to undertake an archaeological excavation of a potential former caretaker's cottage site which may be located at E 775088; N 6418963 near Wollar, New South Wales (NSW). The potential site was identified in a previous Niche report (Niche 2015) and will be displaced by the approved Wilpinjong Extension Project (hereafter referred to as the 'Project'). An archaeological Research Design (ARD) was prepared by Niche (Niche 2017) to satisfy the Condition 49(c) of Development Consent (SSD-6764) for the Wilpinjong Mine Expansion project.

1.2 Project Background

The Wilpinjong Coal Mine is owned and operated by WCPL, a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The Wilpinjong Coal Mine is an existing open cut coal mining operation situated approximately 40 kilometers (km) north-east of Mudgee, near the Village of Wollar, within the Mid Western Regional Local Government Area, in central NSW.

Condition 49(c) of Development Consent (SSD-6764) requires the following:

> *49. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Historic Heritage Management Plan for the development to the satisfaction of the Secretary. The plan must:*
>
> *…*
>
> *(c) include the following for the management of historic heritage:*
>
> *…*
>
> - *undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G);*

This Archaeological Research Design (ARD) is included as an appendix to the approved Historic Heritage Management Plan for the Wilpinjong Coal Mine. This Report outlines the test and salvage excavation (archaeological) which was undertaken in response to the above Condition 49(c).

1.3 Site location

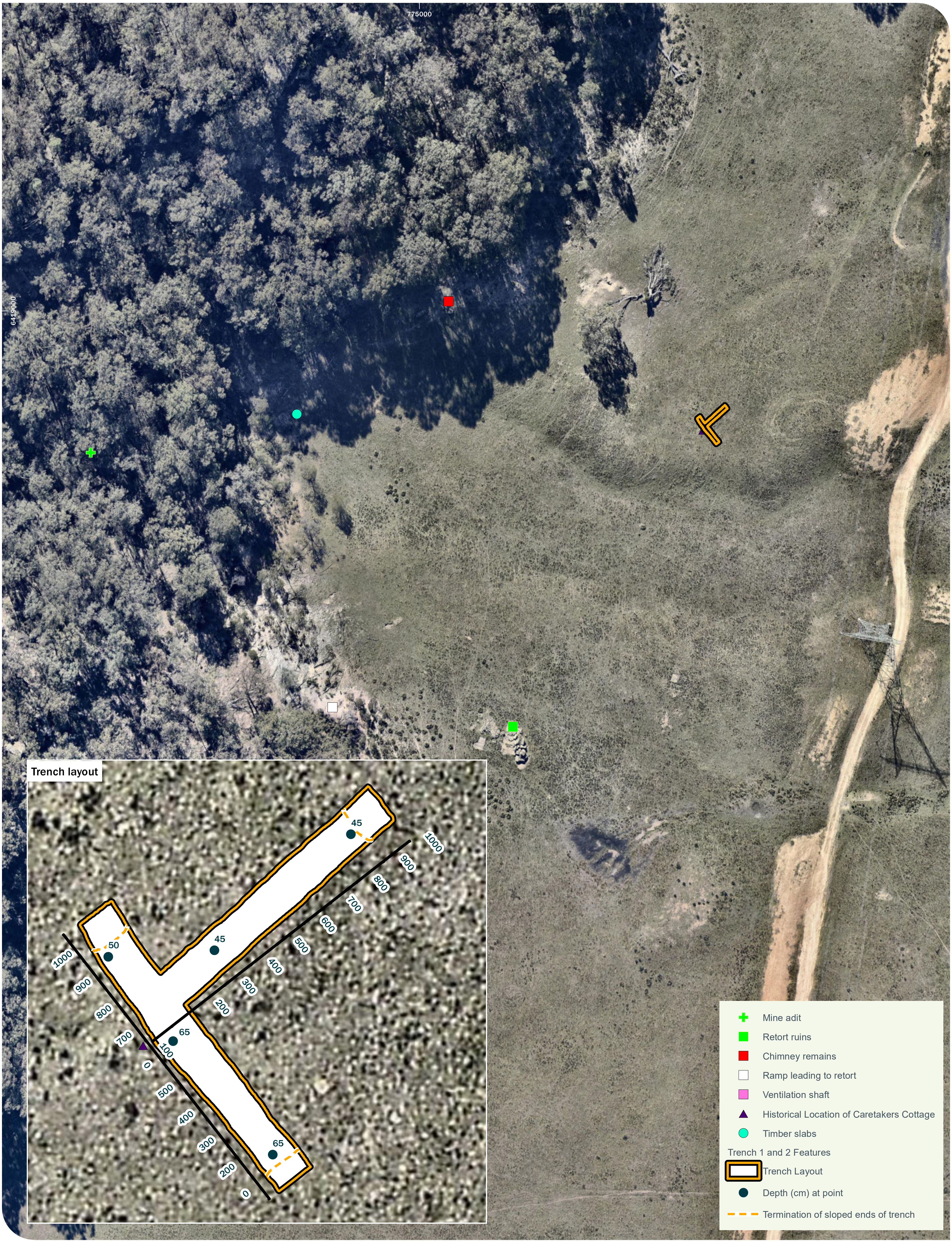
The potential former caretaker's cottage site is located on a property to the south of the Ulan-Wollar Road at coordinates -32.332146, 149.922502. The site is approximately 3 km north-west of the town of Wollar. The general location of the site is shown in Figure 1.

1.4 Limitations and scope

This report provides a limited historical background, and significance assessment and does not include a statement of heritage impact for the caretakers cottage. This ARD has been prepared in accordance with the Heritage Council of NSW's *Archaeological Assessment Guidelines* (1996) and *Assessing Significance for Historical Archaeological Sites and 'Relics'* (2009). Its aim is to satisfy Condition 49(c)(2)(iii) of the Development Consent (SSD-6764): *undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G)*.

1.5 Personnel

Joshua Madden (Team Leader – Historic Heritage of Niche) undertook the archaeological investigation. This report was prepared by Samuel Ward and reviewed by Josh Madden.



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GDA 1994 MGA Zone 55

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Excavation Trench Locations

Wilpinjong Caretakers Cottage Archaeological Excavation Report

Figure 2

Location of the Project Area

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0 500 m

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Figure 1

2. Historical Context

1.1 Preamble

This section provides a brief overview of the history of the Carteakers Cottage, and the Wilpinjong region. It has been compiled from existing documents and sources, in particular the previous Niche report and Archaeological Research Design (Niche 2015 and 2017) and has a limited scope. The aim is to provide an historical context for the Archaeological Excavation Report.

1.2 Historical Background

1.2.1 Aboriginal landscape prior to European contact

The Wilpinjogn region is near the boundary of Wiradjuri country, which spans from the Murray River to the south and the Darling River to the west. Archaeological evidence, such as that from an excavation site at Botobolar, confirms Aboriginal presence in the region at least 5,500 years B.P (Niche 2015). After European settlement, Aboriginal People were displaced from the land and during the nineteenth century some Aboriginal families worked on local farms in the Wilpinjong and Wollar area. The Cassilis Police District employed some Wollar-based Aboriginal trackers however in 1900 most Aboriginal families were forcibly removed from the area around Wollar (Niche 2015).

1.1 Summary chronology

The following is a summary of the chronology of the Wilpingjong region's history, in list form. There were separate expeditions by James Blackman and Willian Lawson with which European settlers explored the Mudgee region in the early 1820's. 1822 saw settlement of Mudgee, and with the redefining of the 'Limits of Location' by Governor Darling in 1826, the region was able to be settled by private subjects.

1821 – James Blackman and William Lawson made separate exploration expeditions to the Mudgee area from Bathurst. Soon access routes to the Central Tablelands could be made from either the Hunter Valley or Bathurst (Niche, 2015).

Mid 1820s – William Lee was thought to be the first settler in the wider area, occupying land in Bylong from the mid-1820s. The prominent emancipist, Robert Fitzgerald, soon followed Lee to the area and took up large blocks of land to become one of the largest landowners in the area. Fitzgerald held a pastoral lease in the Wollar area, and established the "Wollar" run (Wollar Centenary 1984).

1861 – The NSW *Robinson Land Act 1861* was introduced. The Act included free selection and conditional purchase whereby, land parcels of between 40 and 320 acres could be conditionally purchased without a survey on the condition that the purchaser agreed to improve the land acquired and intended to occupy it for at least 3 years (NSW State Library 2014). It was under this Act that settlement in the valley prospered as farmers and pastoralists who otherwise would have been unable to purchase property were able to do so. The more successful settlers would frequently acquire the blocks of their neighbours and build up the size of their holdings.

1870s – Under the NSW *Robinson Land Act 1861* settlement in the area peaked, and is thought to have been a flow on from the Gulgong gold rush.

1882 – Elijah Marskell purchased the subject area and surrounding land at Wilpinjong (Figure 3) (WCPL 2006:11).

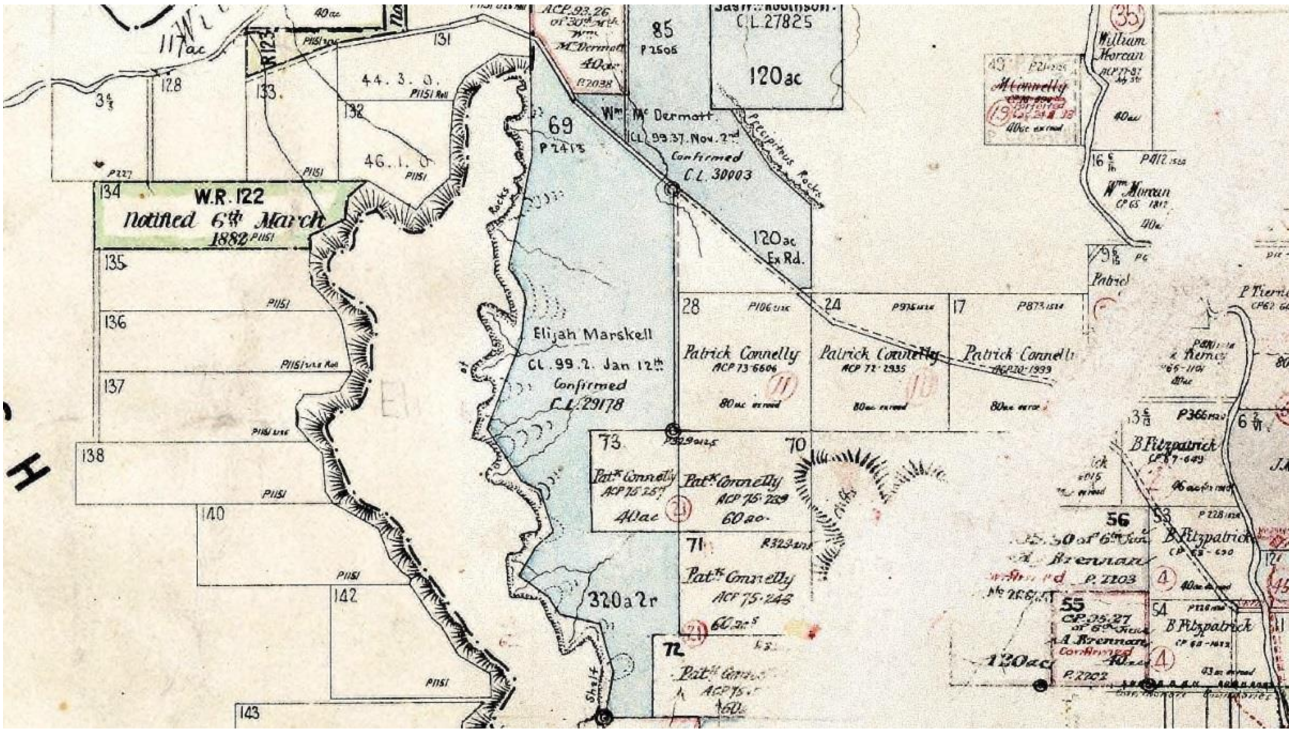

Plate 1: Elijah Marskell's land dated 1882 (Source: LPI)

1927 – It was reported that a rich shale seam had been discovered at Wollar, described as "*the richest and largest seam of oil shale in the world*" (*Mudgee Guardian* 14 November 1927). The shale seam was located after 3 years of prospecting by Mr Mancq (an oil expert who had experience on oil fields in Russia and America) and was three miles long.

Tests on the shale quality were carried out under the supervision of the Government geologist Mr Carr and the results were considered to be highly satisfactory. A local syndicate was formed to mine the shale, which comprised of Mr Joseph Matthews, Mr Joseph Davis and Mr Mancq (*Mudgee Guardian* 14 November 1927:19).

1929 – The shale oil mine ('the shale mine') at Wollar started operations, owned by the Imperial Shale Oil Company. The shale oil was mined from land belonging to Elijah Marskell, as the company did not have the finances to purchase the property. In return for the lease, Marskell was made a shareholder (McDermott 1993: 2).

Circa this time Clarrie Barton, a local to the area, built the cottage along with the site office and dining halls for the workmen, all of these structures are believed to have been located near the mine (the location of the ancillary buildings is unknown); 'There is a small hill down from the face of the mine with a couple of trees, this was where the cottage was situated' (McDermott 1993: 2).

1929 – During the period of 1929-1933[1], Les Chick - the works engineer - lived with his wife and his family in the Caretaker's cottage next to the mine site.

1930 – The crushing plant began to be constructed and the condensers were assembled (*The Sun* 13 September 1930:7).

[1] The dates of operation of the Shale Oil Mine are approximate – more precise information is not currently available

A Schultz retort (P US1931417 A) was erected, which rectified shale to motor oil in a single operation (Figures 4, 5 and 6). Ten people were employed in the mining operations, and retorting was expected to begin in October (*Newcastle Morning Herald* 2 August 1930:8).

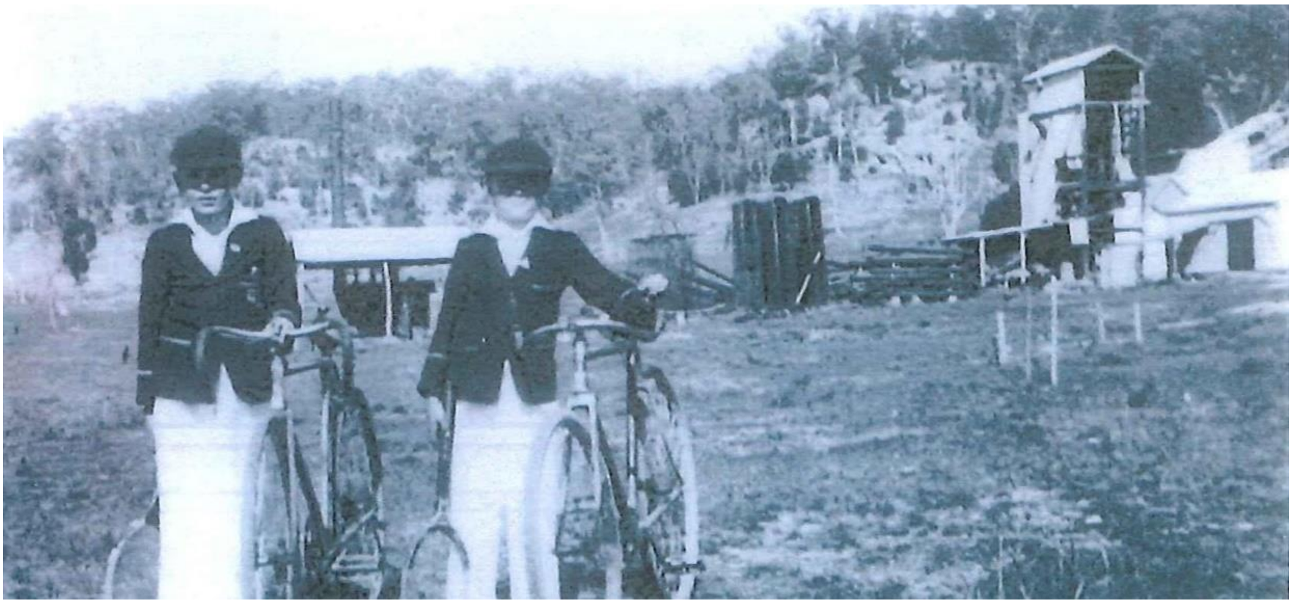

Plate 2: Undated photo of the Wollar shale oil mine refinery works (Source: McDermott 1993)

1930 – The shale mine was closed, as the set up (including the purchase of machinery), operation and production costs of the mine were too great. Drums of oil were abandoned in the paddock for some time after as they were unable to be sold, which was a common theme across NSW at this time.

'With the exception of a small amount taken from the Wollar shale mine, near Mudgee, in the western district, for testing purposes, no oil shale was mined during 1934". This sad comment regarding a potentially great industry is tucked away near the bottom of page 54 of the annual report of the N.S.W. Mines Department' (*Mudgee Guardian* 16 September 1935:04).

1.2 Mining activities

1.2.1 Coal Resources

In December 1924 it was reported that the mining engineer, Mr. T. Cunningham, had discovered a five foot seam of coal, extending over two miles north and one mile west at Ulan (*Sydney Morning Herald* Monday 29 December 1924:9). It was further reported that Cunningham had established the Ulan Coal syndicate which was formed to develop the mine (*Sydney Morning Herald* Monday 5 May 1930:12). The mine opened at the Ulan No 1 Underground Mine. It was further reported in 1933 that Cunningham, part proprietor of the Ulan No 1 Underground Mine, died (Sydney Morning Herald Tuesday 24 October 1933:12). In the years that followed operations were intermittent and there were several changes in ownership. The coal at Ulan was considered inferior to other coal in the region (Roberts c1975:8).

In 1950, the leases were sold to Ulan County Council who began construction of the Ulan Power Station near the mine site. The station was taken over by the Electricity Commission, who called tenders to reopen the Ulan No 1 Underground Mine for a period of 10 years to supply the power plant (Roberts :8; *Mudgee Guardian* and *North-Western Representative* 15 November 1954:1). Development of the Ulan No 1

Underground Mine recommenced in 1956 and various mining operations at the Ulan Coal Mine have continued to the present day.

In 1912 reports of a coal seam at Wilpinjong were made in the papers. A correspondent of the Daily Telegraph reported that he was surprised by the sight of the coal seam at Wilpinjong stating "I was of the opinion when told that a seam of coal 4' thick cropped out in this district was one of those getups for the benefit of the newspaper reporter…..I am surprised at the modest way in which you have brought this before the public, viz. by stating that a coal 4' thick existed when the seam I am looking at is at least 8'thick" (*Mudgee Guardian* 16 May 1912). Another report in June that same year was that the mineral line at Wollar was very rich in coal, and that the coal extended under the entire district. The outcrop at Wilpinjong was reported as being of better quality than that at Lithgow (*Mudgee Guardian* 27 June 1912).

1.2.2 Shale oil resources

NSW was a world leader in extracting oil from shale. Towards the end of the nineteenth century areas such as Mount Kembla, Hartley Vale, Torbane and Joadja gave testament to this industry (Hughes *et al.* 1986: Theme 11).

Shale in the Wollar area had been identified as early as 1887 when Mr. Smith of Barrigan Station sank some pits into a shale deposit on his land. The seam was not mined until 1932 when Mancq and Dewar constructed two substantial adits and a shaft. Shale oil mining also took place at Glen Davis in the region, and the level of activity in the area prompted the Newcastle syndicate, in conjunction with the Mudgee Shale Oil Company, to extract high grade shale and send it to refineries in Newcastle (Hughes *et al.* 1986: Theme 11).

In the late 1860s shale had been identified on land at Ulan owned by Mr Healy and in 1880 the deposit was mined by W.C Wall and J. T. Moir who were able to sell their shale to the Mudgee Gas Co (Hughes *et al*. 1986: Theme 11).

In 1912 newspapers reported on the shale seam at Wollar/Wilpinjong (*Mudgee Guardian* 27 June 1912). This seam was mined from about 1929 to 1933 (see Section 7.1.2). The large expense of the machinery required for building retorts and refineries, and the ongoing expense to operate the mines resulted in the costs outweighing the profits. Many mines were abandoned during the 1930s including the Shale Oil Mine at Wilpinjong.

1.3 Shale Oil Mine Complex, Slate Gully

GPS Reference: Easting 774898; Northing 6418956

The Shale Oil Mine at Wollar was operated from approximately 1929 to 1933 and was owned by the Imperial Shale Oil Company. The directors of the Company were Arnold Resch, Stan Chatterton and Percy Marks, all of whom were from Sydney. The shale oil was mined from land belonging to Elijah Marskell, as the company did not have the finances to purchase the property and Marskell was made a shareholder (McDermott 1993: 2).

Clarence John Camroux was the head of the mine, but only came on site occasionally to inspect proceedings. Les Schulz was the manager of the works. Les Chick was the works engineer, and lived with his wife (who was the sister of Clarence Camroux) and his family in the Caretaker's cottage next to the mine site. Clarrie Barton, a local to the area, built the cottage along with the site office and dining halls for the men. These structures were all located near the mine, "There is a small hill down from the face of the mine with a couple of trees, this was where the cottage was situated" (McDermott 1993: 2).

The main shaft of the mine was 1.5 metres (m) high, 3 m wide and 150 m deep (i.e. into the ridgeline) where the shale was loaded onto skips and pushed out of the mine along tram tracks. There were two skips each approximately three feet high with small wheels "they were pushed out of the mine and along a framework that was built to take them from the hill a short distance down the paddock to the retort. You can still see the marks on the tree from the chains of the winch" (McDermott 1993: 4). The ventilation shaft went into the ridgeline approximately 6 feet and was lined with hessian (McDermott 1993: 4).

The shale oil retort was made from cement blocks. A local recollected the following description of the retort: "An engine with a 8 foot fly wheel was mounted on concrete blocks, this was used to drive the retort. Clay bricks were made in the gully near Marskell's dam. They were left in the sun to dry and used inside the retort as fire bricks to burn the shale. It had cement gutters running from it out into the paddock. These were to get rid of the oil refuse and keep it away from the base of the retort" (McDermott 1993: 4).

Plate 3: Wollar Shale Oil Mine Adit

It was reported in the newspaper of the Wollar Shale Oil Mine "that Retorts have been erected, of which Mr. E. L. Schultz holds the patent rights. It is claimed that in this process the shale can be rectified down to motor spirit in the one operation" (*Newcastle Morning Herald and Miners' Advocate* 2 August 1930:8). The operations at Wollar were based on new methods of refining coal and shale, the new machinery was described as "a wonderful labour saving device and all Australian" *(Mudgee Guardian* Friday 13 June 1930:1). Newspaper accounts at that time indicate the machinery and processes had revolutionised the industry. The Mudgee Guardian described a demonstration "At the Wollar works last week the Australian Imperial Shale Oil Co. Ltd., gave a demonstration of a full-working unit producing oil from shale at the rate of 1000 gallons a day. The company says that the retort is a radical departure from stabilised methods, and that it is possible to produce oil from coal and shale on a commercial basis…The principle is low temperature distillation." (*Mudgee Guardian* 21 December 1931:2).

In 1931 the Mudgee Mail reported that the Shale Oil Mine had suspended operations for approximately five weeks (*Mudgee Mail* 16 July 1931). Five months later it was reported that Mr Camroux, on behalf of the Australian Imperial Shale Oil Company, had applied for a further suspension of labour conditions for three months as "substantial expense had been incurred in mining operations and that the company was temporarily unable to continue the operations requiring time to make further financial arrangements" (*Mudgee Mail* 1 September 1932). Mr Camroux believed it would take three months to obtain the additional capital required to run the mine. The application was granted (*Mudgee Mail* 1 September 1932).

Attempts were made by the Directors of the Shale Oil Mine to get the locals to invest in the mine; however they had no success in this (McDermott 1993:3).

In c1933 the Shale Oil Mine was closed as the costs of setting up the mine (including the purchase of machinery) and the operation and production of the mine were too great. Drums of oil were abandoned in the paddock for sometime after as they were unable to be sold, which was a common theme across NSW at this time.

Plate 4: 1961 Aerial close-up of Wollar Shale Oil Mine – the potential caretaker's cottage site is circled in red (Source: LPI with additions by Niche)

3. Previous Site Inspection and Assessment of Archaeological Potential

1.4 Site inspection

A site inspection was carried out by Fiona Leslie (Principal Archaeologist, Niche) and Clare Leevers (Archaeologist, Niche) on 25 May 2017. The inspection was intended to relocate heritage items identified as part of the Shale Oil Mine Complex, as noted in the previous Wilpinjong Extension Project Historical Heritage Assessment (HHA) (Niche 2015), and assess their condition and archaeological potential.

1.4.3 Introduction

The Shale Oil Mine and associated items are located within Slate Gully. The mine adit (see Plate 7) is located at the base of the slope associated with the ridgeline that separates Slate Gully from the existing Wilpinjong Coal Mine. Remnant post and rail fencing, a cart ramp and a ventilation shaft are all located on the lower slopes of the ridgeline. The remains of the retort are located on the valley floor. A chimney from the caretaker's hut is located uphill of a flat rise within the valley. A stockpile of hardwood timber planks is located on the valley floor near the mine adit. The locations of the components of the Shale Oil Mine Complex are presented on Figure 5.

1.4.4 Potential caretaker's cottage site

A level area of land located on a rise above a small gully could be the possible location of the caretaker's cottage. Some fragments of brick are located across the levelled area and down the slope of the rise. Despite general benching of the area to create a level platform, no *in situ* structural material was identified during the site inspection.

A feature previously identified in the HHA (Niche 2015) as likely being the remnant of a chimney from the potential caretaker's cottage was investigated further, and has been re-assessed as being a fragment of the concrete retort which has been relocated in intervening years onto the rise above the potential caretaker's cottage site.

Plate 5: Possible site of the Caretaker's Cottage (Niche 2017)

Plate 6: The potential 'chimney', now believed to be a piece of the retort ruins (Niche 2017)

1.4.5 Mine adit

The shale oil mine adit was constructed into the sandstone at the base of slope associated with the ridgeline that separates Slate Gully from the remainder of the Wilpinjong Coal Mine. The opening of the adit is reinforced with timber sets as shoring, but large quantities of sandstone from the rock overhang of the entrance have collapsed into the adit head, covering approximately three quarters of the original opening.

Plate 7: The mine adit (Niche, 2017)

1.4.6 Retort

The Schultz retort was a vertical externally-heated retort model with an internal mechanism for keeping the material in motion during distillation. It currently lies in ruins on the surface, much of the vertical structure was potentially reused and recycled elsewhere. During the site inspection two mid- twentieth century hexagonal glass soft drink bottles were located on the surface within the ruins, but no other archaeological material was apparent. As shown in the historical photograph of the retort, timber structures were once present behind the ruin. These buildings likely included a site office and possibly a mess hall. No above ground remains of these structures were identified during the site inspection.

Plate 8: The ruins of the Schultz retort (Niche, 2017)

Plate 9: Close up of the concrete block rubble of the retort (Niche 2017)

1.5 Assessment of archaeological potential

This assessment of potential was undertaken in 2017 and informed the development of the Archaeological Research Design.

The location of the possible caretaker's cottage site contains no in situ surface remains and no scatters of archaeological material or refuse are apparent apart from a few brick fragments. However, given the benched and levelled nature of the area and local knowledge of the potential cottage location, limited archaeological test excavation at the location is warranted prior to the commencement of surface disturbance activities at that location. If archaeological remains of the former cottage have survived they may include: structural remains, such as post holes, fireplace footings and building debris, underfloor deposits within the footprint of the former caretaker's cottage, yard deposits, rubbish pits and deeper subsurface deposits including those used to backfill cesspits and a well (if present). Excavation and analysis of such relics (if present) may contribute to our knowledge of the day-to-day operation and domestic life of the shale oil mine during the early to mid-20th century. If substantially intact remains of the caretaker's cottage site are present they have the potential to be of local heritage significance for their historical heritage value and research potential (Niche 2017).

4. Significance Assessment and Research Framework

1.6 Significance assessment

As noted in the previous HHA (Niche 2015) the Shale Oil Mine Complex (including the potential caretaker's cottage) is of local heritage significance:

Criterion	Significance
(a) An item is important in the course, or pattern, or NSW's cultural or natural history (or the cultural or natural history of the local area);	The shale oil mining industry was important in the course of NSW as a way of obtaining crude oil for fuel. The Shale Oil Mine at Wollar reflected this industry, and contributed to the growth of the Wollar Village where many of the miners lived. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(b) An item has strong or special associations with the life or works of a person, or group of persons, of importance in the cultural or natural history of NSW (or the cultural and natural history of the local area);	The Shale Oil Mine has strong associations with the renowned prospector Mancq who worked on many oil mine sites internationally, and in the local area with associations to the Mudgee Imperial Shale Oil Company that ran the operations of the Wollar mine and the operations of other shale mines in the region. The Shale Oil Mine contributed significantly to the shale oil industry in the local area and the long continued history of mining in the wider area. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievements in NSW (or the local area);	The construction of the mine adit, vent shaft and the retort and oil refinery equipment were instrumental in the daily operations of the Shale Oil Mine. The refinery machinery at Wollar was part of a new Australian-made process that extracted greater quantities of oil. The engineering demonstrates a high degree of technical achievement of oil extraction during the early 1930s. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(d) An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;	There is no evidence to indicate that the Shale Oil Mine Complex has a strong or special association with a particular community or cultural group in NSW (or the local area). The Shale Oil Mine Complex is not significant under this criterion.
(e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);	Archaeological investigation of the Caretaker's cottage could potentially reveal some information which could contribute to the understanding of the caretaker's role in operations of the mine, and of the daily life of the caretaker and his family that lived at the mine site. The Shale Oil Mine Complex is of local heritage significance under this criterion.

Criterion	Significance
(f) An item possess uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);	Shale mines were not particularly rare or uncommon in the area during the early 1930s. An earlier and larger shale mine operated at nearby Barrigan. However, the status of the former Barrigan mine is uncertain and there are no shale mines listed on the Mid Western Regional LEP. As shale is rarely mined these days, physical evidence of this once common activity is becoming increasingly rare. The Shale Oil Mine Complex is of local heritage significance under this criterion.
(g) An item is important in demonstrating the principal characteristics of a class of NSW's: *— Cultural or natural places; or* *— Cultural or natural environments;* *(or a class of the local area's)* *— Cultural or natural places; or* *— Cultural or natural environments;*	The mine adit, ventilation shaft, the remains of the retort and evidence of the Caretaker's cottage demonstrate the principle characteristics of shale mine sites in the early 1930s. The Shale Oil Mine Complex is of local heritage significance under this criterion.

1.7 Historical themes

Based on the historical research completed to-date, the following historical themes would be relevant to the potential caretaker's cottage site:

National Theme	NSW Theme	Local Theme	Examples
3 Developing local, regional and national economies	Mining	Activities associated with the identification, extraction, processing and distribution of mineral ores, precious stones and other such inorganic substances.	Mine, quarry, race, mining field or landscape, processing plant, manager's office, mineral specimen, mining equipment, mining license, ore laden shipwreck, collier, mine shaft, sluice gate, mineral deposit, slag heap, assay office, water race.
3 Developing local, regional and national economies	Technology	Activities and processes associated with the knowledge or use of mechanical arts and applied sciences.	Computer, telegraph equipment, electric domestic appliances, underwater concrete footings, museum collection, office equipment, Aboriginal places evidencing changes in tool types.

5 Working	Labour	Activities associated with work practices and organised and unorganised labour.	Trade union office, bundy clock, time-and-motion study (document), union membership card, strike site, staff change rooms, servants quarters, shearing shed, green ban site, brothel, kitchen, nurses station, hotel with an occupational patronage.
8 Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living in and working around houses and institutions.	Domestic artefact scatter, kitchen furnishings, bed, clothing, garden tools, shed, arrangement of interior rooms, kitchen garden, pet grave, chicken coop, home office, road camp, barrack, asylum.

1.8 Research questions

The main aims of the archaeological investigation would be to determine the nature and extent of archaeological relics at the potential caretaker's cottage site by undertaking a program of test excavation. In the event that locally significant relics were identified by the testing, a program of limited salvage or further investigation may be considered.

The following research questions have been formulated for the potential caretaker's cottage site and would guide the strategy and archaeological methods employed during the investigation:

- Have archaeological relics relating to the early to the 1930s caretaker's cottage survived at the site? If so, what are their condition, nature, extent and significance?
- Does the site contain significant archaeological deposits i.e. underfloor deposits, cesspit fills or well fills? If so, what can they tell us about former occupants of the site?
- What is the spatial arrangement of the archaeological evidence? Can it provide insight into former use of the caretaker's cottage or nearby associated structures (i.e. mine worker's mess hall and mine office)?

5. Archaeological Investigation

5.1 Excavation Methodology

The excavation was carried out on 26/11/2019 by Joshua Madden (Historic Heritage Team Leader, Niche) according to the methodology presented in Appendix E (Niche 2017). The original co-ordinates designated for the location of the possible caretaker's cottage were relocated, and marked out in a runoff line coming off a small spur leading toward the gravelled road. The area and location of the excavated slip trenches are shown in Figure 2 and Plate 10, Plate 11 and Plate 12.

Plate 10: Pre-excavation, possible location of the Caretakers Cottage and location of Trenches 1 and 2.

Prior to excavation, the area was surveyed on foot, and not surface artefacts were found, nor any brick fragments. There was no evidence of cut and benching in the area, with all landforms appearing of natural formation. A 10 metre (m) by 10m area was marked out in preparation for excavation, as per the ARD. The following steps were taken in adherence with this research methodology:

5.2 Slip Trenches

Two strip trenches were positioned within the investigation area to determine the presence / absence of any archaeological remains of the former cottage. An excavation machine (Yanmar ViOss with a 1.2m blade) was used to remove the topsoil and fills, with monitoring from Joshua Madden. The trenches were exposed, and any features were investigated. The natural layer of archaeologically sterile soil was used to gauge the maximum depth to excavate. The excavation methods described in Appendix E were followed and two trenches were excavated, with the results documented below.

Plate 11: The location of Trenches 1 and 2, taken after the excavation was finished, looking west.

Plate 12: The location of Trenches 1 and 2, taken after the excavation was finished, looking east.

5.2.1 Trench 1

Trench 1 was 1.2m wide and 10m in length and was excavated to a depth of 650mm at maximum. This trench was orientated northwest/southeast nearby the datum co-ordinates as shown on Figure 2. Table 1 records the contexts found whilst excavating this trench, and Appendices A and B provide a schematic top-down view and a section drawing of this trench, respectively and photographs are below in Plate 13 to Plate 18.

During the course of excavation of this trench, evidence of a previously burnt/decomposed tree was found (Context 2). This was assessed as this feature was too large to be anything but the location of a former tree stump. It was known that the land was formerly bushland and had been cleared prior to the date that the historical record provides for the construction of the caretaker's cottage. A sondage was excavated in the light brown deposit, with no artefacts or evidence of introduced material.

No archaeological remains were identified in Trench 1.

Table 1: Trench 1 Contexts

No	Category	Description
T1:1	Top soil layer	Up to 150mm of light brown very friable material, mixed with
T1:2	Deposit	Tree roots evident causing staining: high lumic content and had a fill composition of gravels and lumic soils
T1:3	Deposit	Light grey very friable and fine-grained material
T1:4	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles

Plate 13: Trench 1 Partially Excavated, facing northwest.

Plate 14: Trench 1 at context T1:4, looking northwest.

Plate 15: Deposit found in Trench 1.

Plate 16: Deposit found in Trench 1 after excavation of sondage.

Plate 17: View of the stratigraphy of the southern wall of Trench 1.

Plate 18: View of the stratigraphy of the sondage excavated in Trench 1.

5.2.2 Trench 2

Trench 2 was 1.2m wide and 8m in length and was excavated to a depth of 750mm at maximum. This trench was orientated southwest/northeast nearby the datum co-ordinates as shown on Figure 2, and abuts Trench 1 at its southwestern end. Table 2 records the contexts found whilst excavating this trench, and Appendices C and D provide a schematic top-down view and a section drawing of this trench, respectively and photographs are below in Plate 19 to Plate 26.

During the course of excavation of this trench, two features were identified on the southern wall at the interface of the Trench 2: Context 2 and Trench 2: Context 3 horizons. Both of these features elongated on to a east-northeast axis from the Trench 1: Context 2 Tree root feature found in Trench 1. Both had evidence of high lumic content and had a fill composition of gravels and lumic soils. A burnt tree root was found in the most northerly feature. Note that Trench 2: Contexts 4 and 5 are identical to Trench 2: Context 3, and Trench 1: Context 4. This trench was excavated into the Context 3 horizons, however no artefacts or evidence of introduced material was found.

No archaeological remains were identified in Trench 2.

Table 2:Trench 2 Contexts

No	Category	Description
T2:1	Top soil layer	Up to 150mm of light brown very friable material, mixed with
T2:2	Deposit	Light grey very friable and fine-grained material
T2:3	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T2:4	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T2:5	Archaeologically sterile	Light yellow and grey clayey with up to 30% of cobbles
T1:2	Tree root staining	Feature matching that found in T1 - Tree roots evident causing staining: high lumic content and had a fill composition of gravels and lumic soils

Plate 19: View looking east at the start of excavation of Trench 2.

Plate 20: Detail of Trench 2 looking Northeast after the removal of Context T2:1

Plate 21: looking southwest along Trench 2 after Context T2:3,4,5 were reached, showing deposits.

Plate 22: View of Trench 2 looking northeast after Context T2:3,4,5 were reached, showing deposits.

Plate 23: detail of deposits found in Trench 2

Plate 24: Detail of deposits found in Trench 2

Plate 25: Detail of excavated deposit in Trench 2

Plate 26: Detail of excavated deposit in Trench 2

5.3 Summary of Excavation Results

The excavation carried out on 26/11/2019 by Joshua Madden (Historic Heritage Team Leader, Niche) proceeded according to the archaeological methodology found in Appendix E, and in response to the possible location of the caretaker’s cottage identified in the previous heritage survey undertaken by Niche (Niche 2015).

In both trenches, several natural layers were identified, and the remains of what was identified to be a felled tree was noted. No introduced material was discovered, nor any artefacts uncovered. There were therefore no archaeological remains identified in either trench, and nothing to warrant an increase of scope for this excavation. The excavation did confirm that clearing of natural vegetation had been conducted in this area.

It can be understood from these results that this location was either not the location of the caretakers cottage, or that this structure was built of insubstantial materials which have left no archaeological remains.

6. Response to Research Questions

The archaeological test and salvage program conducted within the Project Area, Wilpinjong was carried out in accordance with the archaeological research design outlined in the 2017 ARD (Niche, 2017).

A number of general questions in relation to the nature and extent of the archaeological resource were posed in the 2017 research design to provide a basic archaeological context for the archaeological investigation. These are responded to below:

1.9 Research Questions and Responses

- Have archaeological relics relating to the early to the 1930s caretaker's cottage survived at the site? If so, what are their condition, nature, extent and significance?

There were no archaeological relics relating to the early to the 1930s caretaker's cottage identified at the Project area, either at the surface or in the sub-surface investigation.

- Does the site contain significant archaeological deposits i.e. underfloor deposits, cesspit fills or well fills? If so, what can they tell us about former occupants of the site?

The site did not contain significant archaeological deposits, with the only identifiable feature relating to the clearing of bushland in the region.

- What is the spatial arrangement of the archaeological evidence? Can it provide insight into former use of the caretaker's cottage or nearby associated structures (i.e. mine worker's mess hall and mine office)?

The arrangement of the evidence suggests that the cottage was not constructed in this location. This could indicate that the position of the gravel track leading to the shale mine site, which was identified in historical aerial imagery, is not an accurate indicator of the location of this cottage, with a different layout of this complex than originally thought. The lack of identifiable remains at this location could also suggest that the caretaker's cottage was not as substantial as originally thought and did not include brick construction or substantial foundations. The brick structure shown in Plate 6 was originally thought to be from the caretakers cottage but is now thought to have been a part of the shale oil retort stand. The greater arrangement of features associated with the shale oil site as shown in Figure 2 may indicate that the machinery of shale oil extraction were the most important structures built at this location, with worker's accommodation being of a more temporary nature.

7. Conclusions

This report documents the archaeological test and salvage excavation of the possible location of the Caretakers Cottage feature identified in the Wilpinjong historical heritage survey report completed by Niche in 2015 for the Wilpinjong Mine Expansion Project.

The excavation was undertaken according to the archaeological Research Design (ARD) prepared by Niche in 2017 to satisfy the Condition 49(c) of Development Consent (SSD-6764) for the Wilpinjong Mine Expansion Project. The excavation was carried out for the purpose of undertaking test and salvage excavation at the Potential Caretakers Cottage Site (Site 1G), and to answer research questions which related to the nature and location of this historical item, and to determine if this location was the site of the 1930s Caretakers Cottage.

The results of this excavation found the following: In both trenches, several natural layers were identified, and the remains of what was identified to be a felled tree was noted. No introduced material was discovered, nor any artefacts uncovered. There were therefore no archaeological remains identified in either trench, and nothing to warrant an increase of scope for this excavation. The excavation did confirm that clearing of natural vegetation had been conducted in this area.

The responses to the archaeological research questions can be found in Section 1.9, and due to the lack of artefacts found, no post-excavation artefact analysis was necessary.

It was determined that this location was either not the location of the caretakers cottage, or that this structure was built of insubstantial materials which have left no archaeological remains.

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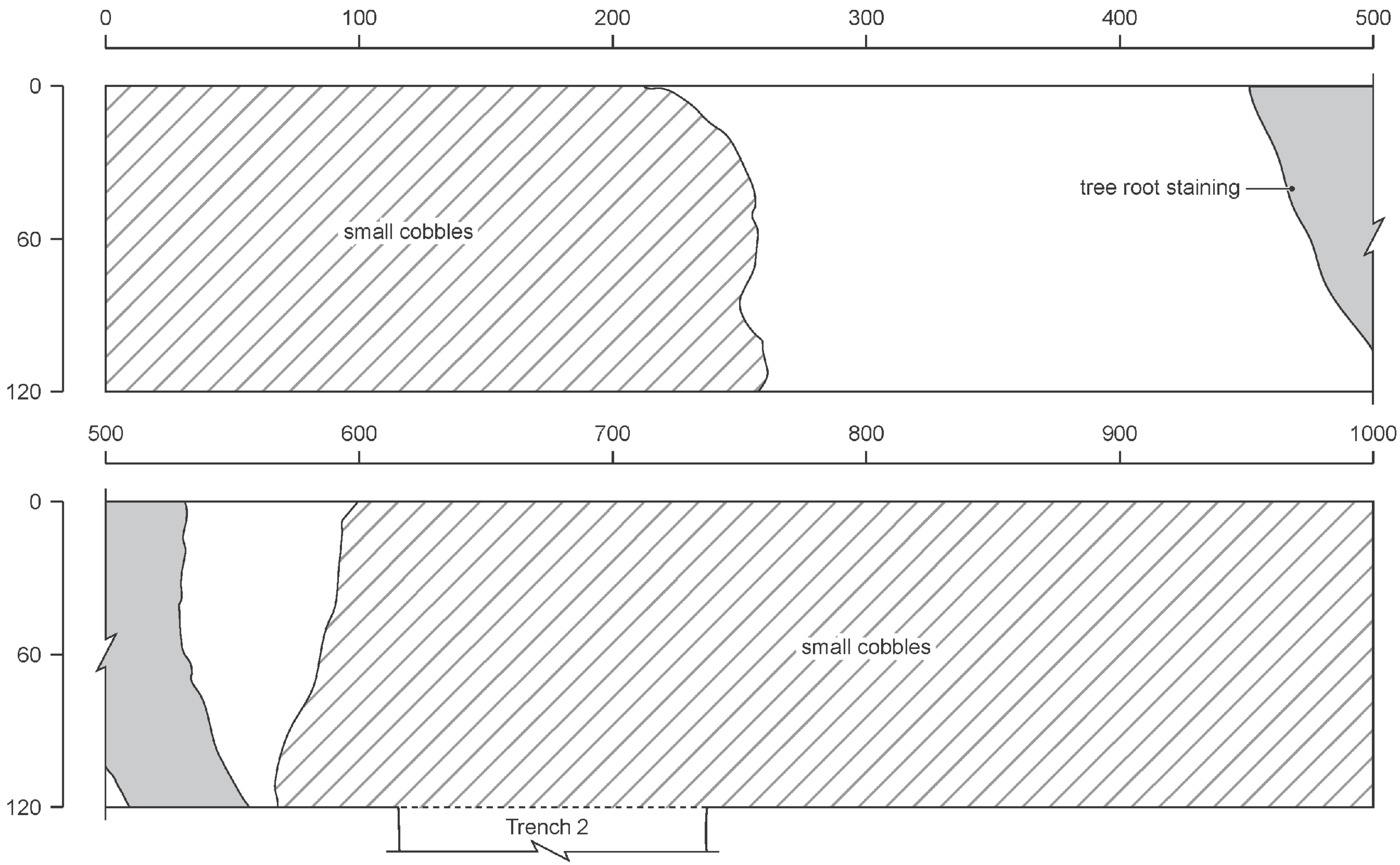
Appendix A Trench 1 Schematic Plan



Schematic Plan of Trench 1

Wilpinjong Caretakers Cottage Archaeological Excavation Report

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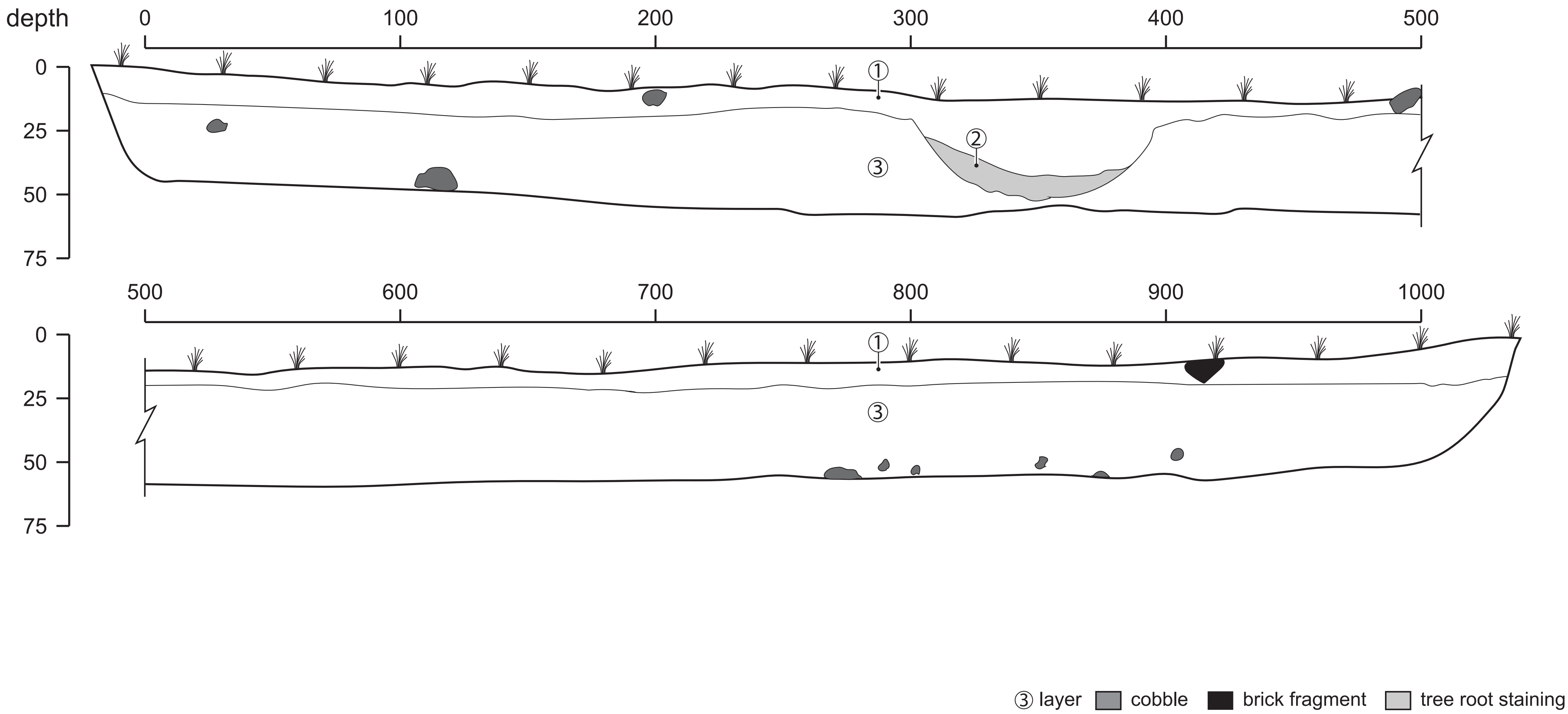
Appendix A

Appendix B Trench 1 Section Plan



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Trench 1 Section Drawing: Southeast Profile
Wilpinjong Caretakers Cottage Archaeological Excavation Report

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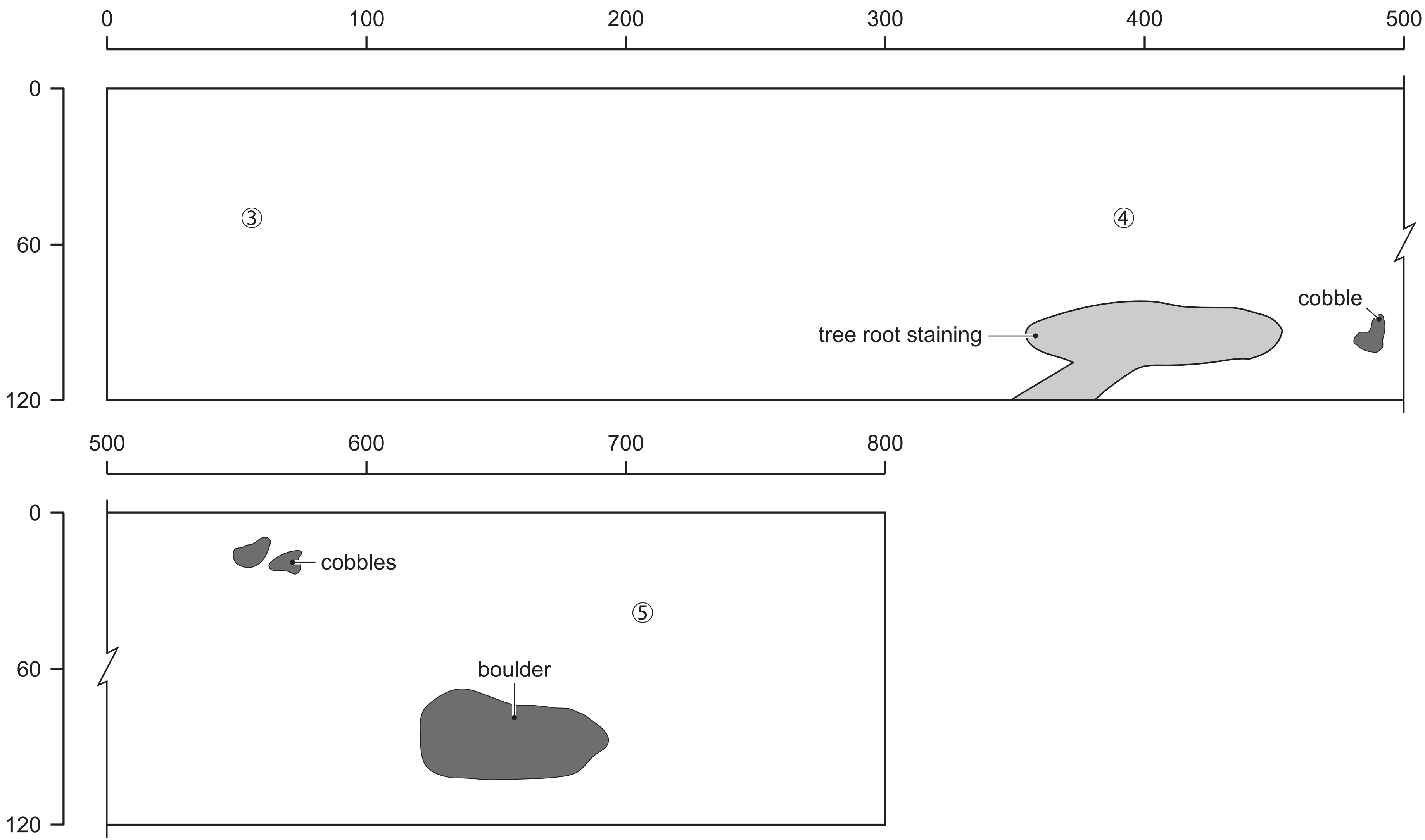
Appendix B

Appendix C Trench 2 Schematic Plan



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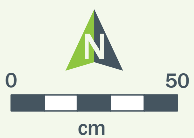

Trench 2 Schematic Plan
Wilpinjong Caretakers Cottage Archaeological Excavation Report

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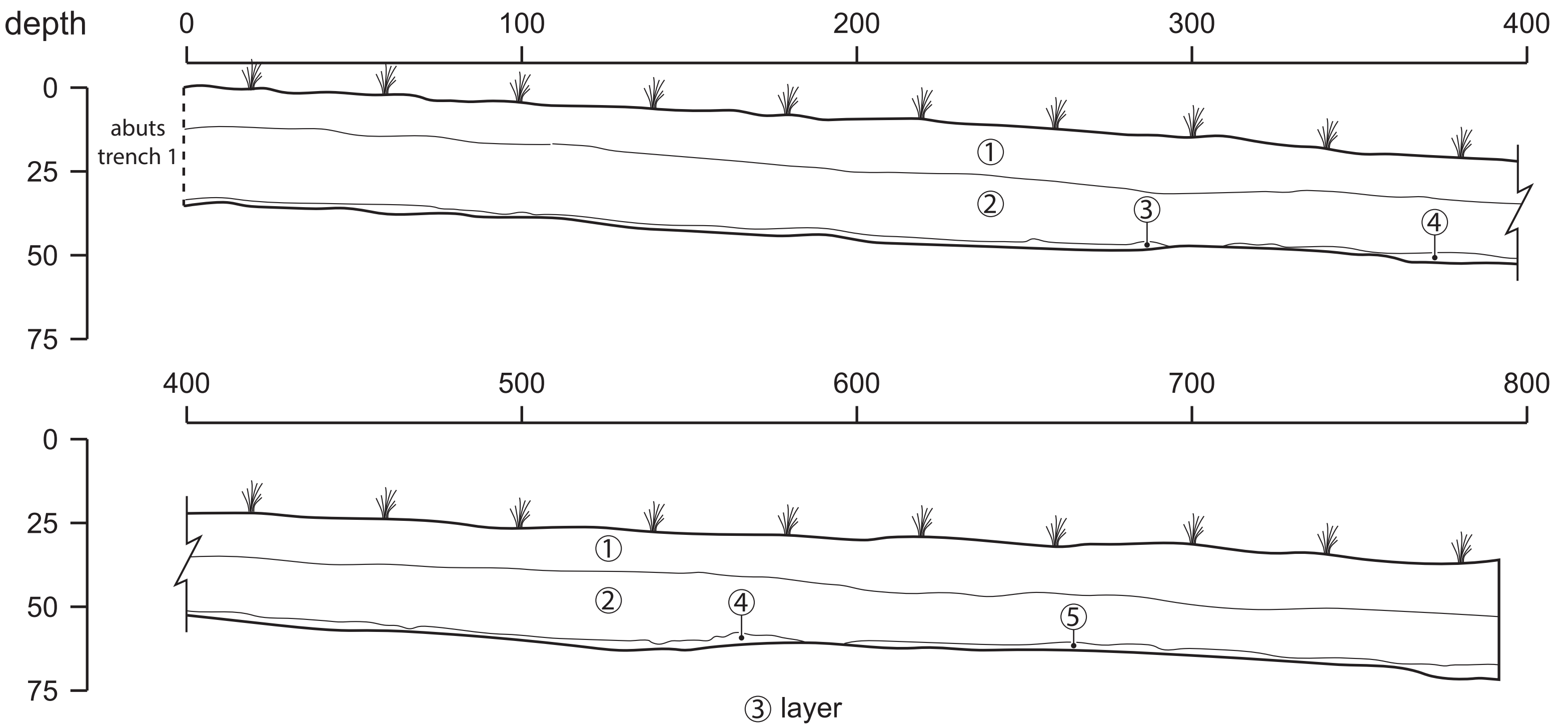
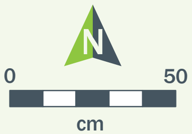
Client: Wilpinjong Coal Pty Ltd

Appendix C

Appendix D Trench 2 Section Plan





Trench 2 Section Drawing: North Profile

Wilpinjong Caretakers Cottage Archaeological Excavation Report

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Appendix D

Appendix E Archaeological Research Design (Niche 2017)

1.1 Proposed strategy and approach

An initial investigation area is proposed for the subject site and is shown in Figure 7.

The area of the initial investigation is believed to be the former caretaker's cottage location (See Plates 4 and 5). This area would measure roughly 10 m wide by 10 m long. Two initial strip trenches would be positioned within this area to determine the presence / absence of any archaeological remains of the former cottage.

If substantially intact archaeological remains were identified within the proposed strip trenches the investigation area would be expanded to capture the full extent of the locally significant archaeological features and deposits.

In general terms, the proposed methodology would involve:

- Machine removal of grass and topsoil and any introduced modern fills, if present, within the strip trenches; and, if relics were identified,
- Open area manual excavation to expose and investigate locally significant archaeological features. The maximum depth of excavation would be the depth of natural / archaeologically sterile soil.

Please note: This methodology does not include provision for the removal of State-significant relics. If State significant archaeological features or deposits were encountered during the excavation, they would be recorded in-situ, where possible, and the NSW Heritage Division, OEH and the DPE would be notified.

1.2 Excavation methods

Standard archaeological excavation and recording methodologies would be adopted during the investigation. These include undertaking the following tasks:

- A survey datum would be established in order to record the levels of extant deposits and features;
- Vegetation and grass would be removed using a small excavator fitted with a batter bucket;
- After the removal of grass and topsoil manual excavation, cleaning and recording of deposits would be undertaken in reverse order of deposition to either the surface of significant archaeological features and / or structures or deposits or culturally sterile levels (e.g. 300mm to 1m, depending on the depth at which sterile subsoil or bedrock is encountered);
- If significant archaeological features or deposits were identified, they would be exposed to their full extent to ensure complete recording;
- Scaled site plans and profile or cross-section drawings showing the location of all archaeological deposits and features revealed by excavation would be prepared as required. These would be keyed to the site datum;
- Photographic recording of all phases of the work on site would be undertaken. This would involve recording of archaeological features using an appropriate photographic scale;
- A standard context recording system would be employed, namely the location, dimensions and characteristics of all archaeological features and deposits would be recorded on sequentially

numbered *proforma* context recording sheets. This form of written documentation would be supplemented by preparation of a Harris Matrix showing the stratigraphic relationships between features and deposits;

- Cultural artefacts retained for analysis would be cleaned on site, sorted according to their fabric classes, bagged and boxed with reference to the context from which they were recovered; and,

Excavation would be conducted until sufficient information to address the research questions was recovered.

Plate 27: Map showing the proposed investigation area (Source: Google 2017 with additions by Niche)

1.3 Post excavation analysis and reporting

Artefact processing may be undertaken off site, as follows:

- Artefacts would be cleaned and dried;
- Items would then be divided into categories according to their type and fabric and in the case of glass and ceramics, by colour. These would be further divided into those which are non-diagnostic and those which require more close consideration;
- Items such as unmarked broken glass, shells, small wooden fragments, metal fragments etc. would be weighed and recorded, then discarded;
- Remaining items would be retained for analysis and research.
- Upon completion of analysis and research, artefactual material may be offered to the nearest local historical society or museum. If the society / museum does not wish to accept the material then Wilpinjong Coal Pty Ltd Mine would provide a safe secure storage place at the Mine.

Any post excavation analysis of materials recovered during excavation would be undertaken in a suitable secure location by a suitably qualified heritage specialist.

On completion of the on-site excavation and any post excavation analyses, an Excavation Report would need to be prepared for the site. The report would present the results of the investigation in accordance with best practice and address the research questions listed in Section 3.3

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Our services

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Heritage management
Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting
Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)

WILPINJONG COAL MINE,
CENTRAL TABLELANDS OF NEW SOUTH WALES:
REASSESSMENT OF PREVIOUSLY REPORTED
GRINDING GROOVE LOCATION WCP730

A report to

Wilpinjong Coal Pty Limited

1434 Ulan Wollar Road
WILPINJONG NSW 2850

by

Birgitta Stephenson
IN THE GROOVE ANALYSIS Pty Limited

and Peter Kuskie
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May 2019

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ABBREVIATIONS

Term	**Definition**
ACHMP	Aboriginal Cultural Heritage Management Plan
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
CHLSC	Cultural Heritage Liaison Sub-Committee
cm	Centimetre
DP&E	Department of Planning and Environment (NSW)
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EL	Exploration Licence
EP&A Act	*Environmental Planning and Assessment Act 1979*
GDA	Geodetic Datum of Australia
GIS	Geographic Information System
GPS	Global Positioning System
ITGA	In The Groove Analysis Pty Limited
LALC	Local Aboriginal Land Council
mm	Millimetre
MGA	Map Grid of Australia
MGATSIC	Murong Gialinga Aboriginal and Torres Straight Islander Corporation
NEWCO	North East Wiradjuri Company Ltd
NP&W Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
PA	Project Approval

Term	Definition
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party
RAPCC	Registered Aboriginal Parties' Consultation Committee
SEA	South East Archaeology
WCPL	Wilpinjong Coal Pty Limited
WEP	Wilpinjong Extension Project
WNTCAC	Warrabinga Native Title Claimants Aboriginal Corporation
WVWAC	Wellington Valley Wiradjuri Aboriginal Corporation
x	Times (in relation to magnification)

1. INTRODUCTION

Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody), owns and operates the Wilpinjong Coal Mine ('the Mine'), an existing open cut coal mining operation located approximately 40 kilometres north-east of Mudgee, near the village of Wollar, in the Central Tablelands of New South Wales (NSW) (refer to Figure 1). It is situated within the Mid-Western Regional Council Local Government Area.

The Mine originally operated under Project Approval (PA 05-0021) that was granted on 1 February 2006 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Modification of the Project Approval (PA 05-0021) subsequently occurred six times, with the most recent Modification approved in August 2016. The Mine has been operating since 2006, and is approved to produce up to 16 million tonnes per annum of run-of-mine coal from various open cut pits.

On 24 April 2017, WCPL was granted Development Consent (SSD-6764) for the Wilpinjong Extension Project that provides for the continued operation of the Mine until 2033, including access to approximately 800 hectares of open cut extensions. The Development Consent (SSD-6764) supersedes Project Approval (PA 05-0021). The Extension Project Development Consent extended the approved Project area to 5,755 hectares (from the previously approved Project area of 4,042 hectares) (refer to Figure 2).

An Aboriginal Cultural Heritage Management Plan (ACHMP) was initially prepared to manage interactions of the Project with Aboriginal heritage under the Part 3A Project Approval (WCPL 2008). The ACHMP was approved by the NSW Department of Planning and Environment (DP&E) and guided the management of Aboriginal heritage in the Project area *in lieu* of a Section 90 Aboriginal Heritage Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* (NP&W Act). Various minor revisions have subsequently occurred to the ACHMP and been approved by the DP&E. A new ACHMP (WCPL 2017a) has now been approved to address the Development Consent (SSD-6764). It applies to the entire approved SSD application area as shown on Figure 2.

South East Archaeology Pty Ltd was engaged by WCPL to reassess the reported grinding groove location, "WCP730", within Pit 5 South East of the Wilpinjong Mine. This location is marked on Figure 3. WCP730 had been recorded by Navin Officer Heritage Consultants ("Navin Officer") in 2017 during a pre-clearance heritage survey within this location (refer to site description in Appendix 1 and Navin Officer 2017).

This assessment has been prepared by Peter Kuskie, an archaeologist with a BA (Honours) degree in Aboriginal archaeology and over 29 years experience in the conduct of Aboriginal cultural heritage assessments throughout Australia, and Birgitta Stephenson of In the Groove Analysis Pty Ltd (ITGA). Birgitta holds a first class BA (Honours) degree in archaeology from the University of Queensland, along with a Bachelor of Pharmacy degree, and has internationally recognised experience in the conduct of use-wear and residue analysis with a focus on Aboriginal ground surfaces.

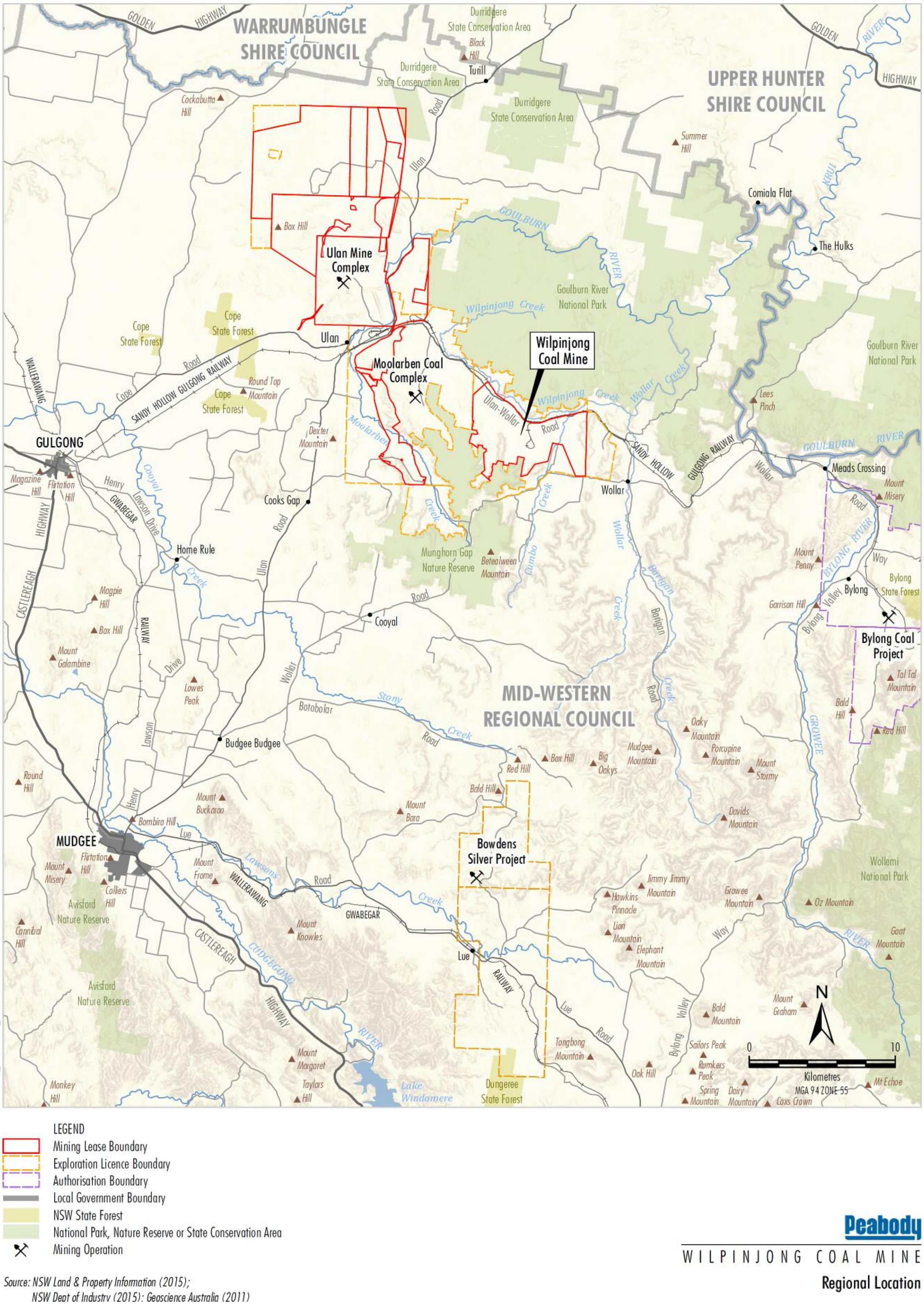

Figure 1: Location of Wilpinjong Coal Mine (courtesy WCPL).

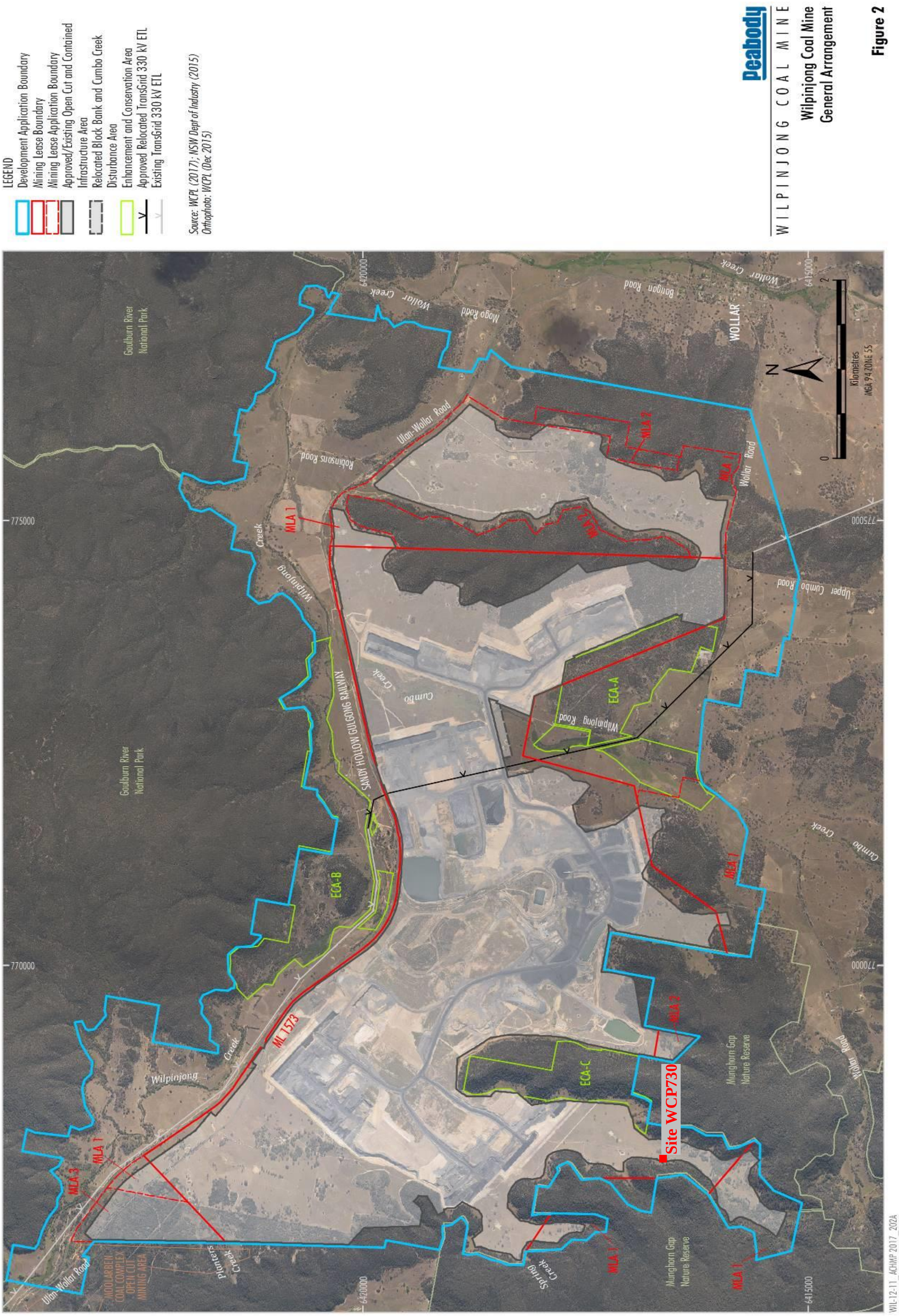

Figure 2: General arrangement of approved Wilpinjong Coal Mine (courtesy WCPL) and location of WCP730.

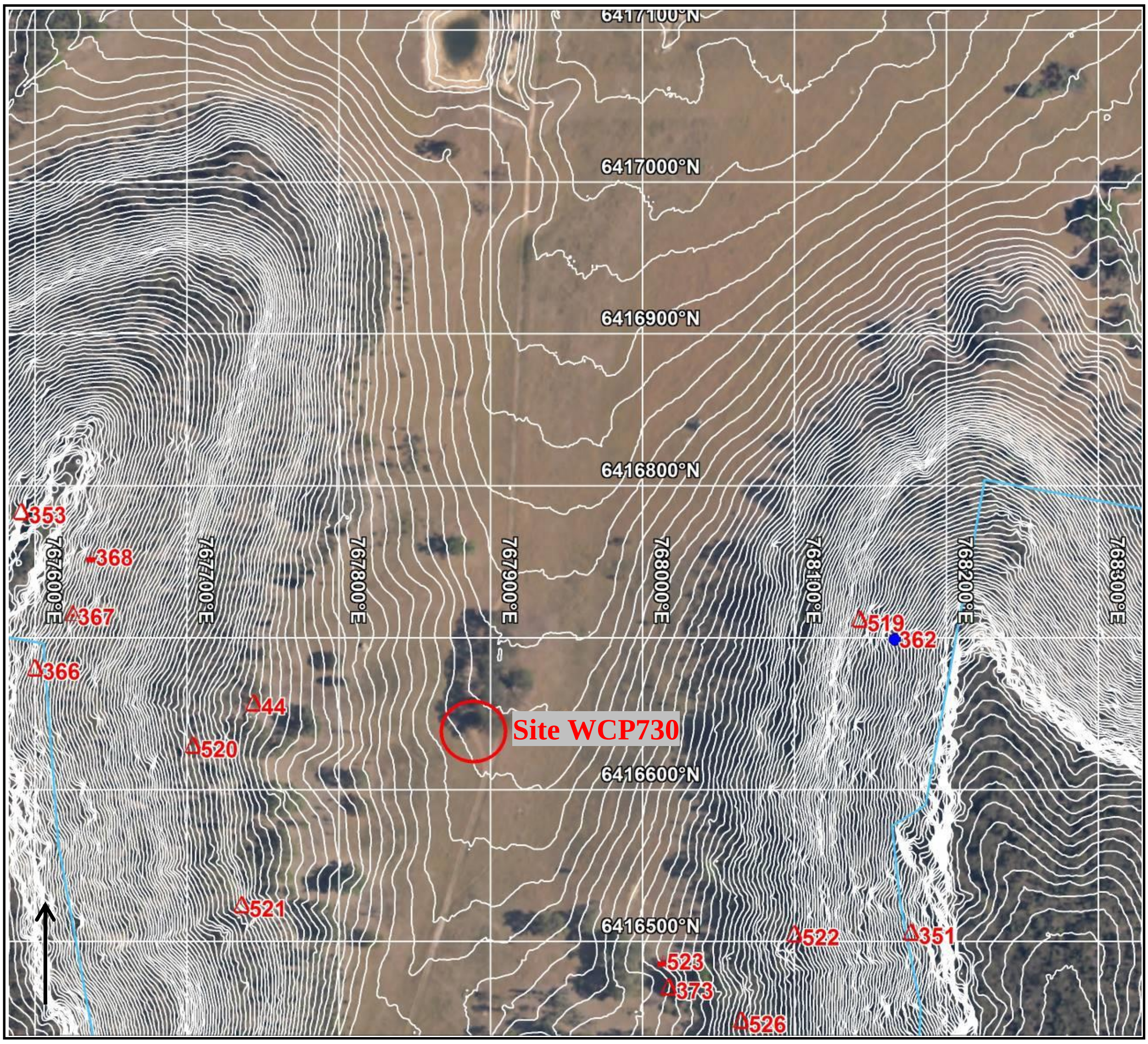

Figure 3: Location of previously reported grinding groove site WCP730 (aerial photograph, one metre contours courtesy WCPL; 100 metre MGA grid).

2. METHODOLOGY

2.1 Aims

The primary aims of the assessment were to:

- Relocate the reported grooves at WCP730 (refer to Figure 3 and Appendix 1) and conduct visual inspection and low-powered digital microscopic use-wear analysis to reassess the formation processes of the grooves, specifically to identify whether they relate to Aboriginal occupation as reported, or were formed from natural or other processes (such as non-indigenous land use impacts);
- Undertake further assessment where necessary of any grooves, for example involving laboratory residue analysis; and
- Prepare a brief report documenting the results of the reassessment.

For more comprehensive details of the environmental, archaeological and cultural context of the locality refer to Kuskie (2015) and Navin Officer (2005).

2.2 Site Inspection

A review of previous research conducted by South East Archaeology into the environmental, historical and archaeological background of the locality preceded the field inspection. Site records and documentation provided by WCPL in relation to the groove location was also reviewed.

The on-site inspection was undertaken on 3 May 2019 by Birgitta Stephenson of ITGA, assisted by James Heesterman of WCPL.

The inspection involved re-locating site WCP730, with further analysis as discussed below to reassess the nature of formation of the grooves.

2.3 Overview of Use-Wear Analysis and Approaches to Ground Surfaces

Use-wear is regarded as the modifications to tool working edges and surfaces resulting from friction between the worked material and the tool (Kononenko 2011:7). Characteristic wear patterns can be utilised to infer tool functions, the context of use and the types of materials processed (Kamminga 1982; Fullagar 1994, 2006; Kononenko 2007). The most common patterns include striations, surface polish, edge rounding, scarring and microfractures (Fullagar 1986:9, 2006:221; Kamminga 1982:4; Odell 2004:135).

Robertson (2009:243) noted, however, that wear features may not always relate to use, but may result from post-depositional taphonomic processes. Therefore, when use-wear is viewed in isolation there is a potential for mis-attribution to cultural causes, which highlights the imperative to integrate multiple lines of evidence (see Lombard and Wadley 2007; Robertson *et al*. 2009). Use-wear consequently, is generally studied in combination with residue analysis (Kealhofer *et al.* 1999:543).

Although residue preservation mechanisms are unclear (Langejans 2010:971), it has been demonstrated that residues can survive and adhere to stone surfaces for prolonged periods of time (Bruier 1976; Fullagar 2006; Fullagar and Field 1997; Hardy 2004; Haslam 2004; Kooyman *et al*. 1992; Loy and Hardy 1992). Residue analysis involves the microscopic identification of surviving residues which commonly include plant, (eg. starch, raphides, phytoliths and pollen), animal (eg. blood, bone, hair and collagen), or inorganic (eg. vivianite, aragonite, ochre and resin) matter. Some residues however may not relate to use (Odell 2001:56) with depositional context, particularly grassland environments, skewing starch and phytolith results (Haslam 2009:136). Similarly, weathering can distort or remove residues, and poor preservation conditions can markedly bias the quantity and type preserved (Bruier 1976:482).

Tribological studies are particularly relevant to assessments of ground surfaces. These studies look at the "continuous damage process of surfaces, which are in contact with a relative movement" (Shizu and Ping 2012:263). Although ground stone surfaces can have a complicated biography due to activities associated with initial formation, maintenance (such as hammer dressing or surface rejuvenation) and further recycling, four processes of wear are consistent. These processes (refer to Figure 4) comprise:

1) Adhesive wear at the atomic level, caused by the molecular attraction of contacting surfaces;

2) Wear fatigue, which is the fracturing of rock grains attributed to contact pressure;

3) Abrasion, involving the scratching, ripping and gouging of soft surface asperities by a harder surface; and

4) Tribochemical wear, which is the result of a build-up of chemical reaction products caused by surface interactions (Dubreuil *et al*. 2014).

Each of these processes leaves distinct patterns on the ground surface (eg. abrasive wear or fatigue are frequently associated with gouges, fractures and cracks). With respect to grinding, wear traces (striations, polish, and tribochemical reactions) and surface topography can be linked to specific grinding functions or activities (see Adams 1999; Dubreuil 2004; refer to Plates 1 – 3). Use-wear traces on ground surfaces are affected by variables including the raw material, the companion muller, the material being ground, the tool morphology, the grinding technique (wet or dry), the amount of pressure applied, the motion itself and the duration of grinding (Dubreuil 2004:1614).

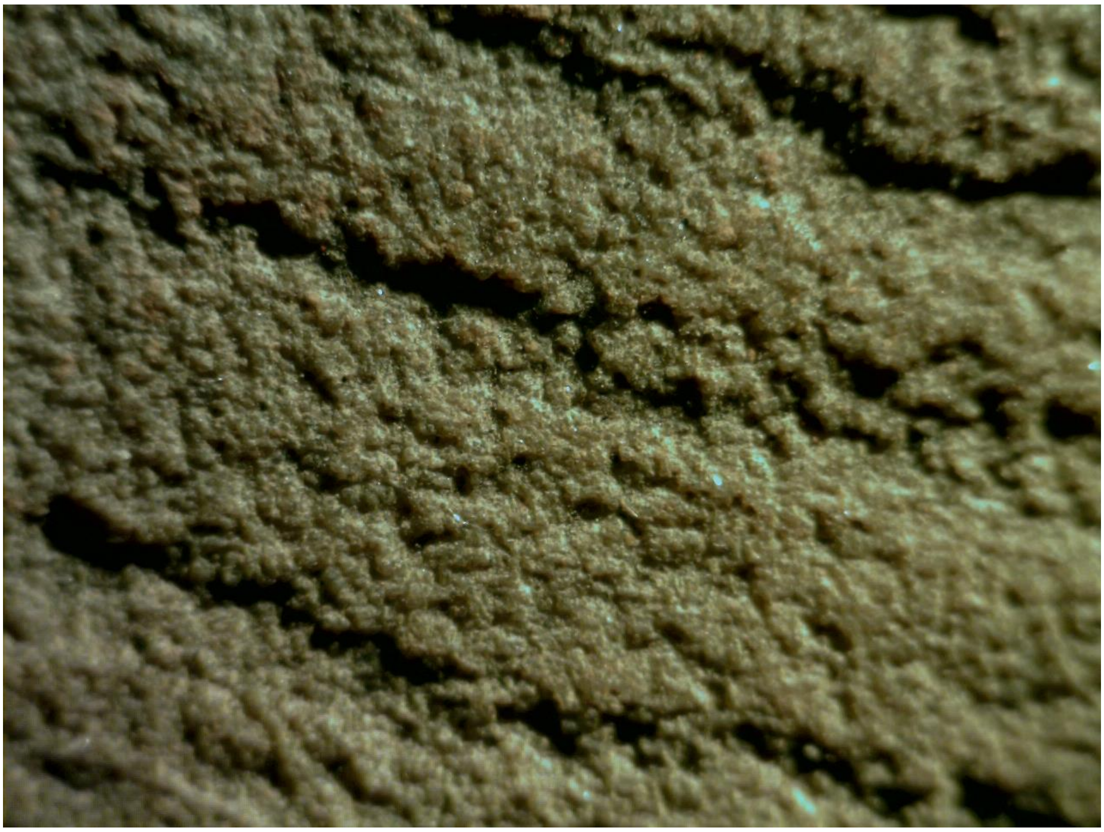

Plate 1: Example of striations on a modified ground surface (170x).

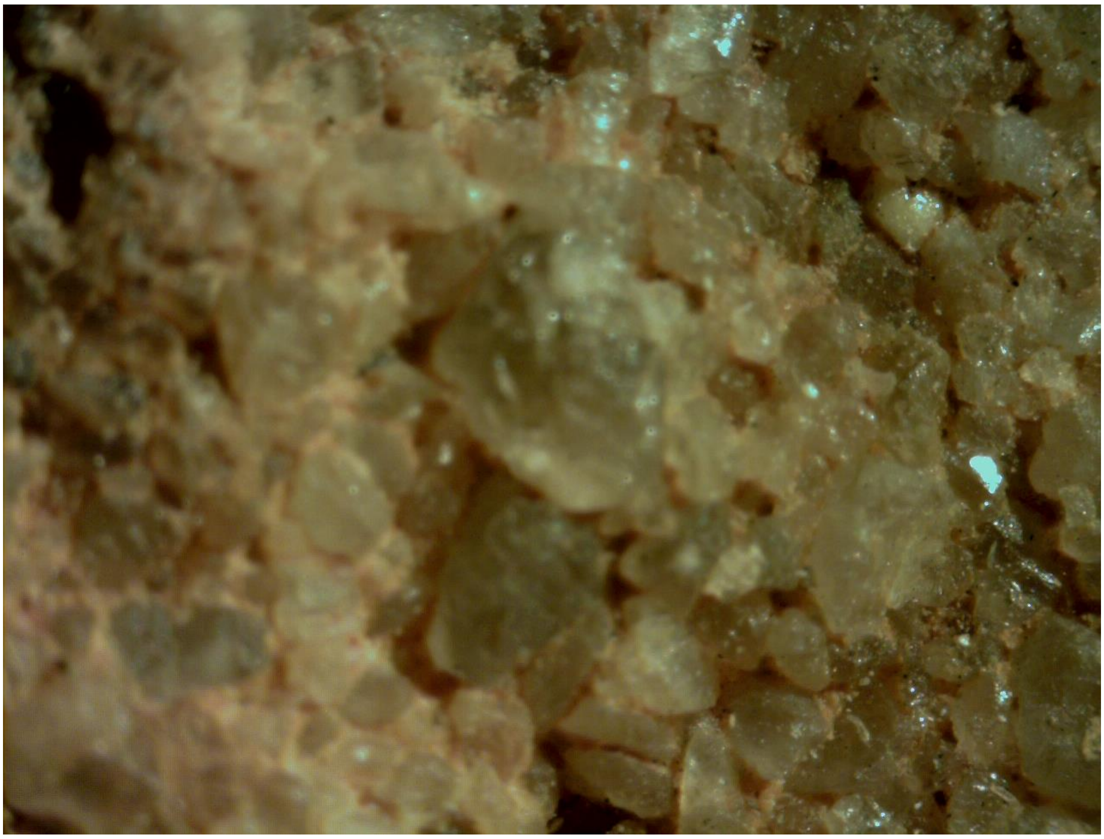

Plate 2: Polished areas across a groove surface (160x).

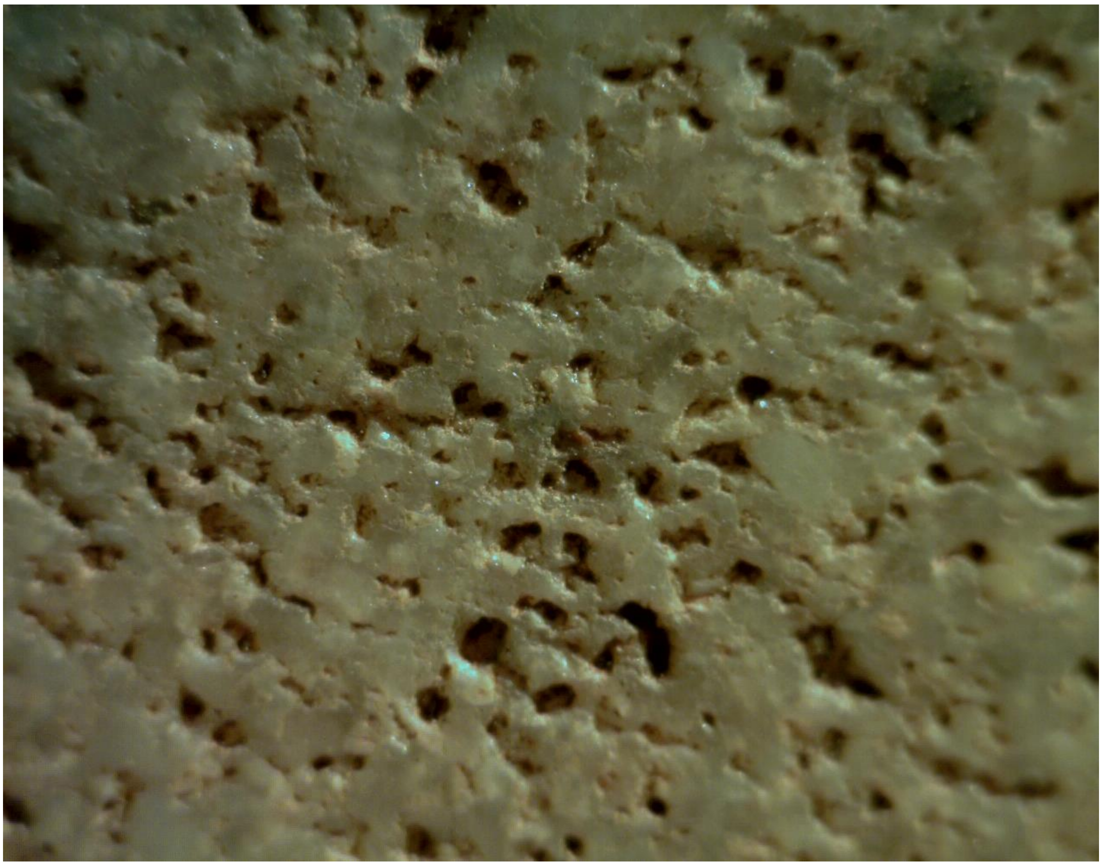

Plate 3: Tribochemical wear across a groove (120x).

Observations of surface topography during a series of experimental grinding exercises allowed Dubreuil (2004) to produce detailed documentation of use-wear characteristics associated with the grinding of stone, bone, wood, shell, skin, ochre, wheat, acorns, fish, dried meat and legumes (Dubreuil 2001, 2004). These documented use-wear characteristics (refer to Table 1 and Figure 5) serve as a baseline reference for comparisons of ground surface modifications from varying regions and contexts. General use-wear similarities across a variety of stone types have been demonstrated in recent studies examining experimental wear patterns (Liu *et al.* 2010, Fullagar and Wallis 2012). This has included research on Australian sandstones, which can host grinding grooves, patches and hollows (Fullagar *et al.* 2008).

With respect to residues, the matrices and voids associated with a ground surface provide an ideal environment for the trapping of residues (see Buonasera 2005; Monnier *et al.* 2012 and Stephenson 2015). The mechanical action which accompanies grinding forces residues into the interstitial spaces. Experimental work has shown that the depth of penetration varies according to the porosity of the surface, the duration of action, the pressure and motion applied and the presence of lubricants such as water (Stephenson 2011). While attrition of the stone surface caused by subsequent grinding and/or weathering may remove some of the impacted residues, a large percentage remain and become continually over-written by additional residues. Due to varying molecular weights, quantities of residues and preservation considerations, a biography of grinding can be recognised, however identification of the actual order or sequence is not possible.

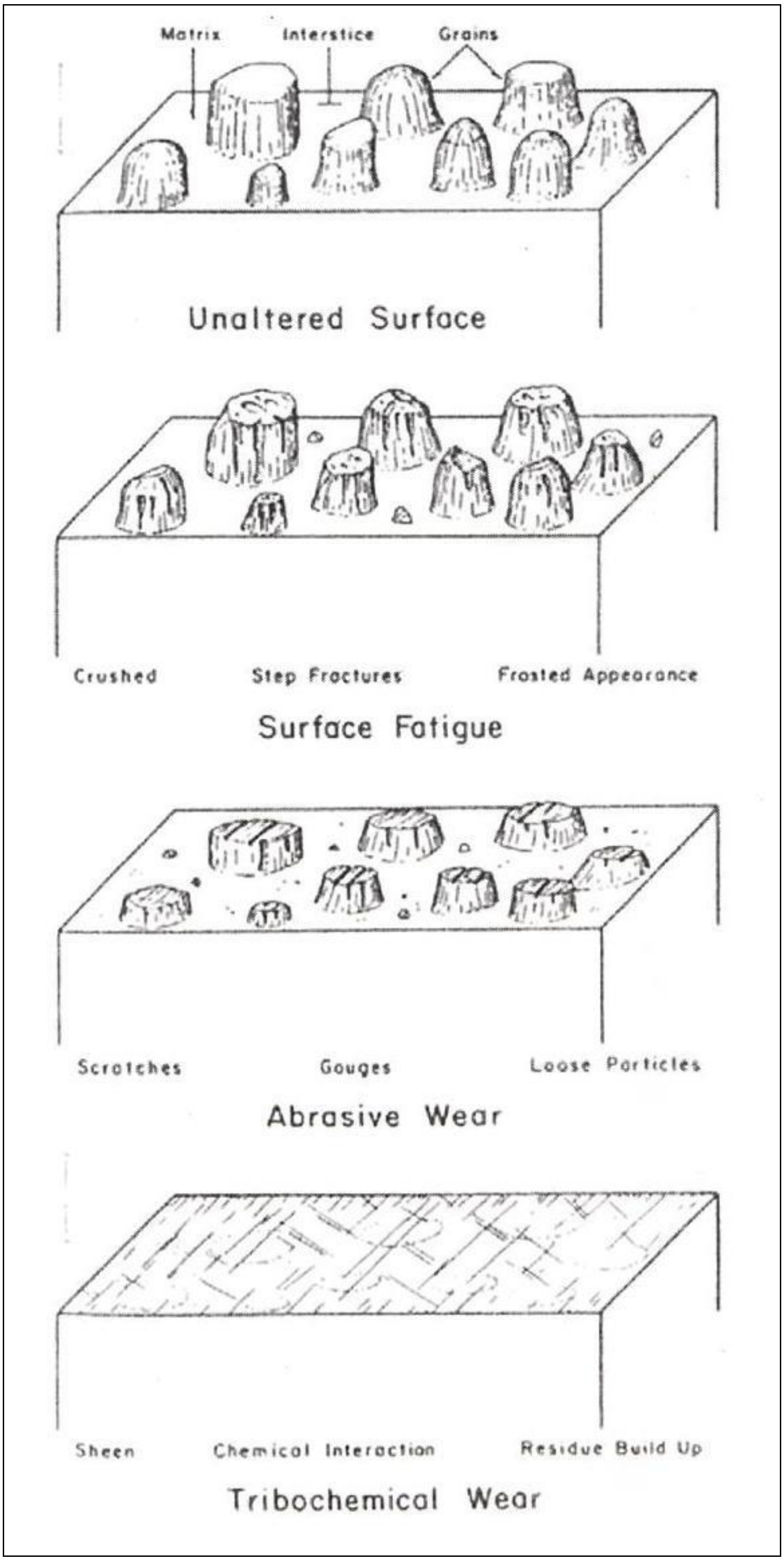

Figure 4: Depictions of the types of grindstone surface wear (Adams 1996:5).

Table 1: Summary of use-wear features associated with the experimental grinding of various raw materials (Adams 1988; Dubreuil 2001, 2004).

Material being ground	**Use-wear patterns - macroscopic**	**Use-wear patterns - microscopic**
Ochre	Overall levelling	Specific wear zones seen as homogenous zones Chipping and micro-crushing of the grain
Animal matter	Hollows and grain removal	Non-homogenous levelling, Individual grain levelling and rounding Reflective sheens, striations
Bone	No overall levelling	Removal of grains in patches/zones, Grain edge rounding Patchy gloss, deep striations
Hide-processing	Homogenous zones, areas of levelling without interstices between grains.	Individual grains clearly defined, Interstices between grains smooth and shiny and free of Grains in high relief, non-level surface
Cereal	Levelled topography Possible polish	Levelled areas less pronounced, Less sheen Interstices full of debris Grains are truncated from micro-fracturing, Some striations associated
Stone	Levelled and rounded grains	Highly abrasive, grains crushed and breaking away Elevated, unsmooth homogenous zones
Vegetable matter	Levelled off areas, Partial gloss	Grains highly worn down, some rounded. Slight relief
Wood	Smooth topography	Crushing and grain truncation, some rounded grains Chipping.

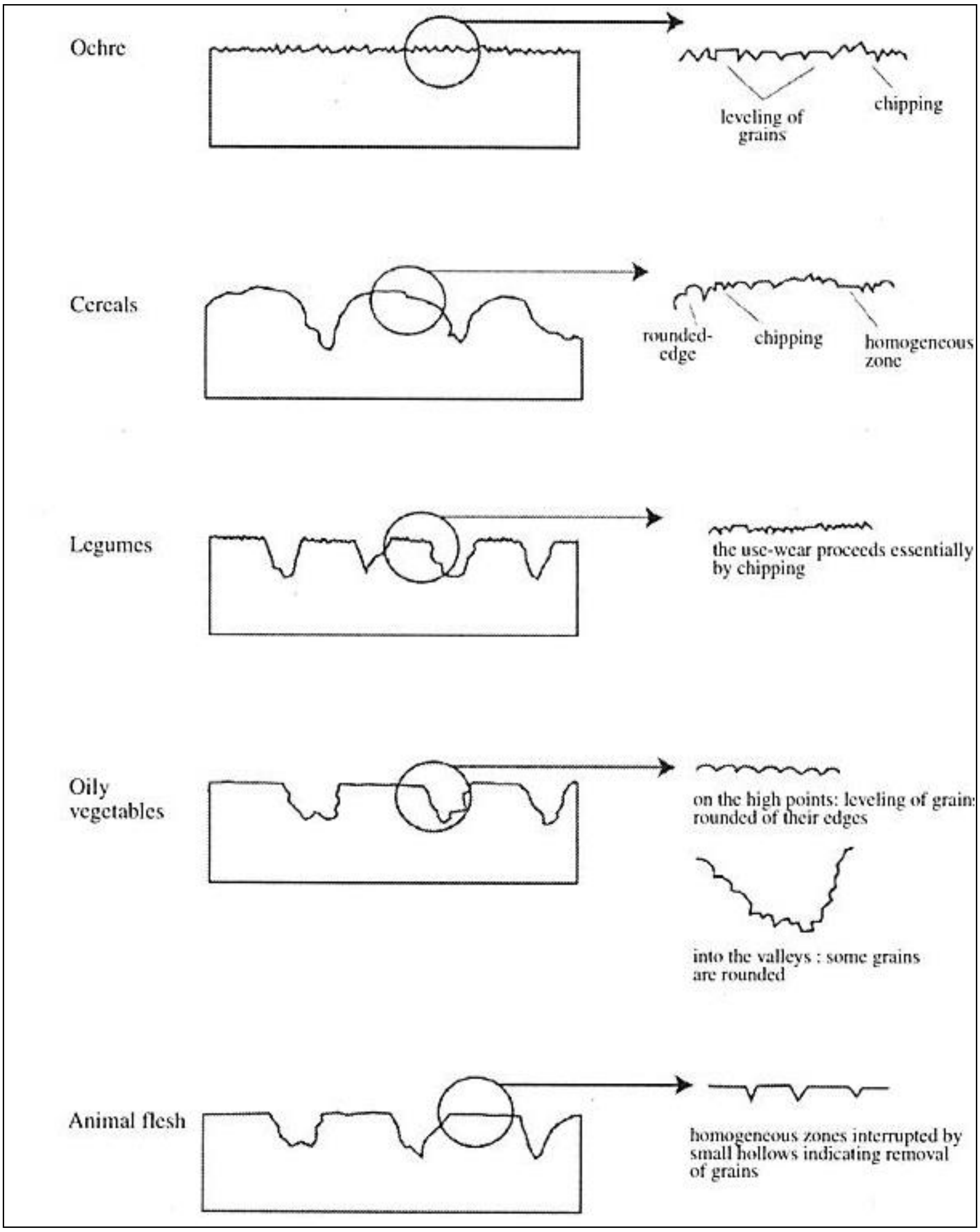

Figure 5: Microrelief and grain surface modifications associated with specific ground materials (Dubreuil 2004:1619).

Until recently the analysis of residues associated with ground surfaces has relied heavily on the identification of morphological characteristics. However, these visual diagnostic features can be altered due to the mechanical forces associated with grinding and also by environmental influences such as water, which can cause residues to swell and become amorphous (see Monnier *et al.* 2012; Stephenson 2015).

Residue ambiguity issues have been reduced significantly with the introduction of biochemical staining, which is used in conjunction with contemporary microscopic use-wear and residue analysis approaches. Stephenson (2015) has developed a series of stains which are specifically designed to identify damaged, fragmented and older archaeological residues. The application of biochemical staining techniques enables a wider range of past processing activities to be identified across ground stone surfaces, including grooves, patches, hollows, mullers and mortars.

2.4 Macroscopic Characteristics of Aboriginal Grinding Grooves

Although there are numerous studies relating to grindstones (see Liu *et al.* 2010 and Smith 2004), grinding implements (see Gorecki *et al.* 1997 and Hamon 2008) and more recently grinding grounds (Fullagar *et al*. 2015), studies on *in-situ* grinding grooves are less common (although see Stephenson 2016, and Stephenson and Kuskie 2016a, 2016b).

At the outset it is necessary to define the characteristics of an Aboriginal grinding groove. While there are a number of macro and micro morphological characteristics, it is important that contextual characteristics, such as landscape setting (eg. natural or modified ground), appearance (eg. cluster or isolated), condition of host surface and other rocks in the locality and previous landscape use, are also considered. For example, sandstone bedrock currently exposed in a drainage where considerable recent gully erosion has occurred (associated with non-indigenous vegetation removal and pastoral use; refer to Dean-Jones and Mitchell 1993, Kuskie 2015), may not have been available to Aboriginal people prior to the recent historical period. As such, the likelihood of a groove on such a surface being of Aboriginal origin is greatly reduced.

In-situ grooves are the result of wear. They are not an artefact that has been intentionally made, rather they are the remnant of a grinding activity.

In many previous heritage studies, *in-situ* grinding grooves have been widely considered to be the result of either stone axe grinding, spear sharpening or seed grinding. Although more recent research demonstrates that these oversimplified analogies can be considered to be uncritical generalisations, it is accepted that a grinding action will produce a groove that generally conforms with a number of recognisable macro-morphological characteristics.

The primary characteristic of an Aboriginal grinding groove is that the long axis or central meridian is invariably straight and will be greater in length than in width (Hiscock and Mitchell 1983:6; refer to Plate 4). A grinding groove will not be curved or wavy, as efficient grinding as described by Dickson (1980:162) requires the object being ground to be pushed directly away from the operator with some pressure for approximately 25 - 50 centimetres, and lifted and returned along the same axis. Approximately 20 forward strokes are needed for a distinct flat area on the raw material to appear and then the object is turned over and the action repeated (Dickson 1980). The movement is a highly controlled, continuous action with pressure being maintained on the forward stroke and released on the return stroke which follows the same line. While curved and wave patterns are seen with engravings (Tacon 2013), they are not associated with grinding grooves (refer to Plate 5).

Plate 4: Typical *in-situ* Aboriginal axe-grinding grooves with straight long axis.

Plate 5: Aboriginal engravings with curved lines, Finchley Track, NSW (*http://images.everytrail. com/pics/fullsize/1600866-Head_Biami_Finchely.jpg*).

Grinding actions are limited by human arm span length, ergonomics, and the associated kinetics of the grinding motion (refer to Plate 6). This varies between activities such as axe grinding and seed grinding, as different pressures and stroke actions are required for the material types.

Dickson (1981), with over 15 years of grinding experimentation, has proposed a general morphology for *in-situ* grooves of Aboriginal origin. Dickson (1981:39) identifies that these grooves are typically 25 to 50 centimetres in length, generally five to eight centimetres wide and have a mid-length depth that is characteristically two to four centimetres. This correlates well with the average measurements of ground stone artefacts, such as ground-edge stone axes and hatchets (Dickson 1981).

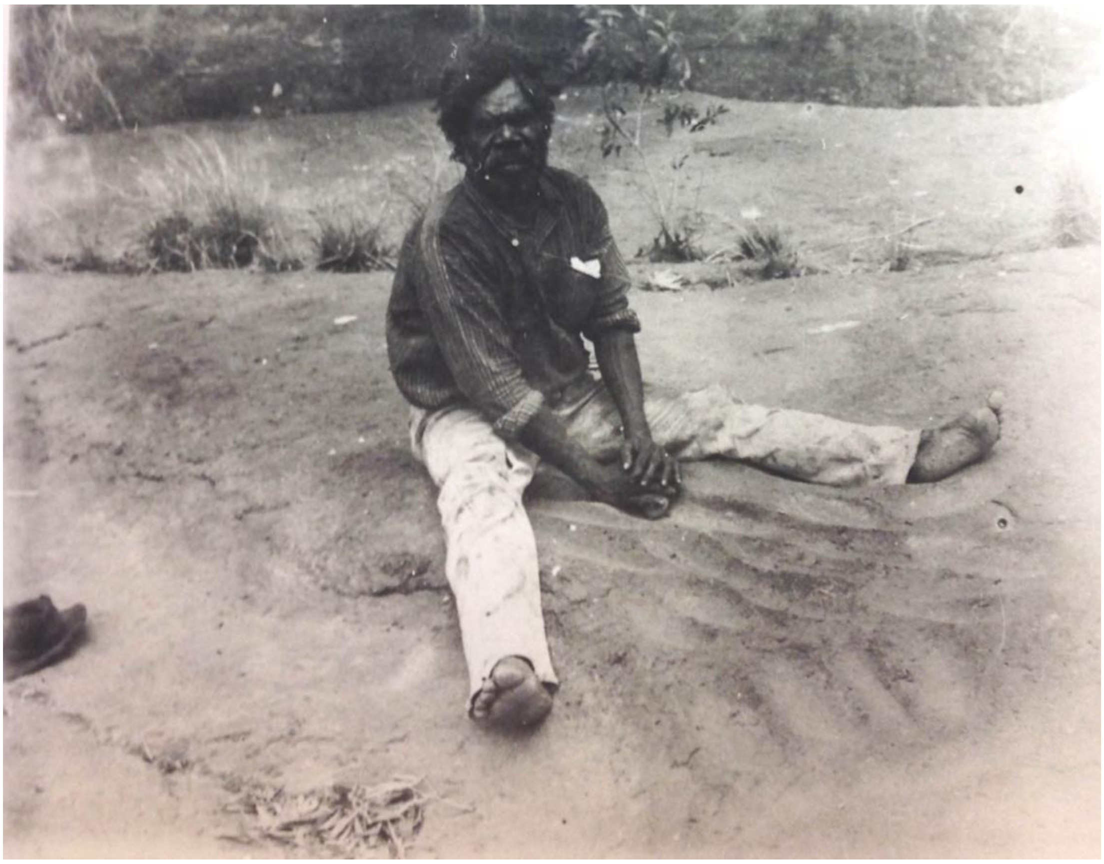

Plate 6: Mechanics of grinding limited by arm length and pressure applied, Leichhardt River (courtesy John Oxley Library).

The groove length in part reflects the length of the arm of the operator. The posture assumed by the person grinding is considered to affect the length, with standing resulting in an increase in groove length. The biomechanics of grinding actions need to be taken into consideration by a recorder when assessing whether a potential feature is of Aboriginal origin. With regard to the depth of grooves, Gorecki *et al*. (1997:142) suggest that user abrasions lead to grooves being abandoned when they become too deep. This is supported by experimental grinding exercises.

It has been proposed by Hiscock and Mitchell (1993:31) that grooves which have 'V shaped' cross-sections that are less than 25 centimetres in length, and with a width of 2.5-3 centimetres, resulted from spear grinding. This is contested by Kamminga (2016 pers. comm.), who suggests that portable rocks were more likely to have been used for spear grinding and that the smaller grooves which are occasionally observed may relate to the polishing, burnishing or re-sharpening of a ground edge. Experimental grinding undertaken by Stephenson supports this proposal (Plate 7). However, regardless of the purpose, as stated above the primary characteristic of a groove of Aboriginal origin is that the long axis is invariably straight and greater in length than the width.

Plate 7: Experimental grinding polishing/sharpening the ground edge and creating narrow 'V' shaped groove.

In cross-section, axe-grinding grooves are typically 'U shaped' due to the oval profile of the rock being ground. Seed grinding grooves, although typically level in cross section (equal forces applied to softer objects, ie. seeds), can vary in profile. Variations in pressure application mean that cross-sectional shape is not necessarily a reliable indicator of an Aboriginal grinding groove. Deep grooves, in particular deep V-sections, may be the result of other non-Aboriginal human activity (eg. plough or tyne marks, dozer tracks or metal cart wheel marks), animal activity (eg. hoofs), natural weathering and/or erosion.

A groove outline or overall shape is dependent on the raw material being worked. While it can vary from oval/elliptical to rectangular, the shape is approximately symmetrical around the mid-line. This is due to the fact that the raw material being ground does not change shape grossly during the grinding action, only the pressure being applied alters during the movement.

Although it may undulate slightly, the topography of a groove surface is considered to be smooth and level along the mid-line. Grinding precludes the presence of greatly varying depths or large undulations along the groove surface. Likewise, "humps", such as small rocks or weathered fragments, are absent as the action of grinding causes continuous damage to the contact surfaces and therefore matrix grains which block this process are removed by abrasive wear.

In general, fine-grained argillaceous sandstone is the preferred grinding medium. Although the matrix grains become blunt, they are easily dislodged (Dickson 1980:162). Sandstone is a relatively soft medium and grooves commonly are located on horizontal or near horizontal sandstone surfaces, frequently in clusters and can number in the tens or hundreds (Hiscock and Mitchell 1993:74). Individual, isolated grooves are less common.

Although dry grinding is possible, ethnographic accounts detail that the wet grinding of axes and some seeds was more commonly practised (Cane 1989:113). As such, grooves are often located within the immediate vicinity of a water source, even an ephemeral one. Landscape context, the landform element that a groove is located in, type of stone material hosting the groove, the surface condition of the host stone and the distance to water are all considerations when assessing whether a groove may be of Aboriginal origin.

In order to determine whether an *in-situ* feature is likely to be a grinding groove of Aboriginal origin, an initial assessment needs to consider the environmental/contextual attributes and macroscopic features discussed here. There are a number of elements which preclude a feature being a grinding groove of Aboriginal origin. As a guide to investigating the likelihood of a groove being an Aboriginal grinding groove, a macroscopic flow chart has been developed (refer to Figure 6)[1]. A second flow chart which aids with the assessment of the microscopic properties of grinding grooves of Aboriginal origin (see Section 2.5) has also been developed to follow on from the macroscopic chart (refer to Figure 7).

2.5 Microscopic Characteristics of Aboriginal Grinding Grooves

There are a number of microscopic features that can be used to identify a groove as being of Aboriginal origin, as opposed to having originated from natural weathering, erosion, animal activity (eg. hoofs) or other non-Aboriginal human activity (eg. plough or tyne marks, dozer tracks or cart wheel marks). These microscopic features are outlined in Figure 7 and discussed below.

The microscopic use-wear features are the result of the four wear formation processes outlined earlier: adhesive wear, fatigue, abrasive wear and tribochemical wear. The primary observable surface modifications include changes to individual matrix grains, linear surface traces and alterations in the overall surface topography. The microscopic changes vary depending on the raw material being ground, the grinding technique (wet or dry), the amount of pressure applied, the motion itself and the duration of grinding (Dubreuil 2004:1614). Field observations and experimental grinding studies have shown that residue accumulation and diagnostic wear patterns such as matrix grain fracture, levelling, rounding and polish develop quickly (Smith 2004:169) (Plate 8). Drawing on experimental grinding studies, associated changes have been summarised by Adams (1988) and Dubreuil (2001, 2004; refer to Table 1). Importantly, for a groove to be considered to be of Aboriginal origin, these traces must be confined to the modified ground surface area and will not be observed on nearby non-ground surfaces (Plate 9).

[1] This flow chart has been designed to guide the assessment of potential Aboriginal grinding grooves and does not take into account other features which may be of Aboriginal origin such as engravings.

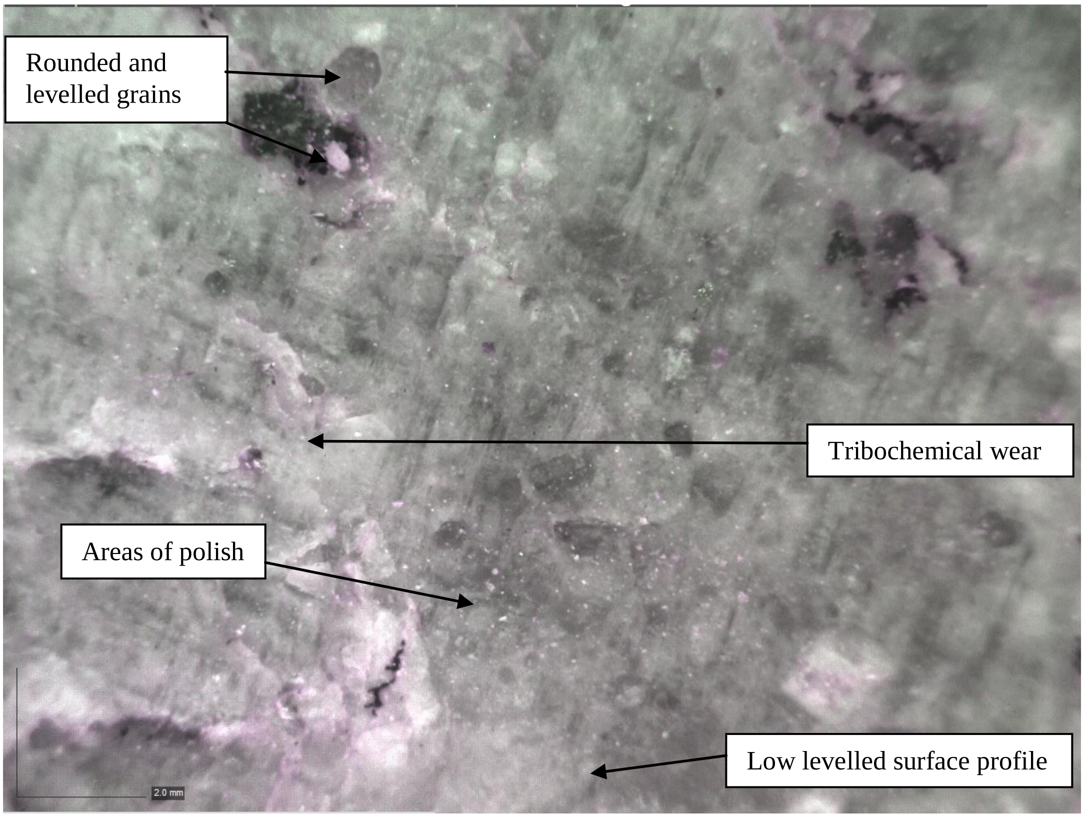

Plate 8: Typical use-wear associated with a ground surface (Stephenson 2012a).

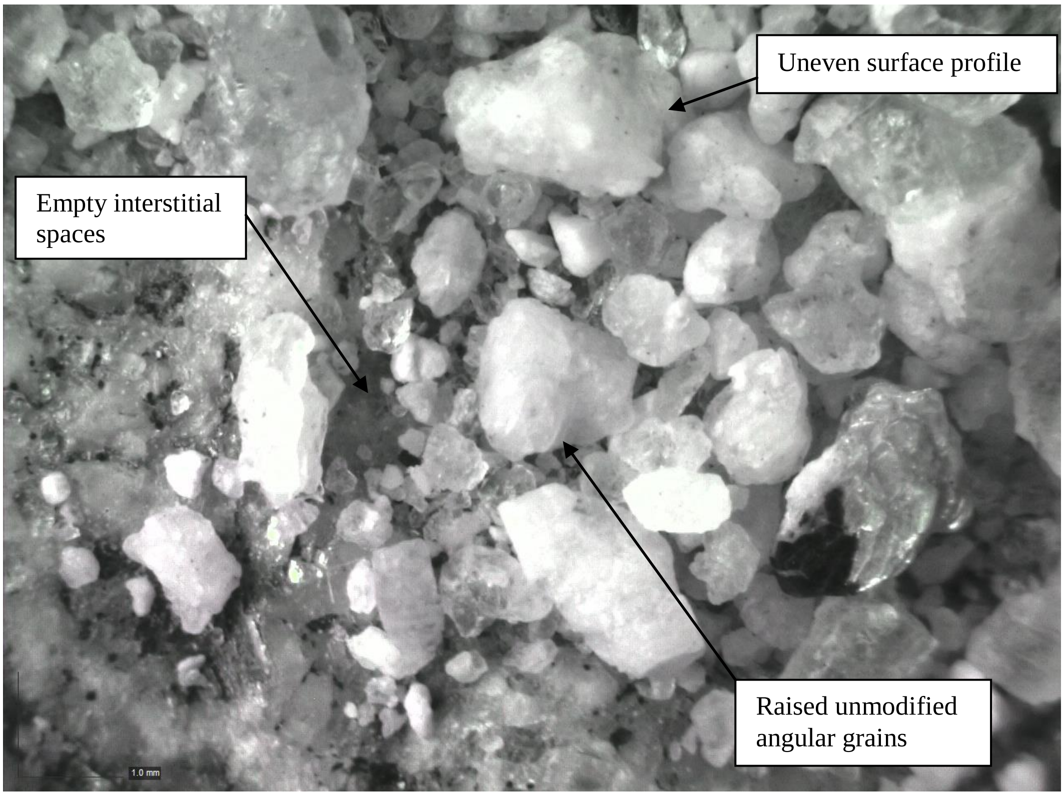

Plate 9: Typical appearance of a non-ground surface (Stephenson 2012a).

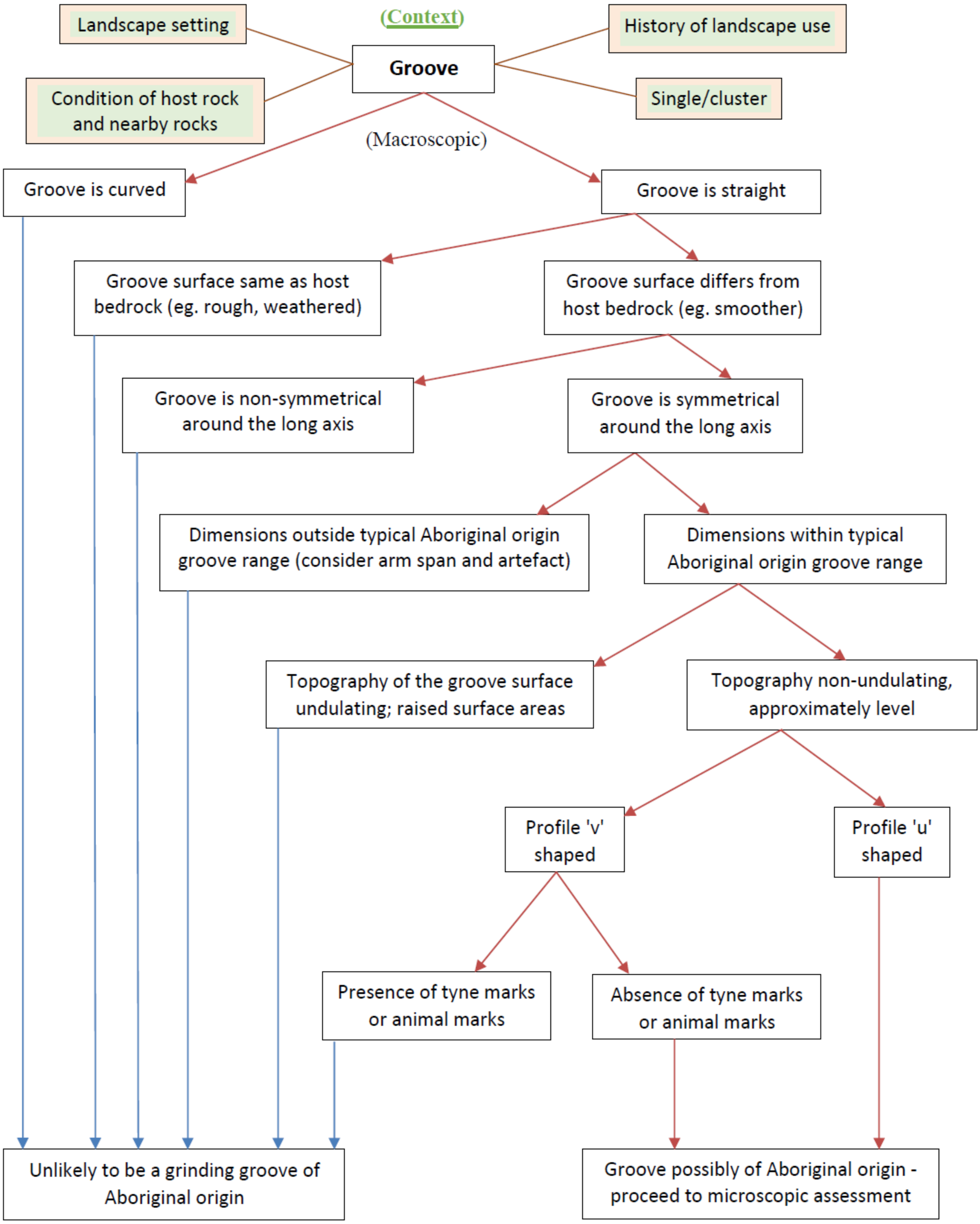

Figure 6: Process for the assessment of contextual and macroscopic characteristics to assess the origin of a grinding groove (Stephenson and Kuskie 2016a).

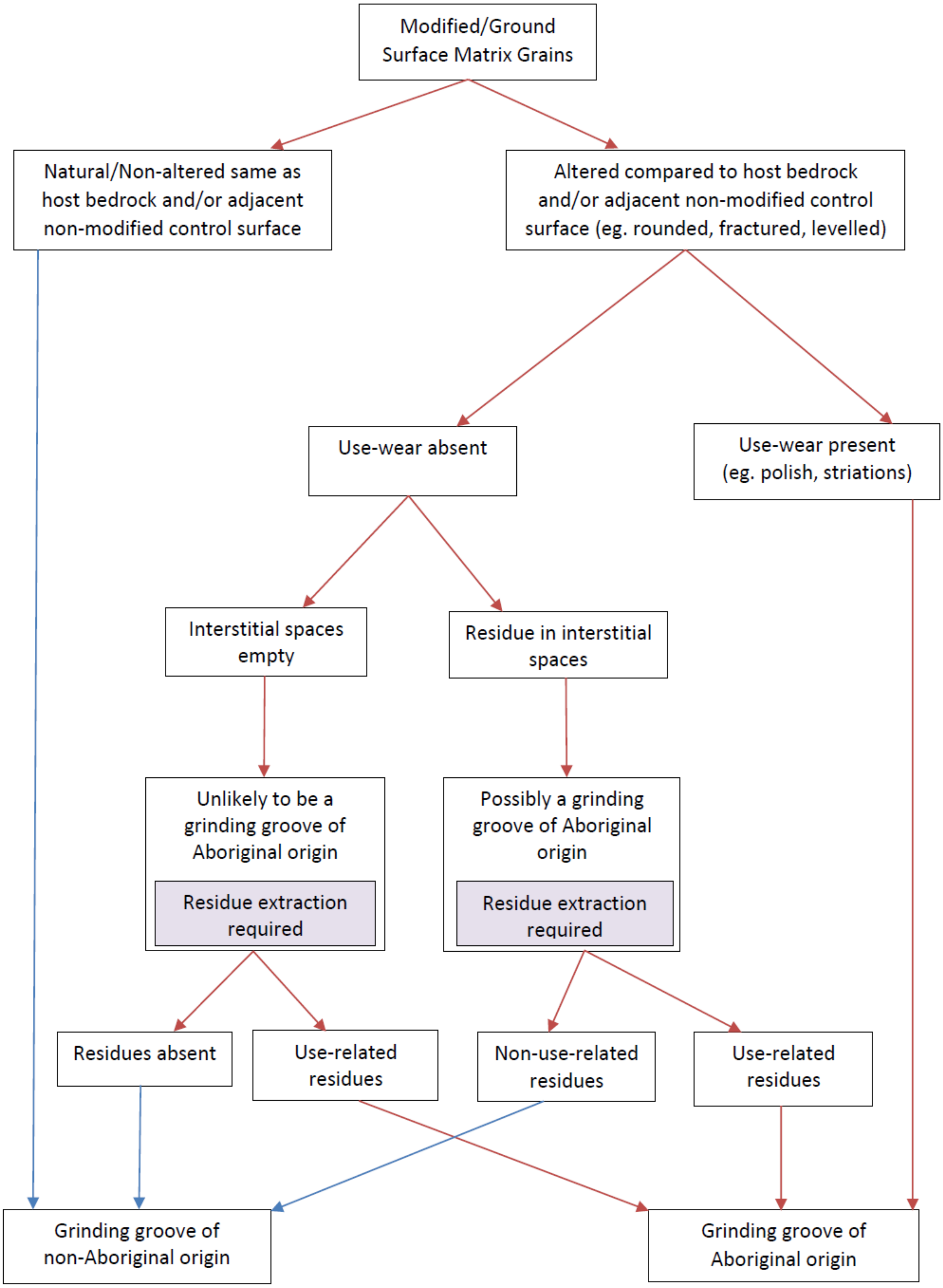

Figure 7: Process for the assessment of microscopic characteristics to assess the origin of a grinding groove (Stephenson and Kuskie 2016a).

The most common surface topographical changes noted are an uneven surface with areas of polish and a smooth levelled surface. Abrasive wear creates striations, scratches and often displaces grains from the softer surface. Uneven surfaces are the result of abrasive wear and are generally associated with the grinding of hides and animal material such as bones (Plate 10). A levelled and smooth topography is most commonly associated with the grinding of cereals, minerals and stone and is attributed to tribochemical wear (Plate 3).

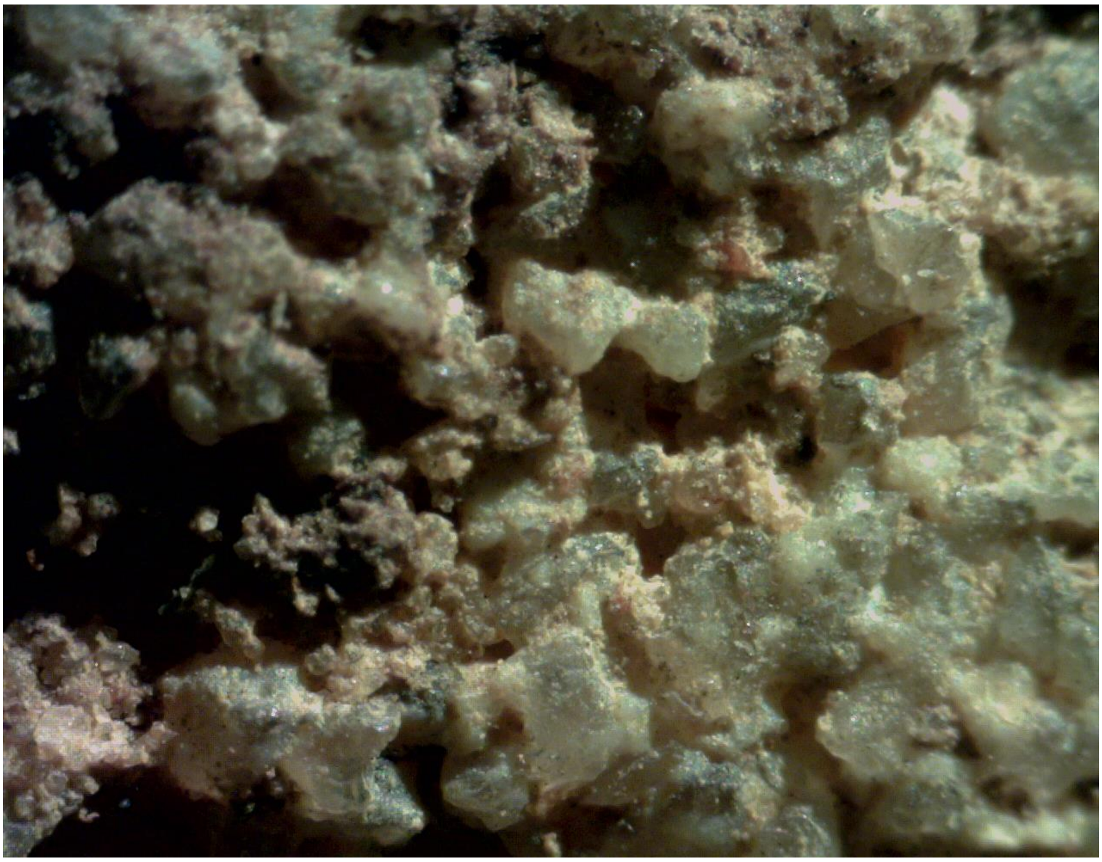

Plate 10: Example of a ground surface with missing or 'ripped' grains (120x).

Modifications to matrix grains attributed to grinding are quite marked. Grain modification is the result of both mechanical and tribochemical actions, which can occur simultaneously (Hamon 2008:1506). The degree of modification is recorded as smoothing or rounding (Plate 11), levelling Plate 12) and shearing or fracturing (Figure 8) and will vary according to the duration of and type of grinding (wet/dry). Grain modification is particularly obvious across quartz grains within sandstone surfaces, such as those commonly found in Australian contexts.

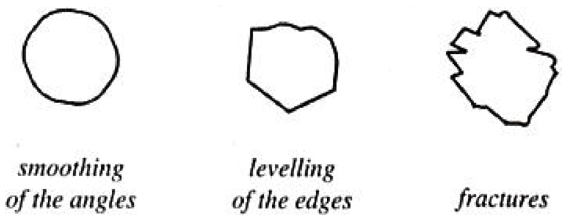

Figure 8: Depictions of differing surface grain modifications ascribed to grinding (Hamon 2008:1508).

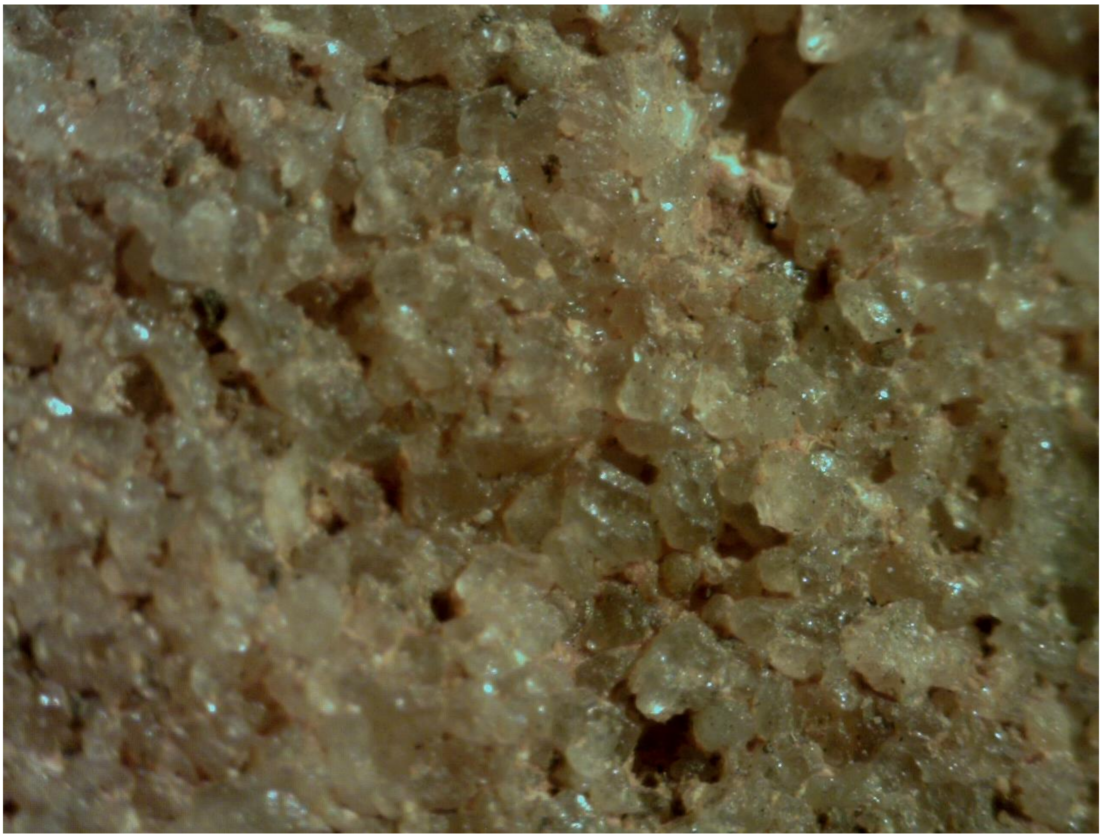

Plate 11: Example of rounded and polish grains (120x).

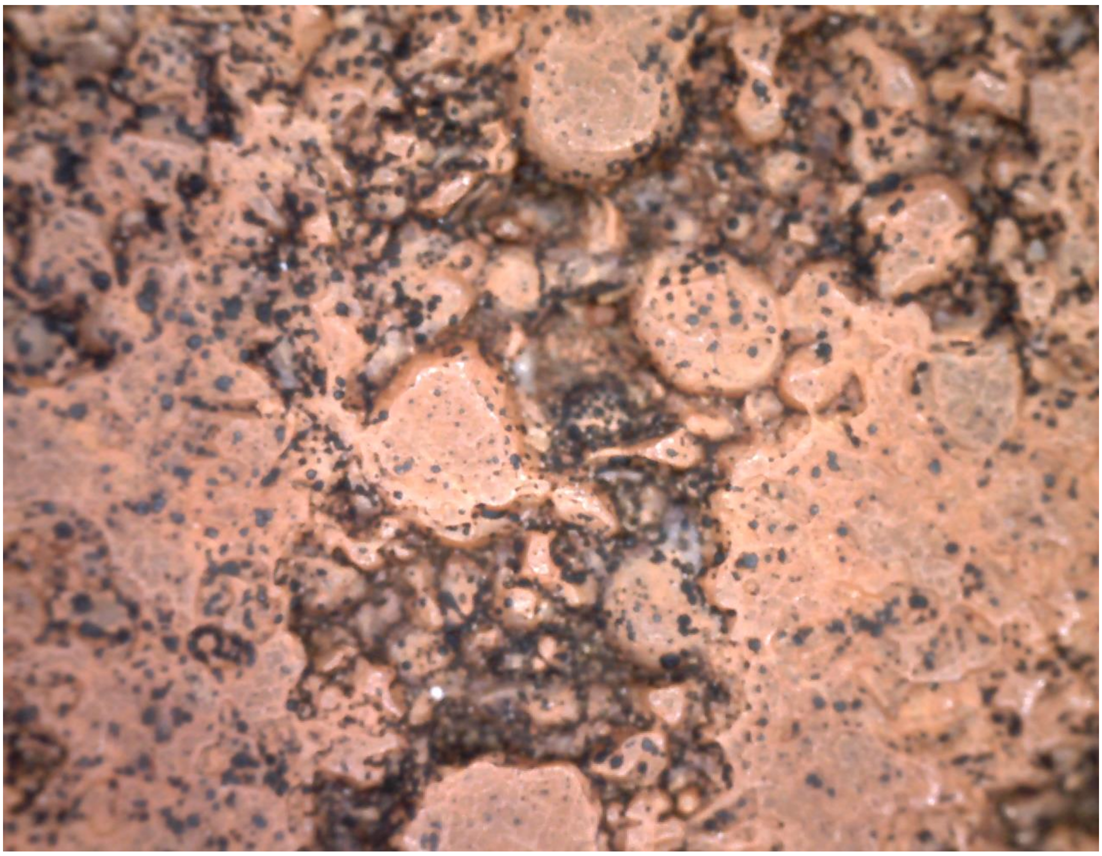

Plate 12: Example of a ground surface with levelled grains (160x).

When present, striations can be seen with low-powered microscopy and are best viewed with oblique lighting if available. Striations, resulting from abrasive wear, provide a valuable source of information regarding the materials and motion employed. Gould *et al.* (1971:164) observed that linear striations were frequently associated with linear grinding motion, such as that seen with grass seed and axe grinding (Plate 1). In contrast, circular striations resulted from the crushing motion used to grind *Solanum* and *Kalpari* seeds or some barks used for poison. Striations can also be seen across individual grains and are used to determine the direction of grinding motion.

Polish is a microscopic feature that is caused by tribochemical interactions. It results from friction-enhanced chemical interactions between the contact surfaces, which leaves worn surfaces with layers of oxide and reaction products. These build up continuously on suitably smooth surfaces and accumulate as sheen or polish (Adams 1988:310). It is noted that different raw materials differ in their susceptibility to polish formation. The constant abrasion of quartz grains in sandstone matrixes is restricted by the constant abrasion of the crystals.

While discussions of polish frequently accompany ground surface use-wear studies, the conclusions vary markedly (see Adams 1988; Dubreuil 2004; Fullagar 1991; Fullagar and Field 1997; Hamon 2008; Smith 2004). The formation of polish has been proposed to be diagnostic of siliceous plant processing, particularly wet seed milling (Fullagar 1991:2). However, formation and degradation of silica polish is cyclical and varies with the type of plant being processed, the amount of water used and the friability of the grindstone surface (Fullagar and Field 1997:302). Polish is not limited to the grinding of seeds and can be formed during the processing of any materials containing natural lubricants, such as meat, fish and nuts (Adams 1988:309; Dubreuil 2004:1619).

The microscopic appearance of interstitial spaces and the build-up of residues within these spaces is another valuable indicator used to determine whether a ground surface is likely to be of Aboriginal origin. Adam’s (1988) study of interstial spaces across ground surfaces concluded that the interstices between the grains of hide processing surfaces were relatively free of debris, often in high relief and occasionally associated with unworn spaces. Additionally, grains were often plucked out of place by this type of processing. In contrast, the interstices of cereal processing tools were full of debris and the grains were generally levelled (Adams 1988:308).

In-situ bedrock bowl-shaped features are occasionally reported in association with grinding grooves. These have variously been referred to as "grinding bowls", "grinding slabs" and "grinding dishes". These features are more correctly identified as mortars. Although mortars are frequently used for mixing and pounding activities (eg. the pounding of *Acacia melanoxylon* to produce a fish poison; Frood 2012), many of the macroscopic and microscopic features discussed above will be associated with these surfaces. In particular, altered surface topography, polish and striations will be seen. The presence of at least one circular concave pounding hollow up to 120 millimetres in diameter and 90 millimetres in depth is considered a defining feature of a mortar (Kamminga pers. comm. 2016). Often pitted or abraded areas will be noted and interstitial spaces will generally contain high levels of debris. Entry and exit point are sometimes observed across the *in-situ* margins associated with shallow surfaces and mark the initiation point of the action. Without the benefit of portable microscopy, gnamma holes, which are discussed below under natural features, may be mistaken for mortar or ‘bowl’ features of Aboriginal origin. As with *in-situ* grooves, discernible differences need to exist between the feature being investigated and adjacent surfaces.

2.6 *In-situ* Features of Non-Aboriginal Origin

There are four key formation processes that can create *in-situ* features that may in some circumstances resemble or be mis-interpreted as being grooves of Aboriginal origin. These are natural weathering (chemical and physical), erosion, animal activity and other non-Aboriginal human activity (eg. plough or tyne marks, dozer tracks or cart wheel marks).

Weathering occurs *in-situ* and is considered to be without movement (Plate 13). Broadly defined, weathering is considered to be either physical (mechanical), which involves the disintegration of rocks without chemical change, or chemical, where-in a rock's composition is changed through chemical reactions.

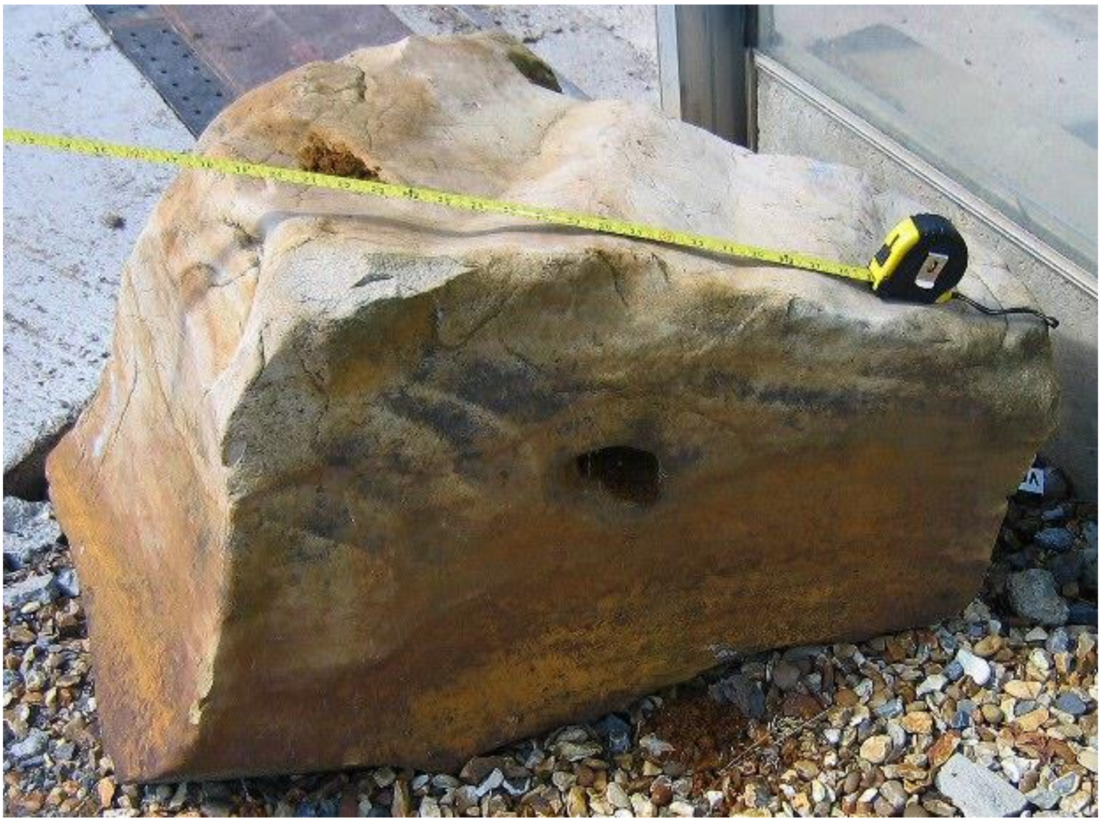

Plate 13: Sandstone faces displaying natural weathering (West and West 1980).

Environmental and atmospheric conditions such as water, heat and pressure are causative agents of physical or mechanical weathering. The splitting of rocks by roots growing within cracks is also considered to be physical weathering. Bednarik (2008:5) reports on an example of physical weathering, where the natural tessellation of sandstone in the Sydney area can give rise to selective weathering, which results in groove-like features (Plate 14).

Chemical weathering is the result of biologically produced or atmospheric chemicals, which in the presence of water, interact with rock minerals and cause oxidation or hydrolysis processes thereby altering the mineral structure. Likewise, acidic rainfall causing dissolution and carbonation and is also an example of chemical weathering.

Plate 14: Natural tessellation patterns in Sydney sandstone (Bednarik 2008:5).

Chemical weathering generally causes processes of dissolution, carbonation, oxidation and hydrolysis of rock minerals and is responsible for natural features found on flattish horizontal surfaces which are variously referred to as solution pans, pan holes, snames or skalne (Bednarik 2008, Clegg 2007). The correct geomorphological term according to Bednarik (2008:7) is *verwitterungswanne* or solution pan. They are described by Clegg (2007) as being flat bottomed depressions, approximately circular (although irregular shapes may occur) and shallow (Plate 15). Bednarik (2008:8) suggests that a continuum of size exists and they can range from 20 millimetres to four metres. These are biochemical phenomenon which commonly occur when rainfall is contained on horizontal sedimentary rocks that lack drainage. Similar features known as gnamma holes are seen across sandstone facies and are caused by the same biochemical phenomenon (Bednarik 2008:7).

In contrast to weathering, erosion is considered to be the movement of minerals and rocks by environmental agents such as ice, water, waves, wind and gravity. Erosion causes rocks to be physically broken and transported to other locations. During these processes, matrix inclusions may be removed at different rates and cause features resembling pitting. Erosion is also responsible for natural features such as potholes (Plate 16), which are caused by fluvial abrasion, especially along rivers and fast flowing creeks. These can vary in shape and size and may resemble or be mis-identified as grinding grooves or “bowls”.

Some rock markings are the indirect result of mechanical activity that can be attributed to recent, non-Aboriginal human activities or animal activities, for example those associated with pastoral use (eg. vegetation removal, ploughing, transport and stock agistment). Features include impressions made by equipment associated with rural land-use (eg. tilling equipment, steel rimmed buggy or cart wheels, bulldozers and steel cables) and scratches made by animal hoofs (Bednarik 2008:2). Tilling equipment typically includes tractors, rippers and chisel ploughs. These apparatus are designed to aerate and loosen soils, shatter and breakup hard ground and to rip the soil surfaces. Marks created by the various farm equipment are broadly referred to as tyne marks and although varied, their morphology can be similar to that of grinding grooves.

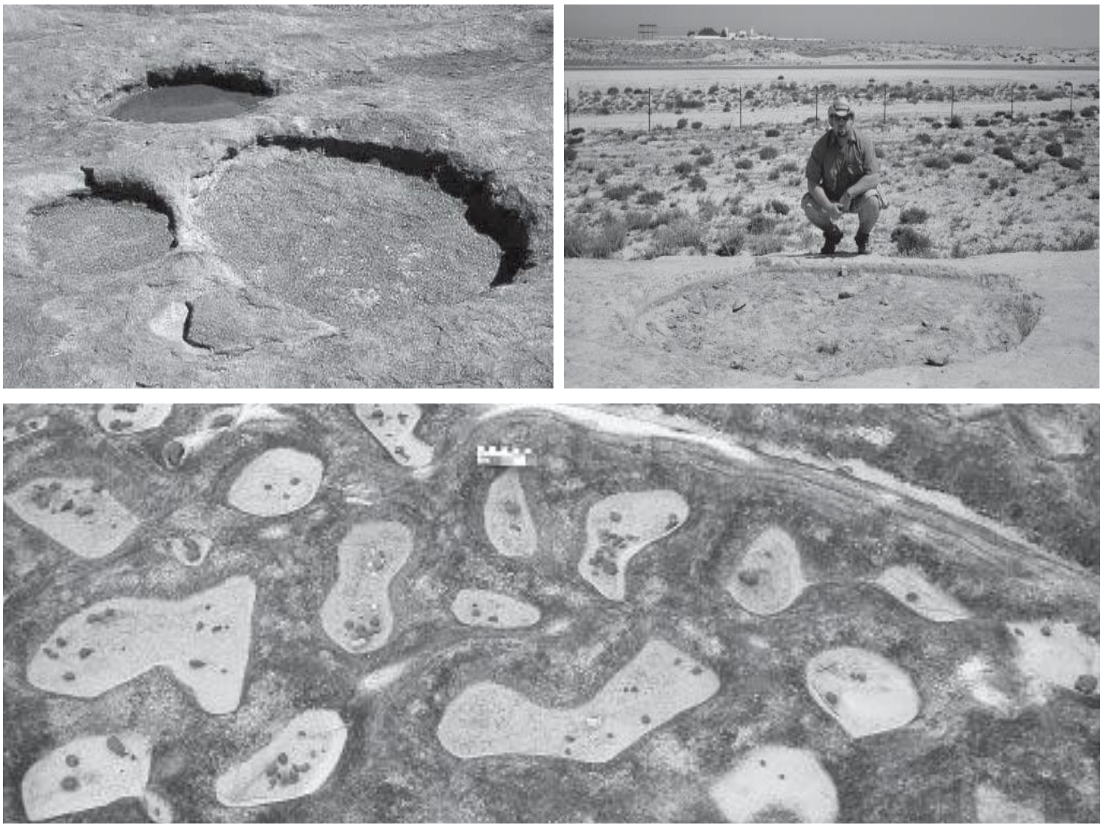

Plate 15: Examples of solution pans in sandstone bedrock (Bednarik 2008:7).

Plate 16: Example of potholes caused by fluvial abrasion or erosion (Bednarik 2008:3).

Tyne marks are commonly found on low bedrock outcrops which have previously been slightly protruding or buried under soils. Plough impacts on exposed sandstone bedrock can be relatively common, with only a low pressure required to create impacts, as bedrock surfaces are frequently covered by a soft weathering rind. The top of the bedrock surface can be marked if the rock is lying at less than the tillage depth, or the side can be marked if the rock is protruding. The plough is typically lifted when the machine operator hears and feels the scraping sound, but the reaction time can vary and therefore the morphology of plough marks varies.

Ciampalini *et al*. (2008) utilised bedrock surface plough marks as a tool to assess past soil erosion, noting that plough marks differed in length from two to three centimetres up to decimetres and in width from four to 60 millimetres. Depth was extremely varied and dependent upon the degree of rock face weathering (Ciampalini *et al*. 2008:21). Ciampalini *et al*. (2008) noted that older groove marks were likely to be covered in varnish, spalled by weathering and appear as an open 'U' shape in cross-section. More recent marks exhibited a tight 'U' shape in cross-section and were generally deeper than the older marks.

Examples of tyne marks can be seen in Plate 17. Unlike grooves of Aboriginal origin, the surface of a tyne mark is very irregular, often rough. Polish and fine striations will be absent. Additionally, animal hoofs have been noted to create scratches across horizontal surfaces that can resemble striations, pitting and in some cases, cup-like features (Bednarik 2008).

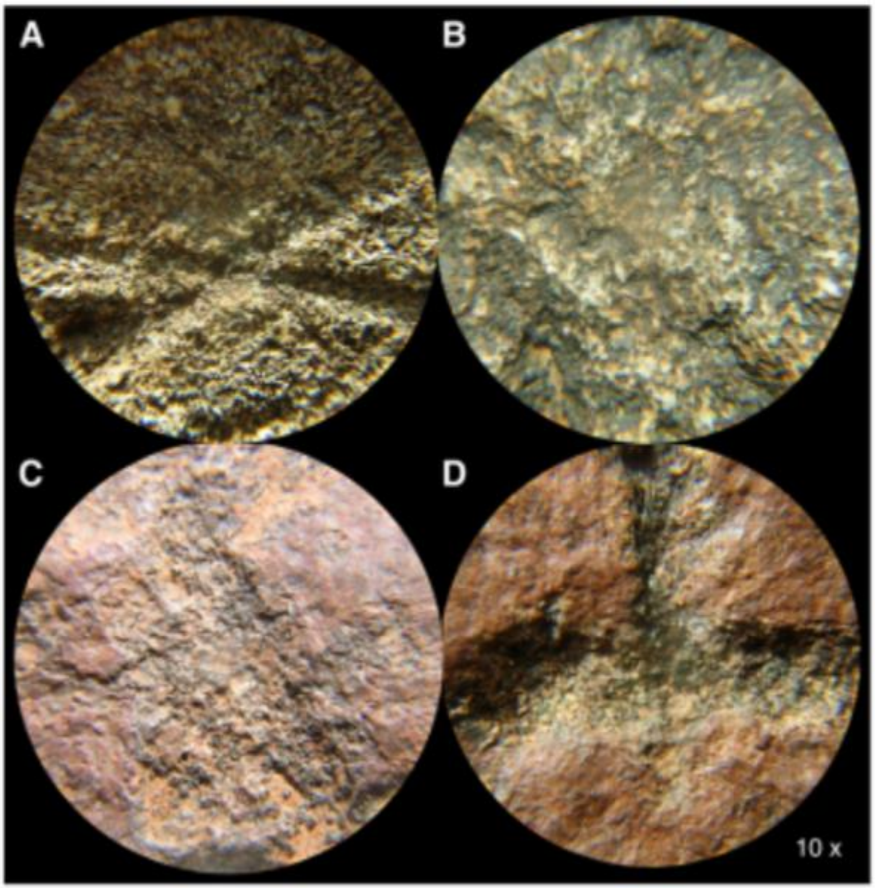

Plate 17: Examples of plough tyne marks on A) long term weathered rock surfaces; B) weathered bedrock with spotted patina; C) manganese and iron oxide bearing rocks with relict varnishes; and D) iron and manganese oxide bearing rocks with black and red varnishes (Ciampalini *et al*. 2008:22).

2.7 Methodology and Approaches Used to Investigate Potential Ground Surfaces at Wilpinjong Coal Mine

Multiple independent lines of evidence were used to re-examine the *in-situ* surfaces previously reported to be Aboriginal grooves at site WCP730 at Wilpinjong Coal Mine. These included contextual observations, macroscopic assessments and microscopic analysis using low and high powered microscopy.

In all assessments, consideration of the extrinsic and intrinsic attributes informed understandings of each feature and its potential origin. Extrinsic features, such as the topographical and spatial context (eg. land surface), association with and similarity with nearby natural features, association with known Aboriginal sites and recent non-Aboriginal rural land-use practises, were considered under 'landscape context'. Intrinsic attributes, such as macroscopic morphological detail and microscopic surface features (polish and striations) were recorded using portable digital microscopy.

The observations address the criteria outlined in Sections 2.4 - 2.6 and correspond with the developed flow chart assessment (refer to Figures 6 and 7). Integration of these approaches was necessary for creating a hierarchy of evidence, thereby strengthening the resulting interpretations. Importantly, while some individual attributes may be consistent with a groove being possibly or probably of Aboriginal origin, there are a number of fundamental attributes which if present, preclude the feature being a grinding groove of Aboriginal origin. These include a curved groove, a groove that is non-symmetrical around the long axis and un-altered or non-modified matrix grains at the microscopic level.

Details of landscape context (eg. noting recent erosion), proximity to water, clustering or otherwise and distance to other known sites were recorded. Importantly, the appearance and condition of nearby rocks was noted, in particular with respect to weathering, erosion and evidence of mechanical damage. All potential WCP730 ground surfaces were cleaned with a nylon brush to remove recent soil and debris accumulation. Physical descriptions of the potential ground surfaces of Aboriginal origin were documented, including the shape of the feature after cleaning, the symmetry, cross-sectional shape, dimensions of length, width and depth and the surface topography.

In addition, the host bedrock and nearby or adjacent surfaces were examined to compare and record any differences in surface topography between these surfaces and potential ground surfaces. The host bedrock and the nearby or adjacent surfaces form a control and comparisons with these controls allow for a more accurate understanding of potential modification that has occurred across the surface being assessed.

Microscopic assessments of use-wear were conducted utilising a hand-held Dino-Lite AM413T USB digital microscope and a hand-held Dino-Lite polarising AM4113ZT microscope at various magnifications (45 – 190 times) (Plate 18). Observations included the general surface topography, modified matrix grains, the presence and/or absence of striations, polish (resulting from tribochemical interactions) and the presence of any residue build-up within the interstitial spaces. As discussed in Section 2.3, the matrixes and voids of ground surfaces provide an ideal environment for the trapping of residues (Buonasera 2007:1379).

Similar control comparisons were made between the surface being assessed and adjacent non-modified surfaces across the host bedrock. To further enhance the microscopic investigations of potentially modified ground surfaces, z-stacked (also known as focus-stacking) images were taken. This process involved taking several photos at a range of magnifications across one axis and then "stitching" the images together. Z-stacking enhances the depth of field and allows microscopic investigations of three dimensional surfaces typically associated with a groove.

Plate 18: Birgitta Stephenson (ITGA) conducting Dino-lite microscopic examination of potential grooves at WCP730.

To extract trapped residues, a series of lifts or extractions were performed across the matrix of the potential ground surface. Ultra-purified water was used as the lifting medium. A variable volumetric pipette was employed to deliver 20 µL aliquots of ultra-purified water to a porous area on the ground surface (a crack or pitting). This was left to soak. This process was repeated a number of times over a 10 to 15-minute period depending on the porosity of the surface. A second pipette was used to agitate the soaked surface area and to draw back and resoak ultra- purified water on the lift area. A venturi effect is created with the process being repeated a number of times until a sample of the water containing extracted residues was drawn up and placed in a 1.5 millilitre micro-centrifuge tube. Six samples were extracted. These included a sample from the centre of each potential groove and a control sample from the adjacent west and east sandstone non-ground surfaces.

To confirm that a residue is use-related, extractions from nearby non-ground surfaces were taken to allow for comparison of residue densities. It is assumed that if the densities of similar residues are significantly higher across the ground surface extraction, then these residues are use-related. Density differences are also a useful measure to eliminate the possibility of ground residues being the result of contamination from surrounding sediments (see Atchison and Fullagar 1998:121).

In the laboratory, the extractions were transferred to slides using a standard wet mount procedure. The slides were covered by pre-cleaned petrie dish lids and dried under lights. Using protocols specifically developed by ITGA the dried slides were stained with dilutions of Picrosirius Red. The introduction of biochemical staining therefore, which relies on colorimetric changes rather than structural features, overcomes many of the issues associated with previous approaches and allow previously unrecognised or overlooked ground residues to be identified (Stephenson 2015:242). High-powered microscopy (200-400 times) using a Leitz Dialux 22 microscope with polarising capability was used to examine the stained slides. A Tucsen ISH 500 camera was used to photograph lifted residues in plane (pp), part polarised (part pol) and cross-polarised (xp) light at magnifications of 250x (times) and 400x.

3. RESULTS

This section details the results of the reassessment of the previously reported grinding groove location WCP730.

WCP730 has previously been described as an exposed "sandstone boulder surface" housing four grooves, located with an open aspect in the valley of an east facing slope (refer to site description in Appendix 1 and Navin Officer 2017). The site was re-located on 3 May 2019 (Plates 19 – 26). Of note the light grey margins of the host sandstone bedrock demonstrate that the stone has been further exposed over time (Plate 23). This is significant as the potential grooves do not continue into these newly exposed margins. The exposed bedrock is approximately three metres west of an unsealed vehicle track which has been in use for at least a decade (Heesterman pers comm. 2019). The track deviates around a cluster of trees and a large damaged tree. The general landscape is modified and has previously been cleared and farmed, with the last wheat crop estimated to have been 30 years ago (Heesterman pers comm. 2019). The area is known to have been worked using a heavy disc plough with inner sclarifier spikes which are used to rip the soil (per comms Heesterman 2019).

The four potential grooves assessed were identified as Grooves 1, 2, 3 and 4 respectively. The approximated maximum dimensions of Groove 1 were 16 x 6 x < 1cm; Groove 2, 15 x 6 x <1cm; Groove 3, 13 x 10 x < 1cm and Groove 4, 10 x 4 x <1cm. The matrix associated with the high points across the sandstone bedrock host and the groove margins running north to south was observed to be different to the low points and bases of the grooves. The higher areas appeared to have been altered and/or impacted (Plate 19). Lichen material was observed across the surface of the boulder and the margins and some natural weathering was visible. There were no similar boulders or exposed bedrock in the nearby vicinity.

Plate 19: Overview of WCP730 (facing south).

Plate 20: Profile view of WCP730 (facing west).

Plate 21: Overview of WCP730 after rain (facing north).

Plate 22: Part profile view of WCP730 after rain (facing north).

Plate 23: Close up of section of WCP730 host rock with newly exposed margins.

Plate 24: Landscape context of WCP730 (view east toward nearby track and current mining).

Plate 25: Landscape context view of WCP730 (facing west).

Plate 26: Landscape context facing north WCP 730 towards extent of current mining.

3.1 Groove 1

Groove 1 was noted to have a fan shape as well as a three groove like impressions running at various angles to the main groove (Plate 27 – 29). The recorded branching groove-like features were observed morphometrically similar with one of the features curving. These smaller grooves were characteristically similar to tyne marks (see Plate 17). The larger groove was a wide u-shaped feature that was observed to pan out. The northern margin was approximately 4 cm and the southern margin was approximately 6 cm (Plate 27). There was no initiation or termination of the groove. The base of the groove was undulating and the surface was irregular.

Observations of the potential modified surface associated with Groove 1 using the Dino-lite microscope included large areas of intact matrix grains within natural sandstone tessellation features (Plates 30 – 32). The matrix grains were seen to be angular, varying in size and non-modified. Features associated with grinding such as surface rounding and/or levelling were absent. Striations and polish were absent. The surface topography was seen to be irregular and undulating. Residue material was not noted within the interstitial spaces. These features were similar to the adjacent non-modified surface and are not indicative of a ground surface.

Plate 27: Overview of Groove 1 WCP730.

Plate 28: Overview of Groove 1 and Groove 2 WCP730.

Plate 29: Profile view of Groove 1 WCP730.

Plate 30: Groove 1, undulating base with intact matrix grains and natural sandstone tessalation features 42x oblique lighting.

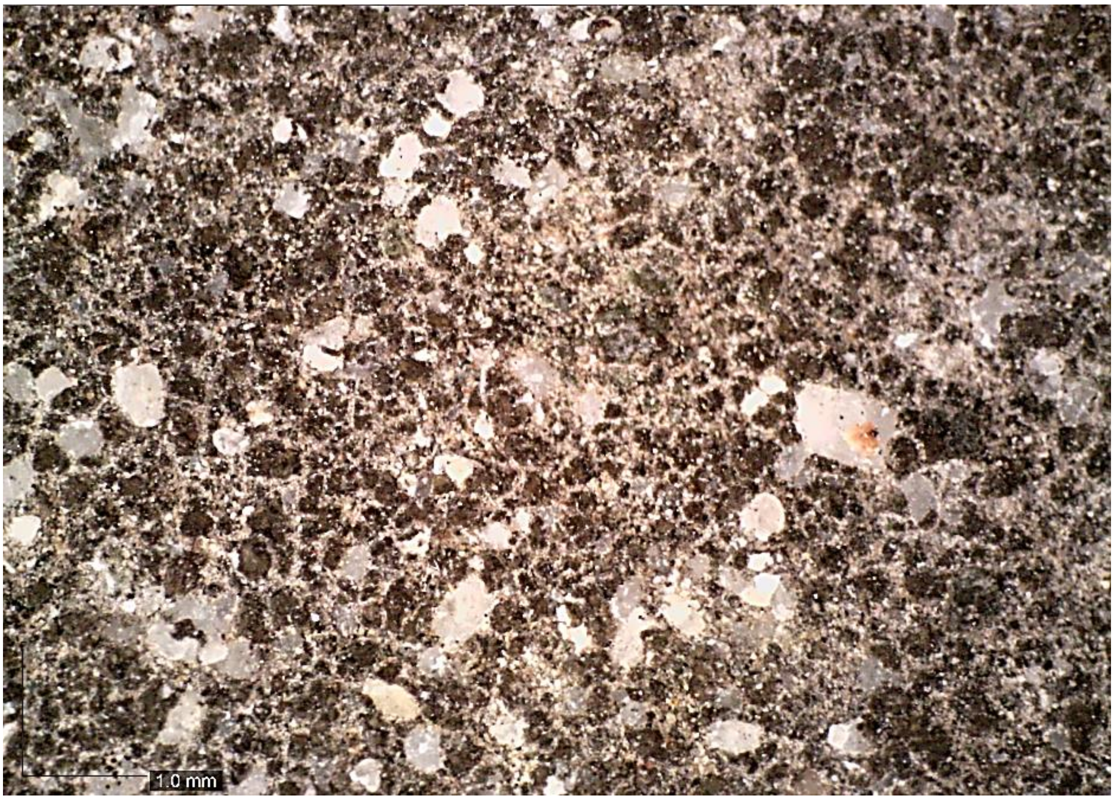

Plate 31: Groove 1, natural sandstone tessalation features and intact matrix grains (46x xp).

Plate 32: Groove 1, exposed natural matrix grains (43x natural lighting).

Although the surface does not have the characterisitics of a ground surface, for completeness a sample was extracted from the centre of Groove 1 and from the nearby adjacent non-modified eastern surface (Plate 33).

The samples were prepared, plated and stained as described in Section 2.7 and examined using high-powered microscopy. Residues noted included matrix grains, carbonised material and an isolated plant fibre (Plates 34 – 37). The combination and density of residues was not indicative of a processing event. The noted density of residues was similar across the proposed modified surface and the control extractions, which similarly indicates that the noted residues are not related to use. The majority of the minerals were observed to be intact with a small number displaying features of natural weathering. The isolated plant fibre was intact and is considered to relate to environmental influences/contamination. Similarly, the carbonised material is considered to relate to environmental influences such as wild fire.

The noted use-wear and the absence of use-related residues indicate that Groove 1 has not been purposely modified or utilised and is very unlikely to be a groove of Aboriginal origin. A summary of the criteria used and associated assessment is presented in Section 4.

Plate 33: Extraction area Groove 1, WCP730.

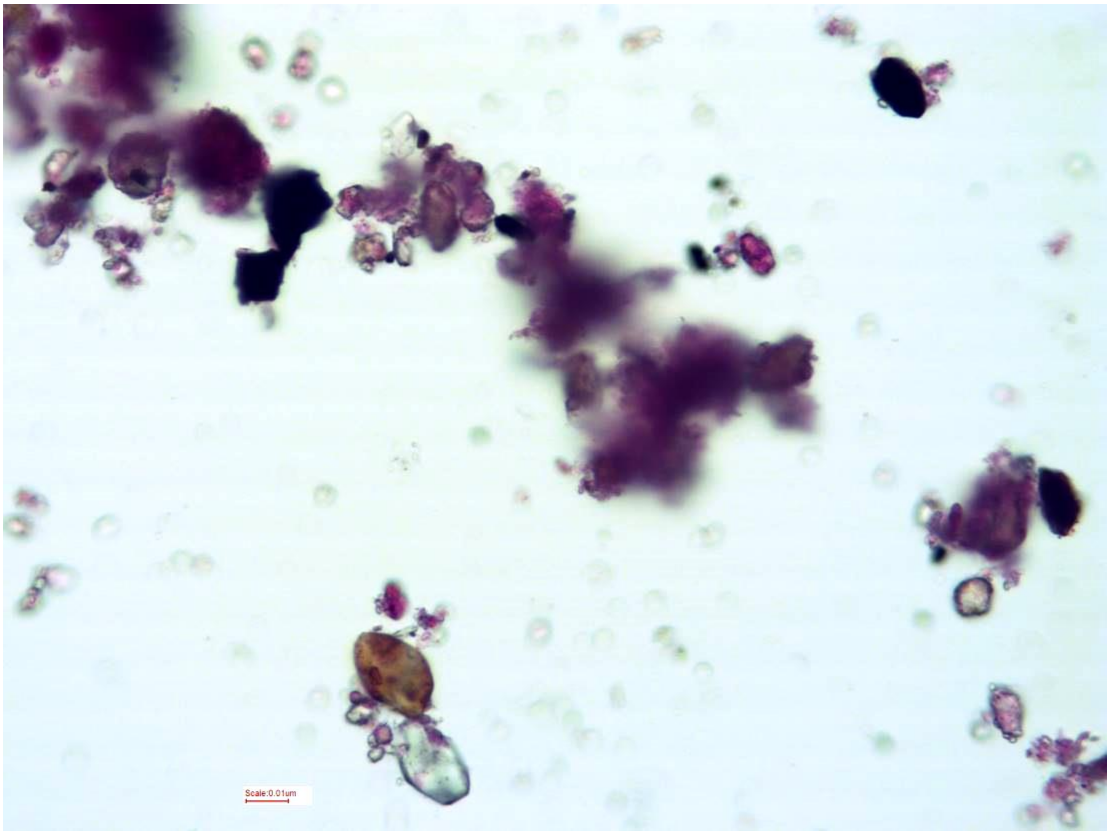

Plate 34: Groove 1, natural minerals and carbonised material (400x pp).

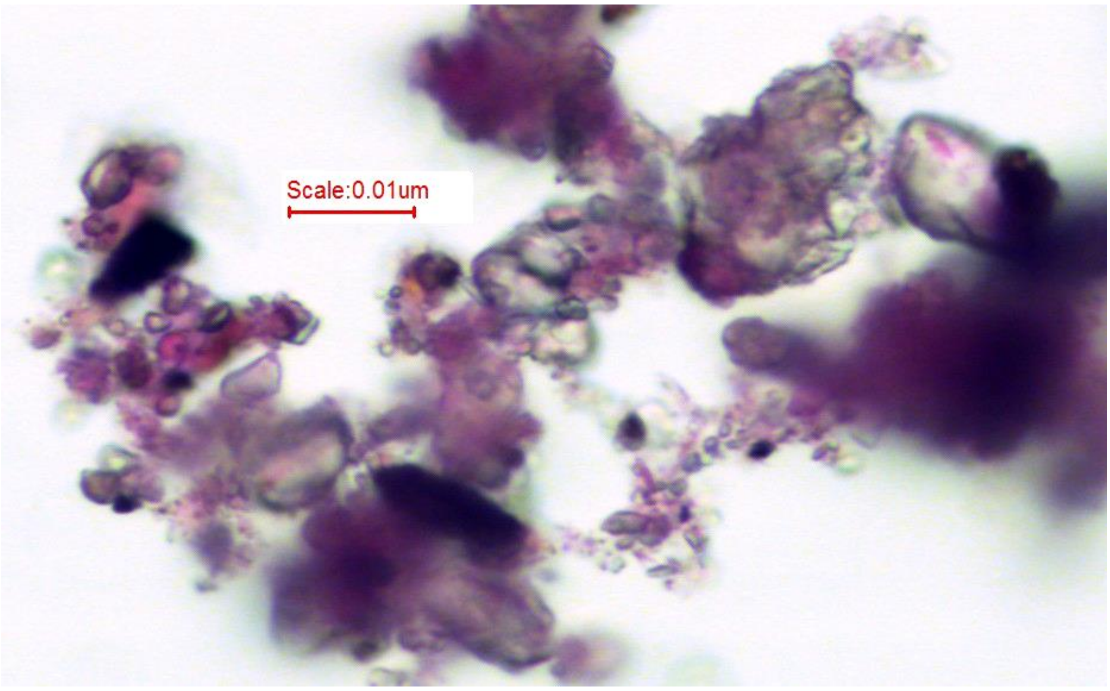

Plate 35: Groove 1, enlarged image of intact matrix minerals and carbonised material (400x pp).

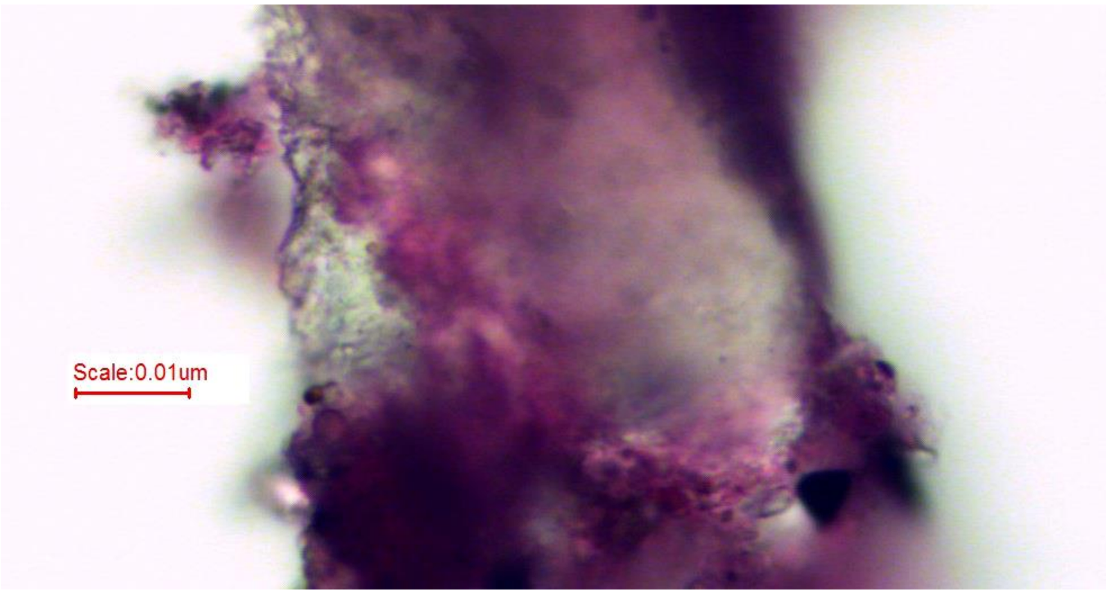

Plate 36: Groove 1, enlarged image of a section of weathered matrix grain (400x pp).

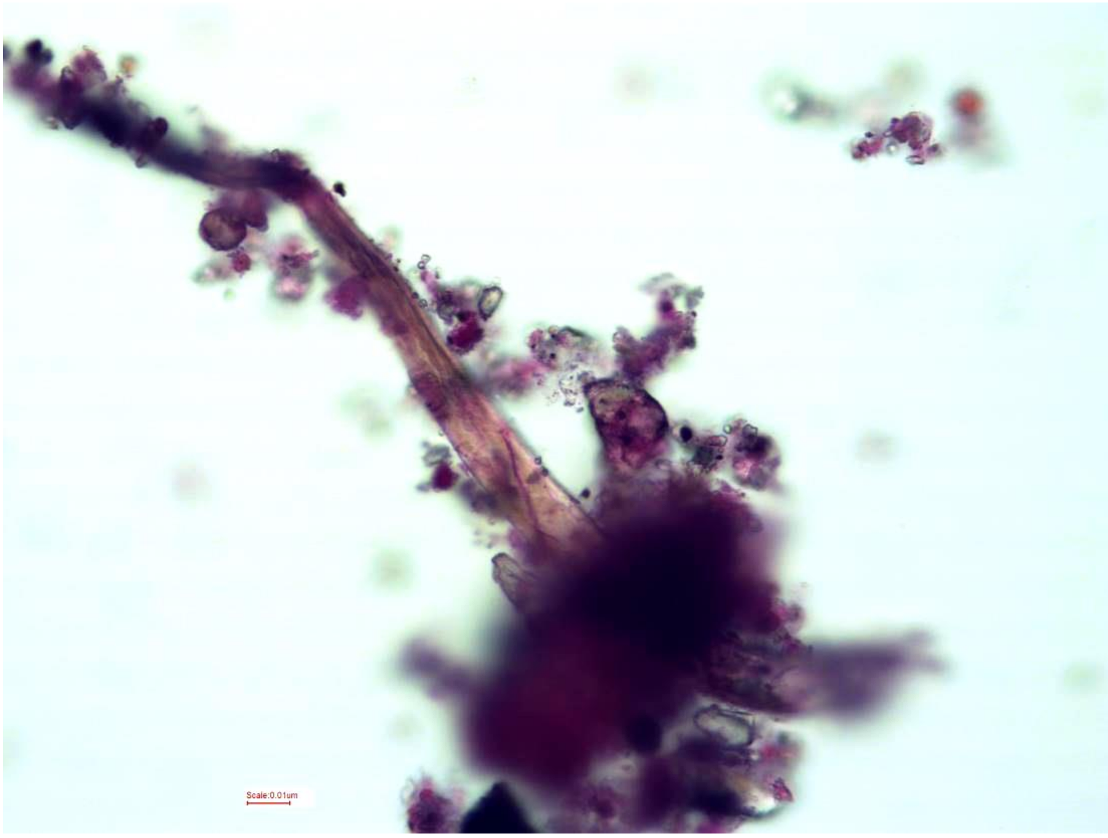

Plate 37: Groove 1, intact plant fibre (400x pp).

3.2 Groove 2

Groove 2, WCP370 was noted to have a fan shape with the northern margin approximately 3cm and the southern margin 6cm (Plates 38 and 39). There was no initiation or termination of the groove. The base of the groove was undulating and the surface was irregular. Notably, the groove did not continue across the more recently exposed southern bedrock margin. The groove was not symmetrical around the central axis. The high points across the longitudinal margins of the groove appeared to have been evenly impacted which is indicative of machinery contact.

Observations of the potential modified surface associated with Groove 2 using the Dino-lite microscope included large areas of intact matrix grains, clusters of natural, non-polished quartz matrix crystals and a potential ripped/impacted area (Plates 40 – 42). Striations and polish were absent when observed with oblique lighting. Matrix grains were angular and varied in size, indicative of natural grains. Polish and rounding were not associated with the observed clusters of quartz minerals. There were areas of ripping or missing matrix grains. Of note, the matrix grains adjacent to these areas were intact and did not display evidence of working/modification. The ripping may potentially be linked to machinery impacts such as heavy disc ploughs with inner sclarifier spikes which are known to have been used in this area. The general surface topography was irregular and undulating. Features associated with grinding such as surface rounding, tribochemical wear and /or levelling were absent. Likewise, striations and polish were not observed. Residue material was not noted within the interstitial spaces. These observations are not indicative of ground surface modifications associated with Aboriginal use.

Plate 38: Overview of Groove 2, WCP730.

Plate 39: Profile view of Groove 2, WCP730.

Plate 40: Groove 2, natural matrix grains, some potential ripped/impacted areas (58x oblique lighting).

Plate 41: Groove 2, clusters of natural quartz matrix crystals, undulating surface (75x pp).

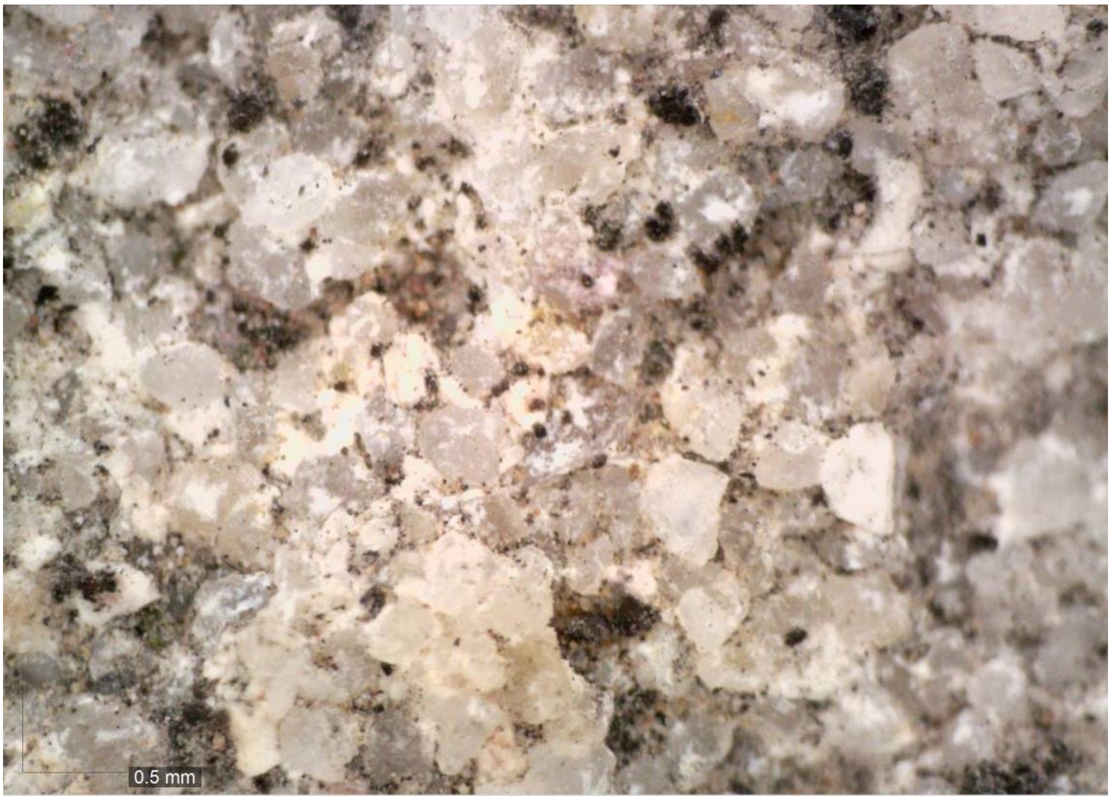

Plate 42: Groove 2, quartz matrix clusters, natural grains unpolished (75x xp).

Although the surface does not have the characterisitics of a ground surface, for completeness a sample was extracted from the centre of Groove 2 and residue material was compared to the control sample extracted from the eastern area of the bedrock (Plate 43). Residues noted included matrix grains, carbonised material, an isolated phytolith and an isolated plant fibre (Plates 44 – 47). The density and combination of residues noted was not indicative of a processing event. As seen with Groove 1, the noted density of residues was similar across the proposed modified surface and the control extraction which indicates that the residues are not related to use. The majority of the minerals were observed to be intact. A few minerals were noted to have micro-fractures and cracking that is frequently seen with hard impact. The matrix adjacent to these damaged minerals was intact. If the damage was related to grinding it would be expected that the adjacent matrix would display evidence of modification such as polish or levelling. This is not evident, therefore it is likely that the noted damage across a few matrix grains relates to machinery impacts. The isolated structured plant fibre, phytolith and carbonised material are considered to relate environmental influences.

The noted use-wear and the absence of use-related residues indicate that Groove 2 has not been purposely modified or utilised and is very unlikely to be a groove of Aboriginal origin. A summary of the criteria used and associated assessment is presented in Section 4.

Plate 43: Sample extraction area Groove 2, WCP730.

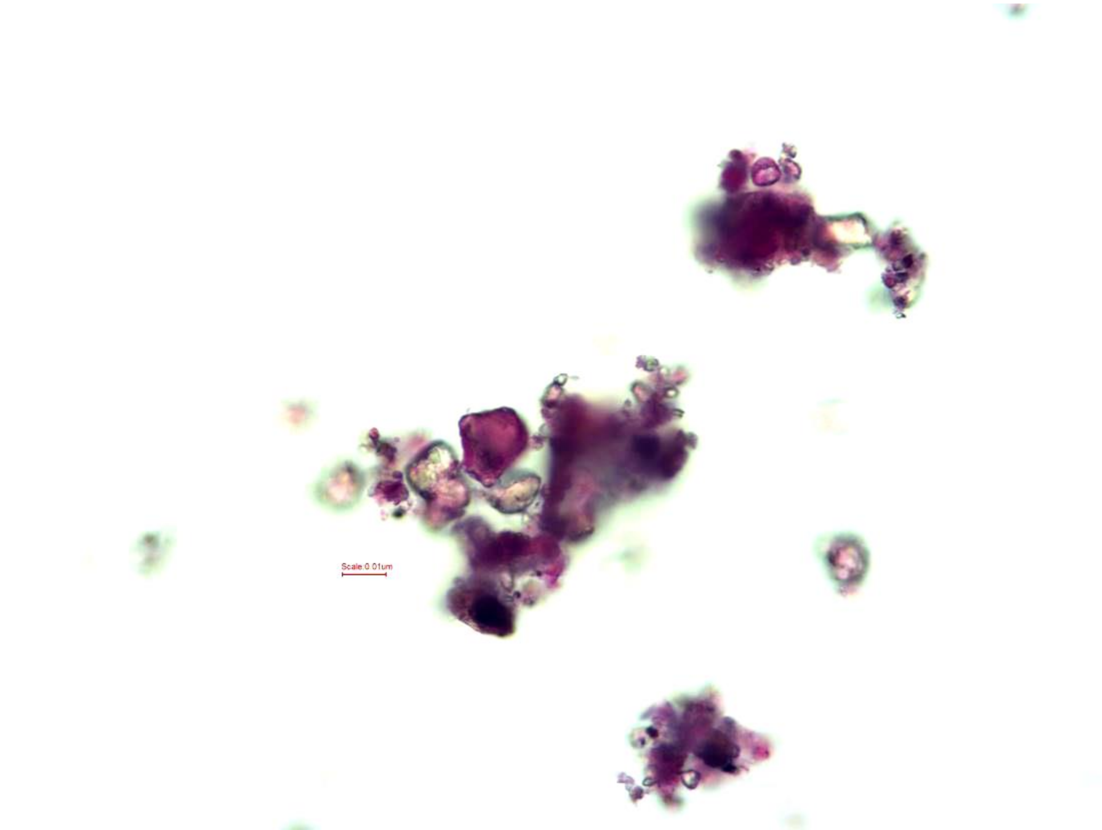

Plate 44: Groove 2, natural matrix grains and carbonised material (400x pp).

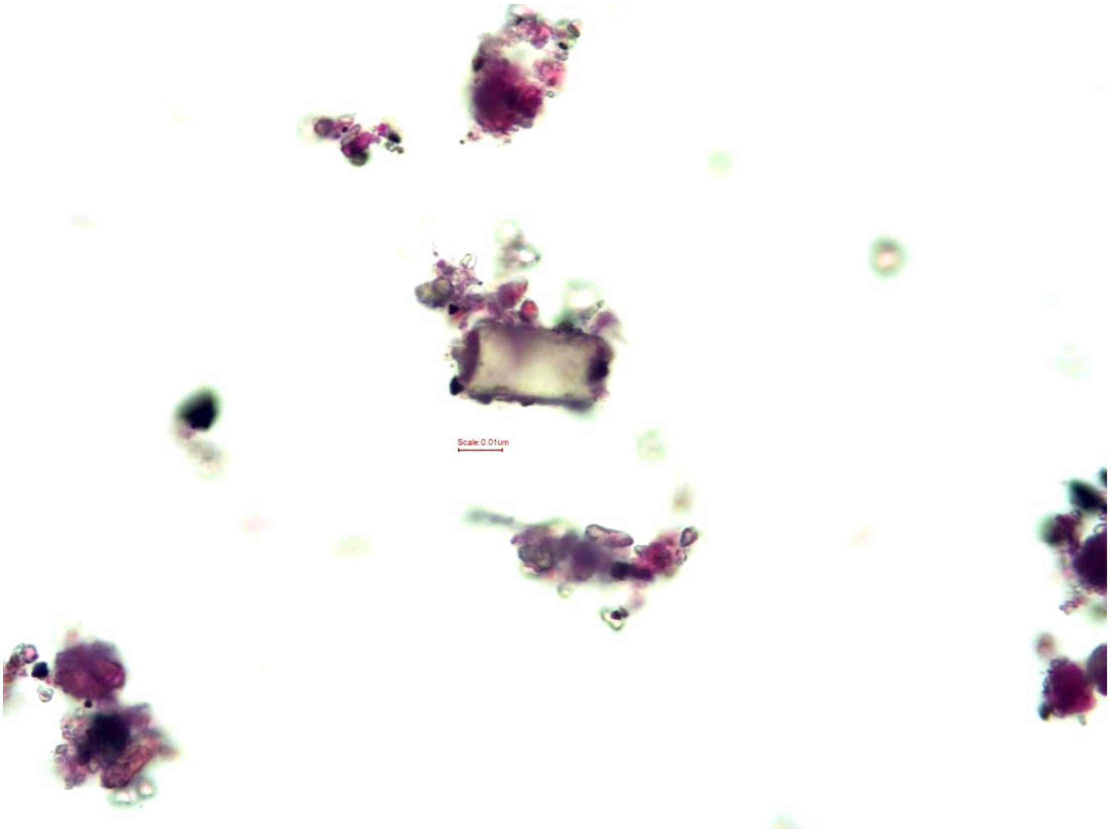

Plate 45: Groove 2, isolated rod-shaped phytolith (400x pp).

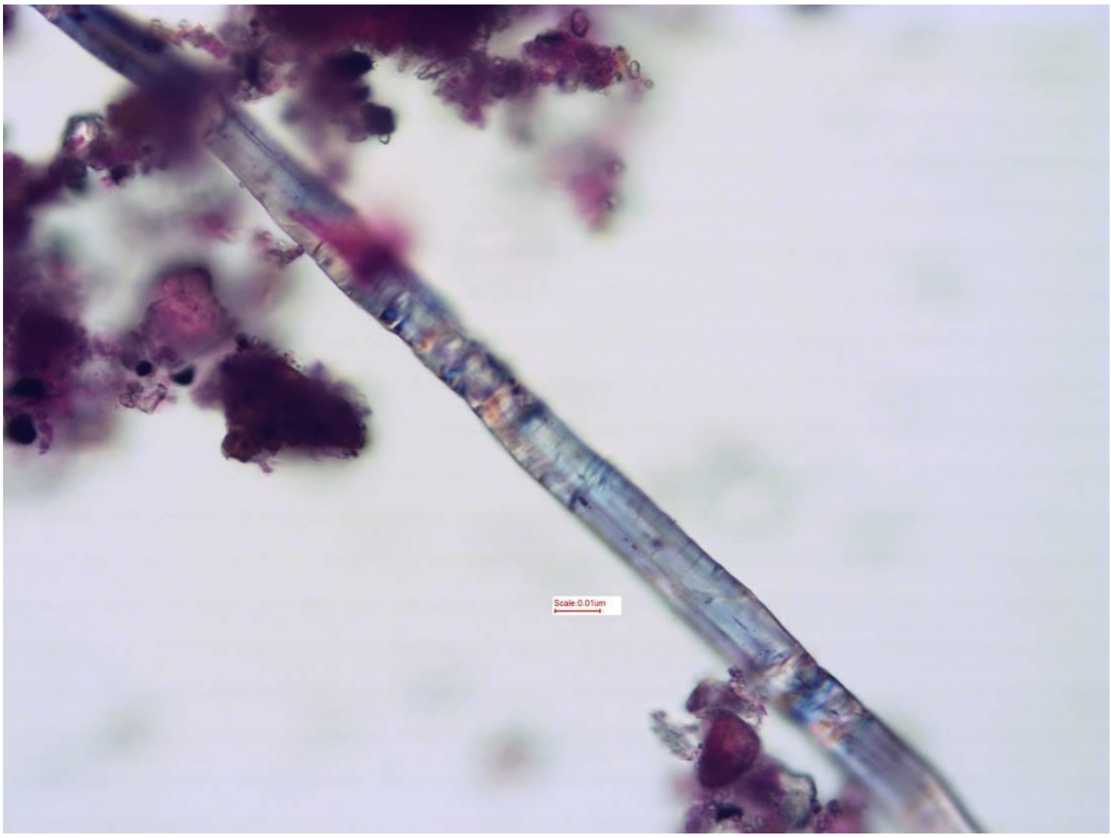

Plate 46: Groove 2, isolated structured intact plant fibre (400x pp).

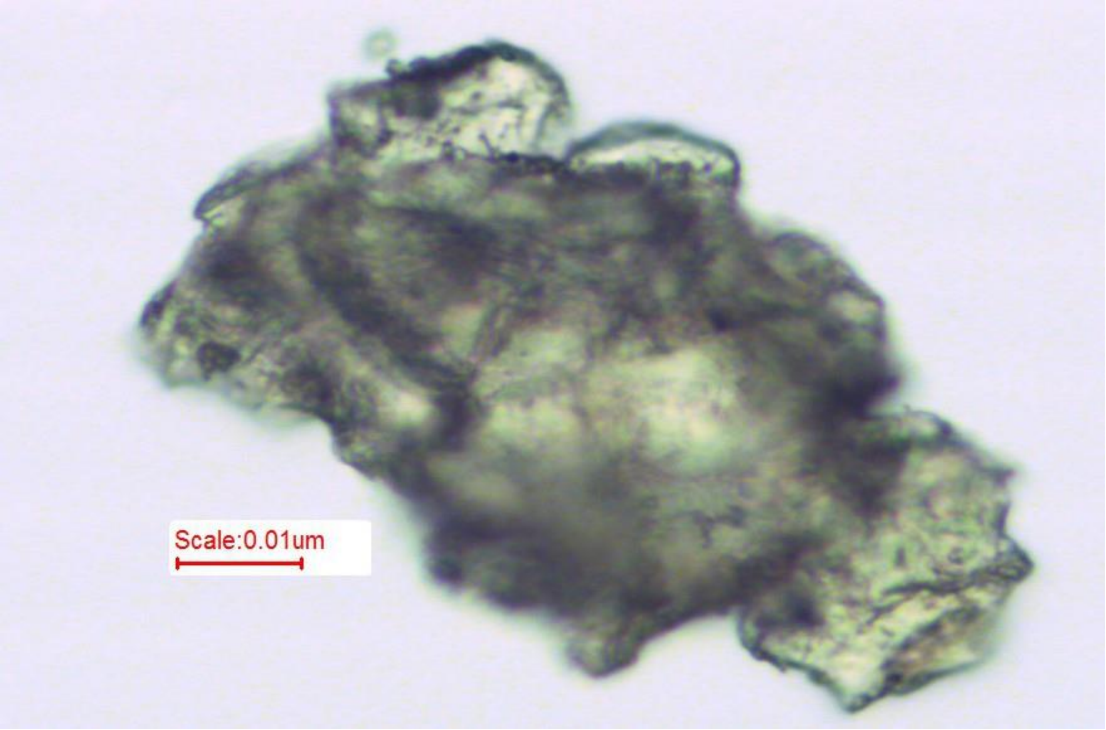

Plate 47: Groove 2, enlarged image of potential damaged/impacted matrix grain (400x pp).

3.3 Groove 3

Groove 3, WCP370 is a large depression within the bedrock with an approximate width of 10cm (Plates 48 and 49). The width of 10cm is outside the average lengths/margins of top stones generally. The depression had a wide shallow "U" shaped base. This was not uniform across the whole area with a number of undulations across the surface. Similar to Groove 2, the groove did not continue across the more recently exposed southern boulder margin and it was not symmetrical around the central axis. The high point bordering the groove appear to have been evenly impacted which is indicative of machinery contact. The surface was relatively rough.

Observations of the potential modified surface associated with Groove 3 using the Dino-lite microscope were similar to Grooves 1 and 2 and included large areas of intact matrix grains, non-polished quartz matrix crystals and an undulating surface (Plates 50 and 51). Natural sandstone matrix tessellations were noted. Striations and polish were absent when observed with oblique lighting. Matrix grains were angular and varied in size indicative of natural grains. The general surface topography was irregular and undulating. Features associated with grinding such as surface rounding, tribochemical wear and /or levelling were absent. Residue material was not noted within the interstitial spaces. These observations are not indicative of ground surface modifications associated with Aboriginal use.

Plate 48: Overview of Groove 3, WCP730.

Plate 49: Profile view of Groove 3, WCP730.

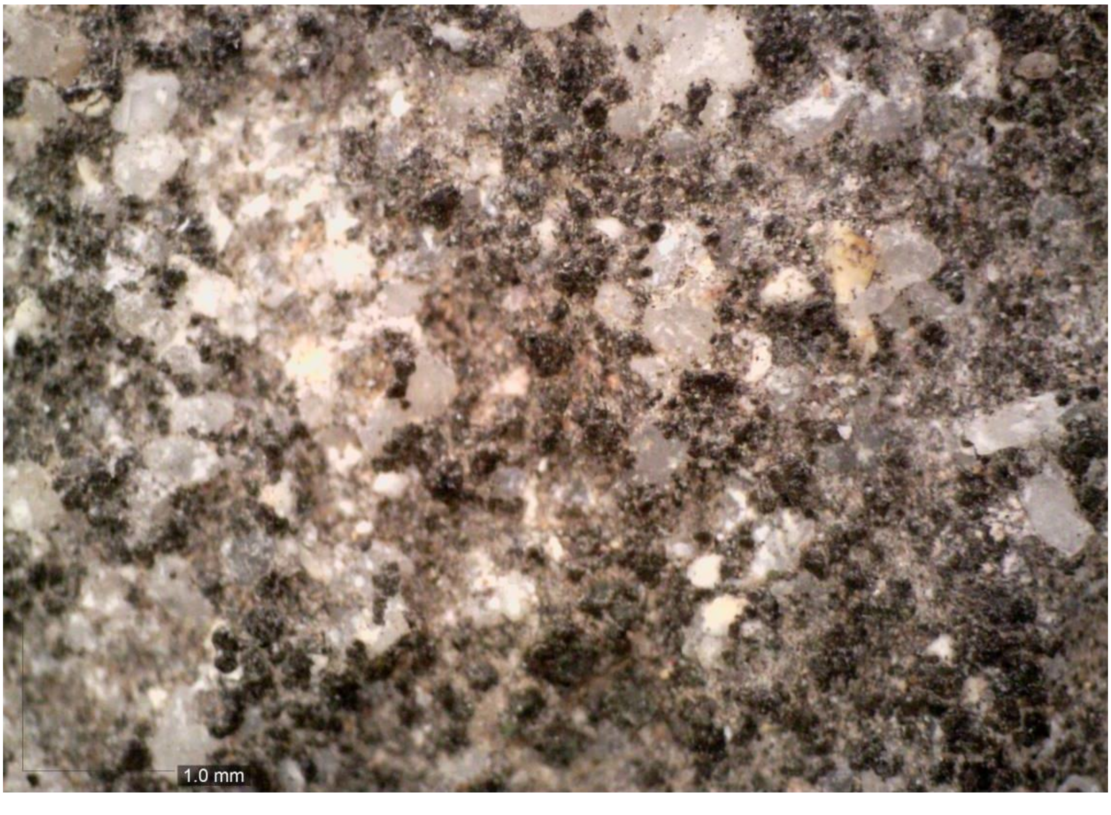

Plate 50: Intact matrix grains Groove 3, WCP730 (56x xp).

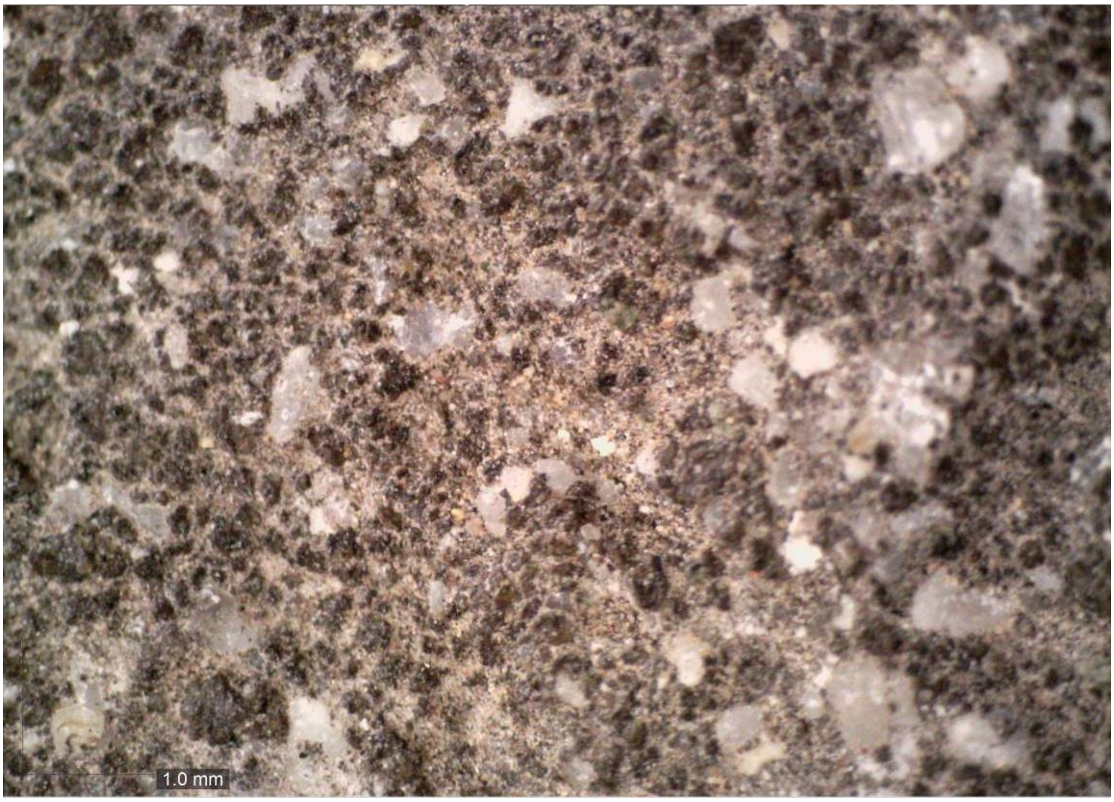

Plate 51: Groove 3, intact matrix grains and weathering tessellation sandstone patination (47x xp).

Although the surface does not have the characterisitics of a ground surface, for completeness a sample was extracted from the centre of Groove 3 (Plate 52) and residue material was compared to control samples extracted from the eastern area and western area of the bedrock. Residues noted included matrix grains, carbonised material, isolated phytoliths and weathered matrix grains (Plates 53 – 56). The density and combination of residues noted was not indicative of a processing event. As with the other grooves, the noted density of residues was similar across the proposed modified surface and the control extractions, indicating that the residues are not related to use. The majority of the minerals were observed to be intact. A few minerals were noted to have partially dissolved margins indicative of weathering. The isolated phytolith and carbonised material are considered to relate environmental influences.

The noted use-wear and the absence of use-related residues indicate that Groove 3 has not been purposely modified or utilised and is very unlikely to be a groove of Aboriginal origin. A summary of the criteria used and associated assessment is presented in Section 4.

Plate 52: Extraction area Groove 3, WCP730.

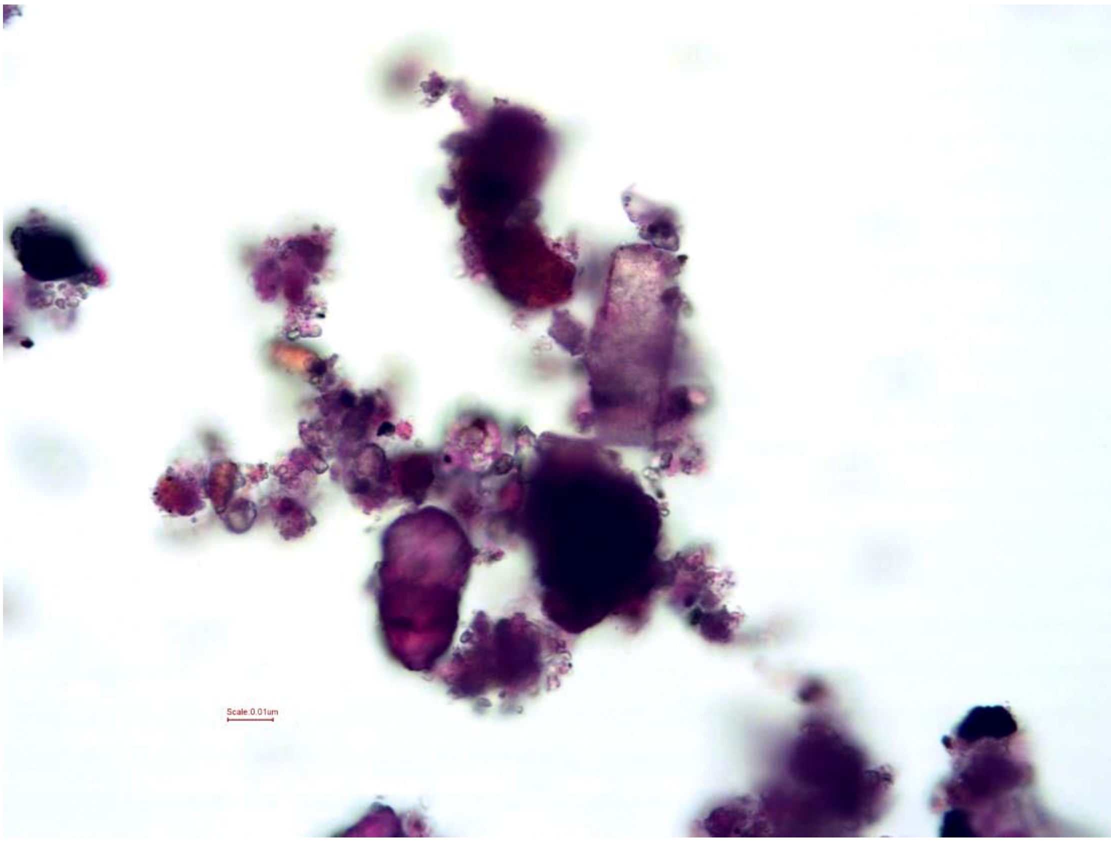

Plate 53: Groove 3, various natural matrix grains/minerals and isolated rod-shaped phytolith (400x pp).

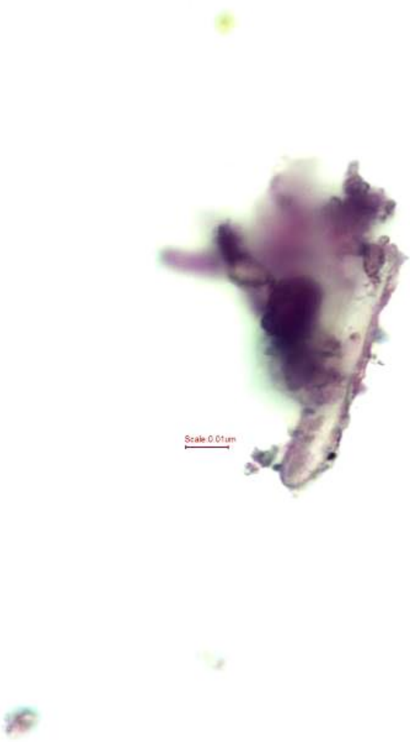

Plate 54: Groove 3, isolated rod-shaped phytolith (400x pp).

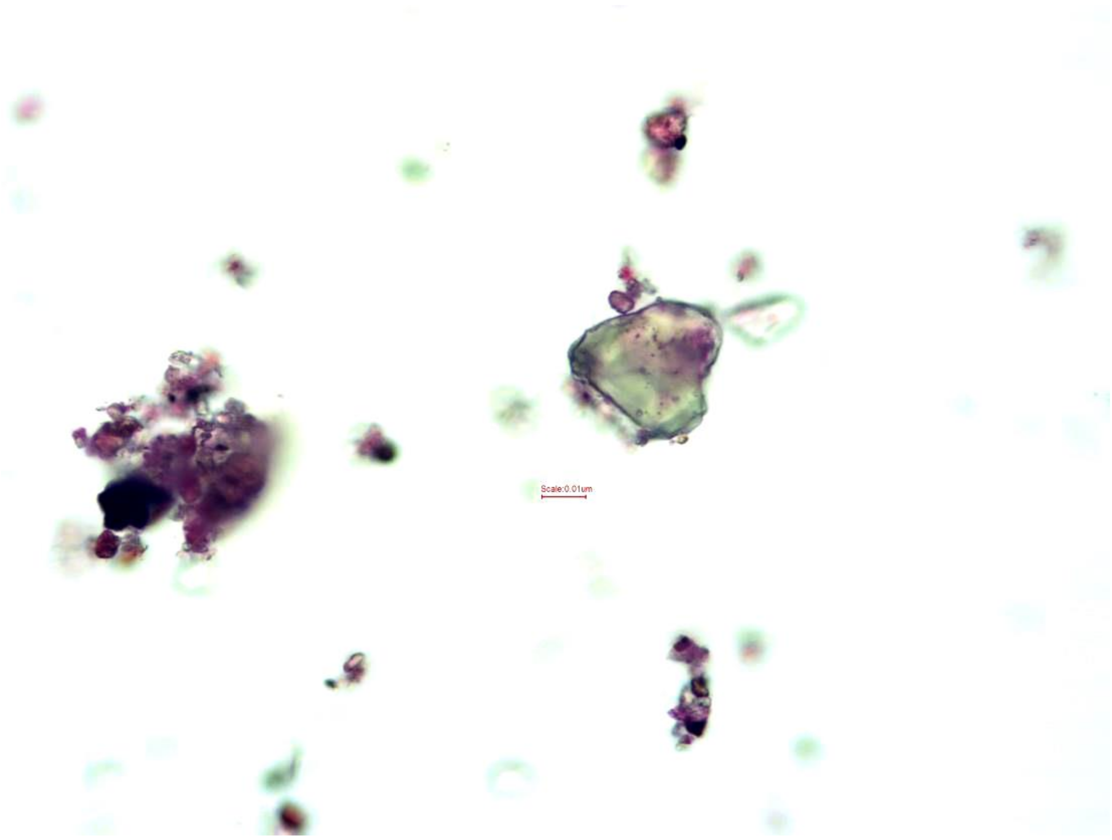

Plate 55: Groove 3, intact natural matrix minerals (400x pp).

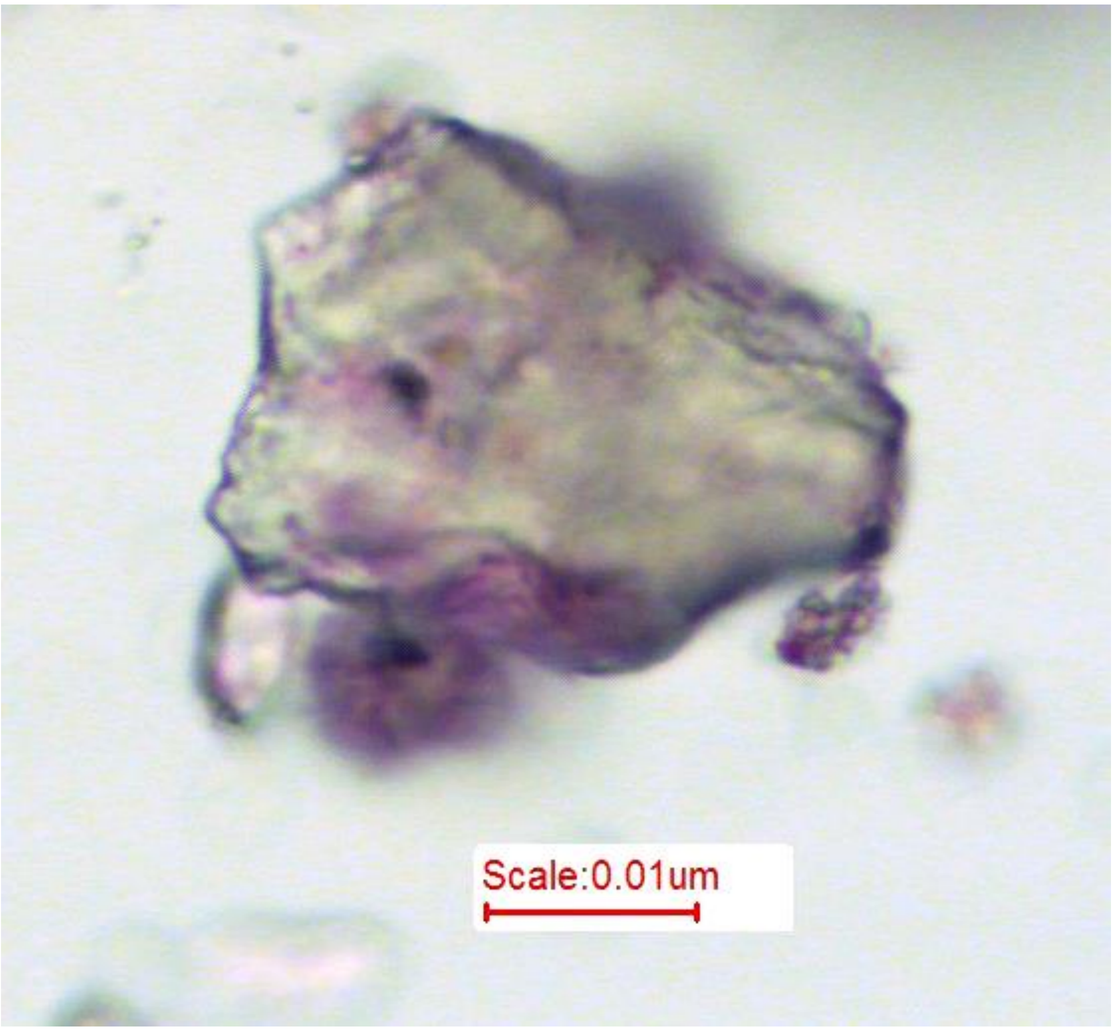

Plate 56: Groove 3, enlarged image of weathered matrix grain (400x pp).

3.4 Groove 4.

Groove 4, WCP370 is a smaller depression with a wide shallow "U" shaped base (Plates 57 and 58). Although the depression was symmetrical around the central axis the depression was fan shaped, the northern margin being 3cm and the southern margin 4cm. Weathering and lichen were noted across the depression. Similar to the other three grooves, the depression did not extend across the more recently exposed surface of the host bedrock. The high point bordering the groove appears to have been evenly impacted which is indicative of machinery contact. Polish or sheen were not noted macroscopically.

Observations of the potential modified surface associated with Groove 4 using the Dino-lite microscope included large areas of intact matrix grains, non-polished quartz matrix crystals, an undulating surface, lichen affected areas and natural sandstone tessellation (Plates 59 – 64). Striations and polish were absent when observed with oblique lighting. Matrix grains were angular and varied in size indicative of natural grains. The general surface topography was irregular and undulating. Features associated with grinding such as surface rounding, tribochemical wear and/or levelling were absent. Residue material was not noted within the interstitial spaces. These observations are not indicative of ground surface modifications.

Plate 57: Overview of Groove 4, WCP730.

Plate 58: Profile of Groove 4, WCP730.

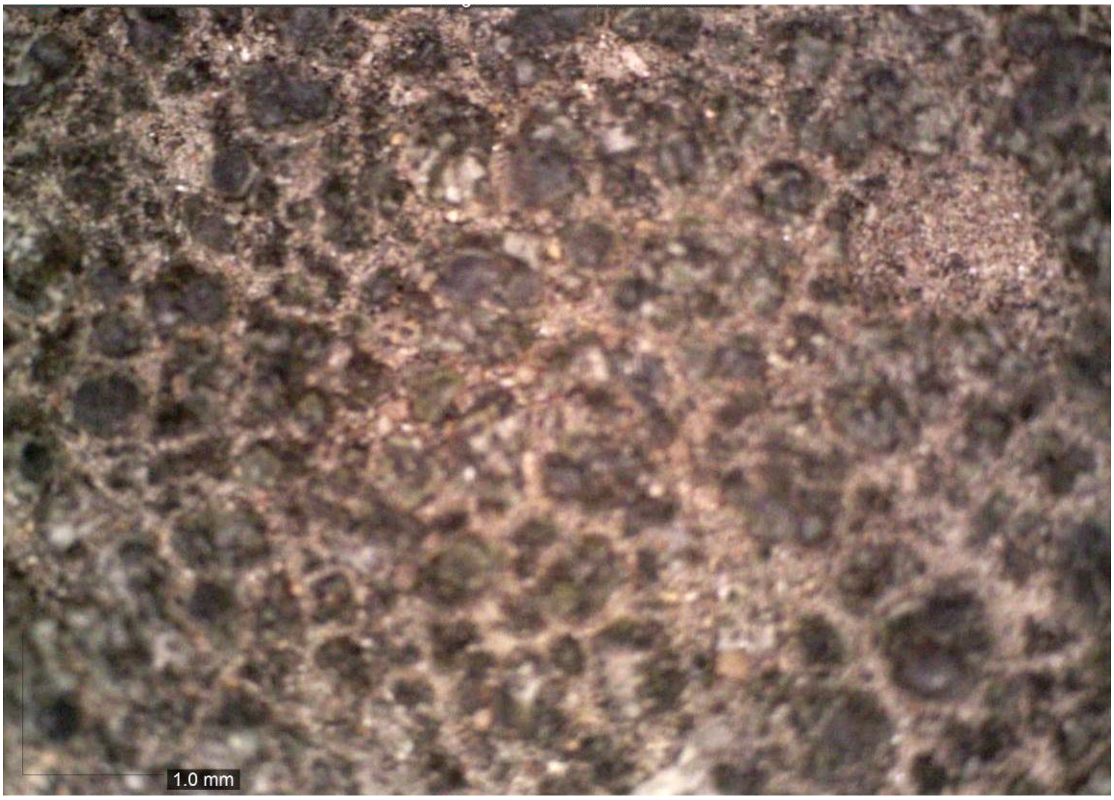

Plate 59: Base of Groove 4, WCP730, natural sandstone tessellation (61x pp).

Plate 60: Base of Groove 4, WCP730, natural matrix grains and lichen (61x pp).

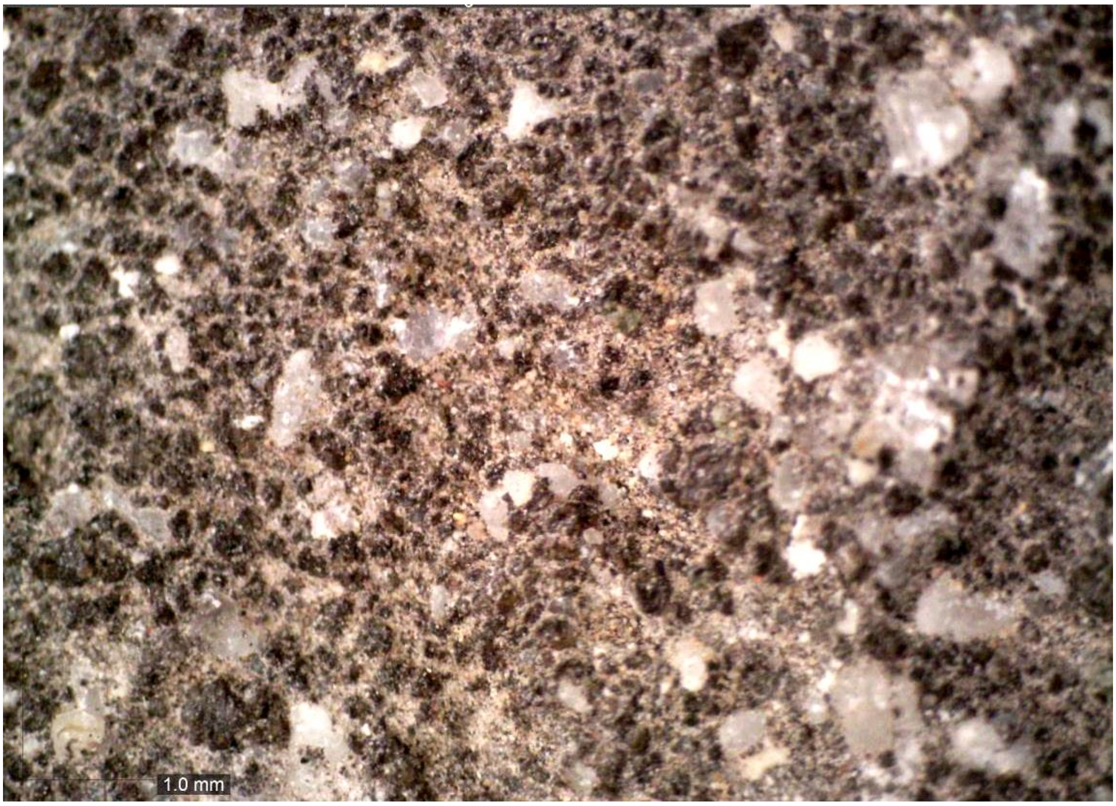

Plate 61: Natural matrix grains and sandstone tessellation patination, Groove 4 (47x xp).

Plate 62: Natural matrix grains and sandstone tessellation patination, Groove 4 (66x xp).

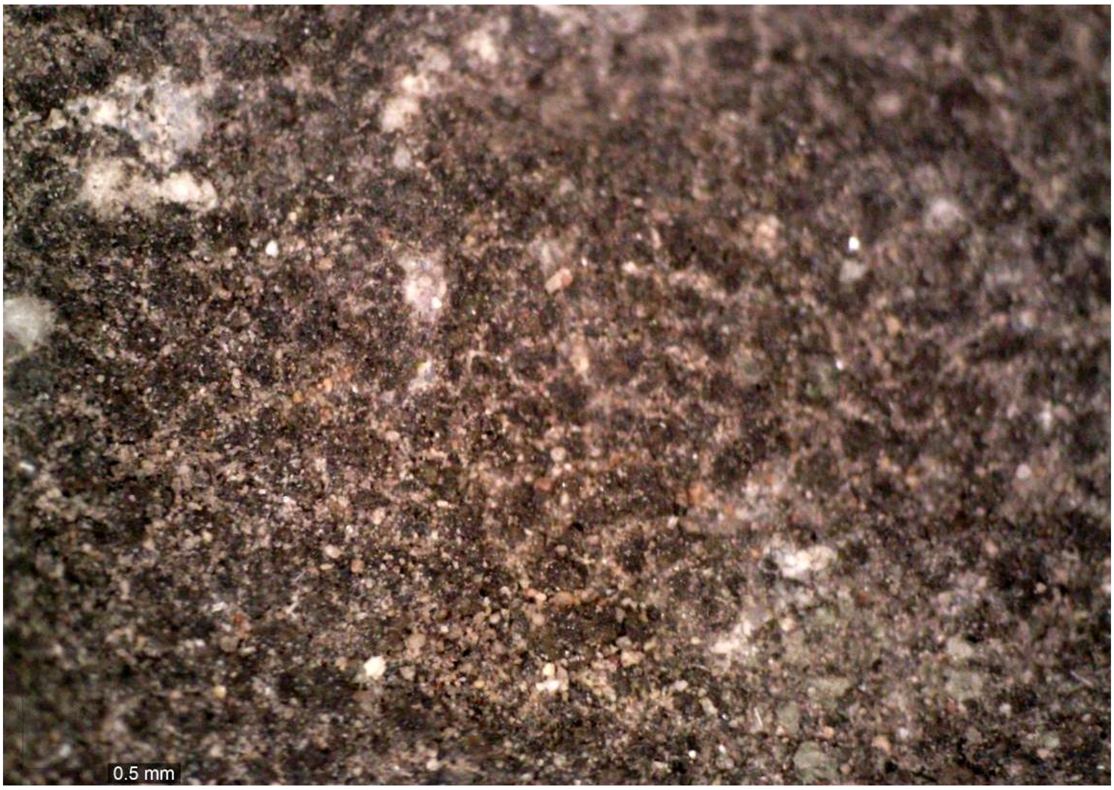

Plate 63: Natural matrix grains and sandstone tessellation patination non-modified control surface western area of bedrock (65x pp).

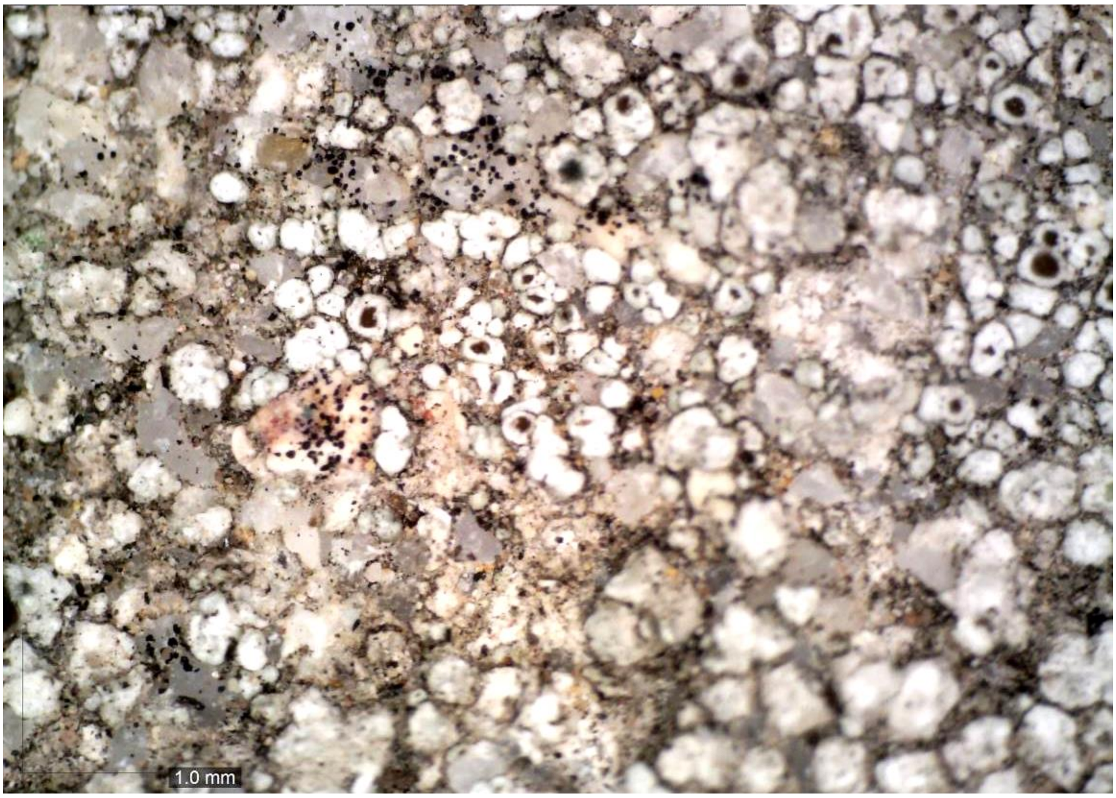

Plate 64: Lichen affected area of bedrock demonstrating the damage to the natural rock matrix (55x xp).

Although the surface does not have the characterisitics of a ground surface, for completeness a sample was extracted from the centre of Groove 4 (Plate 65) and residue material was compared to control samples extracted from the eastern area and western area of the bedrock. Residues noted included matrix grains, carbonised material, isolated rod-shaped phytoliths, isolated plant fibres and lichen (Plates 66 – 71). The density and combination of residues noted was not indicative of a processing event. As seen previously, the noted density of residues was similar across the proposed modified surface and the control extractions, indicating that the residues are not related to use. The majority of the minerals were observed to be intact. Lichen residues were noted across the extractions from the proposed ground surface and the control surface. Lichen may be responsible for some of the damage/weathering that can be macroscopically observed across the bedrock. Lichens are able to dissolve and disintergrate minerals and contribute to cracking within rock matrices.

The noted use-wear and the absence of use-related residues indicate that Groove 4 has not been purposely modified or utilised and is very unlikely to be a groove of Aboriginal origin. A summary of the criteria and associated assessment is presented in Section 4.

Plate 65: Extraction area Groove 4, WCP730.

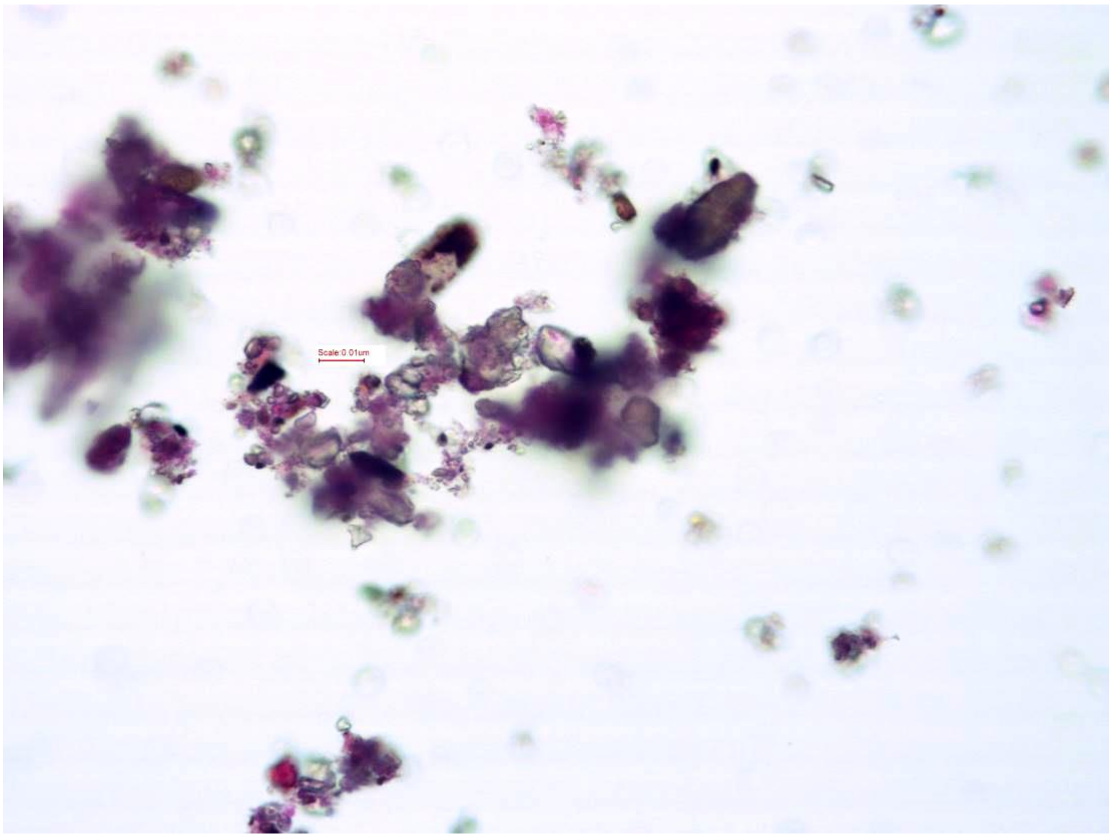

Plate 66: Various intact matrix minerals Groove 4, WCP730.

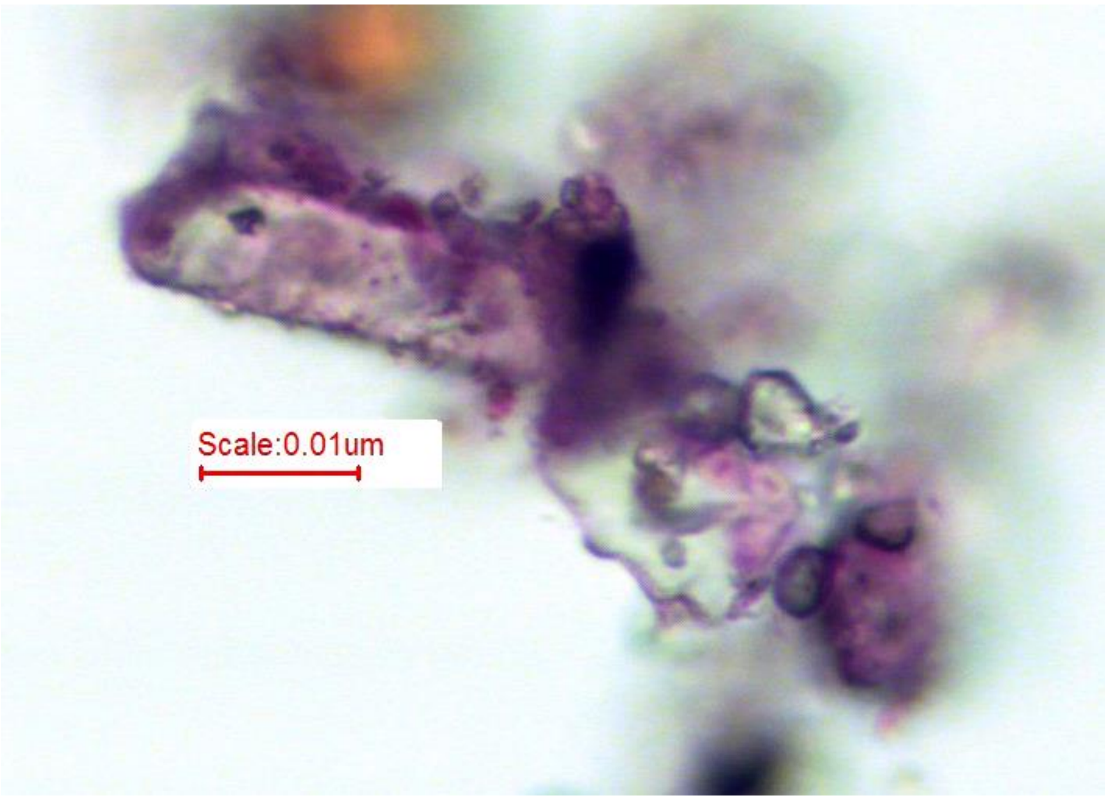

Plate 67: Groove 4, enlarged image of rod-shaped phytolith and quartz matrix mineral (400x pp).

Plate 68: Groove 4, enlarged image of isolated plant fibre (400x pp).

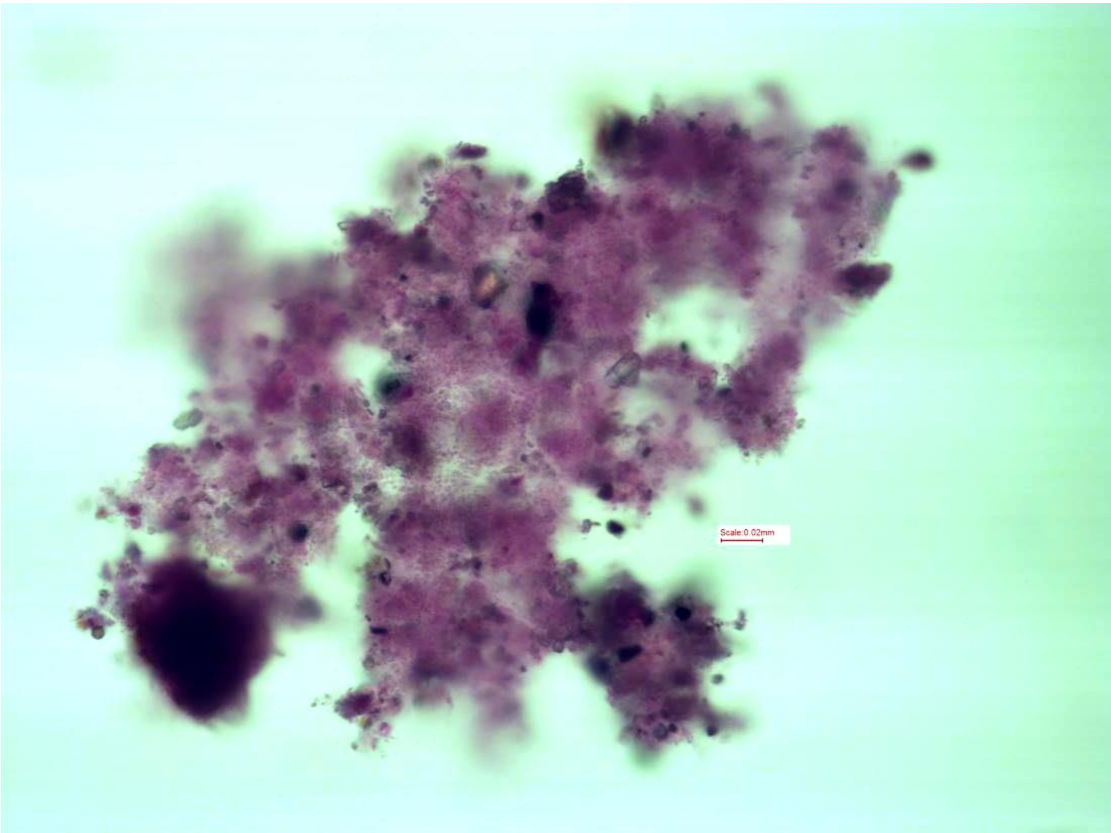

Plate 69: Lichen mass Groove 4 (250x pp).

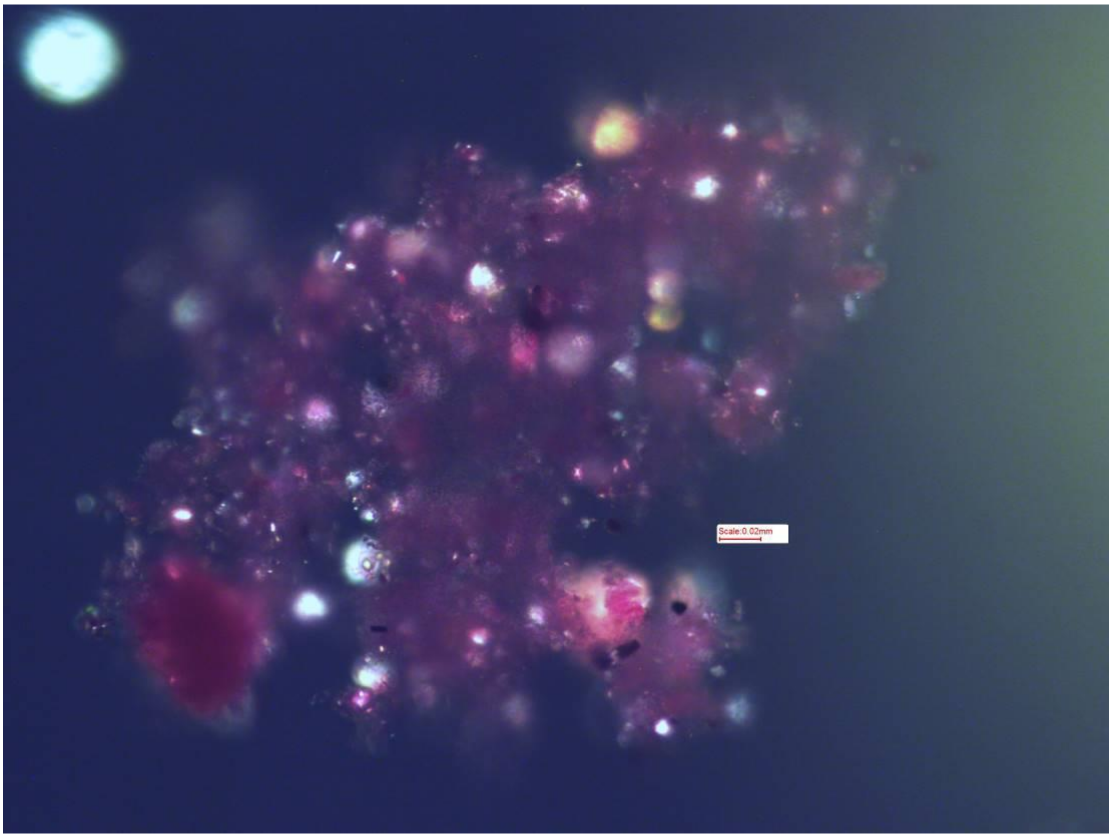

Plate 70: Lichen mass Groove 4 (250x pp).

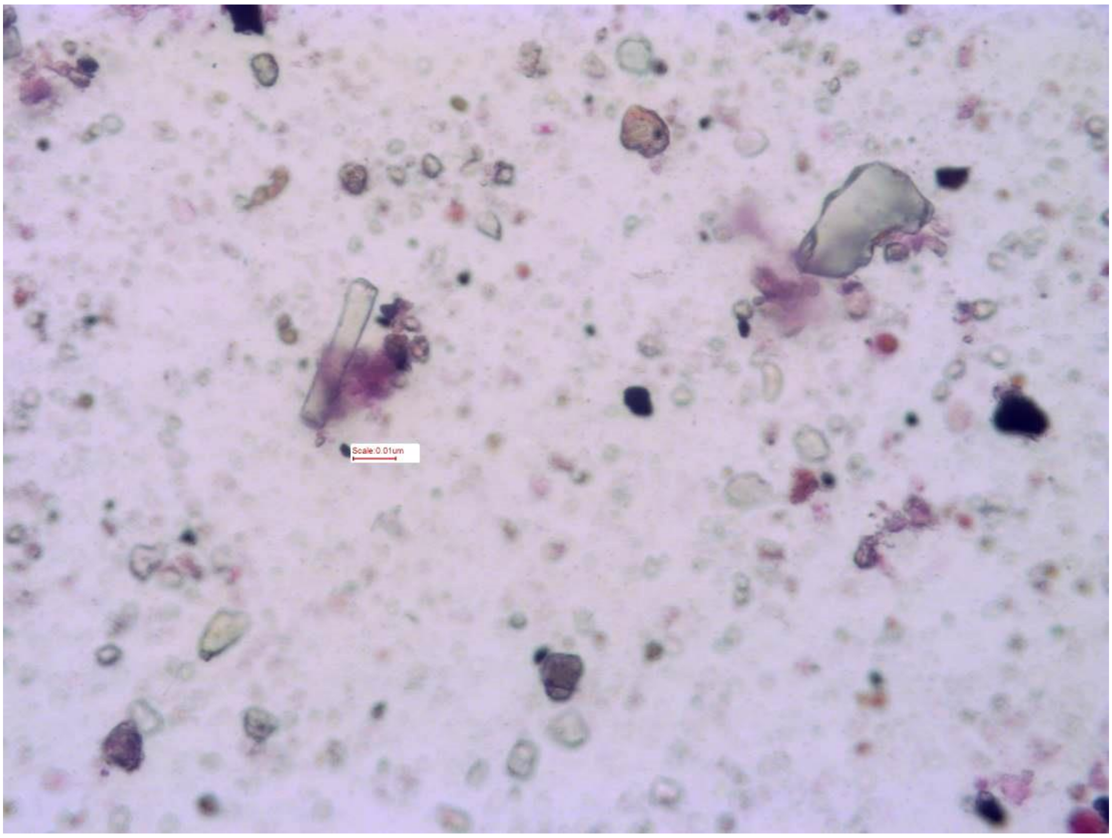

Plate 71: Groove 4, matrix mineral and rod-shaped phytolith control sample (400x pp).

Section 4: Overview of Results

Macroscopic and microscopic features associated with the four investigated grooves at WCP730 and the adjacent non-modified surfaces were noted to be similar. Six samples were extracted from across the bedrock, four from the reported modified ground surfaces (Navin Officer 2017, refer to Appendix 1) and two control samples from the non-modified western and eastern areas of the bedrock.

Residues highlighted, which included isolated plant fibres, isolated rod-shaped phytoliths, carbonised material and matrix minerals, were noted in similar densities and combinations across the six extractions. As such, these were not considered to relate to use and are inferred to be present due to environmental influences. Similarly, the densities of noted residues with the exception of matrix minerals was low and not indicative of a processing event. Features commonly associated with ground surfaces such as levelled surfaces, polish, striations, tribochemical wear and material within the interstitial spaces were not observed across the examined surfaces.

A summary of the macroscopic and microscopic assessment of each groove is presented in Tables 2 to 6. Assessments pertaining to the wider landscape context are the same for all grooves and are documented in Table 2.

Weathering and natural sandstone tessellations were observed to a similar degree across the host bedrock surfaces and the potential groove surfaces. These features were noted to be similar across all surfaces which suggests that purposeful modification such as grinding had not occurred. In addition damage associated with lichen growth was noted across the host surface and Grooves 1, 2 and 4.

Table 2: Reassessment of wider landscape context of WCP730.

Assessment Criteria	WCP730 Groove	Conclusion
Landscape setting - natural or modified	Very gentle ephemeral drainage area with colluvial slope wash, sand infill. Some distance away from higher order watercourse. The area is a modified landscape, that has been cleared.	Probable non-Aboriginal origin
Condition of host surface and nearby rocks	Weathered in areas, lichen growth, some sections recently exposed. Noted damage across high points similar to machinery impacts.	Probable non-Aboriginal origin
Previous landscape use	Clearing, grazing and previously cropped. It is possible that the sandstone bedrock was only exposed during historical times due to farming activities. Last wheat crop 30 years ago. Area known to have been worked with a heavy disc and inner scarifier spikes (Heesterman pers. comm. 2019).	Probable non-Aboriginal origin
Single or cluster	Single.	

Table 3: Reassessment of WCP730 Groove 1 against macroscopic and microscopic criteria.

Assessment Criteria	WCP730 Groove 1	Conclusion
Groove straight or curved*	Straight with curved overlay grooves	Possible Aboriginal origin
Groove surface compared with host surface and nearby rocks	Groove surface matrix is similar to host matrix, undulating, rough and irregular	Probable non-Aboriginal origin
Groove symmetrical around long axis*	Non-symmetrical and pan or fanning	Probable non-Aboriginal origin
Length x width x depth (centimetres)	16 x 6 x < 1cm; within the range of grinding grooves of Aboriginal origin	Probable non-Aboriginal origin due to the shallow depth
Topography of the groove's surface	Irregular	Probable non-Aboriginal origin
Shape of groove profile	Wide shallow U	Probable non-Aboriginal origin
Presence of tyne marks or animal scuffs	Present	Probable non-Aboriginal origin
Matrix grains of the ground surface compared with host surface and/or adjacent control surfaces – natural or modified and description*	Matrix grains similar to host surface, angular, irregular and non-polished.	Probable non-Aboriginal origin
Use-wear present or absent and description	Use-wear absent	Probable non-Aboriginal origin
Residue noted in interstitial spaces	Interstitial spaces empty	Probable non-Aboriginal origin
Residue extraction recommended	Extraction not required but taken	
Residues present	Minerals, carbonise material, isolated plant fibre and isolated rod-shaped phytolith.	Probable non-Aboriginal origin
Use-related residues or non-use related	Non-use-related	Probable non-Aboriginal origin

Table 4: Reassessment of WCP730 Groove 2 against macroscopic and microscopic criteria.

Assessment Criteria	WCP730 Groove 2	Conclusion
Groove straight or curved*	Straight	Possible Aboriginal origin
Groove surface compared with host surface and nearby rocks	Groove surface matrix is similar to host matrix, undulating, rough and irregular	Probable non-Aboriginal origin
Groove symmetrical around long axis*	Non-symmetrical and pan or fanning	Probable non-Aboriginal origin
Length x width x depth (centimetres)	15 x 6 x < 1cm; within the range of grinding grooves of Aboriginal origin	Probable non-Aboriginal origin due to the shallow depth
Topography of the groove's surface	Irregular	Probable non-Aboriginal origin
Shape of groove profile	Wide shallow U	Probable non-Aboriginal origin
Presence of tyne marks or animal scuffs	Absent	Possible Aboriginal origin
Matrix grains of the ground surface compared with host surface and/or adjacent control surfaces – natural or modified and description*	Matrix grains similar to host surface, angular, irregular and non-polished. Some clusters of quartz grains.	Probable non-Aboriginal origin
Use-wear present or absent and description	Use-wear absent	Probable non-Aboriginal origin
Residue noted in interstitial spaces	Interstitial spaces empty	Probable non-Aboriginal origin
Residue extraction recommended	Extraction not required but taken	
Residues present	Minerals, carbonise material, isolated plant fibre and isolated rod-shaped phytolith.	Probable non-Aboriginal origin
Use-related residues or non-use related	Non-use-related	Probable non-Aboriginal origin

*fundamental criteria as discussed in Section 4.7.

Table 5: Reassessment of WCP730 Groove 3 against macroscopic and microscopic criteria.

Assessment Criteria	WCP730 Groove 3	Conclusion
Groove straight or curved*	Straight	Possible Aboriginal origin
Groove surface compared with host surface and nearby rocks	Groove surface matrix is similar to host matrix, undulating, rough and irregular and sandstone tessellations observed.	Probable non-Aboriginal origin
Groove symmetrical around long axis*	Non-symmetrical	Probable non-Aboriginal origin
Length x width x depth (centimetres)	13 x 10 x < 1cm; outside the range of grinding grooves of Aboriginal origin	Probable non-Aboriginal origin due to the shallow depth
Topography of the groove’s surface	Irregular	Probable non-Aboriginal origin
Shape of groove profile	Wide shallow U	Probable non-Aboriginal origin
Presence of tyne marks or animal scuffs	Absent	Possible Aboriginal origin
Matrix grains of the ground surface compared with host surface and/or adjacent control surfaces – natural or modified and description*	Matrix grains similar to host surface, angular, irregular and non-polished.	Probable non-Aboriginal origin
Use-wear present or absent and description	Use-wear absent	Probable non-Aboriginal origin
Residue noted in interstitial spaces	Interstitial spaces empty	Probable non-Aboriginal origin
Residue extraction recommended	Extraction not required but taken	
Residues present	Minerals, carbonise material, isolated plant fibre, isolated rod-shaped phytolith.	Probable non-Aboriginal origin
Use-related residues or non-use related	Non-use-related	Probable non-Aboriginal origin

Table 6: Reassessment of WCP730 Groove 4 against macroscopic and microscopic criteria.

Assessment Criteria	WCP730 Groove 4	Conclusion
Groove straight or curved*	Straight	Possible Aboriginal origin
Groove surface compared with host surface and nearby rocks	Groove surface matrix is similar to host matrix, undulating, rough and irregular and sandstone tessellations observed.	Probable non-Aboriginal origin
Groove symmetrical around long axis*	Non-symmetrical	Probable non-Aboriginal origin
Length x width x depth (centimetres)	10 x 4 x < 1cm; within the range of grinding grooves of Aboriginal origin	Probable non-Aboriginal origin due to the shallow depth
Topography of the groove’s surface	Irregular	Probable non-Aboriginal origin
Shape of groove profile	Shallow U	Possible Aboriginal origin
Presence of tyne marks or animal scuffs	Absent	Possible Aboriginal origin
Matrix grains of the ground surface compared with host surface and/or adjacent control surfaces – natural or modified and description*	Matrix grains similar to host surface, angular, irregular and non-polished.	Probable non-Aboriginal origin
Use-wear present or absent and description	Use-wear absent	Probable non-Aboriginal origin
Residue noted in interstitial spaces	Interstitial spaces empty	Probable non-Aboriginal origin
Residue extraction recommended	Extraction not required but taken	
Residues present	Minerals, carbonise material, isolated plant fibre, isolated rod-shaped phytolith.	Probable non-Aboriginal origin
Use-related residues or non-use related	Non-use-related	Probable non-Aboriginal origin

*fundamental criteria as discussed in Section 4.7.

5. SYNTHESIS

South East Archaeology was engaged by WCPL to reassess the reported grinding groove location, WCP730, within Pit 5 South East of the Wilpinjong Mine. WCP730 had been recorded by Navin Officer Heritage Consultants in 2017 during a pre-clearance heritage survey within this location.

Multiple independent lines of evidence were used to re-examine the *in-situ* surfaces previously reported to be Aboriginal grooves. These included contextual observations, macroscopic assessments and microscopic analysis using low and high powered microscopy, and residue analysis. A flow chart assessment developed by In The Groove Analysis (refer to Figures 6 and 7) was utilised to assist with establishing whether the reported groove features were of Aboriginal origin, or originated from natural weathering, erosion, animal activity or other non-Aboriginal human activity (for example, in association with plough or tyne marks, dozer tracks or cart wheel marks).

The available evidence strongly supports the conclusion that the reported grooves at WCP730 are not of Aboriginal origin and are not associated with Aboriginal occupation. Rather, they relate to previous farming practices (probably including the use of a heavy disc plough with inner sclarifier spikes) and natural erosion and weathering processes.

Given the conclusion that the origin of the grooves reported at WCP730 is not related to Aboriginal occupation, the primary recommendations are that:

1) WCP730 should be removed from the OEH AHIMS and managed on the basis that this is not a feature of relevance to Aboriginal occupation of the locality of the Wilpinjong Mine; and

2) Copies of this report should be provided to the OEH and made available to the Registered Aboriginal Parties for the Wilpinjong Mine.

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ACKNOWLEDGEMENTS

The consultant wishes to acknowledge the assistance of the following people:

- James Heesterman, Clark Potter, Ian Flood, Kieren Bennetts and staff, WCPL.

DISCLAIMER

The information contained within this report is based on sources believed to be reliable. Every effort has been made to ensure accuracy by using the best possible data and standards available. The accuracy of information generated during the course of this field investigation is the responsibility of the consultant.

However, as no independent verification is necessarily available, South East Archaeology provides no guarantee that the base data (eg. the OEH AHIMS) or information from informants (obtained in previous studies or during the course of this investigation) is necessarily correct, and accepts no responsibility for any resultant errors contained therein and any damage or loss which may follow to any person or party. Nevertheless, this study has been completed to the highest professional standards.

APPENDIX 1: Previous Reported Grinding Groove Location Description (Navin Officer 2017)

Sites Recorded in the Current Assessment

Three new sites were found during the current assessment. These sites were a grinding groove and two isolated finds. These sites were designated WCP708, WCP730, WCP713

WCP730

GDA (Zone 55) 767884.6416637

WCP730 is a grinding groove located on a valley floor at the lowest point of an east facing slope (Figure 42). The location has an open aspect with a flat gradient. The four grooves are on an exposed boulder surface in sandstone.

The set of grinding grooves oriented east to west, north east to east south east. The eastern end is recently exposed and has moss removal with the surface patinated by lichens. The rock is bedded, and the grooves have natural weather and has been exploited by grinding. The extent of the outcrop including the groove is 0.68 x 0.24 metres encompassing a total site area of $2m^2$ (Figures 43 and 44).

The ground surface disturbance consisted of vehicle movement and stock damage. The exposure incidence was 30% with 80% visibility within exposures.

The individual grooves were around 150 x 100 millimetres (Figure 50 and 51)

Figure 42 Grinding Groove location facing north

Figure 42 grinding grooves facing north

Figure 43 grinding grooves facing north

Wilpinjong Coal Mine October Clearance Areas
Aboriginal Cultural Heritage Clearance Works *October 2017* *66*

Navin Officer Heritage Consultants Pty Ltd

Wilpinjong Coal Mine

Preliminary Report on excavations at WCP118 and 119

Report to Wilpinjong Coal Mine Pty Ltd

March 2019

Updated May 2019

Incorporating Addendum on the Archaeological Salvage and Community Recovery of Additional Cultural Material

Document control

Project no.:	190064
Project client:	Wilpinjong Coal
Document description:	Updated preliminary report on archaeological salvage and site clearance
Project Manager:	Nicola Hayes
Authors:	Susan McIntyre-Tamwoy and Tessa Bryant.
Internal review:	Susan McIntyre-Tamwoy
Document status:	Updated 9th May 2019
Local Government Area:	Mid-Western Region LGA

Document revision status

Author	**Revision number**	**Internal review**	**Date issued**
SMcIntyre-Tamwoy	V1	Nicola Hayes	
SMcIntyre-Tamwoy	V2	Nicola Hayes	15/03/2019
Tessa Bryant and SMcIntyre-Tamwoy	V3	Updated with addendum covering April 2019 field work	09/05/2019

Cover photographs: NOHC Field Photo WCP118 2018

Executive Summary

The Wilpinjong Coal Project (the Project) is located approximately 40 kilometres north-east of Mudgee, near the village of Wollar within the Mid-West Regional local government area, in central New South Wales. The Project consists of an open cut mining operation, together with the operation of a Coal Handling and Preparation Plant (CHPP); raw and product handling facilities; and rail and train loading infrastructure.

This report is an interim report pending the full analysis of archaeological material recovered during the salvage exaction at WCP118 and 119. Salvage work was undertaken in December 2018 and a brief interim report prepared for Wilpinjong Coal Pty Ltd in March 2019 that summarised the work undertaken, and issues raised by the Aboriginal community representatives. After some discussion, and taking into account the disturbed nature of the deposits at the site, as well as the number and variety of artefacts recovered, it was agreed between all parties that 3 days of additional excavation would be undertaken to recover Aboriginal cultural material particularly from the area around and immediately outside the dripline of WCP118. That work was completed in April 2019.

In addition, a special topsoil recovery protocol was agreed to which recognised that the area outside the shelter was likely to contain Aboriginal artefacts. The recovered soil will be stockpiled locally as indicated in this report so that it can be redistributed across the area after completion of mining and rehabilitation.
Additional cultural heritage work will all continue off site, including:

- Detailed analysis of the artefacts recovered during the salvage program and
- Preparation of a plain English report detailing the results of the analysis, and
- Preparation of OEH Site Cards as required.

Therefore, given all the above and subject to the topsoil protocol being actioned the area is cleared for development works.

Contents

1.Introduction

This current report updates the preliminary report provided in March 2019 that summarised the field work undertaken in the archaeological salvage work carried out at WCP118 and 119 in December 2018. That report was provided to facilitate decision-making regarding the area occupied by WCP 118/119 study area for this proposal is defined as sites WCP118/119. It acknowledged that the Aboriginal representatives had requested the opportunity to salvage additional artefacts from the remaining deposits. This current report replicates the March 2019 interim report with an addendum that documents the work undertaken in April 2019 to recover additional artefacts at the request of the Aboriginal community representatives.

As all analysis and reporting now continues off site, this report concludes that, subject to the topsoil protocol being actioned, the area is now cleared for development works.

1.2 Rationale for the field work carried out in December 2018

Surface clearance, subsurface excavation and salvage was undertaken within the defined areas of these sites and a further test pit was excavated at WCP120 (although this was not required by the ACHMP. Detailed analysis of the material excavated is still being undertaken and a detailed excavation report will be provided once this has been completed.

Section 5.1.8 of the ACHMP identified a requirement to undertake surface collection and salvage excavations within WCP 118 / WCP 119. Wet sieving was specified at both locations.

Works carried out were consistent with:

- The current Wilpinjong Coal Mine – Aboriginal Cultural Heritage Management Plan (ACHMP);
- Investigation and report writing standards outlined by the NSW Office of Environment and Heritage (OEH) [this is ongoing as final report will be provided once analysis of excavated material is completes]; and
- Standards and protocols defined in the 'Burra Charter' (Australia ICOMOS).

The work comprised the following components:

- On-going and continuous consultation with Wilpinjong Coal
- A review of the following:
    - relevant previous cultural heritage assessments,
    - the ACHMP,
    - relevant AHIMS and other Aboriginal site database information
- Aboriginal consultation steps such as drafting of notification letters, on-site advice during archaeological works and on-site discussion regarding the archeological process and the significance of materials found. Invitations were undertaken in compliance with the draft ACHMP.
- Salvage excavation program of WCP 118 / WCP 119 in accordance with the ACHMP.
- Preparation of archaeological report that documents the results of the investigation inclusive of site assessment, any salvage actions conducted, and any recommendations for further impact mitigation measures, if and as necessary prior to clearance. [Final report pending detailed artefact analysis].
- Preparation of a plain English report. A succinct plain English report will be prepared which presents a summary of the results of the excavation program. The intended audience for this report is the registered Aboriginal stakeholder community.
- Preparation of OEH Site Cards if and as required.

1.3 Field team

The field team included NOHC archaeologist's Dr Susan McIntyre-Tamwoy, Mr. Adrian Cressey, Mr. Joel Mason, Dr Kelvin Officer, Ms. Jasmine Fenyvesi and Dr Tessa Bryant. Not all of the team were present for the entire field work however, Dr McIntyre-Tamwoy was present throughout the field season. She also prepared this interim report.

The field team included Aboriginal community representatives as follows: Mr. Larry Foley, Mr. Brad Bliss, Ms. Coral Williams, Ms. Melissa Hartwell, Mr. Larry Flick and Mr. Steven Flick.

Ms. Gail Ratcliffe Aboriginal, community Liaison Officer at Peabody's Wilpinjong Mine also participated in field work on some days.

Mr. Clark Potter was the Peabody Resources project management and attended site on all but the last 3 days when Mr. James Heesterman was on hand in his place.

1.4 Sites salvaged and recorded in December

Field investigations of this site complex were carried out from the 3rd December 2018- 20th December 2018 included:

- Salvage excavation of the shelters labelled 118 and 119 and recording of 3 other boulder shelters two of which featured water storage cavities or small 'wells' in them.
- Recording and excavation of a test pit in WCP 120 and;
- Recording of sites WCP116 and 117.

2.0 Description of the shelters/boulder overhangs

2.1 WCP118

One of the most significant issues affecting the outcome of the salvage was that site WCP118 had been partially excavated by a combination of wombats and persons unknown at some point in the period between when the site was first recorded in 2002 and when this excavation took place in December 2018. On the team's arrival it was clear that several large wombat burrows had caused considerable disturbance through the remaining deposits around the dripline. It is estimated from the dimensions of the visible cavity in the shelter floor at the commencement of the archaeological excavation, that through the combination of past animal and clean-up activity at least 16.2 cubic metres of deposit was removed, at a point prior to the current excavation, from the 'floor' of the shelter; a small amount of it appears to have been redeposited at the dripline of the shelter. Disturbance to remaining deposit in the dripline and immediately outside the shelter is ongoing due to 3 active wombat burrows and a goanna burrow[1]. **Figures 1 and 2** show the site recorded as WCP118 and the debris that was stacked in the rock shelter in 2002. In **Figure 2**, it can be seen that there is already a cavity under the building material stacked in the rock shelter which demonstrates that even then the deposit in this site was disturbed. It is presumed that when this debris was removed at some time in the past, it may have been done using a back hoe or similar. Some distinctive elements of debris seen on the surface in the Figure 2 were found buried during the current excavation suggesting some turn over and compression of parts of the disturbed deposit.

2.2 WCP119

The other side of the tor is characterized by another small, tunnel-like shelter recorded in 2002 as WCP119. Note the existing wombat burrow just outside the overhang the top of which is just visible in Figure 4. That site remained substantially unchanged in appearance from its recording in 2002 except that at commencement of our field work in 2018 there appeared to have been recent animal activity (possibly wild dog) inside the shelter itself as evidenced by recent unconsolidated soil outside the entrance cast out from deeper in the cavity and a long dead wallaby found deep inside.

2.3. WCP120,116 and 117

These were all separate sandstone tors and remained unchanged from the original recording. The ACHMP for the Wilpinjong mine allows for these sites to be recorded and destroyed without excavation.

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[1] Indeed, during the excavation the goanna re-excavated sections of his burrow entrance overnight that had collapsed due to our excavations.

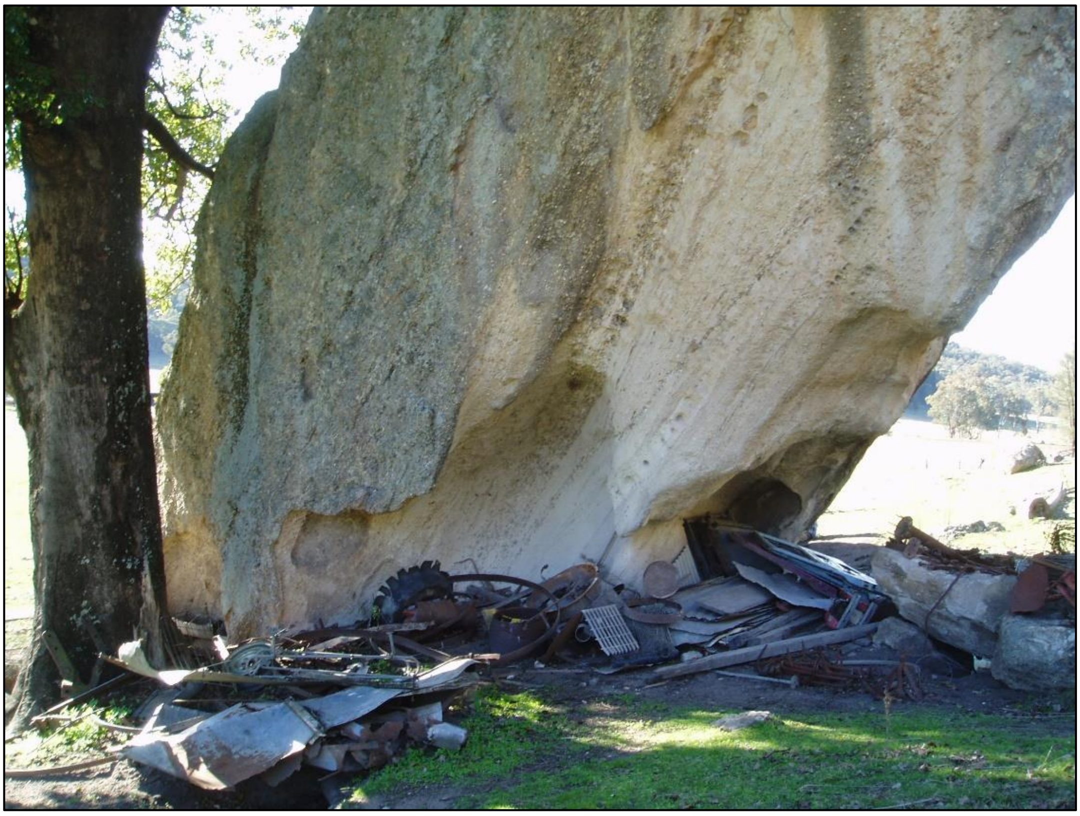

Figure 1 The sandstone tor that forms the shelter WCP118. This view faces the small scooped overhang in the foreground, (excavated as 118a) and the larger shelter floor area of WCP118 facing the right-hand side of photo

Figure 2 The sandstone overhang recorded as WCP118 looking front on when it was first recorded. Note a large cavity possibly a wombat burrow already existed under a large amount of debris that was stored in the shelter

Figure 3 WCP118 as it appeared at the start of the 2018 salvage excavation – nearly all the internal floor area has been already dug out. In the background on the left of the phots is WCP120.

Figure 4: WCP 119 as recorded in 2002

4.0 Fieldwork 2018

4.1 Salvage of visible surface artefacts

All visible artefacts on the surface in the project area as shown in the boundary in **Figure 9** were marked with survey flags, then individually mapped with the total station, labelled and bagged. While there are a few outliers such as in front of 116/117 and 120 most of the artefacts cluster heavily in front of the openings of WCP118 and 119, confirming these two shelters as a focus of cultural activity. Given the disturbance within 118 it is almost certain that some of the artefacts on the surface are actually from the original deposits within the shelter. It is easy to envisage if one looks at the slightly mounded area in front of 118 visible in **Figure 3.** Therefore, one must consider that the surface artefacts are possibly a mixture of *insitu* and redeposited artefacts.

4.2 WCP 118

For purposes of the practical excavation of the deposits a distinction was made between the main overhang and a small overhang at the southern end of the tor which had a small, dry, level floor area and which we referred to as 118a. Given the visible disturbance to the deposits of 118 it was hoped that 118a would prove to be undisturbed. A 50 x50 cm pit was excavated in this area but began to break through to a wombat burrow at 50cm depth so it was extended by excavating an adjoining 50x 50cm pit to make a 1.0m x50cm trench. However, at 30cm this broke through to a large wombat burrow and it became clear that this was going to extend across the entire area.

A base line was laid out in 118 along the length of the shelter. The placement of excavation trenches was aimed at identifying any undisturbed cultural deposits. For this reason, a pit was placed against the back wall where deposits appeared to be compacted and although almost a metre below the original floor level, it was thought due to the relative compaction of the deposit that this might potentially be remnant subsurface cultural deposit. This excavation pit was expanded several times, but the potential remnant deposit did not extend far from the wall. It was excavated to sterile deposits at the base of the tor. The original pit was extended in a north-north-westerly direction (Pit 2) along the back-wall but further extension was deemed pointless once a large buried tyre extending from just below the current surface to the bottom of pit 2 section was encountered in the section of the extended trench. Both Pits 1 and 2 were extend slightly to remove deposit between the tor wall and the pits. Adjacent pits moving towards the center of the floor (Pits 2east and 3east) were found to be disturbed with sheet metal at the base.

A 50x50cm pit was excavated between the wall and the baseline at the northwest end of the rock shelter. However, it quickly became evident that this area was disturbed with steel cable that wound through the floor deposit coming to the surface towards the dripline, a plastic hose and one end of a slab of wood (from a slab hut). The latter was buried and extended across the length of the shelter appearing at a deeper level in Pits 2 east and 3 east.

At the southern end of the rock shelter there was an unexcavated section of deposit. Unfortunately, it was undercut by several large wombat burrows. While this area was not totally weatherproof as was demonstrated after several days of rain later in the field season, it would provide shelter from light drizzle, wind and sunshine. A trench was situated here, positioned so as to hopefully avoid the wombat burrows. The location of the corner of trench A1 can be seen in **Figure 5** in the foreground, before bulk removal of the uneven cutting to the current floor of the shelter noted in **Figure 2.**

Another trench was excavated at the dripline of the rock shelter (FI see **Figure 6).** This proved to be disturbed for at least the top 40cm at which depth a large galvanized pipe was removed. Below this the deposit became increasing consolidated and appeared undisturbed. This pit was extended westward towards the shelter. To make excavation easier the wall (i.e. the edge of the cutting between the external ground level and the current floor of the shelter) between the shelter floor and pit E1 was removed in bulk 20cm spits to enable F1 and E1 to be excavated to a greater depth. It was assumed that this thin wall was disturbed as a large metal spike could be seen half buried and embedded in its base, however it proved to be consolidated and largely undisturbed. It appears that the disturbed material thrown outside the shelter during its pre-excavation disturbance has likely trickled down the exposed surface of the cut. A largely intact grindstone lying face down was recovered in spit 6 in E1 (at 30cm depth).

An animal burrow (possibly goanna-as we had seen one entering an adjacent burrow) ran along the northwestern wall through both E1 and F1. The soil in both these pits became increasing compacted with lots of natural shale like rock and hard cemented soil and a crow bar had to be used to break up the soil before it could be excavated. The combined trench formed by the wall removal and E 1 and F1 was excavated to a depth of 140cm to sterile deposit formed of compacted natural rock fall.

At the end of the excavation 3.0 m^3 had been systematically excavated by hand from the remaining deposit at WCP118. This included 0.88m^3 from 118a. This excavated material was sieved, and artefacts retrieved and bagged for analysis.

Figure 5 WCP 118 showing excavation of the narrow, potentially undisturbed deposits wedged against the rear rock face. Also visible is the disturbed pit in the North west end of the shelter

Figure 6 Commencing the excavation of Trench F1

Figure 7: two pits of 50x50cm were excavated in the small sheltered area recorded as 118a at the southern end of 118 in an attempt to find undisturbed deposit

4.3 WCP 119

This shelter is on the other face of the same tor as WCP118. It appeared to be in much the same condition as it was when first recorded in 2002 (see **Figure 4** and compare with **Figure 8**).

A base-line was laid out across the front of the shelter and extending on each side past the small tunnel like opening. Seventeen 50x50cm adjoining squares were marked off along this baseline and all but pits 8 and 7 which were in the area excavated by a wombat as the sloping entrance passage to its burrow were excavated initially to a depth of 5 cm to get a clear picture of what was happening across the baseline. Pits 15-17 cut into a large ant bed that was visible nearby on the surface and was subsequently abandoned. Pits 4,5, 6 and 9,10,11 were selected to excavate deeper. Pits 4, 5 and 6 were directly in front of the opening (see Figure 8) and 9,10 11 were on the other side of the depression excavated by the wombat.

Perpendicular to the base line 3 squares were marked out and excavated (18-20) numbered from the base line adjoining Pit 5 and heading into the cave like opening. These pits were excavated until they proved impassable due to roots from the large kurrajong tree growing alongside the tor and/or until they began to break through to the large wombat burrow. The deposits were characterised by a layer of soft silty deposits which has been kicked out from the cave by animals. Below this was a very compact undisturbed soil that contained artefacts and this in turn overlaid a natural sterile slightly yellower deposit. It is estimated that over all 1.4m^3 was excavated from this site by hand and sieved.

Figure 8 WCP119 after excavation

4.4 WCP 120

This rock shelter appeared unchanged from the time when it was originally surveyed and recorded. Like 118 it had apparently been used by the former farmer to store things in and there was a large timber beam that was firmly anchored into the deposit to retain whatever had been stored there. There was no requirement to excavate this rock shelter, however after discussion with the team including the Aboriginal representatives, we decided to excavate a 50x50cm square which would provide an insight as to whether this shelter played a significant part in this site complex. This pit was dug to a depth of 50cm when sterile deposit was reached.

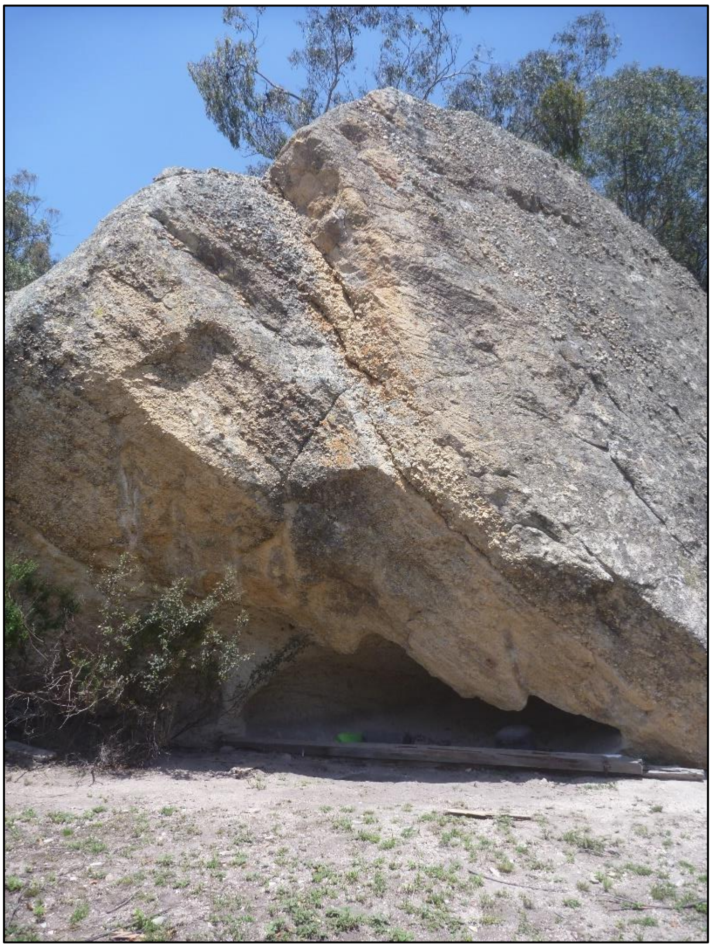

Figure 9 This photo taken at the start of the 2018 field work shows that the site recorded as WCP120 remained unchanged from the original recording in 2002. The wooden beam across the front of the shelter is still anchored in place with metal pegs.

4.5 WCP 116 and 117

These two Tors contained small depressions interpreted as providing temporary water sources. No excavations were carried out at these two tors. They were recorded. Following representations made to him by some of the Aboriginal representatives Clark Potter spoke to his colleagues in Peabody Energy and confirmed that these two components of the site complex would be protected and retained in their locations. Site drawings will be included in the final report.

Figure 10 Location of the boulder rock shelters and excavations pits

Figure 11 Surface artefacts individually recorded with the total station and bagged and labelled

5.0 Aboriginal Community Involvement and Issues

There were several issues raised by Aboriginal representatives during the field work. Not all of these were directly related to the cultural values or cultural significance of the site. On the 19th of December at the request of Clark Potter the team that was on site had a meeting under the Kurrajong tree. The purpose of the meeting was to enable the representatives present to articulate their concerns. The concerns raised varied in nature and short account of the meeting was written down and read back to the people present to ensure that they were happy that it was a true account of their expressions and concerns. That document was provided to Clark Potter by email as requested.

The issues raised are grouped here under the following headings:

- archaeological issues
- cultural values/significance concerns
- internal community organization issues
- working conditions/relations with Wilpinjong Mine

5.1 Archaeological issues

While none of the representatives are archaeologists, they have worked with archaeologists on many field projects in the local region. Several of the Aboriginal representatives are in constant contact with Peter Kuskie, the author of the current ACHMP. Despite many negative comments from the Aboriginal representatives about the requirements for archaeological work as laid out in the current ACHMP, by their own admission they discuss with Mr Kuskie what occurs at Wilpinjong and solicit his opinion and then relay these to the archaeologist on site as critiques covering issues such as trench placement, maximum areas to excavate, excavation methods, dating methods etc. While at one level there is no harm in such discussions or in suggesting different methods, it is important to remember that the reason that there are different methods and process available to archaeologists is precisely because these need to be adapted to the specifics of each site. For example, at WCP118 there are parts of the deposit that are irrefutably and visibly disturbed containing metal, glass, steel cable and building debris. In such circumstances it is nonsensical to remove that deposit in 5 cm spits.

Brad Bliss commented that "I have spoken to other site officers and other archaeologists who all say that regardless of tumultuous disturbance you need to dig through that to the cultural layers". He felt that we should expand the excavation further based on the number of artefacts found. In response to this I would point out that we did dig through to cultural layers and we continued to dig to the base of these at 118 for example in E1 and F1 and A1 and in 119 in pits 5, 18 and 19. It is unlikely that the full extent of the disturbance of the site was understood by those 'archaeologists' with which he discussed the site. For example, they were likely unaware that at least 16.2 m^3 of deposit had already been removed from the site before the excavation team arrived which meant that nearly the entirety of the shelter floor (i.e. the area protected from the elements where human activity is likely to have been focused) had been removed to a depth of over a metre. It is unlikely that they were aware the only undisturbed deposit at the site was located outside the dripline of the shelter. The general lesson here is that it is difficult to comment on an archaeological project without having access to specific data about the site.

Given the artefacts recovered on the surface (remembering many of these are likely redeposited from wombat excavations) and from the excavations, it is likely that there are many more buried artefacts especially immediately outside 118 and if time had allowed, we would have continued to try and recover artefacts from the undisturbed areas avoiding where possible the large animal burrows, however burrowing activity proved extensive. Despite placing our pits to try and maximize the recovery of undisturbed deposits all pits, even E1 and F1 (the least disturbed), had evidence of animal or mechanical disturbance at some point. The point of the archaeological salvage is to recover artefacts and other data form undisturbed contexts that can be analyzed to provide information on the Aboriginal occupation of the site. Unfortunately, the recovery of artefacts from disturbed contexts only, reduces the information that can be retrieved about how these artefacts were used and the social and cultural contexts of the people that occupied the site.

5.2 Cultural Values / Significance concerns

The representatives were very interested in the amount of archaeological material recovered and the range of artefacts, speculating that this would once have been an important cultural site. They expressed concern that not all artefacts will have been recovered in the salvage process and this is clearly correct.

Brad Bliss articulated this "It's our cultural heritage that is going to go and we have to save as much as we can. Even though it is disturbed there are some remnant pockets of cultural material and we just have to save as much as possible."

This concern is understandable, especially given the range and quantity of artefacts being recovered from this site that clearly suggest that it was once an important part of Aboriginal life. However, from an archaeological perspective the potential of the site to yield useful scientific data is severely limited by the disturbance of the deposits. NOHC is confident that the salvage excavation work undertaken at the site responded appropriately to the site and the pattern of disturbance that emerged. During the process we recovered approx. 2,532 artefacts, and soil samples for OSL dating and samples for bulk carbon dating if required. We collected data to allow the site complex to be accurately mapped. Given the level of disturbance at the site we believe the work undertaken to be sufficient to allow analysis of the site in so far as it is possible given the disturbance.

Subsequent to the completion of the work some Aboriginal representatives have stated that they believe that the excavations should be extended especially in the vicinity of E1 however, while this is likely to yield more artefacts and could possibly chance on undisturbed deposits which provide some more information about possible activity outside the shelter; there is no guarantee that this would chance on undisturbed deposits, it will not ensure that all artefacts are recovered, nor will it necessarily provide substantially more information on the nature of the occupation of the site or what occurred inside the shelter where the cultural deposits have been largely destroyed.

An associated concern raised by the Aboriginal representatives related to the timing of the excavation so close to Christmas and the timing constraints that this posed. They said the work should have been undertaken when the open area site clearance nearby occurred. In general, NOHC agrees that it is always beneficial to undertake investigations with a long lead time between the archaeological activity and the planned development to allow for contingencies that arise during the investigation. However, this is a matter outside NOHC control and as we are unaware of the particular mine planning circumstances around the decision about timing, this matter is best be discussed directly with the mine to achieve beneficial future outcomes. In relation to this particular site, NOHC notes that while the salvage excavation was undertaken under some time constraints posed by the looming Christmas break and advice that the mine would be starting work in this area in the new year, the time allocation for the excavation was extended by working over the weekend and into a third week of excavation and this enabled sufficient salvage of archaeological material.

In response to community concerns about salvage of unrecovered artefacts, Clark Potter suggested a localized topsoil protocol (see **Figure 18**) that allows for the full recovering of soil to a depth of 1.5 from a 12m radius around the center of the tor (particularly in that area in front of 118) and then to a depth of 50cm out to a maximum radius of 20m with a shallow scrape of the remaining area upslope to a line formed by 116/117/120. This topsoil he suggested would be stored locally as suggested in **Figure 12.** This will collect all of the artefacts that remain and allow for them to be replaced on site during rehabilitation. Of course, this process will not yield further archaeological information about the occupation of the site but will ensure artefacts are protected from destruction. The representatives indicated at the meeting that they would like to monitor this process. Should unusual or significant artefacts (such as axes, grindstones etc.) be noted during this process NOHC could assist with identification and detailed recording of them including analysis such as residue or use-wear analysis.

5.3 Internal community organization issues

The representatives complained that their organizations were not getting feedback on what was happening on site. Coral Williams suggested "The archaeologists should email the office of the RAP bodies once a week so that they are kept up to date by email." NOHC's response to this is that one of the key reasons for engaging community representatives is that they represent their organization and therefore this falls within their responsibility. The archaeologist's tasks do not always end with the daily sign-off as we have a certain amount of unpacking and sorting of finds bags and notes each day after we leave site. We would be loath to commit to taking on further reporting that is the responsibility of the Aboriginal representatives.

Brad commented that Melissa Hartwell had not given him any feedback before she left. However, as Melissa is an employee of his organization, this is clearly a matter for the organizations themselves to resolve as it is to do with their own efficiency and the briefing of their staff.

Since the field work there has been some discussion about a representative of NOHC attending the regular consultation meetings between the Aboriginal organizations and Peabody Energy to answer any questions and explain the archaeological work. We would be happy to do this, if it is agreed by the relevant parties.

5.4 Working conditions/relations with Peabody Energy

There were several issues raised at the meeting on the 19th that fall under this heading, including late finishes, chain of command issues and perceived safety issues. These are outlined below for further action if required by Peabody Energy.

5.4.1 Late Finishes

There were complaints that sign-off had been late on several days as our escort was late arriving and /or packing up was slow. They stated that it is in their contracts that it should be at 4pm. I pointed out that there were several days were work ceased early for various reason such as the weather, escort availability and the homeward travel time of outbound team members. On several days these factors resulted in sign off around 2 or 3pm. Some felt that there had been more times when they finished late. Over the life of the field program the balance was in fact that there had a number of early finishes.

Brad mentioned that it was a long day for some as they started earlier than others who arrived later. Part of the problem may be that some of the representatives turn up well before the allotted start time and spend that time catching up with various Peabody staff and while this no doubt makes for a long day, it is not a requirement of NOHC and is a matter for Peabody to address.

5.4.2 Chain of command

There were several comments that indicated that the RAPs were unhappy that Clark Potter did not agree with their concerns and there were comments that indicated that they found it more conducive to deal with Keiran Bennett, as noted in the comments from Gail who suggested that RAPs should by-pass Clark.

e.g. Brad: "Larry said there should be an executive meeting to discuss issues with Keiran and Clark". Gail: "Should be with Keiran, not Clark".

Coral: "Archs should do a weekly report and send it to Keiran Bennett, not Clark to email the RAPs about what is happening." Gail: "it has to be Keiran."

In response to the specifics of the comment above, Susan McIntyre-Tamwoy pointed out that the RAPs relationships with Wilpinjong Mine staff are likely to be different to NOHCs. Under our contractual arrangement our contact is Clark Potter and any reporting we do is via him.

This is clearly not an NOHC matter and our only comment is that from past experience we would suggest that Peabody Energy reinforces their desired project management chain for Aboriginal cultural heritage so that work arounds are minimized which will in turn provide greater certainty and transparency and avoid confusion.

5.4.3 Extra vehicle required on site

There was one occasion when thunder was predicted in the weather report and work had to stop due to mine safety protocols. Reflecting on this Brad expressed concern that normally with only one vehicle on site there was inadequate protection available from lightning strike. This is something to be aware of as there are often two vehicle loads of people and only the NOHC vehicle on site during the day, however, on the specific occasion in question Clark Potter had driven out to notify the team and so a second vehicle was available if needed.

6. Preliminary Findings

6.1 Dating

OSL samples were taken from site 118 and 119 and have been prepared for sending to the laboratory for processing. Depending on the results some other samples may be processed including bulk organic samples collected for possible C14 dating.

6.2 Artefact analysis

The analysis of the artefacts recovered from this site complex have not yet been analyzed and only preliminary artefact counts are available.

The excavations at rock shelter 118 resulted in the recovery of 1846 objects of which 1486 have been identified as Aboriginal objects based on a preliminary examination. These artefacts were manufactured from a range of raw materials including a large quantity of a green coloured IMT (indurated mudstone/tuff) material concentrated in spit 8 of pit E1 (**Figure 13),** with other pieces recovered from spits above and below and in adjacent pit F1 but in much lower densities. Other raw materials present include quartz, silcrete and chert. A large grinding stone was also recovered from pit E1 spit 6 **(Figure 14**). Also recovered from this rock shelter was an elongate retouched artefact that is a possible awl **(Figure 15**). Historic materials – particularly metal and glass were common in the upper parts of this deposit, with glass recovered from spit 8 in E1, the spit with the concentration of the green IMT artefacts. The presence of these historic elements indicates that there is a level of disturbance to the deposit.

Excavation at rock shelter 118A recovered 242 objects, 181 have been identified as Aboriginal objects based on a preliminary examination. From field observations there were a number of elongate and blade-shaped flakes recovered from this deposit. In the upper part of the deposit metal, bone and ceramic fragments were found and a large animal hole was adjacent to this pit.

A total of 967 objects were recovered from rock shelter 119, with 680 of these identified as Aboriginal objects based on a preliminary examination. Glass, animal bone and metal were found within pits in 119 to approximately spit 6.

The final rock shelter investigated was 120, upslope of the other shelters. A total of 44 objects were recovered from the test pit, with 18 of these preliminarily identified as Aboriginal objects.

In addition to the rock shelter excavated material, approximately 230 Aboriginal objects were also collected from the surface, mostly around 118 and 119 including several axes (**Figure 16** and **Figure 17**).

In terms of the recording and analysis, the gravels that were brought back to the lab have all been examined and all artefacts extracted. A preliminary count has been made of the entire assemblage and the artefacts from excavation pit F1, 118 was been recorded in detail. The artefacts from the remaining excavation pits within 118 will be recorded next.

6.3 Unrecovered artefacts

Since the field work was completed a subsequent site visit was held to discuss the proposed topsoil protocol methodology to ensure that any unrecovered artefacts are salvaged from destruction and stored on site. This suggestion was made by Clark Potter in response to the finds made at the site and the aspirations voiced by the community representatives that they would like to maximize the retention of artefacts beyond those recovered by the archaeological program. The intent is to salvage soil and place it on a nearby storage site above the current tree-line as indicated in **Figure 12**. A sediment fence will be constructed around this area and the stockpiled soil placed back over the site as part of rehabilitation works. The RAPs have indicated that they would like to monitor this process and NOHC has indicated that should unusual and/or significant artefacts be identified during this process such as axes or grindstones we would be able to assist with identification, recording and specific analysis such as residue or use-wear analysis to maximize retrieval of cultural information.

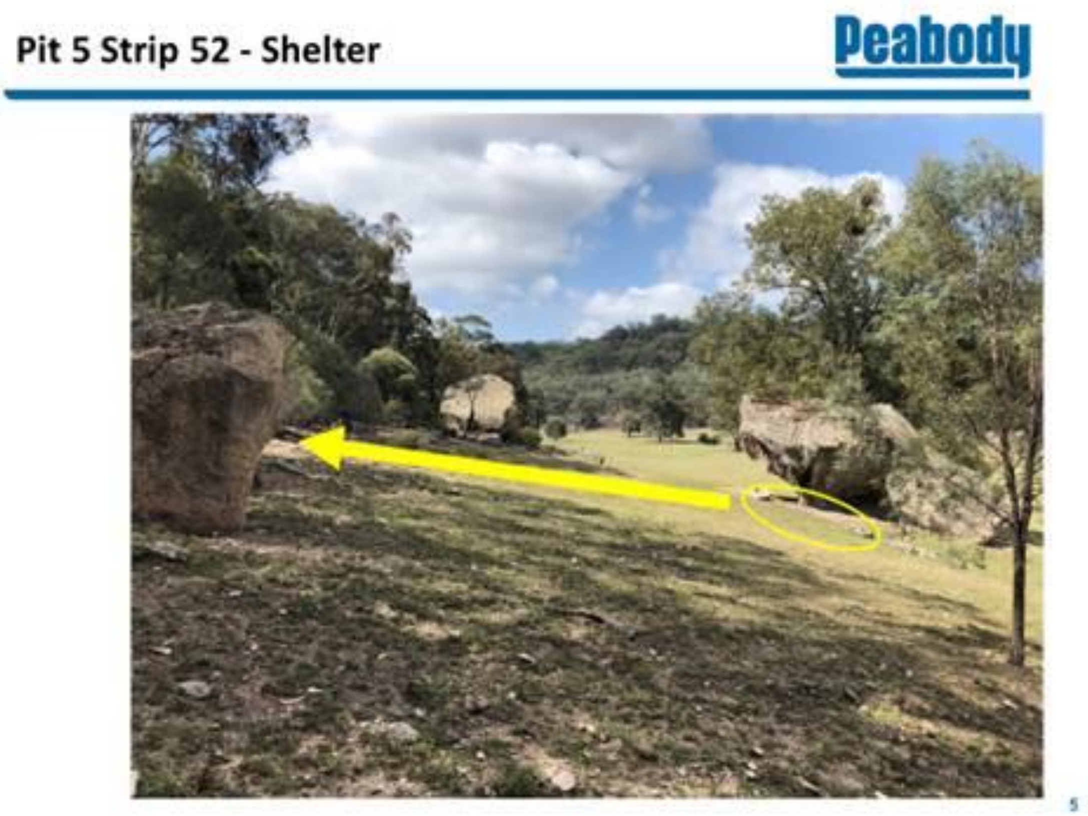

Figure 12 This is the indicative suggestion from Peabody to address the retention of artefacts through a localised topsoil management process.

Figure 13 Green IMT artefacts from Rock shelter 118, pit E1 spit 8.

Figure 14 Grindstone from Rock shelter 118, E1 spit 6

Figure 15 . Possible awl from Rock shelter 118, pit A1.

Figure 16 . Axe WCP0140 from surface collection.

Figure 17 Axe WCP0105 from surface collection

7.0 Further work

The detailed artefact analysis remains to be completed as does the OSL dating. Based on the outcomes there may be further samples that we have taken that we would recommend be analysed (e.g. bulk carbon dating and/or use-wear analysis). The detailed plans and drawings of the shelters and the site complex need to be converted from the field recordings to final form.

All of this information will be brought together in a final report that meets required professional standards.

In relation to artefacts that remain unrecovered by this archaeological salvage program we note that the proposed localized topsoil recovery program will collect and store these in a stockpile on site for later repatriation to the site after rehabilitation.

Figure 18 Proposed topsoil recovering to maximise retention of artefacts [NB in final report we will select better colour differentiation between 12m and 20m radius]

Addendum Report on Cultural Salvage excavation works undertaken at WCP118, 2019.

A1.1 Background

During the surface collection and salvage excavations at WCP118, 2.10m^3 was excavated by hand from the deposit and a total of 1486 Aboriginal objects were recovered based on preliminary examinations. Discussions between Peabody and the Aboriginal stakeholders following the issuing of an interim report by NOHC (March 2019) led to Peabody Energy agreeing to give the Aboriginal stakeholders a further three days of work at the rock shelter to undertake cultural salvage and retrieve more artefacts from the deposit. This was consistent with an option suggested in the interim report to undertake a limited quantity of further controlled excavation focusing on the area of the dripline and beyond, extending from excavation pit F1 to the northwest and east and then adopt a topsoil protocol as indicated in section 6.3 of the report to which this addendum is attached (see also Figures 12 and 18).

This report is prepared as an addendum to the preliminary report in March 2019. Analysis of the artefacts recovered is yet to be completed.

A1.2 Field team

The field team included NOHC archaeologist's Dr Tessa Bryant, Mr Ben Sybert and Mr Murray Holland. The field team included Aboriginal community representatives as follows: Mr Larry Foley, Mr Brad Bliss, Mr Larry Flick, Ms Tayla Pennell, Mr Troy <>. Fieldwork was undertaken from the 14^{th} to the 18^{th} of April 2019. Mr Clark Potter was the Peabody Energy project manager.

A1.3 Cultural Salvage

The further excavation works were regarded as a form of cultural salvage and the areas that were selected for excavation were determined by consultation with the Aboriginal community representatives present on site. The Aboriginal community representatives, particularly Mr. Brad Bliss and Mr. Larry Foley wished to remove the top 50cm as bulk to get past the layers of highest disturbance and into the deposit with the highest numbers of artefacts as found during the previous excavation. This material was stockpiled downslope of the shelter (**Figure A19**). Artefacts within this material were haphazardly collected but this material was not sieved. The stockpile will be relocated as part of the removal and storage of the topsoil.

Initially two 1x1m test pits were added adjacent to the test pits F1 and E1, test pits 100 and 101 (**Figure A20**). Test pit 102 was put in on top of a sandstone ledge between test pits Y1 and A1 to investigate whether the sandstone might have grinding grooves (**Figure A21**). Test pit 103 was placed behind test pit 101. Test pit 104 was added adjacent to 100 to further examine the extent of the deposit. Two 50x50cm test pits were placed at the edge of the mound ~1.5m to the north of the main excavation area. These test pits were designed to test the extent of the main concertation of artefacts and check that the topsoil protocol will capture the majority of the artefact bearing deposit. Test pits were excavated in 10cm spits by hand.

Approximately a further 2.7m^3 was excavated and sieved during the cultural salvage works. Based on the field counts a total of 2319 Aboriginal objects were recovered from the cultural salvage works (**Table A1**). Based on field observations these artefacts do not substantially alter the archaeological signature of the site. It remains a site with a high density of artefacts within a deposit that has differing levels of previous disturbance from a combination of factors such as animal activity and previous machine activity. Glass and metal objects were recovered intermittently from the test pits including in association with some of the spits with the highest number of recovered artefacts.

Table A1. Summary of test pits excavated during cultural salvage works at WCP118.

Test Pit	Number of spits	Artefact count
100	8	740
101	8	513
102	4	147
103	1	129
104	6	650
105*	4	16
106*	4	3
Surface and Bulk		121
Total	-	2319

* These test pits were 0.5m x.0.5m

Figure A19 Cultural salvage works at WCP118. The stockpile of soil from the top ~50cm of 100 and 101 and the front of the mound is evident in the front left of the photo.

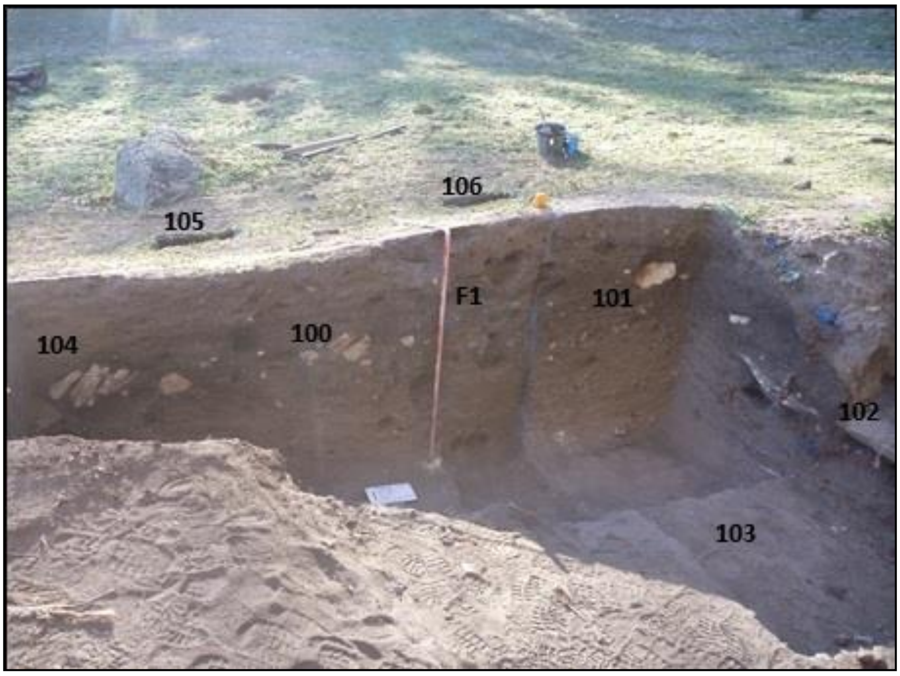

Figure A20 The finished excavation. Blue paint indicates the original test pit F1 (to the right of the tape). From left to right the test pits were 104, 100, F1, 101 and then coming towards the shelter 103 behind 104 and 102 on top of the rock shelf visible in the far right. The two smaller 50x50cm test pits at the edge of the mound are (from left to right) 105 and 106.

Figure A21 Test pit 102 to investigate the sandstone shelf for signs of grinding grooves.

A1.4 Further Work

The excavation report and analysis (OSL dating and detailed lithics analysis) from the December 2018 field work is still in progress. The level of analysis and reporting required for the material recovered during the additional cultural salvage works is yet to be determined. Analysis of the lithic material recovered from the cultural salvage phase was discussed on site with the Aboriginal community representatives expressing an interest in having these recorded to the same level as the previously recovered assemblage.

Topsoil recovery protocol

In terms of the field work the remaining task to be undertaken is to follow the topsoil protocol (Figure 18 interim report):

> Machine recovery of soil to a depth of 1.5 from a 12m radius around the center of the tor and then to a depth of 50cm out to a maximum radius of 20m with a shallow scrape of the remaining area upslope to a line formed by 116/117/120. This topsoil to be stored locally as suggested in **Figure 12** (interim report)**.** This will collect all the artefacts that remain and allow for them to be replaced on site during rehabilitation.

The topsoil that was removed in bulk during the cultural salvage works would be captured within this removal.

The excavation of the small test pits 105 and 106 indicate that the artefact density was concentrated within the mound and towards the rock shelter within WCP118. These results indicate that the topsoil protocol area, from the surface to a depth of 1.5m and to a radius of 12m from the tor, will ensure recovery of the majority of the artefact bearing deposit. The addition shallower recovery of the remainder of a radius extending to 20 upslope of shelter 118 will capture remaining artefacts that might exist outside the area of main concentration.

Clearance to proceed with Development

The work carried out at WCP118 and 119 is consistent with Section 5.1.8 of the ACHMP which identified a requirement to undertake surface collection and salvage excavations within WCP 118 / WCP 119.

During the field work Wilpinjong Coal has committed to a special topsoil recovery protocol as outlined in this report, to be carried out at the commencement of their work in this area.

Additional cultural heritage work will all continue off site, including:

- Detailed analysis of the artefacts recovered during the salvage program and
- Preparation of a plain English report detailing the results of the analysis, and
- Preparation of OEH Site Cards as required.

Therefore, given all the above and subject to the topsoil protocol being actioned the area is cleared for development works.